Title: Electrical Operational &

**Maintenance Manual** 

Project: NC National Guard TAC OPS

Date: <u>9/17/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

# **Table of Contents**

Gear

**UPS** 

**Generator & ATS** 

**Fuel System** 

HVAC: AC-1 & CU-1 HVAC: Insulation

**HVAC: Test Balance** 

**HVAC: Computer Room Unit** 

**HVAC: Roof Top Unit HVAC: Air Distribution** 

Warranties

# KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

# Gear

# **NC National Guard TAC OPS**

KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/5/14</u>

Engineer: Bass, Nixon, & Kennedy

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DHyatt@kadconstruction.com

Supplier: Eck Supply

Manufacturer: Square D

**Specification:** Gear

Submittal #: 1

X'APPROVED """
"""APPROVED AS NOTED
"""REVISE AND RESUBMIT



REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY ERRORS THEREIN OR FOR FURNISHING THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC.

DATE 2-24-14 BY Nixon

KAD Construction, Inc.						
X	Approved					
	Approved as noted					
	Revised & Resubmit					
Signature:	Dan Hyatt					
Title:	Owner					
Date:	Feb 05, 2014					

#### JOB:

# **National Guard**

CONTRACTOR:

# **KAD Construction**

LOCATION:

Raleigh, N.C.

# Gear Submittal

Submitted by: Eck Supply Raleigh 2539 Noblin Road Suite 107 Raleigh, N.C. 27604 (919) 876-3650

REV	DESCRIPTION	BY	DATE	_	 	/	//	′
_			//	-	 	/	//	

CKT NO	ACCESSORIES	TYPE	RATING AMP/P				RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1		QOB	20/1	<b>⊸</b> ⊸	<del> </del>	+	20/1	QOB		2
3		QOB	20/1	⊸´	╁	<del> </del> ∕-∘	20/1	QOB		4
5		QOB	20/1	⊸ં ે⊸	+ +	<b>∳</b> ⊸ં∂ે	20/1	QOB		6
7		QOB	20/1	⊸´	<b>♦</b> ├	<del> </del> ∕-`	20/1	QOB		8
9		QOB	20/1	⊸´	╁	+	20/1	QOB		10
11		QOB	20/1-	⊸´	+	<b>∳</b> ⊸∕	20/1	QOB		12
13		QOB	20/1	€`ò	<b>♦</b>	+	20/1	QOB		14
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17		QOB	20/1	⊸ _ ⊸	+ +	<b>♦</b> —○	20/1	QOB		18
19		QOB	20/1	<b>⊸</b> ⊶	<b>♦</b> ──	<del> </del>	20/1	QOB		20
21		QOB	20/1	<b>⊸</b> _⊸	╀┢╌	<del> </del>	20/1	QOB		22
23		QOB	20/1	<b>⊸</b> _ ⊸	+	<b>•</b> • •	20/1	QOB		24
25		QOB	20/1	<b>⊸</b> ⊸	┥┈	+	20/1	QOB		26
27		QOB	20/1	<b>⊸</b> —	╀┢╌	<del> </del>	20/1	QOB		28
29		QOB	20/1	<b>⊸</b> _⊸	+	<b>∳</b> ⊸ੰ∘	20/1	QOB		30
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33		QOB	20/1	<b>⊸</b> ⊸	┷	+	20/1	QOB		34
35		QOB	20/1	<b>⊸</b> ⊶		<b>∳</b> ⊸ੰ∘	20/1	QOB		36
37		QOB	20/1	<b>⊸</b> _⊸	<b>♦</b> ──	<b>├</b> ~~	20/1	QOB		38
39		QOB	20/1	<b>⊸</b> ⊶	<b>├</b>	<del> </del>	20/1	QOB		40
41		QOB	20/1	<b>⊸</b> ⊶		lacktriangle	20/1	QOB		42
			S	• QB			SN			

# PHYSICAL DATA

UL Service Entrance ENCLOSURE Type 1

> Surface — Hinged FRONT CAT#: NC50SHR BOX CAT#: MH50

DIMENSIONS:

50"H x 20"W x 5.75"D WIRE BENDING SPACE:

TOP - 5
BOTTOM - 9.26
SIDE - 6.13
PBA: 707HR

BUSSING: Copper

Silver/Tin Plated

OPTIONAL FEATURES: Copper GROUND BAR COPPER SOLID NEUTRAL

# ELECTRICAL DATA

SYSTEM: 208Y/120V 3Ph 4W 60Hz System Ampacity: 150A

10kA SYMS. SCCR

MAIN: MAIN BREAKER QB 150A

10kA AIR

INCOMING CONDUCTORS(S) PER NEC:

#4 - 300 kcmil

BRANCH MOUNTING TYPE: BOLT-ON

----BRANCH SUMMATION-----

42 - 20A/1P QOB

JOB NAME:	NC DEPT PUBLIC SAFETY TAC OPS	EQUIPMENT DESIGNATION:	P8			
JOB LOCATION:	RALEIGH NC	EQUIPMENT TYPE:	NQ ( Circuit Breaker	Type)	PANEL 1	1 OF 1
DRAWN BY:	(Q2C)	DRAWING TYPE:	ONE LINE DIAGRAM			
ENGR:		I	SQUARE D			
DATE:	December 13 2013		by Schneider Electric			
DRAWING STATUS:	QUOTE	DWG# 033860208-01		PG <b>1</b>	OF <b>1</b>	REV -

REV	DESCRIPTION	BY	DATE	ı	 	/	//	/
_			//	1	 -	/	//	/

CKT NO	ACCESSORIES	TYPE	RATING AMP/P	_				RATING AMP/P	TYPE	ACCESSORIES	CKT NO
1 3 5		EGB	70/3					30/3	EGB		2 4 6
7				$\neg \bigcirc$	┡		<b>—</b>	20/1	EGB		8
9		EGB	30/3	⊸୕୵୴	<del>  ♦</del>	<b>├</b> ─॒॔॔े	<u> </u>	20/1	EGB		10
11				<b>⊸</b> ∕⊸	╀	<b>∳</b> —∕_``	<u> </u>	20/1	EGB		12
13		EGB	20/1	<b>⊸</b> ´_`⊶	┿┼┼	<b>├</b> ─०`_`	<u> </u>	20/1	EGB		14
15		EGB	20/1	<b>⊸</b> ⊂_•	┡		<u> </u>	20/1	EGB		16
17	PREPARED SPACE	EGB	20/1	< ´_` }	┷	<b></b> -€`````````````````````````````````	5- <b>-</b> -	20/1	EGB	PREPARED SPACE	18
19	PREPARED SPACE	EGB	20/1	- ⊸ົ` ≽- ⊣	┿┼	<b></b> -∕_```	5- <b>-</b> -	20/1	EGB	PREPARED SPACE	20
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23	PREPARED SPACE	EGB	20/1	< ´ ` `	$\vdash$	<b></b> -∕_``≀	<u>-</u> -	20/1	EGB	PREPARED SPACE	24
25	PREPARED SPACE	EGB	20/1	<´``}	┥	<b></b> - ∕ ````	<u></u>	20/1	EGB	PREPARED SPACE	26
27	PREPARED SPACE	EGB	20/1	√ ( ) }	┷	<b></b> -∕_```	S	20/1	EGB	PREPARED SPACE	28
29	PREPARED SPACE	EGB	20/1	√ ´ `	╀	<b>↓</b> <´^``	<del>-</del> -	20/1	EGB	PREPARED SPACE	30
				150A M/L	I I I	<u>L</u>	S <sub>/N</sub>				

# PHYSICAL DATA

ENCLOSURE Type 1

Surface — Hinged FRONT CAT#: NC38SHR BOX CAT#: MH38

**DIMENSIONS:** 

38"H x 20"W x 5.75"D WIRE BENDING SPACE:

TOP - 5

BOTTOM - 13.25

SIDE - 4.1 PBA: 550HR

BUSSING: Copper

Silver/Tin Plated

OPTIONAL FEATURES: Copper GROUND BAR COPPER SOLID NEUTRAL

# ELECTRICAL DATA

SYSTEM: 480Y/277V 3Ph 4W 60Hz

System Ampacity: 150A

22kA SYMS. SCCR MAIN: MAIN LUGS: 150A

INCOMING CONDUCTORS(S) PER NEC:

#6 - 350 kcmil

BRANCH MOUNTING TYPE: BOLT-ON

----BRANCH SUMMATION----

1 - 70A/3P EGB 2 - 30A/3P EGB 7 - 20A/1P EGB 14 - 20A/1P-PS EGB

JOB NAME:	NC DEPT PUBLIC SAFETY TAC OPS	equipment designation: TAC			
JOB LOCATION:	RALEIGH NC	EQUIPMENT TYPE: NF ( Circuit Brea	ker Type )	PANEL 1	I OF 1
DRAWN BY:	(Q2C)	drawing type: ONE LINE DIAGRAN	1		
ENGR:		I SQUARE D			
DATE:	December 13 2013	by Schneider Electric			
DRAWING STATUS:	QUOTE	DWG# 033860208-01	PG <b>1</b>	OF <b>1</b>	REV -

# Mini Power-Zone<sup>®</sup> Unit Substation Selection Tables

#### **Selection Tables**

**NOTE:** The enclosure drawings referenced in the Enclosure column of the selection tables are shown on pages 10–15. The wiring diagrams referenced in the selection tables are shown on page 16.

#### Single Phase

#### 480 Volt Primary, Load Center Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

				Feed	er Circuit Bre				
kVA	Part Number	Primary Main	Secondary Main	Maximun	n Number	Maximum	Enclosure	Wiring Diagram	
		Wan	Wall	1 pole	2 pole	Ampere Rating		Diagram	
5	MPZ5S40F	FAL24015	QO230	10	5	20	Α	i	
7.5	MPZ7S40F	FAL24020	QO240	10	5	30	Α	i	
10	MPZ10S40F	FAL24030	QO260	10	5	40	Α	i	
15	MPZ15S40F	FAL24060	QO280	24	12	60	В	i	
25	MPZ25S40F	FAL24100	QO2125	24	12	100	В	i	

#### 480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 18 kAIR, NEMA Type 3R

				Feed				
kVA	Part Number	Primary Main	Secondary Main	Maximun	n Number	Maximum	Enclosure	Wiring Diagram
		IVIGITI	Wiaiii	1 pole	2 pole	Ampere Rating		Diagram
5	MPZB5S40F	FAL24015	QOB230	10	5	20	AA	i
7.5	MPZB7S40F	FAL24020	QOB240	10	5	30	AA	i
10	MPZB10S40F	FAL24030	QOB260	10	5	40	AA	i
15	MPZB15S40F	FAL24060	QOB280	24	12	60	BB	i
25	MPZB25S40F	FAL24100	QOB2125	24	12	100	BB	1

# INCLUDES: (1) QOB230 (3) QOB120

#### 480 Volt Primary, Load Center Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

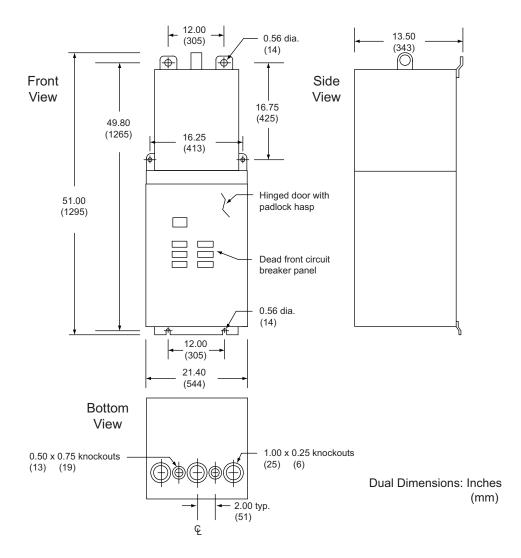
				Feed	er Circuit Bre				
kVA	Part Number	Primary Main	Secondary Main	Maximun	n Number	Maximum	Enclosure	Wiring Diagram	
		IVIGITI	Wiaiii	1 pole	2 pole	Ampere Rating		Diagram	
5	MPZ5S40F25K	FHL26015	QO230	10	5	20	Α	i	
7.5	MPZ7S40F25K	FHL26020	QO240	10	5	30	Α	i	
10	MPZ10S40F25K	FHL26030	QO260	10	5	40	Α	i	
15	MPZ15S40F25K	FHL26060	QO280	24	12	60	В	i	
25	MPZ25S40F25K	FHL26100	QO2125	24	12	100	В	i	

#### 480 Volt Primary, NQ Panelboard Interior, Interrupt Rating 25 kAIR, NEMA Type 3R

				Feed	er Circuit Bre				
kVA	Part Number	Primary Main	Secondary Main	Maximun	n Number	Maximum	Enclosure	Wiring Diagram	
		Mani	Man	1 pole	2 pole	Ampere Rating		Diagram	
5	MPZB5S40F25K	FHL26015	QOB230	10	5	20	AA	i	
7.5	MPZB7S40F25K	FHL26020	QOB240	10	5	30	AA	i	
10	MPZB10S40F25K	FHL26030	QOB260	10	5	40	AA	i	
15	MPZB15S40F25K	FHL26060	QOB280	24	12	60	BB	i	
25	MPZB25S40F25K	FHL26100	QOB2125	24	12	100	BB	i	

# Mini Power-Zone<sup>®</sup> Unit Substation Enclosure Drawings

## Single Phase—Enclosure BB



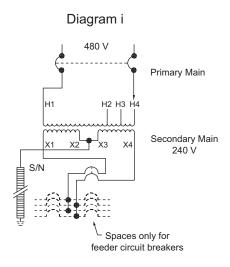
#### **Replacement Parts**

Item	Catalog Number
Box and back plate	39002-431-50
Dead front	39002-431-05
Hinged cover	39002-431-06
Ground bar	PK18GTA
Neutral assembly	SN-38

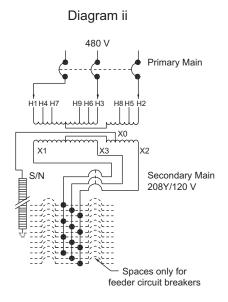
# Mini Power-Zone® Unit Substation **Wiring Diagrams**

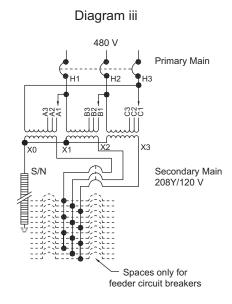
# **Wiring Diagrams**

#### Single Phase



#### **Three Phase**





#### **Additional Information**

#### **Designed for Ease of Installation**

The Mini Power-Zone Unit Substation has a unique two-part construction that provides installation flexibility. This two-part construction uses removable transformers, available from factory stock, which can be replaced without disturbing external panelboard wiring. The transformer and panelboard can be mounted one part at a time if there is a space or handling problem.

The panelboard can be removed and wired first, if desired. The transformer simply mounts on top of the panelboard, and the primary and secondary leads are re-connected to the main circuit breakers.

All sizes are carried in Schneider Electric warehouse system stock. Each comes complete with the transformer and the main primary and secondary circuit breakers, all sized in accordance with NEC requirements. Branch circuit breakers are supplied separately.

#### **Replacement Transformers and Interiors**

Does not include backfeed secondary main circuit breaker

		Catalog Number					
Phase	kVA	Transformer	Interior				
		Transformer	Load Center	Panelboard			
	5	MPT5S40F					
	7.5	MPT7S40F		NQM18L1C			
1	10	MPT10S40F	QON30CCI				
	15	MPT15S40F		NOM201.2C			
	25	MPT25S40F		NQM30L2C			
	15	MPT15T2F					
3	22.5	MPT22T2F	QON330L200	NQM430L1C			
	30	MPT30T2F					

#### **Special Applications**

Solar Photovoltaic Systems

• NEC 690.64 Point of Connection

The output of a photovoltaic (PV) utility interactive inverter can be connected to either the line or load side of the utility service, based on the system design and the requirements found in NEC 690.64. Mini Power-Zone units are ideal where voltage transformation is needed. The units include both primary and secondary overcurrent protective devices along with panelboard mounted devices for each inverter output.

Particular attention must be paid for load side connections and the requirements of NEC 690.64(B). If the panelboard in the Mini Power-Zone unit contains overcurrent protective devices for both PV inverter sources and system branch circuits or feeders, the sum of the ampere ratings of devices supplying power to the panelboard cannot exceed 120% of its ratings to comply with 690.64(B)(2). In addition, consider 690.64(B)(7), where the sum of the ampere ratings of devices supplying power exceeds the panelboard rating the devices used to connect PV inverters must be located at the opposite end from the input feeder or main circuit location. Since the panelboard devices are backfed from the PV inverters, hold down brackets are required to comply with 690.64(B)(6). Contact your local Schneider Electric representative for specific application assistance on using Mini Power-Zone units in PV systems.

# Mini Power-Zone<sup>®</sup> Unit Substation Product Specifications

NEC 690.9 (B) Power Transformers

Must meet NEC 450.3 for overcurrent protection for primary protection.

Since the Mini Power-Zone unit will be used in both directions, the main circuit breakers must both comply with the secondary overcurrent protection limit of 125% maximum. That being the case, the limits for the primary circuit breakers at 480 V are as shown in the following table.

kVA	Phase	480 V Current	125% Handle Rating
5	1	10.42	15 <sup>1</sup>
7.5	1	15.63	20 <sup>1</sup>
10	1	20.83	30 <sup>1</sup>
15	1	31.25	40
25	1	50.08	70
15	3	18.04	25
22.5	3	27.06	35
30	3	36.08	50

The standard single phase 5, 7.5, and 10 kVA circuit breakers comply with NEC 690.9 (B). Others will have to be quoted as special orders to meet the requirement.

## **Product Specifications**

#### **Unit Substations**

UL Listed per UL 1062 File E92978

#### **Transformers**

Specification Number: 26 20 00.16

Product Name: DRY TYPE RESIN ENCAPSULATED TRANSFORMERS

#### **Primary Overcurrent Protection (Circuit Breaker)**

Specification Number: 26 28 16.14

Product Name: MOLDED CASE CIRCUIT BREAKERS

#### Secondary Panelboard and Secondary Main

Specification Number: 26 24 19.05

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT LOAD CENTERS

or

Specification Number: 26 24 16.14

Product Name: LIGHTING AND APPLIANCE BRANCH CIRCUIT PANELBOARDS 240 VAC, 48 VDC

MAXIMUM



# <u>UPS</u>

# **NC National Guard TAC OPS**

# KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/5/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

Supplier: Eck Supply

**Manufacturer:** Schneider Electric

**Specification:** UPS

Submittal #: 1

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""APPROVED AS NOTED
""REVISE AND RESUBMIT



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BASS, NIXON & KENNEDY, INC.

DATE 2-24-14 BY Nixon

KAD Construction, Inc.							
Χ	Approved						
	Approved as noted						
	Revised & Resubmit						
Signature:	Dan Hyatt						
Title:	Owner						
Date:	Feb 05, 2014						



# TABLE OF CONTENTS NCNG MORRISVILLE

<u>DESCRIPTION</u>	<u>PAGES</u>
BILL OF MATERIALS	2
GALAXY 5000 BROCHURE	3-8
GALAXY 5000 TECH. SPECS.	9-17
GALAXY 5000 – UPS CABINET MECH. DRAWINGS	18-21
GALAXY 5000 – MBP CABINET MECH. DRAWINGS	22-24
GALAXY 5000 – BATTERY CABINET MECH. DRAWINGS	25
GALAXY 5000 SYSTEM ONE LINE DIAGRAM	26
GALAXY 5000 FLECTRICAL DATA SHEET	27



# **BILL OF MATERIALS NCNG - MORRISVILLE**

#### QTY. DESCRIPTION

**GALAXY 5000 SERIES UPS SYSTEM** 1

**DIMENSIONS & WEIGHT:** 

UPS MODULE: 28"W x 33"D x 75"H; 882 LBS

BATTERY CABINET: 32"W x 33"D x 75"H: 2.950 LBS BYPASS CABINET: 28"W x 33"D x 75"H; 1,200 LBS

RATING: 40KVA / 36KW

INPUT & OUTPUT FREQUENCY: 60HZ

**INPUT VOLTAGE: 480V** 

**OUTPUT VOLTAGE: 208V** 

BATTERY RUN TIME: 10 MINUTES @ 36KW LOAD (ADJACENT CABINET)

- 3CB EXTERNAL MAINTENANCE BYPASS (ADJACENT CABINET; INCLUDES 480/208V TRANSFORMER)
- SNMP / WEB COMMUNICATION CARD
- MODBUS COMMUNICATION CARD
- SINGLE INPUT / TOP OR BOTTOM ENTRY
- INSTALLATION, OPERATION, & MAINTENANCE MANUAL
- START-UP & SAME DAY BASIC OPERATOR TRAINING BY APC FIELD SERVICE (MON - FRI; 8AM - 5PM)THREE WEEKS ADVANCE NOTICE REQUIRED

WARRANTY (1 YEAR; PARTS & SERVICE)

EACH GALAXY SERIES UPS MODULE INCLUDES MICROPROCESSOR CONTROLLED LOGIC CIRCUITS, INPUT CONTACTOR AND FUSES, STATIC BYPASS SWITCH (100% RATED), OUTPUT FUSES AND STATIC SWITCH, MANUAL MAINTENACE BYPASS SWITCH STATUS/CONTROL PANEL, AND COMMUNICATION PORTS FOR CUSTOMER USE

1 ON-SITE CUSTOMER TRAINING FOR ABOVE GALAXY 5000 UPS BY APC FIELD SERVICE (MON - FRI; 8AM - 5PM)

THREE WEEKS ADVANCE NOTICE REQUIRED

STANDARD FACTORY TESTING WILL BE PROVIDED FOR ABOVE UNIT - SEE ATTACHED REPORT FOR DETAILS ON PROCEDURES. SPECIFICATIONS DO NOT CLARIFY SPECIFIC TESTING REQUIREMENTS.

FINAL ACCEPTANCE TESTING – SPECIFICATIONS DO NOT DETAIL REQUIREMENTS FROM MANUFACTURER, NO TESTING IS PROVIDED IN ABOVE **PROPOSAL** 

# MGE Galaxy 5000

40/50/60/80/100/130 kVA

The recommended power protection for all critical applications



40 – 130 kVA state-of-the-art three-phase power protection designed to meet a wide range of requirements from medium data centers to industrial and facilities applications

- Upgradable power ranges
- Internal maintenance bypass
- Intuitive monitoring
- Parallel capable
- Front access servicing
- High power availability
- UL® 924 rated battery cabinets (40 kVa and 50 kVA)



# Features and benefits

# Flexible three-phase power protection designed to meet a wide range of requirements, from medium data centers to industrial and facilities applications.

The MGE Galaxy™ 5000 offers state-of-the-art technology that increases performance and reliability, protecting against all power quality disturbances while allowing you to customize a solution to meet your unique specifications. The space-saving reduced footprint, power factor corrected input to prevent oversizing cables, circuit breakers, and generator result in lower total cost of ownership and overall customer savings. Upstream harmonics management allows a generator-friendly installation and flexible configurations for even the most demanding designs. Features such as parallel capability for both capacity and redundancy, full front access for ease of serviceability, user-friendly graphical display with multiple language options, and SNMP with network-based power management options make the Galaxy 5000 one of the easiest UPS units in its class to manage and maintain.

# Galaxy 5000 -

#### High power availability

Fault tolerance Built-in 100 percent rated static bypass switch prevents interruption by allowing load transfer to utility power during heavy overloads

Redundant components Provides increased backup for greater reliability and ensures continuous operation

**High overload capacity** Improves downstream circuit discrimination

#### Installation and serviceability

**Easy to install** All connections are made through the front, eliminating the need for rear or side access

Front access servicing Simplifies installation and maintenance while minimizing space requirements

Multiple levels of service With package or individual service component options, our services are structured for you to choose what APC™ by Schneider Electric™ can do for you

#### Flexible and upgradable

**Expandable power ranges** Scalable power levels to accommodate varying power requirements

**Higher capacity or redundancy** Parallel up to six modules to adapt to increasing power needs

**Simple integration** Easily works with networking and monitoring systems

**Extended backup options** Choice of backup times from five minutes to eight hours to meet varying requirements

**Compatible** Operates with inductive and leading power factor loads

**Field upgradable** Change from single to parallel capability, increasing total power capacity, by simultaneously using multiple UPS units

#### Low total cost of ownership

**Power factor corrected input** Prevents the need for oversizing cables, circuit breakers, and generators

**Efficient** Up to 94.5 percent in online double conversion mode



# MGE Galaxy 5000 features



- 1 IGBT-based technology for power quality Supplies clean, stable power to sensitive loads, ensuring critical power protection, optimum performance, and extended life
- Q Dual input Allows for connection to two separate input sources for increased availability
- Parallel operation
  Connect as many as six units in parallel for capacity and redundancy to grow with your power requirements
- Redundant components
  Provides increased backup for greater reliability
  and ensures continuous operation
- Built-in static and maintenance bypass
  Enables the UPS to transfer the load to utility
  power, without interruption, in the event of heavy
  overload or fault

# MGE Galaxy 5000 options

#### Integrated input isolation transformer

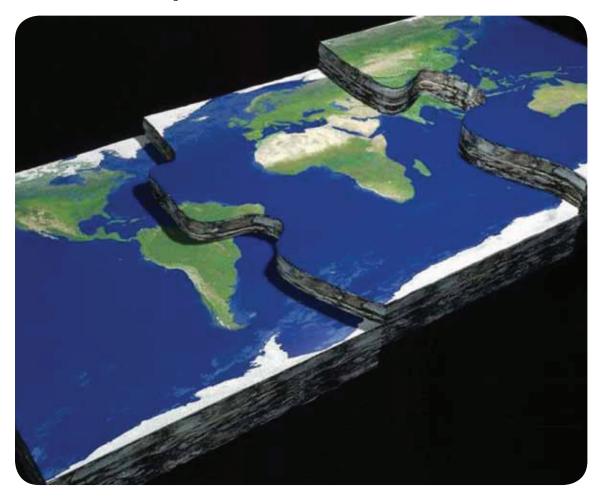
The MGE Galaxy 5000 can be equipped with an input isolation transformer fully integrated into the core module. Integrating the transformer directly into the module saves footprint and provides all the benefits of galvanic isolation including providing a very robust buffer between the utility and the critical load.

#### Seismic certification

The MGE Galaxy 5000 has been certified by independent professional engineers to Seismic ZONE 4 specifications. This is done by using the brackets supplied by APC by Schneider Electric and fastening into the substrate as noted in the installation drawings.

#### **Options**

- Parallel system bypass cabinets
- 65 kAIC rating
- IP32 rated cabinets
- External maintenance bypass
- Wall mounted or stand alone
- Remote alarm status panel (RASP)
- Remote summary alarm panel (RSAP)
- 42 pole distribution in a matching cabinet
- Seismic anchors
- Top cable entry cabinet
- Communications cards
- Advanced power management software
- UL 924 rated battery cabinets for 90-minute runtimes. (40 and 50 kVA models)



# StruxureWare for Data Centers Software Suite

APC by Schneider Electric UPS units and secure power systems are a core component of any architecture designed for highly critical applications, such as data centers, industry environments, infrastructure, and buildings.

Intelligent energy management of these systems is enabled by Schneider Electric EcoStruxure™ integrated hardware and software system architecture. StruxureWare™ software applications and suites are a key element of the EcoStruxure architecture. The software helps maximize system reliability and optimize operational efficiency.

StruxureWare for Data Centers software collects and manages real-time information about assets, resource use, and operation status throughout the data center life cycle. This data center infrastructure management (DCIM) software fully integrates the Galaxy 5000 UPS. With full system visibility, managers can monitor and apply this information in order to optimize data center performance to meet IT, business, and service-oriented goals.



# A Comprehensive Portfolio of Services

Schneider Electric Critical Power & Cooling Services (CPCS) provides the highest quality services and solutions by trained and trusted professionals. Our world-class services offer a smart way to build, operate, and maintain your critical applications, ensuring the right people, in the right place, at the right time.

#### Assembly and Start-Up Service

Assembly and Start-Up Service by a certified Field Service Engineer (FSE) ensures full factory warranty coverage. A Schneider Electric-certified installation ensures your equipment is properly and safely configured for optimal performance. This service features a standard eight-hour, five-day response time, with upgrades available for off-business hours.

#### **On-site Warranty Extension Service**

In the event of a system issue, an FSE will arrive by the next business day (or faster with upgrades) to isolate, diagnose, and correct the problem in as little time as possible, minimizing downtime.

#### **Advantage Plans**

Flexible service packages offer hassle-free system maintenance to improve uptime at a predictable cost. The Advantage Plus, Prime, Ultra, and Max are full-service packages that include technical support, preventive maintenance, quick on-site response, and remote monitoring. Response time upgrades are available.

#### Remote Monitoring Service (RMS)

RMS is an economical and easy-to-use Web-based service that lets you quickly respond to environmental or system changes. Trained technicians provide secure 24-hour monitoring of your physical infrastructure to diagnose and resolve problems before they become critical.

#### **Preventive Maintenance**

Preventive Maintenance on-site examinations of your critical systems are designed to prevent problems and keep your system running at maximum efficiency.



# **Technical specifications**

Rated power (kVA/kW)	40/36 50/45	60/54 80/72	100/90 130/117						
Normal AC supply input									
Input voltage (V)	480 V core, 3 wire	+ G (220 V, 208 V, 600 V w/ aux t	ransformer 4 wire + G)						
Frequency (Hz)		60 Hz +/-5%							
Input power factor		>.99 at full load							
THDI		<5% at full load							
Input voltage tolerance utility operation	480	480 V core (166 – 600 V with aux transformer)							
Dual mains input		Yes							
Input voltage tolerance bypass	+10	)% standard +4, 6, 8, 10% (program	nmable)						
Back-feed protection		Built-in back-feed contactor							
Output									
Nominal output voltage (V)	480 V core, 3 wire	+ G (220 V, 208 V, 600 V w/ aux t	ransformer 4 wire + G)						
Efficiency at full load (AC-AC)	93%	93.5%	94.5%						
Load power factor		0.5 leading to 0.5 lagging	1						
Output frequency	Mains synchror	nized in normal operation 60 Hz +	0.05% free running						
Overload capacity utility operation	12	125% for 10 minutes, 150% for 60 seconds							
Overload battery utility operation		150% for 60 seconds							
VTHD	<1%	L-L and L-N for non-linear loads (<	:2% max)						
Output voltage tolerance		+1% static, +5% at 100% load ste							
Communication and management									
Control panel	Mult	ti-function LCD, status, and control	console						
Dimensions and weights		,							
UPS		76" H x 28" W x 33" D all kVA rang inimum: 20 – 60 kVA 881 lb., 80 – kimum: 20 – 60 kVA 2,149 lb., 80 –	130 kVA 1,147 lb.						
Top entry cabinet		75" H x 14" W x 33.42" D							
Battery cabinet		75" H x 26" W x 33.42" D							
Battery cabinet		75" H x 32" W x 33.42" D							
•		75" H x 32" W x 33.42" D 75" H x 48" W x 33.42" D							
•									
Battery cabinet Matching maintenance bypass		75" H x 48" W x 33.42" D							
Battery cabinet  Matching maintenance bypass  Transformer cabinet		75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D							
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet	(48	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D	33.42″ D						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet	(48	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D	33.42″ D						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory	(48	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D							
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety	(48	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 30 V Only) 28" or 75" H x 42" W x 3	1						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI		75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 30 V Only) 28" or 75" H x 42" W x 33.42" UL 1778, ISO9001, FCC class A	A 5A						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI  Approvals		75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 30 V Only) 28" or 75" H x 42" W x 33.42" UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15	A 5A						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI  Approvals  Environmental		75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 30 V Only) 28" or 75" H x 42" W x 33.42" D UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15	A 5A						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI  Approvals  Environmental  Storage temperature	CE	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 70 V Only) 28" or 75" H x 42" W x 33.42" UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15 , UL 924 for 40 – 50 kVA battery c	SA abinets						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI  Approvals  Environmental  Storage temperature  Operating temperature	CE	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 60 V Only) 28" or 75" H x 42" W x 3 UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15 T, UL 924 for 40 – 50 kVA battery c -13 °F to 113 °F PS (32 °F to 104 °F), bat. (66 °F to	SA abinets						
Battery cabinet  Matching maintenance bypass  Transformer cabinet  Distribution cabinet  Parallel system bypass cabinet  Regulatory  Safety  EMC/EMI/RFI  Approvals  Environmental  Storage temperature  Operating temperature  Relative humidity	CE	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 30 V Only) 28" or 75" H x 42" W x 3 UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15 , UL 924 for 40 – 50 kVA battery c -13 °F to 113 °F PS (32 °F to 104 °F), bat. (66 °F to 0 – 95% non-condensing	SA abinets						
Battery cabinet  Matching maintenance bypass  Transformer cabinet	CE	75" H x 48" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 28" W x 33.42" D 75" H x 42" W x 33.42" D 60 V Only) 28" or 75" H x 42" W x 3 UL 1778, ISO9001, FCC class A EN50091-2 IEC 62040-2 FCC15 T, UL 924 for 40 – 50 kVA battery c -13 °F to 113 °F PS (32 °F to 104 °F), bat. (66 °F to	SA abinets						

# Technical Specifications

MGE Galaxy 5000 40–130 kVA 480 V





# **Technical Data**

# **Model List**



- MGE Galaxy 5000 50 kVA
- MGE Galaxy 5000 60 kVA
- MGE Galaxy 5000 80 kVA
- MGE Galaxy 5000 100 kVA
- MGE Galaxy 5000 130 kVA

# **Input Power Factor**

	20% Load		50% Load		75% Load		100% Load	
	Linear load	Non linear load	Linear load	Non linear load	Linear load	Non linear load	Linear load	Non linear load
80 kVA	0.94	0.93	0.99	0.99	0.99	0.99	0.99	0.99
130 kVA	0.87	0.88	0.99	0.99	0.99	0.99	0.99	0.99

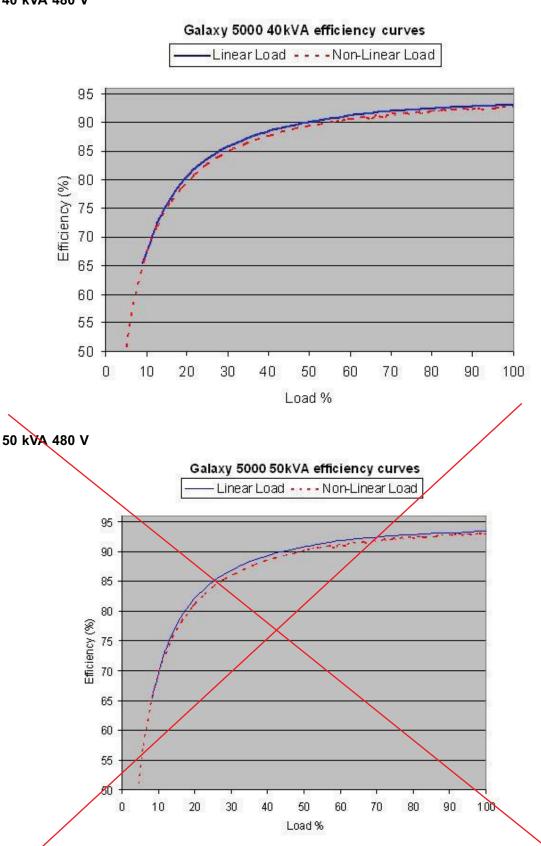
# **Efficiency**

The table below shows the average system efficiencies with a balanced linear load and pf = 0.9.

System	25% load	50% load	75% load	100% load
40 kVA	84.23	90.22	92.26	93.16
50 kVA	84.11	90.17	92.27	93.09
60 kVA	87.1	91.48	93.08	93.61
80 kVA	89.28	92.65	93.53	93.72
100 kVA	90.19	93.66	94.38	94.53
130 kVA	91.79	94.27	94.51	94.53

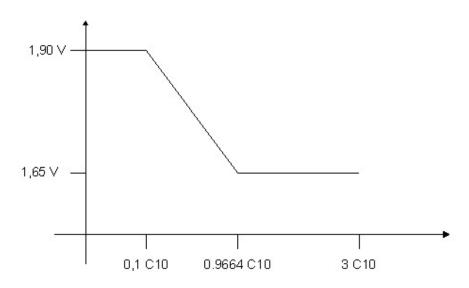
# **Efficiency Curves**

## 40 kVA 480 V



# **Batteries**

# **End of Discharge Voltage**



# **Battery Material Safety Data Sheet**



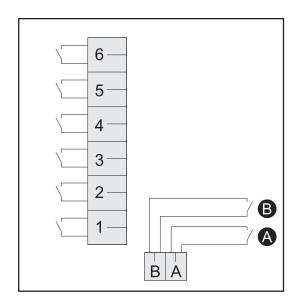
**Note:** For Material Safety Data Sheet (MSDS), go to "http://nam-en.apc.com/app/answers/detail/a\_id/564/kw/msds".

# **Communication and Management**

# **Relay Communication Card**

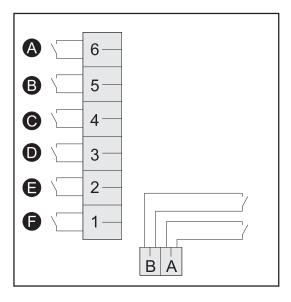
## **Input Contacts**

A.UPS OFF B.UPS ON



#### **Output Contacts**

- A.General alarm
- B. Battery fault
- C.Load on UPS
- D.Load on automatic bypass
- E. Load on battery power
- F. Low battery warning



# **EPO Options**

An optional Emergency Power Off or Remote Emergency Power Off can be connected to the UPS system.

Pressing the general shutdown button causes UPS shutdown and opening of the battery circuit breaker (with opening of the bypass static switch depending on customisation settings). The Remote Emergency Power Off (REPO) notion is applicable to installations where pressing the button also causes the upstream Normal AC source and AC bypass source circuit breakers to open. In parallel systems, there must be a single general shutdown button with a separate contact for each UPS unit.

# Compliance

The MGE Galaxy 5000 conforms with the following regulatory approvals:

- · cUL Listed
- EN/IEC 62040–1
- EN/IEC 62040–2
- EN/IEC 62040–3
- FCC Part 15 Class A
- ISO 9001
- UL 1778

# **Facility Planning**

# **AC Input**

	40 kVA	50 kVA	60 kVA	80 kVA	100 kVA	130 kVA
Nominal input voltage (V)	480	480	480	480	480	480
Input frequency (Hz)	60	60	60	60	60	60
Nominal input current (A) <sup>1</sup>	48	59	71	94	117	151
Max input current (A) <sup>2</sup>	59	70	88	111	150	182
Input current limit (A) <sup>3</sup>	71	84	97	111	164	182
Input phase rotation	A, B, C cl	ockwise				
Input power factor	> 0.98					
THDI	5%	5%	3%	3%	3%	3%
Maximum Short Circuit Withstand (kA)	20			•	30	

<sup>&</sup>lt;sup>1</sup> Input current based on rated load and batteries fully charged.

# **AC Bypass**



	40 kVA	50 kVA	60 kVA	80 kVA	100 kVA	130 kVA
Input frequency (Hz)	60	60	60	60	60	60
Nominal input current (A)	48	59	71	94	117	151

# **AC Output**



	40 kVA	50 kVA	60 kVA	80 kVA	100 kVA	130 kVA		
Nominal input voltage (V)	480	480	480	480	480	480		
Overload Capacity	125% for 10 minutes 150% for 1 minute 220% for 1 second							
Nominal output current (A)	48	59	71	94	117	151		
Output frequency (Hz)	60							
THDU		$\leq$ 0.5% phase to phase for linear loads $\leq$ 2% phase to phase for non-linear loads						

<sup>&</sup>lt;sup>2</sup> Input current based on fully battery recharge, nominal voltage and rated load.

<sup>&</sup>lt;sup>3</sup> Nominal voltage -10% voltage with partial recharge.

# **Batteries**

	40 kVA	50 kVA	60 kVA	80 kVA	100 kVA	130 kVA	
Nominal voltage (VDC)	432						
End voltage (VDC)	356						
Max. floating voltage (VDC)	490						
I <sub>Nom</sub> discharge <sup>1</sup> (A)	90	113	135	180	225	293	
I <sub>Max</sub> discharge <sup>2</sup> (A)	109	137	164	219	273	355	

 $<sup>^{\</sup>rm 1}$  Nominal battery discharge current based on rated load and nominal battery voltage.  $^{\rm 2}$  Maximum battery discharge current based on rated load at the end of the discharge.

# **Recommended Over Current Protection**

					50 kVA					
2	208:208	480:208	480:480	600:208	600:600	208:208	480:208	480:480	600:208	600:600
nput (A)	175	80	80	60	60	225	90	90	70	70
Output (A)	150	150	60	150	50	175	175	80	175	60
.put (11)	- / -									

	60 kVA					80 kVA				
	208:208	480:208	480:480	600:208	600:600	208:208	480:208	480:480	600:208	600:600
Input (A)	300	110	110	90	90	350	150	150	125	125
Output (A)	225	225	90	225	80	300	300	125	200	100

	100 kVA					130 kVA				
	208:208	480:208	480:480	600:208	600:600	208:208	480:208	480:480	600:208	600:600
Input (A)	450	200	200	150	150	600	250	250	200	200
Output (A)	350	350	150	350	125	450	450	200	200	175

# **Physical**

# **Weights and Dimensions**

Cabinet	Weight kg (lbs)	Height mm (in)	Width mm (in)	Depth mm (in)
40 kVA	400 (880)	1900 (74.80)	712 (28.03)	848 (33.39)
50 kVA	400 (880)	1900 (74.80)	712 (28.03)	848 (33.39)
60 kVA	400 (880)	1900 (74.80)	712 (28.03)	848 (33.39)
80 kVA	540 (1188)	1900 (74.80)	712 (28.03)	848 (33.39)
100 kVA	540 (1188)	1900 (74.80)	712 (28.03)	848 (33.39)
130 kVA	540 (1188)	1900 (74.80)	712 (28.03)	848 (33.39)

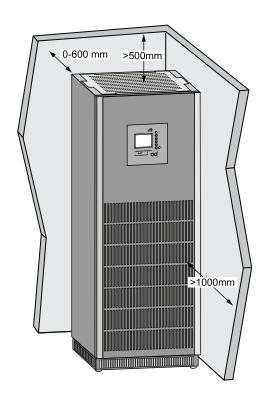
# **Shipping Weights and Dimensions**

	Weight kg (lbs)	Height mm (in)	Width mm (in)	Depth mm (in)
40 kVA	420 (924)	2030 (79.92)	980 (38.58)	960 (37.80)
50 kVA	420 (924)	2032 (80.00)	978 (38.50)	960 (37.80)
60 kVA	420 (924)	2030 (79.92)	980 (38.58)	960 (37.80)
80 kVA	540 (1188)	2030 (79.92)	980 (38.58)	960 (37.80)
100 kVA	540 (1188)	2030 (79.92)	980 (38.58)	960 (37.80)
130 kVA	540 (1188)	2057 (81)	813 (32)	950 (37.40)

# Clearance



**Note:** Clearance dimensions are published for airflow and service access only. Consult with the local safety codes and standards for additional requirements in your local area.

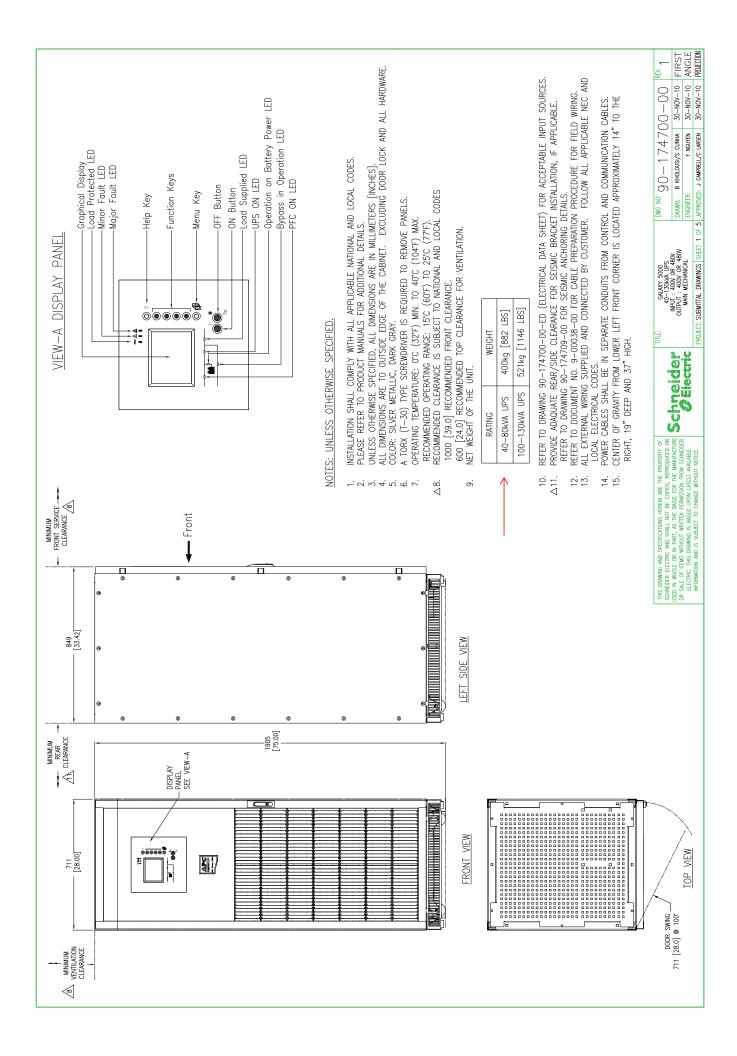


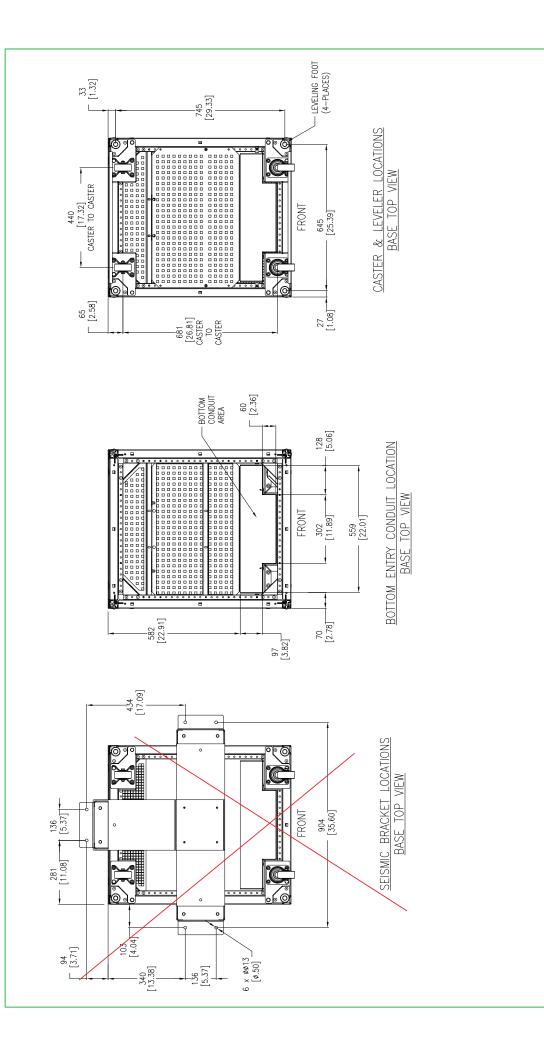
# **Environmental**

Operating Temperature	0 - 40 °C (32-104°F)
Storage Temperature	-20 - 45 °C (-4-113°F)
Operating Relative Humidity	0 - 95%, non-condensing
Storage Relative Humidity	0 - 95%, non-condensing
Operating Elevation	0-1000 m (0-3000 ft)): 100% load At 1500 m (4500 ft): 85% load At 2000 m (6000 ft): 79% load At 2300 m (7500 ft): 75% load At 3000 m (10000 ft): 69% load At 4000 m (13000 ft): 59% load
Storage Elevation	0-12000 meters (0-40000 ft )
Audible noise at 100% load – 1 meter from surface of unit 40 kVA 480 V 50 kVA 480 V 60 kVA 480 V 80 kVA 480 V 100 kVA 480 V 130 kVA 480 V	63 dBA 63 dBA 63 dBA 63 dBA 65 dBA 65 dBA
Protection Class	IP20
Colour	Charcoal

# **Heat Dissipation**

	40 kVA	50 kVA	60 kVA	80 kVA	100 kVA	130 kVA
Typical losses (kW)	2.63	3.23	3.75	4.92	5.24	6.81
Heat dissipation (BTU/hr)	8974	11021	12796	16788	17880	23237

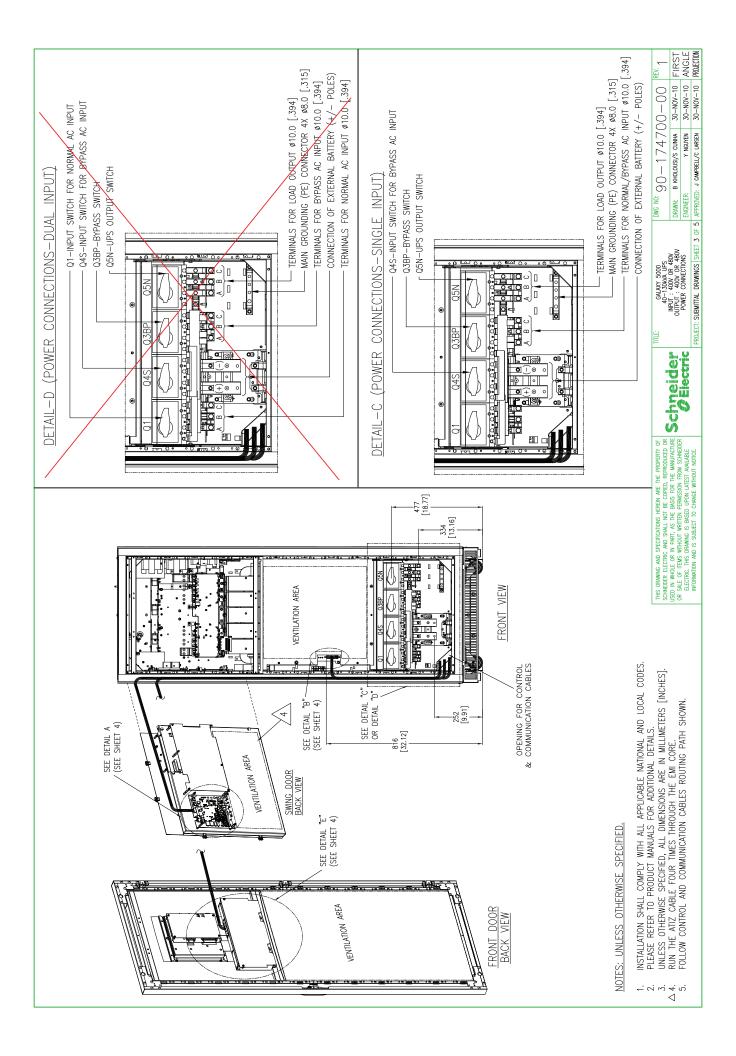


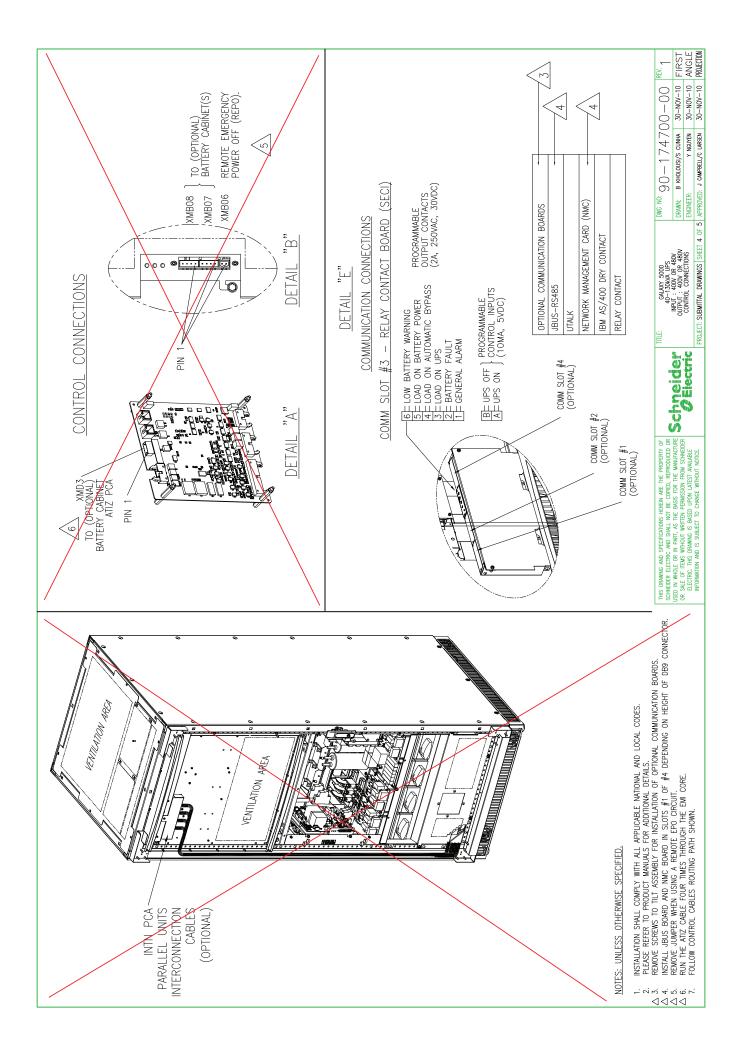


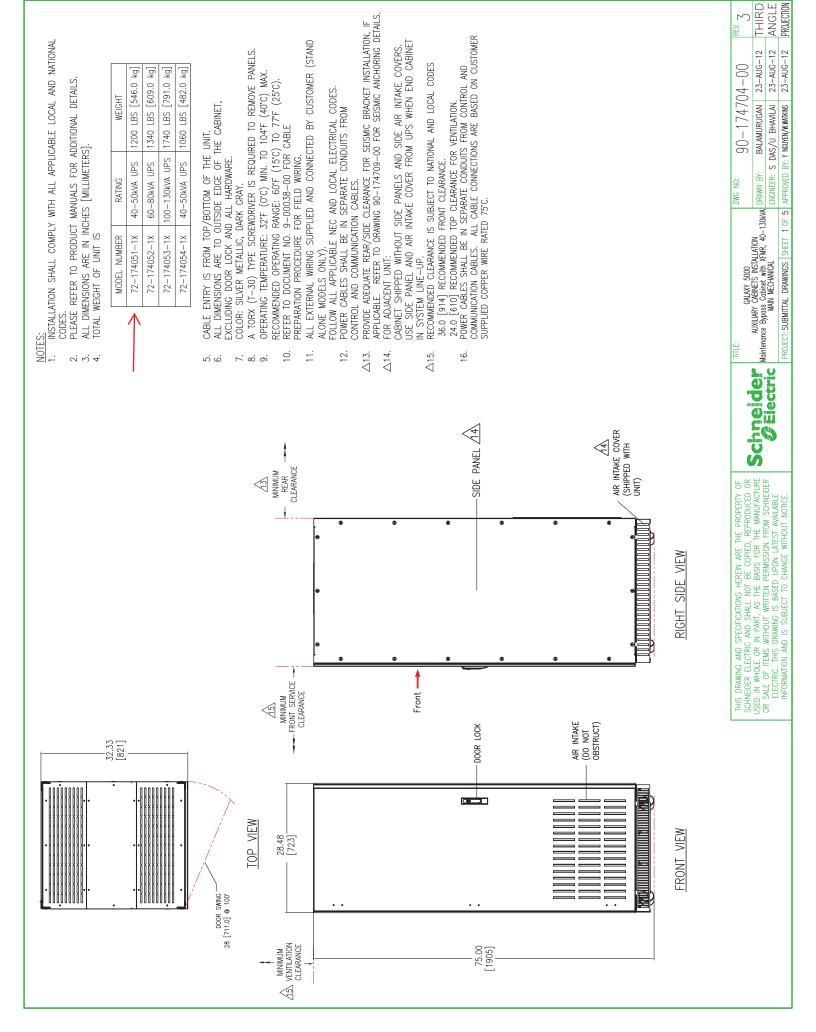
# NOTES: UNLESS OTHERWISE SPECIFIED.

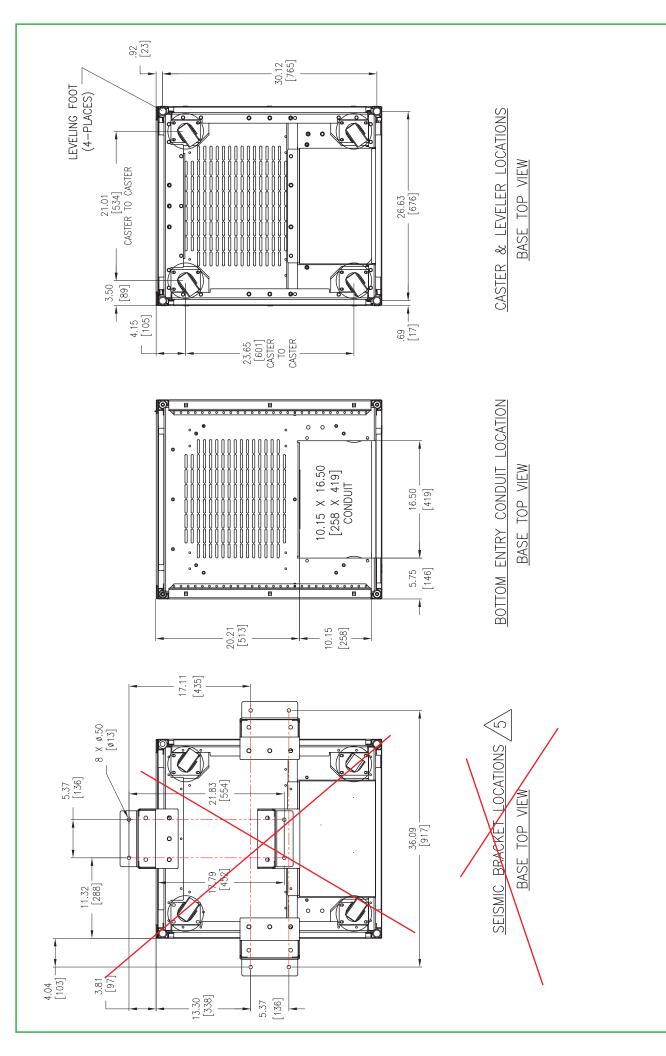
- INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL AND LOCAL CODES. PLEASE REFER TO PRODUCT MANUALS FOR ADDITIONAL DETAILS. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS ARE IN MILLIMETERS [INCHES]. DIMENSIONS SHOWN WITHOUT SIDE PANELS {EACH SIDE PANEL 6.0 [0.24]} -. ≤ €. 4.

•	TITLE: GALAXY 5000 40-130kW UPS	DWG NO: 90-174700-00	-00 REV. 1	_
nelder	OUTPUT : 400V OR 480V	DRAWN: B KHOLOUSI/S CUNHA 30-NOV-10 FIRST	NOV-10 FIF	ZST
# Electric	ANCHORING AND BOTTOM VIEW	ENGINEER: Y NGUYEN 30-NOV-10 ANGLE	NOV-10 AN	1GLE
	PROJECT: SLIBMITTAL DRAWINGS SHEFT 2	PROJECT: SUBMITTAL DRAWINGS SHEFT 2 OF 5 APPROVED: J. CAMPBELL /C. LARSEN 30-NOV-10 PROJECTION	NOV-10 PROJ	IFCTION









NOTES: UNLESS OTHERWISE SPECIFIED

INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL AND LOCAL CODES. PLEASE REFER TO PRODUCT MANUALS FOR ADDITIONAL DETAILS.
ALL DIMENSIONS ARE IN INCHES [MILLMETERS].
FOR INCHANGO SHOWN WITHOUT SIDE PAUELS {EACH SIDE PANEL 6.0 [0.24]} FOR STAND ALONE VERSION ONLY, FOR ADJACENT VERSION REFER TO THE APPROPRIATE SYSTEM INSTALLATION DRAWING.

THIS DRAWING AND SPECIFICATIONS HEREIN ARE THE PROPERTY OF SCHNEIDER ELECTRIC AND SHALL NOT BE COPIED, REPRODUCED OR USED IN WHOLE OR IN PART, AS THE BASIS FOR THE MANUFACTURE OR SALE OF TEMS WITHOUT WRITTEN PERMISSION FROM SCHNEIDER ELECTRIC. THIS DRAWING IS BASED UPON LATEST AVAILABLE

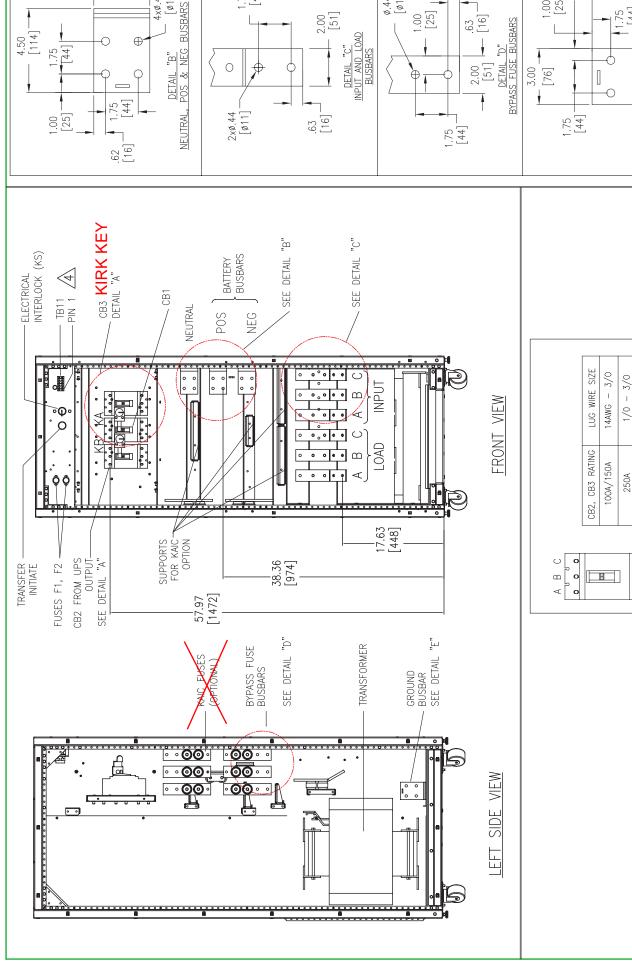
INFORMATION AND IS SUBJECT TO CHANGE WITHOUT NOTICE

Schneider Electric

BALAMURUGAN 23-AUG-12 23-AUG-12 PROJECT: SUBMITTAL DRAWINGS SHEET 2 OF 5 APPROVED BY: Y NOVEN/M.MATKINS 23-AUG-12 90-174704-00 I. KENNEDY/S.DAS DRAWN BY: ENGINEER: GALAXY 5000
AUXILIARY CABINETS INSTALLATION
Maintenance Bippas Cabinet with XFMR, 40–130kNA,
60/T/0M VIEW & ANCHORING

DWG NO:

THIRD ANGLE PROJECTION PROJECTION



3.00 [76]

[114] 4.50

44]

[ø1] 4ר.44

44]

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K.NAGENDRA 01-JUL-08 B.SHERIDAN 01-JUL-08 90-174704-00 DETAIL "E" GROUND BUSBAR I. KENNEDY/S.DAS  $\oplus$ DRAWN BY: ENGINEER: DWG NO: [ø11] 4×ø.44

4.50

[44]

.62 [16]

1.00

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[16] .63

2.00 [51]

NOTES: UNLESS OTHERWISE SPECIFIED.

INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL AND LOCAL CODES. PLEASE REFER TO PRODUCIN AMANIALS FOR ADDITIONAL DETAILS. ALL DMENSIONS ARE IN INCHES IMPLIMETERS]. ROUTE WRING TO TBIT THROUGH THE HOLE ABOVE TBIT.

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"∀" CB2, CB3

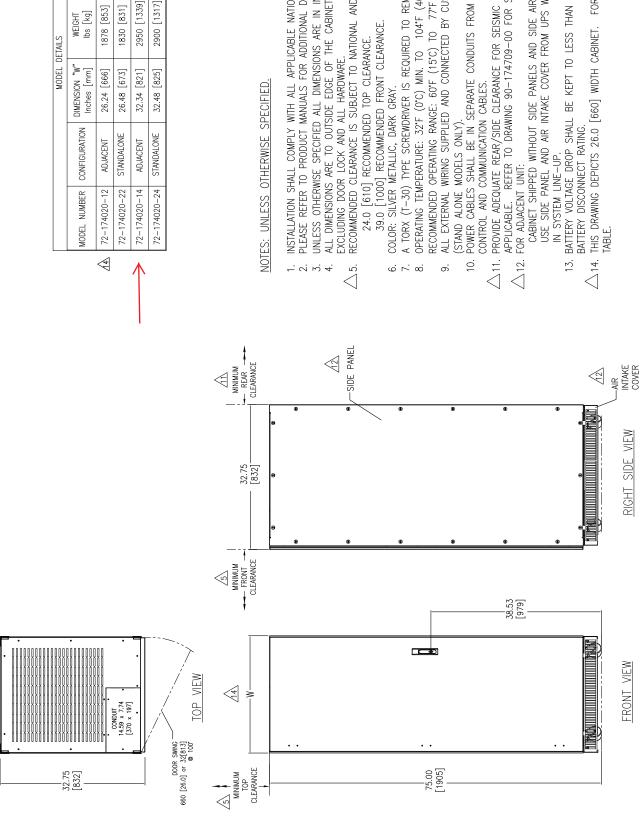
DETAIL

Schneider Electric

PROJECT: SUBMITTAL DRAWINGS | SHEET 3 OF 5 | APPROVED BY: GALAXY 5000
AUXILIARY CABINETS INSTALLATION
Maintenance Bypass Cabinet with XFMR, 40–130kNA
INTERNAL VIEW

THIRD ANGLE PROJECTION N

01-JUL-08





QF1 Rating

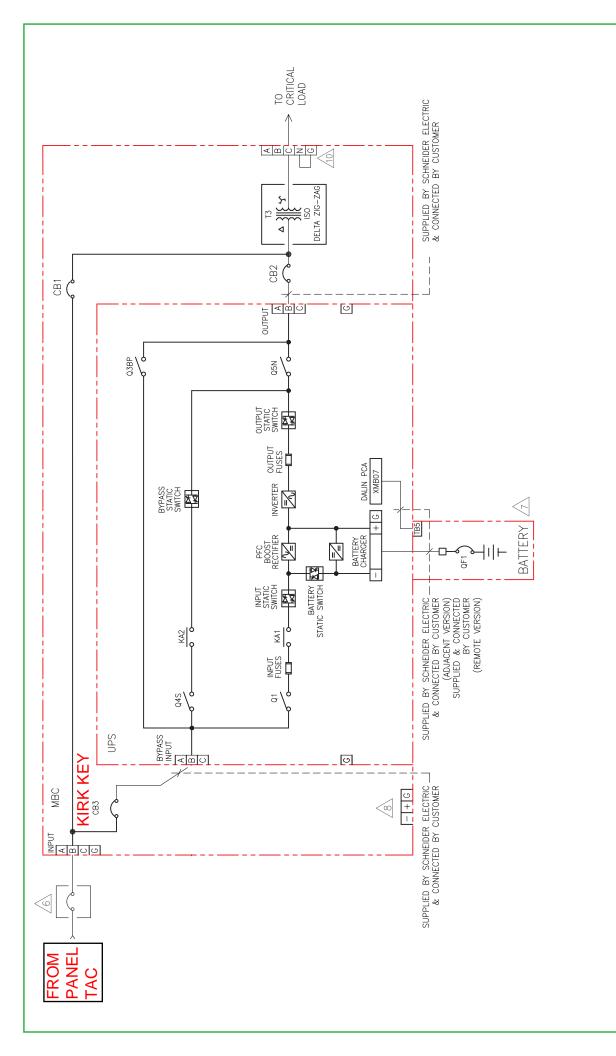
MODEL DETAILS

Amps 175A 175A 250A 250A

- INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL AND LOCAL CODES. PLEASE REFER TO PRODUCT MANUALS FOR ADDITIONAL DETAILS.
- UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES [MILLIMETERS]. ALL DIMENSIONS ARE TO OUTSIDE EDGE OF THE CABINET.
- EXCLUDING DOOR LOCK AND ALL HARDWARE. RECOMMENDED CLEARANCE IS SUBJECT TO NATIONAL AND LOCAL CODES 24.0 [610] RECOMMENDED TOP CLEARANCE.
  - 39.0 [1000] RECOMMENDED FRONT CLEARANCE.
- A TORX (T-30) TYPE SCREWDRIVER IS REQUIRED TO REMOVE PANELS.
  - OPERATING TEMPERATURE: 32'F (0°C) MIN. TO 104'F (40°C) MAX.
    - RECOMMENDED OPERATING RANGE: 60'F (15'C) TO 77"F (25'C). ALL EXTERNAL WIRING SUPPLIED AND CONNECTED BY CUSTOMER
- 11. PROVIDE ADEQUATE REAR/SIDE CLEARANCE FOR SEISMIC BRACKET INSTALLATION, IF APPLICABLE. REFER TO DRAWING 90-174709-00 FOR SEISMIC ANCHORING DETAILS.
  - - USE SIDE PANEL AND AIR INTAKE COVER FROM UPS WHEN END CABINET IN SYSTEM LINE—UP. CABINET SHIPPED WITHOUT SIDE PANELS AND SIDE AIR INTAKE COVERS.
      - 13. BATTERY VOLTAGE DROP SHALL BE KEPT TO LESS THAN 1% BASED ON
- 14. THIS DRAWING DEPICTS 26.0 [660] WIDTH CABINET. FOR OTHER DETAILS REFER TO

CALAXY 500 INSTALLATION DRA BATTERY CABINET 28" W MAIN MECHAN	PROJECT: SUBMITTAL DRAWIN
Schneider Electric	

2000				DWG NO:	90-174701-00	01-00	REV.
A AMIN	DRAWINGS:	>		DRAWN BY:		S CUNHA 20-0CT-10	THIRD
ANICAL				ENGINEER:	ENGINEER: S DAS/U BHAVILAI 20-0CT-10 ANGLE	20-0CT-10	ANGLE
NNGS	SHEET	1 OF	4	APPROVED	WINGS SHEET 1 OF 4 APPROVED BY: Y NGVYEN/J CAMPBELL	20-0CT-10	PROJECTION



# UPS WITH SINGLE INPUT BATTERY, MBC LOAD XFMR

DWG NO: 90-174770-00-SD

DRAWN: B.KHOLOUSI/BALAMURUGAN

TITE: GALAXY 5000 40-130kA UPS Input/Output: - 420//480/v, 480//208V, 208//208V, 220v/220v, 600v/600v, 600v/208V SYSTEM ONE LINE DIAGRAM

I.KENNEDY

ENGINEER:

APPROVEDB. SHERIDAN / F. DIOSA

DRAWINGS SHEET 1 OF 3

△9. FOR 2018 MINON ONLY. SHOULD FEEF FROM THE SAME SOURCE AS THE MBC.

△10. THE OUTPUT NEUTRAL IS BONDED TO GROUND.

11. REFER TO DRAWING NO. 90–174700–00–ED FOR AND ELECTRICAL DATA, VARIOUS INPUT SOURCE REQUIREMENT AND HIGH RESISTANCE GROUNDING APPLICATION DETAILS.

| Application of the control of t

ALL EXTERNAL WIRING BY CUSTOMER. CUSTOMER IS RESPONSIBLE FOR CONNECTING ALL SCHNEIDER ELECTRIC SUPPLIED CABLES.

ONE CABINET SHOWN. FOR UP TO FOUR (4) BATTERY ENCLOSURE CONNECTIONS, REFER TO DRAWINGS 90-174701-00 or 90-174701-01. FOR STAND ALONE BATTERY CABINETS WITH TOP ENTRY SYSTEM CONFIGURATION, DC CONNECTION IS FED THROUGH THE ADJACENT MBC.

≥8.

5. 7. 7.

POWER AND CONTROL CABLES SHALL BE IN SEPARATE CONDUITS. UPSTREAM PROTECTIVE DEVICE REQUIRED. PROVIDED BY CUSTOMER.

INSTALLATION SHALL COMPLY WITH ALL APPLICABLE NATIONAL AND LOCAL CODES. PLEASE REFER TO PRODUCT MANUALS FOR ADDITIONAL DETAILS.

NOTES: UNLESS OTHERWISE

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Schneider Ø Electric

VIN/VOUT			220\	220V/220V					0009	600V/208V					0009	0009/0009		
RATING AT 0.9 PF LAG.	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA
INPUT VOLTAGE/ OPTIONAL BYPASS INPUT VOLTAGE		7	220VAC 3PH	220VAC 3PH 60HZ 3W+G	ب			,0009	600VAC 3PH 60HZ 3W+G	HZ 3W+G				\009	600VAC 3PH 60HZ 3W+G	HZ 3W+G		
NOMINAL INPUT CURRENT ON UPS/ON BYPASS (A/A)	105/105	129/131	155/157	105/105   129/131   155/157   205/209   255/262	255/262	329/340	38/38	47/47	57/58	75/77	94/96	121/125	38/38	47/47	57/58	75/77	94/96	121/125
MAXIMUM INPUT CURRENT (BATTERY CHARGING) (A/A)	129	153	192	242	314	397	47	56	70	89	115	146	47	56	70	89	115	146
OUTPUT VOLTAGE		220V	AC 3PH 60	220VAC 3PH 60HZ 3 OR 4W +G	0+ W			208VAC	208VAC 3PH 60HZ 3 0R 4W +G	3 OR 4W	9+			600VAC	3PH 60HZ	600VAC 3PH 60HZ 3 OR 4W +G	P.G	
OUTPUT CURRENT (FULL LOAD) (A/A)	105	131	157	209	262	340	111	138	166	222	277	360	38	47	58	77	96	125
BATTERY DC FLOAT VOLTAGE (MAX) (VDC)	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490
BATTERY DC NOMINAL VOLTAGE (VDC)	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432
BATTERY DC CURRENT AT NOMINAL VOLTAGE (A)	06	113	135	180	225	293	06	113	135	180	225	293	06	113	135	180	225	293
BATTERY MAXIMUM DC CURRENT AT CUT-OFF VOLTAGE (A)	109	137	164	219	273	355	109	137	164	218	273	355	109	137	164	218	273	355
Q1, Q4S, Q3BP, Q5N SWITCHES (690V) CURRENT (A)	125	125	125	125	250	250	125	125	125	125	250	250	125	125	125	125	250	250

VIN/VOUT			480V/480V	/480V			<b> </b>		480V/208V	/208/					208V/208V	,208V		
RATING AT 0.9 PF LAG.	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA	40KVA	50KVA	60KVA	80KVA	100KVA	130KVA
INPUT VOLTAGE/ OPTIONAL BYPASS INPUT VOLTAGE		480\	480VAC 3PH 60HZ 3W+G	)HZ 3W+G				48	480VAC 3PH 60HZ 3W+G	60HZ 3W+G				20	208VAC 3PH 60HZ 3W+G	30HZ 3W+G		
NOMINAL INPUT CURRENT ON UPS/ON BYPASS (A/A)	48/48	29/60	71/72	94/96	117/120	151/156	48/48	29/60	71/72	94/96	117/120	151/156	111/111	136/138	164/166	217/222	270/277	348/360
MAXIMUM INPUT CURRENT (BATTERY CHARGING) (A/A)	59	70	88	111	148	182	59	70	88	111	148	182	136	162	203	256	332	420
OUTPUT VOLTAGE		480VAC	480VAC 3PH 60HZ 3 OR 4W +G	3 OR 4W	9+			208V.	208VAC 3PH 60HZ 3 0R 4W +G	4Z 3 OR 41	9+ W			208VAC	208VAC 3PH 60HZ 3 OR 4W	3 OR 4W	9+	
OUTPUT CURRENT (FULL LOAD) (A/A)	48	09	72	96	120	156	11	138	166	222	277	360	111	138	166	222	277	360
BATTERY DC FLOAT VOLTAGE (MAX) (VDC)	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490	490
BATTERY DC NOMINAL VOLTAGE (VDC)	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432	432
BATTERY DC CURRENT AT NOMINAL VOLTAGE (A)	06	113	135	180	225	293	06	113	135	180	225	293	06	113	135	180	225	293
BATTERY MAXIMUM DC CURRENT AT CUT-OFF VOLTAGE (A)	109	137	164	219	273	355	109	137	164	218	273	355	109	137	164	218	273	355
Q1, Q4S, Q3BP, Q5N SWITCHES (690V) CURRENT (A)	125	125	125	125	250	250	125	125	125	125	250	250	125	125	125	125	250	250

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INFORMATION AND IS SUBLECT TO CHAMISE WITHOUT NOTICE.

PROJECT: SUBMITTAL DRAWINGS SHEET 2 OF 2 GALAXY 5000 40–130k/A UPS Input/Output :- 480V/480V, 480V/208V, 208V/208V, 220V/220V, 600V/600V, 600V/208V ELECTRICAL DATA

DWG NO: 90-174700-00-SD

DRAINN:BKHOLOUS/BALANURUGAN 22-DEC-11 ANGLE ENGINEER: I.KENNEDY, S.DAS 22-DEC-11 PROJECTION APPROVEDB.SHERIDAN/F.DIOSA 22-DEC-11 N.A.



# Closeout Documentation: Operating & Maintenance Manuals & Testing Reports

Project: National Guard Tactical Operations Center

Engineer: Bass Nixon Kennedy

Distributor: Eck Supply

Contractor: KAD Construction

#### **Total Solution Bill of Materials:**

Bill of Materials:

Two APC Galaxy 5000 80KVA/72KW UPS modules configured for parallel operation on a common output bus. Also included is a system control cabinet with system external maintenance bypass. Each UPS provided with network interface communications card.

#### **Closeout Documents:**

- 1. Operating & Maintenance Manual Galaxy 5000
- 2. Factory Testing
- 3. Startup Documents
- 4. Warranty Information

#### **Technical Support Phone Number:**

800-890-4272 option 5

#### Website:

www.apc.com

Submittal Provided By:



#### Dana Lotz

#### **Contractor Specialist Carolina's Factory Sales Office**

721 Stackhurst Way Wake Forest, NC Tel: (919) 453-2231

Mobile: (919) 604-6701

Email: dana.lotz@schneider-electric.com



# MGE Galaxy 5000 40-130 kVA 480 V

# Operation



# **Table of Contents**

About This Manual	1
Symbols Used	
Companion Manuals	1
Find Updates to this Manual	1
Overview	2
User Interface	
Display Screens	
Basic Operation of Display	
Measurements	
Alarms	_
Status	
Settings	
Controls	
UPS Configuration	6
Access to the Personalization Functions	6
Personalization Settings	
Operation	c
Operation	
Operating Modes	
Normal (Double Conversion) Mode	
ECO Mode (Single UPS Only)	
Load on Battery Power	
Operation of Mimic-Panel LEDs	
Operation Procedures	
Shut Down a Single UPS	
Restart a Single UPS	
Shut Down a Parallel Configuration	
Restart a Parallel Configuration	
Isolate UPS	
Return to Normal Operation	
Restart the UPS Unit for which Switch Q3BP (10) is ON and the Other Switches are OFF	
Restart the UPS for which All Switches are Set to OFF.	
Operation of the Relay Communication Card (Dry Contacts)	22
Standard Mode	22
Programmable Mode	
List of Operating Status Conditions That Can be Assigned to an SECI Output	
Maintenance	26
Life Cycle Monitoring (LCM)	26
Servicing Batteries	
IMPORTANT SAFETY INSTRUCTIONS FOR SERVICING BATTERIES	
Troubleshooting	2.8
Identification of Alarms	
Alarm or Status Display Messages List	
1 /	

# **About This Manual**

This manual describes the startup, shutdown, and normal operation of the MGE Galaxy 5000 with information on the user interface display and display menu structure. For maintenance the manual describes alarm conditions, UPS isolation operation and maintenance and safety information on servicing batteries for the MGE Galaxy 5000.

## **Symbols Used**



WARNING: Indicates an electrical hazard, which, if not avoided, could result in injury or death.



**Caution:** Indicates a hazard, which, if not avoided, could result in injury or death.



**Note:** Indicates important information.



**See:** Indicates that more information is available on the subject.

### **Companion Manuals**

For additional information about the MGE Galaxy 5000, see the following documents:

- MGE Galaxy 5000 Installation 990–5217–001
- MGE Galaxy 5000 Receiving & Unpacking 990–5218–001

## **Find Updates to this Manual**

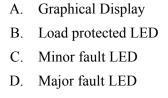
You can check for updates to this manual on www.apc.com. Look for the latest letter revision (A, B etc.) of the manual.

1

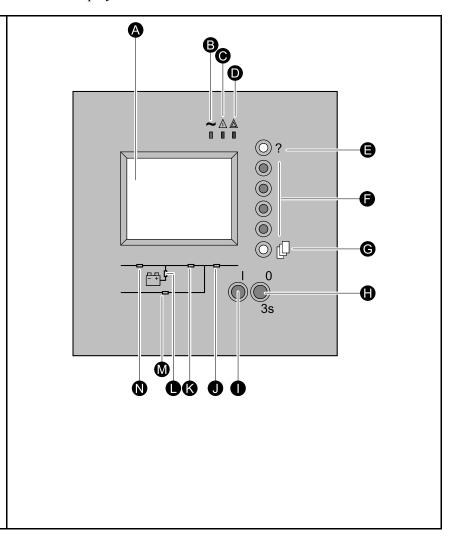
# **Overview**

#### **User Interface**

The UPS is operated using the control and display interface.

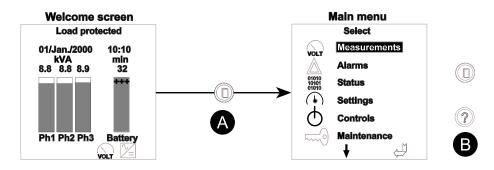


- E. Help key
- F. Function keys. Each key corresponds to a function presented on the display. The function of each key changes depending on the menu displayed on the screen.
- G. Menu key. This button provides direct access to the main menu.
- H. ON button.
- I. OFF button.
- J. PFC ON LED
- K. UPS ON LED
- L. Operation on battery power LED
- M. Load supplied LED
- N. Bypass in operation LED



# **Display Screens**

#### **Basic Operation of Display**



A	Press the Menu key to access the Main Menu.
В	Press the Help key for information on the pictogram functions. The key must be held down.

#### **Measurements**

The **Measurements** display screens consist of the following measurements screens:

- 1. Press the Menu key to return to the Main Menu.
- 2. Use the function keys  $\uparrow$  or  $\downarrow$  to highlight **Measurements** on the display.
- 3. Press the function key  $\leftarrow$  to select **Measurements**.
- 4. Use the function keys  $\uparrow$  or  $\downarrow$  to select between the following measurements:
  - Battery Measurements
  - Voltage Measurements
  - Current Measurements
  - Power Measurements
  - Frequency Measurements
  - Ratios Measurements
  - Parallel Measurements (option)
- 5. Press the function key  $\leftarrow$  to select the required measurements screen.

#### **Alarms**

Detailed information on all alarms is supplied on the display. See the "*Troubleshooting*" section for a list of possible alarm messages in the display.

- 1. Press the Menu key to return to the Main Menu.
- 2. Use the function keys  $\uparrow$  or  $\downarrow$  to highlight **Alarms** on the display.
- 3. Press the function key  $\leftarrow$  to select **Alarms**.
- 4. Use the function keys  $\uparrow$  or  $\downarrow$  to select between the alarm messages.
- 5. Press the function key  $\leftarrow$  to select the required alarm screen.

#### **Status**

The Status display screens consist of the following Status screens:

- 1. Press the Menu key to return to the Main Menu.
- 2. Use the function keys  $\uparrow$  or  $\downarrow$  to highlight **Status** on the display.
- 3. Press the function key  $\leftarrow$  to select **Status**.
- 4. Use the function keys  $\uparrow$  or  $\downarrow$  to select between the following two Status screens:
  - · Time stamped events
  - Statistics
- 5. Press the function key  $\leftarrow$  to select the required Status screen.

#### **Settings**

The **Settings** display screens consist of the following Settings screens:

- 1. Press the Menu key to return to the Main Menu.
- 2. Use the function keys  $\uparrow$  or  $\downarrow$  to highlight **Settings** on the display.
- 3. Press the function key  $\leftarrow$  to select **Settings**.
- 4. Use the function keys  $\uparrow$  or  $\downarrow$  to select between the Settings screens:
  - Language
  - Date / time
  - Display contrast
  - · Buzzer volume
  - Personalization
  - · Output voltage
  - Password
  - Dry-contact settings
- 5. Press the function key  $\leftarrow$  to select the required Settings screen.

#### **Controls**

The **Controls** display screens consist of the following Controls screens:

- 1. Press the Menu key to return to the Main Menu.
- 2. Use the function keys  $\uparrow$  or  $\downarrow$  to highlight **Controls** on the display.
- 3. Press the function key  $\leftarrow$  to select **Controls**.
- 4. Use the function keys  $\uparrow$  or  $\downarrow$  to select between the Controls screens:
  - · Reset Alarms
  - Inverter on
  - Inverter off
  - Force load transfer to inverter
  - Force load transfer to bypass
  - · Desynchronize inverter from bypass
  - · Resynchronize inverter and bypass

- Tests LEDs
- Buzzer OFF
- Enable LCM indications
- Disable LCM indications
- 5. Press the function key ← to select the required Controls screen.

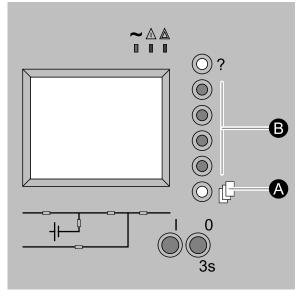
# **UPS Configuration**

#### **Access to the Personalization Functions**



**Caution:** Personalization must be carried out with switches Q1 (8) and Q5N (11) open (OFF) and switch Q4S (9) closed (ON).

- 1. Press the menu key (A).
- 2. Select **Settings**, then **Personalization** using the function keys (B)  $\uparrow$  or  $\downarrow$ .
- 3. Confirm by pressing the function key (B)  $\leftarrow$ ).
- 4. Enter the password by successively selecting each icon using the corresponding function key.
- 5. Confirm by pressing the function key (B)  $\leftarrow$ .
- 6. To save the personalization settings, confirm by pressing the function key (B) ←.



Ø

Ø





The password is factory set to: For information on how to change the password, see *"Settings"*.

# **Personalization Settings**

#### **Operating Mode**

Function	Factory setting	Options
UPS operating mode	NORMAL	
UPS automatic start	Disabled	Enabled
Authorized number of starts	4	1 to 255
Delay before reset of number of executed automatic starts	4 seconds	1 to 60 seconds

#### **Frequency**

Function	Factory setting	Options
UPS output frequency	60 Hz	60 Hz
Tolerance for bypass AC source	8 %	0.5 – 1 – 2 – 4 %
Synchronization speed with bypass AC source	2 Hz / s	1 Hz / s

# **Automatic Bypass**

Function	Factory setting	Options
Transfer to bypass AC source	Enabled	Disabled – disabled when limiting
Transfer to bypass with bypass AC source out of tolerances	Enabled	Disabled

# Battery

Function	Factory setting	Options
Low battery warning threshold if battery monitor inactive	40% remaining backup time	20 – 60 – 80 % remaining backup time
Low battery warning threshold if battery monitor active	4 minutes of battery backup time	1 to X minutes of battery backup time
Interval between two battery tests	30 days	1 to 180 days

# **Operation**



**Caution:** All operations concerning system start-up and compliance with standards and regulations, including those related to the battery cabinet, must be carried out by trained and certified personnel before using the UPS.

# **Operating Modes**

#### **Normal (Double Conversion) Mode**

This is the standard operating mode, set by default in the factory. Two possible cases:

1. Normal AC source available: LED (A) is ON.  The load is protected by the UPS.	A B C
<ol> <li>Normal AC source not available: LED (B) is ON. The buzzer sounds intermittently. Operation on battery power LED on the mimic-panel is green.</li> <li>The load is supplied by the UPS from battery power.</li> </ol>	A B C



8

**Note:** The display indicates any anomalies related to the AC source or the UPS as well as remedial action if applicable. Press the function key indicated by the display to turn the buzzer OFF.

#### **ECO Mode (Single UPS Only)**

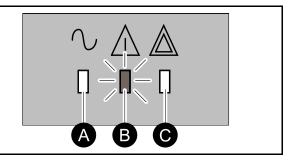
The main advantage of this mode is that it reduces the consumption of electrical power. ECO mode may be selected exclusively via the control panel on the UPS. Three possible scenarios:

1. Bypass AC source available: LED (A) is ON.

The load is supplied in ECO mode.

2. Bypass AC source not available: LED (A) is ON. The buzzer sounds intermittently. The load is automatically supplied in normal mode via the Normal AC input.

3. Both normal and Bypass AC sources not available or out of tolerance: LED (B) is ON. The buzzer sounds intermittently. The load is supplied by the UPS from battery power.





Note: The display indicates the UPS operating status conditions and the required actions.

#### **Load on Battery Power**

The load continues to be protected by the UPS when the normal AC source is not available. Power is supplied by the battery.

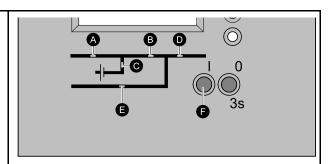
Transfer to Battery Power	A A
LED (B) is ON. The buzzer sounds intermittently.	
The load is supplied by the battery.	A B C
End of Battery Power	A A
LED (C) is ON. The buzzer sounds intermittently.	
The load is transferred on the bypass AC input if it is present.	
	ABG

# **Operation of Mimic-Panel LEDs**

The MGE Galaxy 5000 system is simple to operate and yet provides a wealth of continuous monitoring and diagnostic features to ensure proper operation. Operators gain access to information in the MGE Galaxy 5000 system through the display and its integrated LED mimic panel.

The mimic diagram displays information directly on the front panel. Segments are green when the function is active. Segments are OFF when the function is not active. Segments are red when a fault has occurred in the function.

- A. PFC ON LED
- B. UPS ON LED
- C. Operation on battery power LED
- D. Load supplied LED
- E. Bypass in operation LED
- F. ON button



#### Start Up Single UPS on Normal AC Input

Steps	Action	LED (A)	LED (B)	LED (C)	LED (D)	LED (E)
1	Q1 open	Off	Off	Off	Off	Off
2	Close Q1	green	Off	red	Off	red
3	Close Battery CB	green	Off	Off	Off	red
4	Close Q4S	green	Off	Off	Off	green
5	Close Q5N	green	Off	Off	green	green
6	Open Q3BP	green	Off	Off	green	green
7	Press ON button (F)	green	green	Off	green	Off

#### Start Up Single UPS on Bypass AC Input

Steps	Action	LED (A)	LED (B)	LED (C)	LED (D)	LED (E)
1	Q4S open	Off	Off	Off	Off	Off
2	Close Q4S	Off	Off	red	Off	green
3	Close Q5N	Off	Off	red	green	green
4	Open Q3BP	Off	Off	red	green	green
5	Close Q1	green	Off	red	green	green
6	Close Battery CB	green	Off	Off	green	green
7	Press ON button (F)	green	green	Off	green	Off

# **Operation Procedures**

#### Shut Down a Single UPS

The UPS remains energized unless it is shut down.

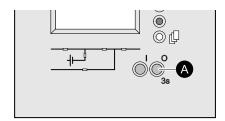
- 1. Press a button to exit sleep mode.
- 2. Press the OFF button (A) for 3 seconds.

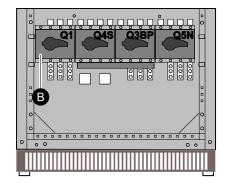
The load is no longer protected by the UPS. It is supplied via the bypass.

- 3. Set the battery circuit breaker of the auxiliary cabinets to OFF.
- 4. Set the input switch Q1 (B) to OFF.

The charger no longer operates to keep the batteries fully charged.

5. Open the upstream circuit breakers of the Normal AC source and Bypass AC source to completely power off the UPS.





#### **Restart a Single UPS**

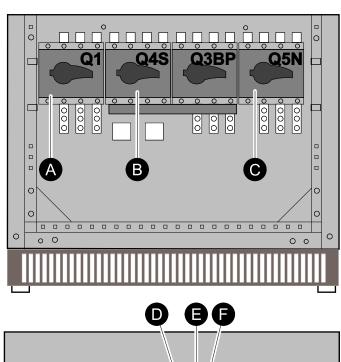
Check that switches Q4S (B) and Q5N (C) are closed. If this is the case, continue with this procedure, otherwise refer to "Return to the Normal Operation, Single UPS".

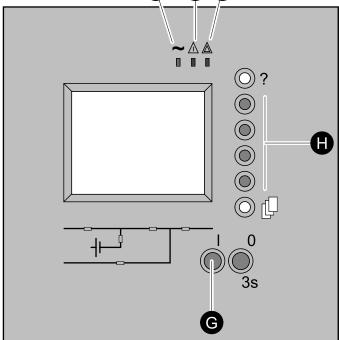
- 1. Set the Normal AC source input switch Q1 (A) to the ON position.
- 2. Wait until the end of the start sequence.
- 3. Set the battery circuit breaker of the auxiliary cabinets to the ON position.

The UPS starts automatically. LED (D) is ON. **The load is protected by the UPS.** 

If the LED (D) remains OFF, press the ON button (G) (the UPS is in manual start mode) and confirm if necessary by pressing the function key (H) marked  $\leftarrow$ .

If the LED (C) still remains OFF and either of the LEDs (E) or (F) is ON, a fault has occurred (see "*Identification of Alarms*".





#### **Shut Down a Parallel Configuration**

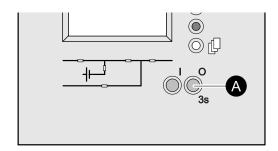
- 1. Press a button on each unit to exit sleep mode.
- 2. Press the OFF button (A) on each unit for 3 seconds.

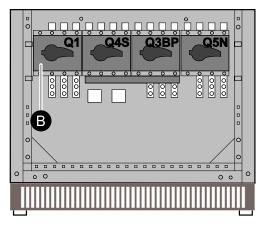
The load is no longer protected by the UPSs. It is supplied via the bypass.

- 3. Set the battery circuit breakers of the auxiliary cabinets to the OFF position.
- 4. Set the input switch Q1 (B) in each UPS to the OFF position.

The charger no longer operates to keep the batteries fully charged.

5. Open the upstream circuit breakers of Normal AC source and Bypass AC source to completely power off the installation.





#### **Restart a Parallel Configuration**

Check that switches Q4S (B) and Q5N (C) are closed. If this is the case, continue with this procedure, otherwise refer to "Return to Normal Operation, Parallel UPS".

- 1. Check that the output switch CB2 in the external system bypass cabinet is closed.
- 2. Check that the bypass switch CB1 in the external system bypass cabinet is open.

Then carry out steps 3 to 5 below on each of the UPSs.

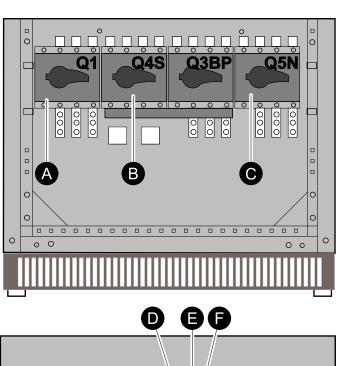
- 3. Set the Normal AC source input switch Q1 (A) to the ON position.
- 4. Wait until the end of the start sequence.
- 5. Set the battery circuit breaker of the auxiliary cabinets to the ON position.

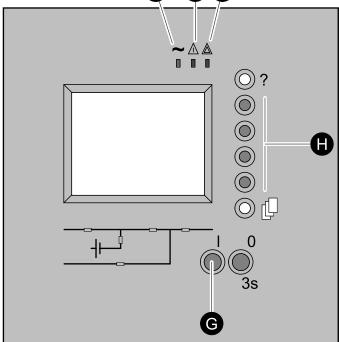
The UPSs start automatically. On each unit, LEDs (E) and (F) go OFF and LED (D) goes ON.

#### The load is protected by the UPSs.

If the LED (D) remains OFF, press the ON button (G) on each UPS (the UPS is in manual start mode) and confirm if necessary by pressing the function key (H) marked  $\leftarrow$ .

If the LED (D) still remains OFF and either of the LEDs (E) or (F) is ON, a fault has occurred (see "Identification of Alarms").





#### **Isolate UPS**

#### **Isolate Single UPS**

To isolate the UPS from the electrical power source and supply the load directly by the normal or bypass AC source, follow the instructions below:

- 1. Press a button to exit sleep mode.
- 2. Shut down the UPS by pressing the OFF button (A) for 3 seconds.

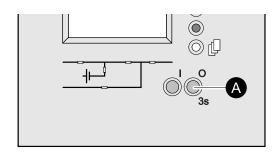
#### The load is no longer protected by the UPS.

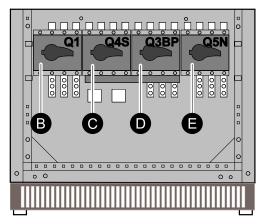
- 3. Set bypass switch Q3BP (D) to ON.
- 4. Set output switch Q5N (E) to OFF.
- 5. Set the battery circuit breaker of the auxiliary cabinets to OFF.
- 6. Set the input switch Q1 (B) to OFF.
- 7. Set the switch Q4S (C) to OFF.
- 8. Wait until the display and LEDs go off.

The load is no longer protected by the UPS, but continues to be supplied with AC power. UPS maintenance or servicing can now be carried out.



WARNING: Power is present on the power connection terminals.





#### **Isolate Parallel UPS Without External Bypass Cabinet**

#### Shut down and isolate the first UPS:

- 1. Check that the two UPSs are operating.
- 2. Press a button to exit sleep mode.
- 3. Shut down the UPS by pressing the OFF button (A) for 3 seconds.
- 4. Set output switch Q5N (E) to OFF.
- 5. Set the battery circuit breakers of the auxiliary cabinets to OFF.
- 6. Set the input switch Q1 (B) to OFF.
- 7. Set the switch Q4S (C) to OFF.
- 8. Wait until the display and LEDs go off.

The load is still protected by the other UPS. Maintenance or servicing can now be carried out on the UPS that has been shut down.



WARNING: Power is present on the power connection terminals.

# has been shut down. G: Power is present on

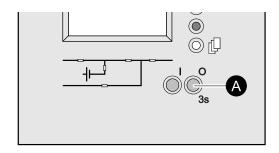
#### Shut down and isolate the second UPS:

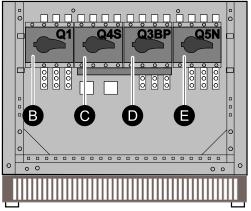
- 9. Press a button to exit sleep mode.
- 10. Shut down the UPS by pressing the OFF button (A) for 3 seconds.
- 11.Set bypass switch Q3BP (D) to ON.
- 12. Set output switch Q5N (E) to OFF.
- 13.Set the battery circuit breaker of the auxiliary cabinets to OFF.
- 14. Set the input switch Q1 (B) to OFF.
- 15. Set the switch Q4S (C) to OFF.
- 16. Wait until the display and LEDs go off.

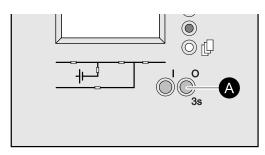
The load is no longer protected by the UPS, but continues to be supplied with AC power. UPS maintenance or servicing can now be carried out.

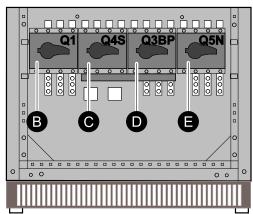


WARNING: Power is present on the power connection terminals.





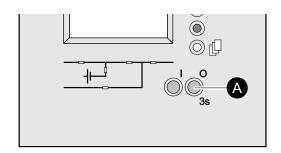


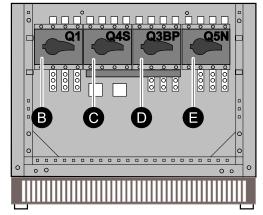


#### **Isolate Parallel UPS With External Bypass Cabinet**

#### Shut down and isolate one UPS:

- 1. Check that the total capacity of the remaining UPSs is sufficient to supply the connected load.
- 2. Press a button to exit sleep mode.
- 3. Shut down the UPS by pressing the OFF button (A) for 3 seconds.
- 4. Set output switch Q5N (E) to OFF.
- 5. Set the battery circuit breaker of the auxiliary cabinets to OFF.
- 6. Set the input switch Q1 (B) to OFF.
- 7. Set the switch Q4S (C) to OFF.
- 8. Wait until the display and LEDs go off.

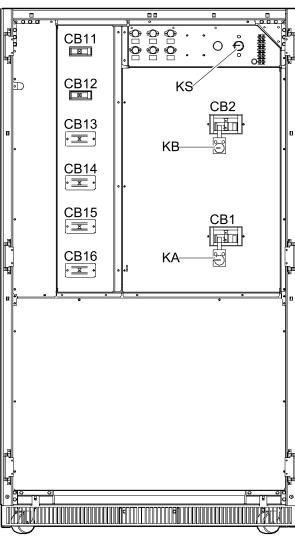




#### Shut down and isolate all the UPSs:

- 9. On each UPS, press a button to exit sleep mode.
- 10.Shutdown each UPS by pressing their OFF buttons (A) for 3 seconds.
- 11.Depress the "transfer initiate" switch on the SBC. Unlock "KS" and remove key "A".
- 12.Insert key "A" into CB1. Unlock and close CB1.
- 13. Open CB2 and lock open, and remove key "B".
- 14.Insert key "B" into key interlock "KS" and turn to lock.
- 15.Open output isolation CB11–16, as applicable, and open all Q5N (E) switches of each UPS.
- 16. Open battery CB of each UPS.
- 17.Open Q1 (B) and Q4S (C) switches of each UPS.
- 18. Turn off all inputs to the UPSs.
- 19. Wait until the control electronics of all UPS units have fully shutdown.

The load is no longer protected by the UPSs, but continues to be supplied with AC power. UPS maintenance or servicing can now be carried out.



#### **Return to Normal Operation**

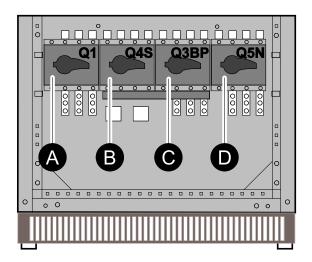
#### **Return to Normal Operation, Single UPS**

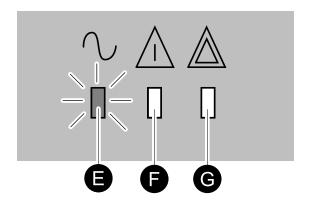
- 1. Check that bypass switch Q3BP (C) is ON and that all other switches are OFF.
- 2. Set switch Q4S (B) to ON.
- 3. Set output switch Q5N (D) to ON.
- 4. Wait until the display goes on and check that there are no faults on the static switch on the bypass line.
- 5. Set bypass switch Q3BP (C) to OFF.
- 6. Set the input switch Q1 (A) to ON.
- 7. Set the battery circuit breaker of auxiliary cabinets to ON.

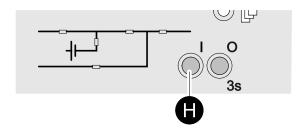
# The UPS starts automatically. LED (E) is ON.

If the LED (E) remains OFF, press the ON button (H) (the UPS is in manual start mode) and confirm if necessary by pressing the function key marked  $\leftarrow$ .

If the LED (E) still remains OFF and either of the LEDs (F) or (G) is ON, a fault has occurred (see "*Identification of Alarms*").







#### Return to Normal Operation, Parallel UPS Without External Bypass Cabinet

#### Restart the UPS Unit for which Switch Q3BP (10) is ON and the Other Switches are OFF

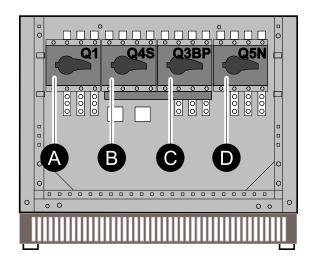


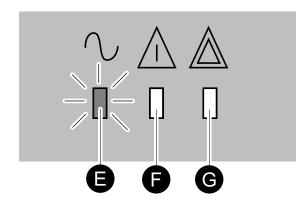
**Caution:** It is imperative to restart this UPS. Otherwise, load power is lost if the other UPS is shut down.

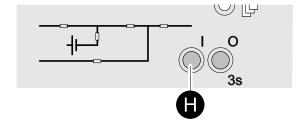
- 1. Set the input switch Q4S (B) to ON.
- 2. Set output switch Q5N (D) to ON.
- 3. Check that the UPS is listed by the display, then confirm by pressing the function keys.
- 4. Set bypass switch Q3BP (C) to OFF.
- 5. Set the input switch Q1 (A) to ON.
- 6. Set the battery circuit breaker of the auxiliary cabinets to ON.

# The UPS starts automatically. LED (E) is ON. The load is protected by the UPS.

If the LED (E) remains OFF, press the ON button (H) on each UPS (the UPS is in manual start mode) and confirm, if necessary, by pressing the function key marked  $\leftarrow$ . If the LED (E) still remains OFF and either of the LEDs (F) or (G) is ON, a fault has occurred (see "Identification of Alarms").







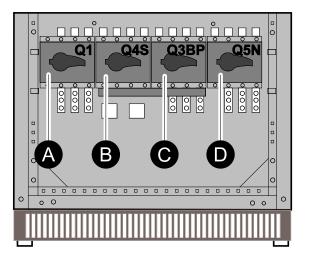
#### Restart the UPS for which All Switches are Set to OFF

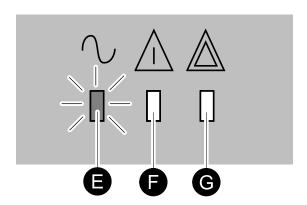
- 1. Set the input switch Q4S (B) to ON.
- 2. Set output switch Q5N (D) to ON.
- 3. Check that all the UPS units present in the installation are included in the list on the display and confirm by pressing the function keys.
- 4. Set the input switch Q1 (A) to ON.
- 5. Set the battery circuit breaker of the auxiliary cabinets to ON.

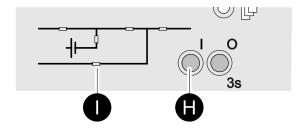
#### The UPS restarts and LED (E) is ON.

If the LED (E) remains OFF, press the ON button (H) on each UPS (the UPS is in manual start mode) and confirm, if necessary, by pressing the function key marked  $\leftarrow$ .

If the LED (E) still remains OFF and either of the LEDs (F) or (G) is ON, a fault has occurred (see "*Identification of Alarms*").





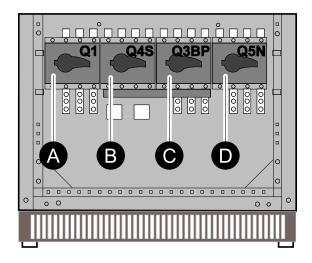


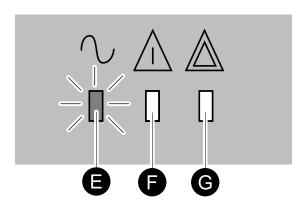
#### **Return to Normal Operation, Parallel UPS With External Bypass Cabinet**

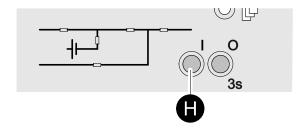
- 1. Check that all switches on the UPSs are set to OFF.
- 2. Apply bypass and input power to UPSs.
- 3. Set switch Q4S (B) on each UPS to ON.
- 4. Set output switch Q5N (D) on each UPS and CB11–16, as applicable, to ON.
- 5. Check that all the UPSs present in the installation are included in the list on the display and confirm by pressing the function key on each UPS.
- 6. Set CB2 in the external system bypass cabinet to ON
- 7. Set CB1 in the external system bypass cabinet to OFF.
- 8. Set the input switch Q1 (A) on each UPS unit to ON.
- 9. Set the battery circuit breakers of the auxiliary cabinets to ON.

# The UPS units start automatically. LED (E) is ON. The load is protected by the UPS.

If the LED (E) remains OFF, press the ON button (H) on each UPS unit (the UPS is in manual start mode) and confirm, if necessary, by pressing the function key marked ←. If the LED (E) still remains OFF and either of the LEDs (F) or (G) is ON, a fault has occurred (see "Identification of Alarms").







# Operation of the Relay Communication Card (Dry Contacts)

All systems are equipped with this remote transmissions card (also known as SECI). A complete specification exists for the card used in MGE Galaxy 5000. This card is used for the transmission of information between the system and the environment. Two inputs and six outputs are available for the user (see the table below for the default programming).

#### Standard Mode

It is compatible with all MGE systems that are I<sup>2</sup>C compatible.

All SA1 microswitches must be set to OFF (if two SECI cards are installed in the unit, the second card must be identified differently. On the second card, microswitch 1 on SA1 must be set to ON).

In this mode, the relays switch when the UPS changes status. The information listed below is transmitted if the parameters were enabled.

Inputs	Factory configuration	Other possible signals for each contact
1.A	UPS ON	Temperature fault in room
1.B	UPS OFF	Transfer to bypass AC input disabled
		Transfer to bypass AC input disabled if it is out of tolerances
		UPS not synchronized with the bypass AC input

Outputs	Factory configuration	Other possible signals for each contact
1.1	General alarm	• Overload
1.2	Battery fault	• PFC fault
1.3	Load on UPS	Inverter fault
1.4	Load on automatic bypass	Charger fault
1.5	Load on battery power	Automatic-bypass fault
1.6	Low battery warning	Bypass AC source out of tolerances
		Battery-temperature fault
		Ventilation fault
		Emergency power OFF activated
		Battery circuit breaker(s) open
		Phase inversion on normal or bypass AC input
		• Fuses blown
		Transfer to AC bypass disabled
		Operation in ECO mode
		Load on maintenance bypass

The indications 1.X become 2.X for a second identical card in the UPS.

Contacts are of the NO (normally open) type.

(1) The general alarm can be tested by opening the battery circuit breaker.

# **Programmable Mode**

This operating mode is specific to the MGE Galaxy 5000.

**Microswitch 3 on SA1** must be set to **ON** (if two SECI cards are installed in the unit, the second card must be identified differently. On the second card, microswitch 1 on SA1 must be set to ON).

In this mode, it is possible to assign predefined operating status conditions (see the complete list) to the various SECI output relays and predefined UPS commands to the SELV inputs.

Assignments are made using the MGE Galaxy 5000 user interface.

# List of Operating Status Conditions That Can be Assigned to an SECI Output

Operating status conditions	Description
GENERAL ALARM	PFC fault OR Inverter fault OR Bypass static switch fault OR Charger fault OR Thermal overload on AC bypass OR ALIN board input fuse blown OR Q3BP and Q5N are closed simultaneously OR External Q3BP and external Q5N are closed simultaneously OR EPO activated OR Battery backup time ended, shift to wait mode OR Battery temperature fault > 45°C, charger shutdown OR Battery deep discharge OR Charger shutdown due to battery room temperature outside tolerances OR Abnormal presence of voltage on the output before closing the bypass static switch. (frequency converter) OR UPS in downgraded mode - External CAN communication fault OR - Internal CAN communication fault (GDEN, MIZNUS and CHAN) OR - CAN cable physically cut OR - CAN communication relay fault OR UPS personalization fault
BATTERY FAULT	The battery will soon reach the end of its theoretical service life OR Battery must be checked (following a faulty battery test)
LOAD ON UPS	Inverter connected to the load and operating on normal AC input. Battery operations due to a BPI or battery test are signalled as operation on the normal AC input.
LOAD ON AUTOMATIC BYPASS	The static switch on the AC bypass is closed.
LOAD ON BATTERY POWER	Inverter connected to the load and operating on battery power. Battery operations due to a battery test are not signalled.
LOW BATTERY WARNING	Battery has reached the low-battery warning level (voltage or time). The two thresholds may be user set.
OVERLOAD	One of the unit modules (rectifier, inverter or AC bypass) is overloaded (thermal or instantaneous).

Operating status conditions	Description
PFC FAULT	Neutral leg fault OR Neutral leg IGBT temperature outside tolerances OR - Voltage difference between 2 DC half-buses outside tolerances OR - Top DC half-bus voltage outside tolerances OR - Bottom DC half-bus voltage outside tolerances PFC fault OR - DC-bus voltage at end of CSR1 walk-in is lower than a threshold OR - DC-bus voltage at end of DC walk-in is lower than a threshold OR - DC-bus voltage is higher than the high threshold OR - DC-bus voltage is lower than the minimum threshold OR - Mean DC-bus voltage is higher than the maximum setpoint OR - Mean DC-bus voltage is lower than the minimum setpoint OR - DC-bus voltage is higher than the fast hardware threshold OR - Temperature of the static switch on the AC normal outside tolerances OR - Temperature of the battery static switch outside tolerances OR - Rectifier is current limiting OR - Rectifier thermal overload OR PFC IGBT base-plate temperature outside tolerances OR IGBT inductor temperature outside tolerances.
INVERTER FAULT	Inverter short-circuit detected OR Inverter current limiting OR Inverter static switch failure OR Temperature fault on inverter static switch OR Inverter base-plate temperature outside tolerances OR Inverter thermal overload OR Inverter phase-1 fuse has blown OR Inverter phase-2 fuse has blown OR Inverter phase-3 fuse has blown OR Inverter phase-1 voltage amplitude outside tolerances OR Inverter phase-2 voltage amplitude outside tolerances OR Inverter phase-3 voltage amplitude outside tolerances OR Inverter phase-3 voltage amplitude outside tolerances OR Inverter phase-3 voltage outside tolerances OR Inverter relay for parallel connection is faulty.
CHARGER FAULT	Fault of non-isolated supply on charger board OR Fault of isolated supply on charger board OR Opening fault on battery circuit breaker no. 1 OR Opening fault on battery circuit breaker no. 2 OR Charger IGBT temperature outside tolerances OR Difference in charge-current measurements between safety and measurement systems OR Charge current on measurement system close to zero OR Charge current on safety system close to zero OR Charge current is higher than safety level OR Difference in voltage measurements between safety and measurement systems OR Voltage on measurement system close to zero OR Voltage on safety system close to zero OR Battery voltage higher than safety level OR Charger fuse blown.
AUTOMATIC-BYPASS FAULT	Supply fault for the static switch on the AC bypass OR Fault on static switch on AC bypass OR Temperature of the static switch on the AC bypass outside tolerances.
BYPASS AC SOURCE OUT OF TOLERANCE	Bypass AC source outside of tolerances (voltage and/or frequency).
BATTERY TEMPERATURE FAULT	Battery ambient temperature outside tolerances.
VENTILATION FAULT	Excessive temperature on one or more inductors OR Inverter or AC bypass static switch fan fault.
EMERGENCY POWER OFF ACTIVATED	EPO set on control-monitoring board OR EPO set on charger board.

Operating status conditions	Description	
BATTERY CIRCUIT BREAKER(S) OPEN	One or two Battery circuit breakers is open.	
PHASE ROTATION FAULT	Phase inversion on normal AC input OR Phase inversion on AC bypass.	
FUSES BLOWN	Fuse blown at normal AC input OR Charger fuse has blown OR Power supply board fuse has blown OR Inverter phase-1 fuse has blown OR Inverter phase-2 fuse has blown OR Inverter phase-3 fuse has blown.	
TRANSFER TO BYPASS DISABLED	Transfer to AC bypass disabled (control and monitoring board checks for disabling by the personalization and/or an SECI input).	
ECO MODE ACTIVATED	The unit is operating in ECO mode. It is configured for ECO mode and the static switch on the AC bypass is closed.	
MAINTENANCE POSITION	Switch Q5N is open.	
CHECK THE UPS	A Life Cycle Monitoring alarm has been activated:	
	End of warranty	
	End of AC capacitor service life	
	End of DC capacitor service life	
	End of fan service lives	
	End of power supply board service life	
	End of battery service life	

MGE Galaxy 5000 can be equipped with up to two SECI cards maximum. In this case, the second card must be identified differently. On the second card, microswitch 1 on SA1 must be set to ON.

# **Maintenance**

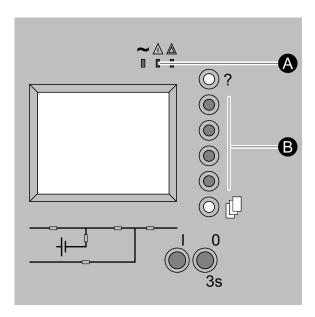
# **Life Cycle Monitoring (LCM)**

The "Life Cycle Monitoring" (LCM) function provides UPS maintenance advice to guarantee installation availability for the user.

The display gives three messages enabling the following to be identified:

Status	Display Message
The end of the contractual legal warranty	End of warranty check recommended
Regular maintenance requirements and the end of service life for consumable components	Technical check recommended
The end of the battery service life	Battery check required

In addition to these messages, the minor fault LED (A) lights up and the buzzer sounds. These messages can be deleted by pressing the function key (B). This also causes LED (A) to go out, the buzzer to stop and the removal of the "Global Alarm" remote signalling.



To completely disable LCM indications, use the display to enter the password required to disable the function.

#### **Servicing Batteries**

#### IMPORTANT SAFETY INSTRUCTIONS FOR SERVICING BATTERIES

Servicing of batteries should be performed or supervised by personnel knowledgeable of batteries and the required precautions. Keep unauthorized personnel away from the batteries.

When replacing batteries, use the same model and manufacturer of batteries.



**Caution:** Do not dispose of battery or batteries in a fire. The battery may explode. Do not open or mutilate the battery or batteries. Released electrolyte is harmful to the skin and eyes. It may be toxic. A battery can present a risk of electrical shock and high short-circuit current.

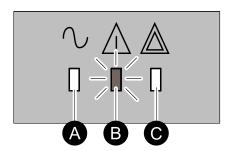
The following precautions should be observed when working with batteries:

- Remove watches, rings, or other metal objects.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not lay tools or metal parts on top of batteries.
- Disconnect charging source prior to connecting or disconnecting battery terminals.
- Determine if the battery is inadvertently grounded. If inadvertently grounded, remove the source of ground. Contact with any part of a grounded battery can result in electrical shock. The likelihood of such shock will be reduced if suchs grounds are removed during installation and maintenance.

## **Troubleshooting**

#### **Identification of Alarms**

Alarm conditions are identified by LEDs (A), (B), (C) and the buzzer.



LED (A)	A) LED (B) LED (C) Buzzer		Buzzer	Significance
-		-	Intermittent	Normal AC source not available
-	-		Intermittent	UPS shut down following end of battery power
-	-		Intermittent	UPS shut down on fault requiring servicing by after-sales support

Detailed information on all alarms is supplied on the display.

- On the screen, select the alarm for which information is required.
- Hold down the corresponding function key to display the possible causes of the fault and the required action.

## **Alarm or Status Display Messages List**

Display Message	Level
Abnormal bypass operation	Internal and external switches
Abnormal external bypass operation	Internal and external switches
Abnormal presence of output voltage	Fault or state of load
AC Bypass static switch thermal overload	Fault or state on Bypass AC or Bypass Static Switch
Battery circuit breaker 2 open (QF2) (Battery Cabinet #2 or #4)	Fault or state of standard charger
Battery circuit breaker open (QF1) (Battery Cabinet #1 or #3)	Fault or state of standard charger
Battery deep discharge	Fault or state of standard charger
Battery room temperature fault	Fault or state of standard charger
Battery temperature fault	Fault or state of standard charger
Battery test in progress	Fault or state of standard charger
Battery test result not OK	Fault or state of standard charger
Bypass AC backfeed (KA2) fault	Fault or state on Bypass AC or Bypass Static Switch
Bypass AC backfeed (KA2) is open	Fault or state on Bypass AC or Bypass Static Switch
Bypass input phase rotation fault	Fault or state on Bypass AC or Bypass Static Switch
Bypass source outside tolerances	Fault or state on Bypass AC or Bypass Static Switch
Bypass source present	Fault or state on Bypass AC or Bypass Static Switch
Bypass static switch fault	Major Fault on subassembly
Bypass static switch overload	Fault or state on Bypass AC or Bypass Static Switch
CAN communication relay fault	Fault of downgraded mode
CAN communication resynchronization fault	Fault of downgraded mode
Charger fault	Major Fault on subassembly
Charger shutdown by PFC overload	Fault or state of standard charger
Customer communication disabled	Fault, filtering of customer communication
Emergency Power Off (EPO)	Generic fault on equipment
End of theoretical battery service life	Fault or state of standard charger
External sync frequency outside tolerances	Fault or state of external synchronization
External CAN communication fault	Fault of downgraded mode
External Q3BP switch closed (MBC or SBC CB1)	Internal and external switches

External Q4S switch open (MBC CB3)  Internal and external switches  External Q5N switch open (MBC or SBC CB2)  Internal and external switches  Fan fault  Major Fault or state of installation  Internal CAN communication fault  Inverter and bypass desynchronized  Fault or state of inverter  Inverter current limiting  Fault or state of inverter  Inverter fault  Major Fault or state of inverter  Inverter fault  Inverter fuse blown  Fault or state of inverter  Inverter ready for load connection  Inverter ready for load connection  Fault or state of installation  Inverter thermal overload  Fault or state of installation  Inverter thermal overload  Fault or state of inverter  Inverter thermal overload  Fault or state of installation  Inverter thermal overload  Fault or state of inverter  Load short circuit  Fault or state of load  Loss of communication with UPS 1  Fault or state of load  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS 5  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS 5  Fault of state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Display Message	Level			
Installation overload Internal CAN communication fault Inverter and bypass desynchronized Inverter and bypass desynchronized Inverter and bypass desynchronized Inverter fault Inverter fault Inverter fault Inverter fault Inverter fault Inverter fuse blown Fault or state of inverter Inverter overload Inverter overload Inverter ready for load connection Inverter ready for load connection Inverter starting Fault or state of installation Inverter starting Fault or state of installation Inverter thermal overload Fault or state of installation Inverter thermal overload Fault or state of inverter Load short circuit Fault or state of inverter  Load short circuit Fault or state of inverter  Loas of communication with UPS 1 Fault of downgraded mode Loss of communication with UPS 2 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS 5 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS 5 Fault of downgraded mode Loss of communication with UPS 4 Fault of state of installation Fault or state of installation Nornel AC backfeed (KA1) fault Fault or state of installation Nornal AC backfeed (KA1) fault Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC	External Q4S switch open (MBC CB3)	Internal and external switches			
Installation overload Internal CAN communication fault Internal CAN communication fault Inverter and bypass desynchronized Inverter and bypass desynchronized Inverter current limiting Inverter fault Inverter overload Fault or state of inverter Inverter ready for load connection Inverter starting Fault or state of installation Inverter starting Inverter thermal overload Fault or state of inverter Inverter thermal overload Fault or state of load Inverter thermal overload Fault of downgraded mode Inverter thermal overload Fault of downgraded mode Fault of downgraded mode Fault of downgraded mode Fault or state of standard charger Fault or state on Normal AC Normal AC backfeed (KA1) fault Fault or state on Normal AC Normal AC input phase rotation fault Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC	External Q5N switch open (MBC or SBC CB2)	Internal and external switches			
Internal CAN communication fault Inverter and bypass desynchronized Inverter current limiting Fault or state of inverter Inverter current limiting Fault or state of inverter Inverter fault Major Fault on subassembly Inverter fuse blown Fault or state of inverter Inverter overload Fault or state of inverter Inverter ready for load connection Fault or state of inverter Inverter starting Fault or state of inverter Inverter starting Fault or state of inverter Inverter starting Fault or state of inverter Inverter thermal overload Fault or state of inverter Fault or state of load Loss of communication with UPS 1 Fault or state of load Loss of communication with UPS 2 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault or state of standard charger Low battery shutdown Fault or state of standard charger Low battery warning Fault or state of standard charger Non-redundant installation Fault or state of installation Normal AC backfeed (KA1) fault Fault or state on Normal AC Normal AC backfeed (KA1) is open Fault or state on Normal AC Normal AC input phase rotation fault Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC	Fan fault	Major Fault on subassembly			
Inverter and bypass desynchronized  Fault or state of inverter  Inverter fault  Major Fault or state of inverter  Inverter fuse blown  Fault or state of inverter  Inverter fuse blown  Fault or state of inverter  Inverter overload  Fault or state of inverter  Inverter ready for load connection  Inverter starting  Fault or state of installation  Inverter starting  Fault or state of installation  Inverter thermal overload  Fault or state of inverter  Load short circuit  Fault or state of inverter  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault or state of standard charger  Low battery shutdown  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC suckfeed (KA1) is open  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Installation overload	Fault or state of installation			
Inverter current limiting Fault or state of inverter Inverter fault Major Fault or state of inverter Inverter fuse blown Fault or state of inverter Inverter overload Fault or state of inverter Inverter ready for load connection Fault or state of installation Inverter starting Fault or state of installation Inverter thermal overload Fault or state of inverter Load short circuit Fault or state of load Loss of communication with UPS 1 Fault of downgraded mode Loss of communication with UPS 2 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault of state of standard charger Low battery shutdown Fault or state of standard charger Low battery warning Fault or state of standard charger Non-redundant installation Fault or state of installation Normal AC backfeed (KA1) fault Fault or state on Normal AC Normal AC backfeed (KA1) is open Fault or state on Normal AC Normal AC fuse blown Fault or state on Normal AC Normal AC input phase rotation fault Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC Normal AC source outside tolerances Fault or state on Normal AC	Internal CAN communication fault	Fault of downgraded mode			
Inverter fault  Inverter fuse blown  Fault or state of inverter  Inverter overload  Inverter ready for load connection  Inverter starting  Fault or state of installation  Inverter starting  Fault or state of installation  Inverter thermal overload  Fault or state of installation  Inverter thermal overload  Fault or state of inverter  Load short circuit  Fault or state of load  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault of standard charger  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC	Inverter and bypass desynchronized	Fault or state of inverter			
Inverter fuse blown  Fault or state of inverter  Inverter overload  Fault or state of inverter  Inverter ready for load connection  Fault or state of installation  Inverter starting  Fault or state of installation  Inverter starting  Fault or state of installation  Inverter thermal overload  Fault or state of load  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault or state of standard charger  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of installation  Norned AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC	Inverter current limiting	Fault or state of inverter			
Inverter overload  Fault or state of inverter  Inverter ready for load connection  Fault or state of installation  Inverter starting  Fault or state of installation  Inverter thermal overload  Fault or state of inverter  Load short circuit  Fault or state of load  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC	Inverter fault	Major Fault on subassembly			
Inverter ready for load connection  Fault or state of installation  Inverter starting Fault or state of inverter  Fault or state of inverter  Load short circuit Fault or state of load  Loss of communication with UPS 1 Fault of downgraded mode  Loss of communication with UPS 3 Fault of downgraded mode  Loss of communication with UPS 4 Fault of downgraded mode  Loss of communication with UPS X Fault of downgraded mode  Loss of communication with UPS X Fault of downgraded mode  Los of communication with UPS X Fault or downgraded mode  Low battery shutdown Fault or state of standard charger  Low battery warning Fault or state of standard charger  Non-redundant installation Fault or state of installation  Normal AC backfeed (KA1) fault Fault or state on Normal AC  Normal AC fuse blown Fault or state on Normal AC  Normal AC input phase rotation fault Fault or state on Normal AC  Normal AC source downgraded Fault or state on Normal AC  Normal AC source downgraded Fault or state on Normal AC  Fault or state on Normal AC	Inverter fuse blown	Fault or state of inverter			
Inverter starting Fault or state of installation Inverter thermal overload Fault or state of inverter Fault or state of load Loss of communication with UPS 1 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 3 Fault of downgraded mode Loss of communication with UPS 4 Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault of downgraded mode Loss of communication with UPS X Fault or state of standard charger Low battery shutdown Fault or state of standard charger Low battery warning Fault or state of installation Normal AC backfeed (KA1) fault Fault or state on Normal AC Normal AC backfeed (KA1) is open Fault or state on Normal AC Normal AC fuse blown Fault or state on Normal AC Normal AC input phase rotation fault Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC Normal AC source downgraded Fault or state on Normal AC	Inverter overload	Fault or state of inverter			
Inverter thermal overload  Fault or state of inverter  Load short circuit  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Inverter ready for load connection	Fault or state of installation			
Load short circuit  Fault or state of load  Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault or state of standard charger  Low battery shutdown  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Inverter starting	Fault or state of installation			
Loss of communication with UPS 1  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Inverter thermal overload	Fault or state of inverter			
Loss of communication with UPS 2  Fault of downgraded mode  Loss of communication with UPS 3  Fault of downgraded mode  Loss of communication with UPS 4  Fault of downgraded mode  Loss of communication with UPS X  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC	Load short circuit	Fault or state of load			
Loss of communication with UPS 3 Fault of downgraded mode  Loss of communication with UPS X Fault of downgraded mode  Loss of communication with UPS X Fault of downgraded mode  Low battery shutdown Fault or state of standard charger  Low battery warning Fault or state of standard charger  Non-redundant installation Fault or state of installation  Normal AC backfeed (KA1) fault Fault or state on Normal AC  Normal AC backfeed (KA1) is open Fault or state on Normal AC  Normal AC fuse blown Fault or state on Normal AC  Normal AC input phase rotation fault Fault or state on Normal AC  Normal AC source downgraded Fault or state on Normal AC  Normal AC source outside tolerances Fault or state on Normal AC	Loss of communication with UPS 1	Fault of downgraded mode			
Loss of communication with UPS 4  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Fault or state on Normal AC	Loss of communication with UPS 2	Fault of downgraded mode			
Loss of communication with UPS X  Fault of downgraded mode  Low battery shutdown  Fault or state of standard charger  Low battery warning  Fault or state of standard charger  Non-redundant installation  Fault or state of installation  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Fault or state on Normal AC	Loss of communication with UPS 3	Fault of downgraded mode			
Low battery shutdown  Fault or state of standard charger  Fault or state of standard charger  Fault or state of installation  Fault or state of installation  Fault or state on Normal AC  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC	Loss of communication with UPS 4	Fault of downgraded mode			
Low battery warning  Fault or state of standard charger  Fault or state of installation  Fault or state of installation  Fault or state on Normal AC	Loss of communication with UPS X	Fault of downgraded mode			
Non-redundant installation  Fault or state of installation  Fault or state on Normal AC  Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Fault or state on Normal AC	Low battery shutdown	Fault or state of standard charger			
Normal AC backfeed (KA1) fault  Fault or state on Normal AC  Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC	Low battery warning	Fault or state of standard charger			
Normal AC backfeed (KA1) is open  Fault or state on Normal AC  Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Fault or state on Normal AC  Fault or state on Normal AC	Non-redundant installation	Fault or state of installation			
Normal AC fuse blown  Fault or state on Normal AC  Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Normal AC backfeed (KA1) fault	Fault or state on Normal AC			
Normal AC input phase rotation fault  Fault or state on Normal AC  Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Normal AC backfeed (KA1) is open	Fault or state on Normal AC			
Normal AC source downgraded  Fault or state on Normal AC  Normal AC source outside tolerances  Fault or state on Normal AC	Normal AC fuse blown	Fault or state on Normal AC			
Normal AC source outside tolerances Fault or state on Normal AC	Normal AC input phase rotation fault	Fault or state on Normal AC			
	Normal AC source downgraded	Fault or state on Normal AC			
Namual AC assume static emitals failure	Normal AC source outside tolerances	Fault or state on Normal AC			
Normal AC source static switch failure Fault or state on Normal AC	Normal AC source static switch failure	Fault or state on Normal AC			

Display Message	Level
Not enough bypass static switches	Fault or state of installation
Not enough inverters for load connection	Fault or state of installation
Personalization does not match UPS	Generic fault on equipment
PFC fault	Major Fault on subassembly
PFC overload	Fault or state for PFC
PFC thermal overload	Fault or state for PFC
Power supply board fuse blown	Major Fault on subassembly
Q1 switch open	Fault or state on Normal AC
Q4S switch open	Internal and external switches
Q5N switch open	Internal and external switches
Resynchronizing	Fault of downgraded mode
Starting	Fault or state for PFC
Transfer to bypass disabled	Generic fault on equipment
TVSS fault	Major Fault on subassembly
UPSs not connected by CAN cable	Fault of downgraded mode
UPS on external synchronization	Fault or state of external synchronization
UPS personalization fault	Generic fault on equipment

#### **Worldwide Customer Support**

Contest the Customer Summer Content by telephone on a mail. For least country manifes content

Customer support for this or any other product is available at no charge:

• Contact the Customer Support Center by telephone or e-mail. For local, country-specific centers: go to www.apc.com/support/contact for contact information.

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990-5219-001 April 2011

#### APPENDIX A

# Schneider Electric

#### GALAXY 5000 SINGLE MODULE TEST DATA FORM

Work Order# 4214261	Sales Order # 70538 4299	Model# 72-174 001-06
Customer: ADRTH CAROLINA	Serial # 3 A FQ 04005001	Commercial Cofiguration: 40 KVA
Technician: HongN.	Date: 3/26/14	Test Stamp: (CMF 157)
		(EST)

TEST STEP	TEST DESCRIPTION	MIN	MEAS	MAX	UNITS
HYPOT		0 ma		10 ma	1
To the County	Alto the Control of t	* * ·	いないないというないから	aminth-vicinian	S. Southle to the
TEST STEP	TEST DESCRIPTION	MIN	MEAS	MAX	UNITS
8.3	BATTERY VOLTAGE CONFIG. & NAME PLATE	1	- CONTRACTOR	Erry 4. The	Nation Age
8.3.1	Battery type		ENEISY		
	Back up time			95	Minute
8.3.2					
8.5	BYPASS OUTPUT WIRING		1	LA . 418	はなっているなけ
8.5.4		456	1480	504	VAC
8.5.5	Bypass phase sequence	n/a		n/a	1
8.5.8	Bypass output voltage	456	480	504	VAC
8.7	PERSONALIZATION PROCESS	3. 3. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5. 5.	. CYTHERDS	this is allow	HELDER KA
8.7.4	Fan Operation	n/a	V	n/a	1
5.6	START UP PROCESS		Water.	De little all his	44 00 PF 45
9.4	Upper DC Bus voltage	396	460	404	VDC
	Lower DC Bus voltage	396	400	404	VDC
9.8	STATIC SWITCH FUNCTIONS -NO LOAD	ESTATE OF THE	THINKS WELLEN	SEMANDORUM:	<b>以往</b> 在
9.8.2	Static Switch voltage phase AB - Line to Line	470.4	473	489.6	Vrms
	Static Switch voltage Phase BC - Line to Line	470.4	476	489.6	Vms
	Static Switch voltage Phase CA - Line to Line	470.4	474	489.6	Vrms
9.9	INVERTER FUNCTIONS -NO LOAD .	HARRIE LA		HANN SELEC	WHEN THE WAY
9.9.2	Inverter Phase Rotation	n/a	1	n/a	1
9.9.3	Inverter voltage phase AB Line to Line	475.2	481.5	484.8	Vrms
	Inverter voltage phase BC Line to Line	475.2	480.9	484.8	Vms
	Inverter voltage phase CA Line to Line	475.2	481.0	484.8	Vrms
9.10	BATTERY PRESENT MONITOR		. 1.6200.0	, ·	p 1000
9.10.2	Battery Voltage is within 1% v/s display	n/a	7.	n/a	1 1
9.11	STATIC SWITCH - FULL LOAD	Input .	Output 75	". Loss" .	1.10
9.11.3	Static Switch voltage PHASE AB	471.9	1 469.6	2.3	<3 Vrms
	Static Switch voltage - PHASE BC	475.3	472.9	2.4	<3 Vms
	Static Switch voltage - PHASE CA	473.5	471.2	2.3	<3 Vms

Document # TEOP00532	Revision # 1.0	Page 25 of 26				
Author: Nhon Tran		Date: 11/19/2012				
Document Description: GALAXY 5000 SINGLE MODULE TEST PROCEDURE						

	1			T	
TEST STEP		MIN	MEAS	MAX	UNITS
	INVERTER - FULL LOAD	San Service Control	ACCOUNT OF THE PARTY		CHECK STREET,
9,12.2	Inverter THD PHASE AB – Full Load		. 42	≤2	%
	Inverter THD PHASE BC - Full Load		-40	≤2	%
0422	Inverter THD PHASE CA - Full Load Input Current THD phase A - Full load		.45	≤2	%
9.12.3	Input Current THD phase B - Full load	-	2.12	≤5 ≤5	%
_	Input Current THD phase C - Full load		2.24	≤5	% · %
9.12.4	Inv. output voltage PHASE AB - Full load	475.2	480.8	484.8	Vms
3.12.4	Inv. output voltage PHASE BC Full load	475.2	480.5	484.8	Vms
	Inv. output voltage PHASE CA - Full load	475.2	481.0	484.8	Vms
9.12.5	Inverter Frequency	59.5	19.9	60.5	Hz.
	INPUT POWER FACTOR AT FULL LOAD	Testions.	CONTRACTOR OF THE PARTY OF THE	THE PROPERTY OF THE PARTY OF TH	OTTO HE CONTROL
	Input power factor at full load	.99	•99	n/a	Pf
	INVERTER CURRENT READING	· Freeding and an		(STATES TO LER	SHARK MANAGE
9.14.1		n/a	1/	n/a	J
	BATTERY OPERATION ·		THE HARMAN		alakana.
9,15.3	Input disturbance - Transfer to Battery Mode	n/a		n/a	J
9.15.4	Display panel function	n/a	/	n/a	<del></del>
9.16	BATTERY MODE FULL LOAD		WAR CHANGE		THE STATE OF THE S
9.16.1	Battery Mode, Full Load, THD PHASE AB	0	.40	1	%
5,10,1	Battery Mode, Full Load, THD PHASE BC	Ö	• 40	i	. % .
	Battery Mode, Full Load, THD PHASE CA	ō	. 39	i	<del>%</del>
9.16.2	Battery Mode, Full Load, Output Volts PHASE AB	475.2	480.8	484.8	Vrms
	Battery Mode, Full Load, Output Volts PHASE BC	475.2	480.5	484.8	Vrms
	Battery Mode, Full Load, Output Volts PHASE CA	475.2	480.9	484.8	Vrms
9.17		CONTRACTOR (CO.)			
9.17.2	Unit transfer form Battery to Normal mode	n/a		n/a	7
9.18		的特別的問題的	THE PROPERTY OF		TENEDE PROPERTY
9.18.2	Battery charger current	4.9	7.0	13	Amps
9.19	EFFICIENCY - FULL LOAD	THE CONTRACTION	THE PURE SHIP	MUTA HELLEN	TOTAL STREET
9.19.4	Unit efficiency at full load.	93	93	n/a	%
9.20	ECO MODE TEST	STREET, STREET	的知识和现在分类	<b>经总权的批准</b>	ENTERING I
9.20.11	ECO Test completed	n/a		n/a	1
9.21	BURN-IN	VERTER TEMPER	MINISTRA	WE TO COME	STEEL STEEL
9.21.3	Battery Charge Current	n/a	V	n/a	Amps
9.21.4	4 hours burn-in completed	n/a		n/a	7
9.21.5	No Alarms after burn-in	n/a	V	n/a	_ 1
9,22	U-TALK CARD OPERATION	In Unit	Separate	ROSMITS SAFE	CHARLES COM
	U-TALK operation			✓ n/a	7
9.23	JBUS RS485 CARD OPERATION	In Upit	Separate	EXACTE: SOFT	THE PROPERTY OF SERVICE
	JBus card operation	回回		n/a	1
9.24	NMC / WEB CARD OPERATION	In Unit	Separate	CAK OFFICE	<b>TENNESSENS</b>
	NMC / WEB card operation	<u>U</u>		n/a	1
9.25	AS 400 REMOTE POWER CARD OPERATION	In Unit	Separate	PLOPE CENTRAL	ATTENESHIE
	AS 400 Remote Power card operation			v n/a	1
9.26	SECI CARD OPERATION	In Unit	Separate	MARKAMAN N	INTERNATION
	SECI card operation	9		. n/a	7
9.27	CHANGE PERSONALIZATION FOR SHIPPING	\$582\\U.\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	HERITATION OF THE	d chestians	WE THE WATER
	Automatic start condition	n/a	N/A	n/a	7
	Alarms and status clear	n/a		n/a	<del>- j -</del>
	Set the Service life of Battery to 60 months	n/a		n/a	
	For Unit w/o batteries, change to External Charger present	n/a	N/A	n/a	i

Document # TEOP00532	Revision # 1.0	Page '26 of 26		
Author: Nhon Tran		Date: 11/19/2012		
Document Description: GALAXY 5	000 SINGLE MODULE TEST P	ROCEDURE		

# 

reference / référence : 0L-34002537XM

index I Indice:

. AQ

Page / page:

1/4

		Ì		Prepared by : Réalisé par :		Approved by: Approvvé par:	
index	Date Date	Modification / Modification	Name Nom	signature visa	Name Nom	signature visa	Micro- filmed Archivage
AA	18/11/07	First Issue / Édition originale	A. De Oliveira		D Gonzalez		
AB	03/03/08	Evolution for the IP	A. De Oliveira		D Gonzalez		
AC	07/03/08	Remark of US team	A. De Oliveira		D Gonzalez		M 355
AD	10/06/08	Evolution for NT and SIL	A. De Oliveira		D Gonzalez		
AE	,1,1/07/08	Change comment	A. De Oliveira	9 Cincin	D Gonzalez		
AF	16/09/08	Update of UPS Tuner Rev.	G. Souchet		D. Gonzalez		
AG	27/10/08	Update of UPS Tuner Rev. + global UPS TL	G. Souchet		D. Gonzalez	-	1
AH	10/12/08	Update of UPS Tuner Rev.	G. Souchet		D. Gonzalez		
AJ	28/01/10	Change technical level of UPS with MUTONUS NT03, MIZNUS NT09 and add SYNIN . (BEDI E1PK501)	H. Marizon		R. Maurel		
AK	19/05/10	Update of UPS Tuner Rev 1.8.2.13	R.Maurel		P.Chapuis		
AL	14/10/10	Update of UPS Tuner BB Revision 3.1,3.2 and add new PN UPS Tuner CAT 3460487200, (ECN E1PL534)	JP Ah-klem		R Maurel		
AM	*06/04/11	8 keys Improvements for MIZNUS NT12, CHAN NT08 and change UPS to NT05, ecn E1PM003, eco SN309	JP Ah-klem		C. Pin		
AN	09/09/11	ALIN, CSIEN, CSION, CSNON, CSPEN, DCHEN, DCHON, MUTENUS Field quality improvement / NT updated	C. Pin		P Chapuis		
AP	12/10/12	SN677: MIZNUS Quality Improvement , PFC Fault correction: Use of FW B6 SN388: SECI_EMC Improvement	C. Pin		P Chapuis		
AQ	23rd april 2013	SN874 : SN714 SECI FB NT05 : connection improvment cable shielded and update the manual installation	C. Pin		Jerôme Vacher		

For Maintenance or Upgrading operation, USE the XM last version on Service View site.

WHEN CHANGING CARDS OR MODULES ALWAYS USE A PART WITH A "TECHNICAL LEVEL"
GREATER THAN OR EQUAL TO THE PART BEING REPLACED

This document is intended to AFTER SALES SERVICE.

Please keep it in the unit

Pour les opérations de maintenance ou de mise à jour, UTILSER la dernière version du XM dans Service View

EN CAS DE CHANGEMENT DE CARTE ou DE MODULE UTILISER TOUJOURS UN ARTICLE DE "NIVEAU TECHNIQUE " SUPÉRIEUR ou ÉGAL A CELUI EN PLACE

Document réservé à L'APRÈS VENTE

A laisser dans l'appareil

POS JA DO

UPS Single Module & Multi Module Galaxy 5000 US - 40 to 130 kVA

UPS SM & MM Galaxy 5000 US 40 to 130 kVA

APPAREIL / UI	VIT	
ENSEMBLE / ASSE	MBLY	57500 F
34002537XM	AQ	1/4
N° Document	page	

# UPS SM & MM Galaxy 5000 US 40 to 130 kVA

APPAREIL/UNIT ENSEMBLE/ASSEMBLY 34002537XM

N\* Document

ā à

page 2/4

SOTINATION								100 to 130kVA 5	40 to 80kVA
1	20	2 2	2 2	2 2		Š	200	AGAN	. AGAN 3400118500/ 0P3839
	204	204	2 04	2 24		≥ EA04	204	ALIN (DI) 3400117100/0P2612	ALIN (DI) 3400117100/0P2612
	206	8	8	206		≥CB05	204	CHAN (DI) 3400117900/ 0P2613CF	CHAN (DI) 3400117900/0P2613CF
	202	-	3 8	3 8		≥ DA02	202		CSIEN (2) 3400118900/0P3834
	202	202		8		2DA02	202	CSION 3400116500/ 0P3834	
	202	202		8		2 EA02	202		CSNEN 3400118700/0P3823
	202	202	202	202		EVO2	202	CSNON 3400115500 / 0P3833	
	202	8	2	8		≥ DA02	202		CSPEN (1) 3400119400/0P3410
_	24	7	2	2	u	2000 x	203	DALIN (DI) DI3400116900 / 0P2611	DALIN (DI) DI3400116900/ 0P2611
	203	-	ដ	ដ		≥ C803	203		DCHEN 3400116300/ 0P3847
	203	-	-	B 요		2CB03	200	DCHON 3400116100/0P3836	
	≥03	-	2	8	CA02	~	201	ETONUS 3400201300 / 0P3844	ETONUS 3400201300/0P3844
	202	-		8	2	ž	202	* EXTN (DI) (1) 3400117500/ 0P3821EC	EXTN(DI) (1) DI3400117500/ 0P3821EC
	201	201	_			× ABOI	201	FIAZN 3400226400 / 0P3822	FIAZN 3400226400 / 0P3822
	2	22	204	-		2FA04	204	FIBAN 3400117300/ 0P2610	FIBAN 3400117300/ 0P2610
	202	22	202	202	_	Š	202		FIBEN 3400225300 / 0P3824
A St	202	202	202	≥02		\$CA82	202	FIBON 3400225500 / 0P3825	
	≥ 03	≥03	≥03	≥03		ČC803	203	FISNUS 3400201500 / 0P3835	FISNUS 3400201500 / 0P3835
L	≥ 02	202	202	≥02		* 80g	202	FUSNUS 3400225700 / 0P3841	FUSNUS 3400225700 / 0P3841
	≥ 05	205	205	205		202	205	GDEN (5) 3400118100/0P3828AM	GDEN (5) 3400118100/0P3828AM
	≥01	201	≥01	≥01		1003 2 EB03	201	IDIN 3400119700 / 0P3848	IDIN 3400119700/0P3848
	203	203	≥03	≥03		2 EB03	≥02	KCTNUS 3400235300 / 0P3840	KCTNUS 3400235300/0P3840
	≥ 06	206	≥05	≥05		POMOS	≥02	MIZNUS (4) 3400220100 / 0P3457ED	MIZNUS (4) 3400220100 0P3457ED
	≥01	≥01	≥01	≥01		2861	≥01		MUTENUS 3400200200/ 0P3842
	10≥	≥01	≥01	≥01		2861	≥01	MUTONUS 3400200100/0P3830	
								SYNIN (3 ) 3400118300/ 0P3843	SYNIN (3 ) 3400118300/ 0P3843
1.8.2.10	> AN	≥ AM 1.8.2.9	≥ AL 1.8.2.8	≥ AJ 1.8.0	-	>A1180	2 AJ 1.7.9	UPS TUNER APC 3400394100 UPS TUNER CAT 3460487200	UPS TUNER APC 3400394100 UPS TUNER CAT 3460487200
	ខ	203	02	02	;	02	10		TECH LEVEL ASSEMBLY NT. de L'ersemble
L	AH	AG	ĄF	ΑE	3	A	A		Indice revision

# TECHNICAL LEVELS SUMMARY TABLE / TABLEAU DE SYNTHESE DES NIVEAUX TECHNIQUES 1/2

TECHNICAL LEVELS OF INCLUDED SUBASSEMBLIES / NIVEAUX TECHNIQUES DES SOUS-ENSEMBLES CONSTITUANTS

#### 2/2

#### TECHNICAL LEVELS SUMMARY TABLE / TABLEAU DE SYNTHESE DES NIVEAUX TECHNIQUES

#### TECHNICAL LEVELS OF INCLUDED SUBASSEMBLIES / NIVEAUX TECHNIQUES DES SOUS-ENSEMBLES CONSTITUANTS

:: <b>:</b> ::::																				-									
40 to 80kVA ⇔	AGAN 3400118500/0P3839	ALIN (DI) 3400117100/0P2612	CHAN (DI) 3400117900/0P2613CF	CSIEN (2) 3400118900 / 0P3834		CSNEN 3400118700/0P3823		CSPEN (1) 3400119400/0P3410	DALIN (DI) DI3400116900/0P2611	DCHEN 3400116300/0P3847		ETONUS 3400201300/0P3844	EXTN(DI) (1) DI3400117500/0P3821EC	FIAZN 3400226400 / 0P3822	FIBAN 3400117300/0P2610	FIBEN 3400225300 / 0P3824		FISNUS 3400201500 / 0P3835	FUSNUS 3400225700 / 0P3841	GDEN (5) 3400118100 / 0P3828AM	IDIN 3400119700/0P3848	KCTNUS 3400235300 / 0P3840	MIZNUS (4) 3400220100 0P3457ED	MUTENUS 3400200200/0P3842		SYNIN (3) 3400118300/ 0P3843	UPS TUNER APC 3400394100 UPS TUNER CAT 3460487200	TECH LEVEL  of  ASSEMBLY  NT. de  L'ensemble	Indice revision
100 to 130kVA ⇔	AGAN 3400118500/0P3839	ALIN (DI) 3400117100/0P2612	CHAN (DI) 3400117900/0P2613CF		CSION 3400116500/0P3834		3400115500 / 0P3833		DALIN (DI) DI340011690010P2611	•	DCHON 3400116100/0P3836	ETONUS 3400201300/0P3844	3400117500/0P3821EC	FIAZN 3400226400 / 0P3822	FIBAN 3400117300/0P2610		FIBON 3400225500 / 0P3825	FISNUS 3400201500 / 0P3835	FUSNUS 3400225700 / 0P3841	GDEN (5) 3400118100 / 0P3828AM	1DIN 3400119700/0P3848	3400235300 / 0P3840	MIZNUS (4) 3400220100 / 0P3457ED		MUTONUS 3400200100 / 0P3830	3400118300/ 0P3843	UPS TUNER APC 3400394100 UPS TUNER CAT 3460487200		
	≥01	200	>00	≥ 02	> 02	≥02	≥02	≥02	> 04	≥ 03	≥03	≥ 03	≥ 02	≥01	≥ 04	≥ 02	≥02	≥ 03	≥02	≥ 05	≥01	≥03	≥09	≥01	≥ 03	≥04	≥ AN 1.8.2.10	04	AJ
	≥01	≥04	≥06	≥02	≥02	≥02	≥ 02	The Part of the Pa	≥ 04	≥ 03			≥ 02	170-2000	≥ 04			≥03	≥02	≥05	≥01	≥03	≥09	-	≥ 03	≥04	≥ AQ .8.2.13	04	AK
	≥01	≥04	≥06	≥ 02	-	≥02	≥02	≥02	≥ 04	≥ 03	≥03	≥ 03	≥ 02	≥01	≥ 04	≥02		≥03	≥02	≥05	≥01	≥03	≥09	≥01	≥ 03	≥04	≥ BB 3.1.3.2	04	AL
	≥01	≥04	≥08	≥ 02	-	≥02	≥02	≥02	≥ 04	≥03	≥03	≥ 03	≥ 02	≥01	≥ 04		≥ 02	≥03	≥02	≥05	≥01	≥03	≥12	≥01	≥ 03	≥04	≥ BB 3.1.3.2	05	AM
	≥01	≥05	≥08	≥03	≥03	≥03	≥04	≥03	≥ 04	≥04	≥04	≥03	≥ 02	≥01	≥ 04	≥02		≥03	≥02	≥ 05	≥01	≥03	≥12	≥03	≥ 03	≥04	≥ BB 3.1.3.2	05	AN
	≥01	≥05	≥08	≥03	≥ 03	≥03	≥ 04	≥03	≥04	≥ 04	≥04	≥03	≥02	≥01	≥04	≥02		≥03	≥02	≥ 05	≥01	≥03	≥ 13.	≥03	≥03	≥04	≥ BB 3.1.3.2	05	AP
	≥01	≥05	≥08	≥03	≥ 03	≥03	≥04	≥03	≥ 04	≥ 04	≥04	≥ 03	≥02	≥01	≥04	≥02	≥02	≥03	≥02	≥ 05	≥01	≥03	≥13	≥03	≥03	≥04	≥ BB 3.1.3.2	05	AQ

Uniquement pour les onduleurs parallèles / only for parallel units (part numbers : 72-174011-00 (CM 40-80kVA) & 72-174012-00 (CM 100-130kVA))
Uniquement pour les onduleurs unitaires / only for single units (part numbers : 72-174001-00 (CM 40-80kVA) & 72-174002-00 (CM 100-130kVA))
Test diélectrique sur la carte (Carte specifique Galaxy 5000 US) / Dielectric test on the board (Specific board for Galaxy 5000 US)
Uniquement pour l'option synchronisation externe / Only for external synchronisation option
Evolution commune MIZN et MIZNUS pour NT12, MIZNUS passe de NT09 à NT12 / Common change MIZN & MIZNUS for NT12, MIZNUS upgrade from NT09 to NT12
Ne concerne pas GDEN CAT ; pour GDEN CAT utiliser GDEN 07 => 0P3462 / no impact on GDEN CAT; For GDEN CAT, use the GDEN 07 => 0P3462

UPS SM & MM Galaxy 5000 US 40 to 130 kVA

APPAREIL/UNIT ENSEMBLE / ASSEMBLY

34002537XM	AQ	3/4
N° Document •	Ind.	page

#### LISTE DE COMPATIBILITE DES OPTIONS D'UN APPAREIL / UNIT OPTIONS COMPATIBILITY LIST

APPAREIL DE BASE · BASICAL UNIT			OPTIONS						1 0	
			PCA ATIZ TEMP MONITOR (6739069) (Only in battery cabinet, optional)	U-Talk/Basic card (66060)	Jbus/Modbus card (66061)	AS400 relay (66068)	SECI: 0P2845 Alarm relay card (66069)	YUPI Network management card (66074)		d.
DESIGNATION	Part numbers	NT/TL	NT/TL	NT/TL	NT/TL	NT/TL	NT/TL	NT/TL	NT/TL	
Galaxy 5000 Single Unit. Galaxy 5000 // unit	72-174001-00 72-124002-00 72-174011-00 72-174012-00	03	≥01	≥05	≥08	≥02	≥02	• ≥10		AG
Galaxy 5000 Single Unit, Galaxy 5000 // unit	72-174001-00 72-124002-00 72-174011-00 72-174012-00	03	≥01	≥05	≥08	≥02	≥04	≥10		AP
Galaxy 5000 Single Unit, Galaxy 5000 // unit	72-174001-00 72-124002-00 72-174011-00 72-174012-00	03	≥01	≥05	≥08	≥02	FB/≥05	≥10		AQ
	•			-						4

IMMEMBER

UPS SM & MM Galaxy 5000 US 40 to 130 kVA

APPAREIL/UN		
ENSEMBLE /ASSE	MBLI	
34002537XM	AQ	414
N° Document	Ind.	page



# MGE<sup>™</sup>Galaxy<sup>™</sup> 5000

## Bulletin d'essai

Test Report
Reference 34001000 XJ

Date	25/01/2014
Date (us)	01/25/2014
N° de série Serial number	3AEQ04005001 BD1404004481
Contrôleur Tested by	2107

Appareil contrôlé Equipment tested

136.1

ASI UPS



# MGE<sup>™</sup>Galaxy<sup>™</sup> 5000

#### Bulletin d'essai by Schneider Electric Test Report Reference 34001000 XJ

#### Essais réalisés en usine Factory tests

Contrôle visuel & vérification câblage	Ø
Visual inspection & wiring control	
Essais diélectriques Dielectric control	
Essais à faible charge Low load test	
Essais des dispositifs auxiliaires	☑
Essais de coupure et retour du réseau d'alimentation AC input outage and return test	☑
Essai de transfert Transfer test	図
Essai à pleine charge	<u>ଏ</u>
Essal de pouvoir de surcharge et de court-circuit  Overload capability and short-circuit tests	<u>ज</u>
Essai de rendement de l'A.S.I	
Essai de performance du PFCPFC performance check	Ø
Essai de fonctionnement de l'afficheur graphique	☑

Les essais réalisés en usine et les résultats sont conformes : Factory tests and results comply with:

A la norme Sécurité des A.S.I CEI 62040-1-2:2003 UPS safety standard IEC 62040-1-2:2003

A la norme Performances et procédures d'essai des ASI CEI 62040-3 UPS Performance and test requirements standard IEC 62040-3

A la spécification de contrôle 34001000WC Test specification 34001000WC



# MGE<sup>™</sup>Galaxy<sup>™</sup> 5000

## Bulletin d'essai

Test Report
Reference 34001000 XJ

# Performances sur charge linéaire (inductive) / Facteur de puissance = 0.9 Performances on linear load (inductive) / Power factor = 0.9

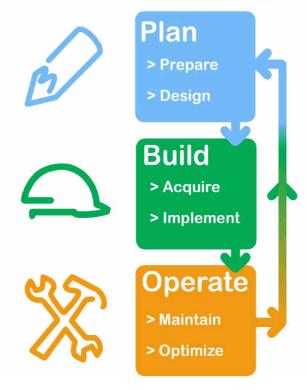
Niveau de charge Load level		50%	E	100%
Tension de sortie demandée Output voltage requested		480V		480V
Taux de distorsion en courant (THDi) amont typique Typical input current distortion (THDi)	(+/- 0.5%)	6.00%	: :	3.00%
Taux de distorsion en tension (THDu) aval typique Typical output voltage distortion (THDu)	(+/- 0.5%)	0.94%		1.33%
Rendement typique A.S.I Typical UPS efficiency	(+/- 0.5%)	92.00%		93.00%

Données issues de la spécification de contrôle de référence - Extract from referenced test specification

## Schneider Electric



## **Critical Power and Cooling Services**



#### Install report - Start up

Site Contact Randy Perry

Site Company

NORTH CAROLINA NATIONAL GUARD

Site Address

5132 Departure Dr, Raleigh, NC, 27604

Site Country United-States

Date 21 July 2014

#### Field Service Engineer

FSE Jonathan Langley

Service district NC/SC

Address 132 Fairgrounds Road

West Kingston, RI 02892





Service Request # / Activity : C1-5680434698/1-2LY4HLJ

Service District : NC/SC

Entitlement # : 1-2LXZFF0 Entitlement Name : Start-Up Service 5x8 - 1

Account ID : 1-1MLPODZ ISX Solution : ISX0001101122-0002

Customer Company : NORTH CAROLINA NATIONAL GUARD

Customer Address : 7410 Chapel Hill Road

Customer City : RALEIGH, North Carolina, 27607

Customer Name : Randy Perry
Phone / Fax Number / E-Mail : 919-868-7797 / /

Site Company : NORTH CAROLINA NATIONAL GUARD

Site Address : 5132 Departure Dr
Site Town : Raleigh, NC, 27604
Site Contact : Randy Perry
Phone / Fax Number / E-Mail : 919 868 7797 / /

Equipment concerned : Galaxy 5000 Install/Startup date : 21 July 2014

Power : 40 kVA Serial number : 3AEQ04005001

Phase Type : 3:3

Configuration : Single unit

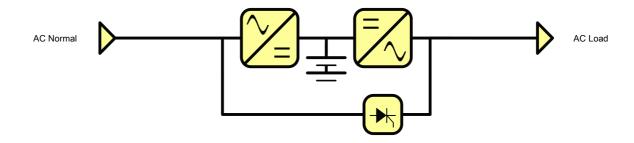
The 3rd battery from the most positive point has extremely high impedance. This is causing the charger to fail, and therefore the startup has been halted. A new battery has been ordered.

Customer signature Schneider Electric signature

Randy Perry Jonathan Langley

#### **Maintenance summary**

#### Installation configuration



#### Checks carried out

D 05 : 101 I	
Room & Environment Check	<u> </u>
Battery characteristics	<b>♥</b>
Unit & System Inspection	<b>♥</b>
Power Cables	<b>♥</b>
Low Voltage Option Inspection	<b>♥</b>
Classic Battery Solution Inspection	<b>♥</b>
Communication options	<b>♥</b>
System Preparation	<b>♥</b>
Classic battery Pre startup check	<b>♥</b>
Measurements	♥
Initial Functional Check	♥
Final Inspection	♥
Comments	♥

#### Comments

Customer
No comment

#### Customer issues

Customer

No comment

#### Schneider Electric

No comment

#### List of measurement devices



Device type	Device model	Serial number	Last calibration date
Battery Tester	Alber CRT-400	CRT-400-653729	13 November 2013
Multimeter	Fluke 87 V	13950377	14 November 2013
Oscilloscope	Fluke 43B	06163	13 November 2013

#### 1 System Room Check

#### 1.1 Room & Environment Check

#### **Unit Check**

Ensure you are working on correct unit	Yes	
The equipment sitting in the room matches what was	Yes	
purchased by customer		

#### **Battery Check**

The battery characteristics and its corresponding parameters	Yes
are matching with customer order  Battery Location	Same as equipment room

#### Equipment

List/Verify all auxiliary cabinets as part of the system	MBC, Battery Frame
Compatibility of upstream and downstream AC protections	Satisfactory
(breakers) have been checked	
Compatibility of upstream and downstream equipment and	Satisfactory
settings have been checked	

#### **Unit Room Condition**

The environment of the UPS is suitable for service operation		Yes	
The general appearance and cleanliness of the room are		Satisfactory	
acceptable			
Identify the type of room		Data Room	
Identify the type of ventilation used in the room	By air-conditioning	Satisfactory	
Measure Room Temperature (and humidity)	76 °F	Satisfactory	

#### Grounding

Check Grounding system of the installation and Neutral	Yes
Conductors	

#### 1.2 Battery characteristics

Battery capacity	40 Ah
Quantity of battery blocks per strings	36
ype of battery block	12 V
Quantity of battery cells (2V/Cell) per string	216
Quantity of battery strings	1
Backup time	11.5 min
Float voltage	490 V
finimum battery voltage	356.4 V
ambient temperature	76 °F
Cabinet temperature	76 °F

#### Section comments

Batteries were taken off float charge Mar 2014.

#### 2 System Check

#### 2.1 Unit & System Inspection

#### Visual Check

Describe the system status when arriving	System on
Appearance of the exterior of the cabinets (unit and	Satisfactory
auxiliaries)	

#### Internal Inspection

Internal Inspection	
Appearance of the interior of the cabinets (unit and	Satisfactory
auxiliaries)	
All cabinets (including auxiliaries) are free of foreign items	Yes
The Air filters are clean and properly installed.	N/A
Condition of windings, chemical capacitors and internal	Satisfactory
power connections	
Visual inspection of the ventilation has been done	Satisfactory
Condition of boards, subassemblies and their connections	Satisfactory
Grounding	
Grounding	
Grounding straps (PE) of all cabinets are present and	Yes
secured.	
Breakers	
Breakers of the unit are set according to Schneider	N/A
specifications.	· · · · · · · · · · · · · · · · · · ·
·	
2.2 Power Cables	
AC Power cables	
Length and size of AC Power cabling are adapted	Satisfactory
DC Power cables	
Size of DC cables are compliant with Schneider	Yes
recommendations.	
DC Power Cables wiring are correctly installed and	Satisfactory
connected	
2.3 Low Voltage Option Inspection	
2.0 LOW Voltage Option hispodeon	
Low Voltage	
Length and size of Low Voltage cabling are adapted	Satisfactory
Low Voltage Cables are wired compliant with State-of-the-art.	Yes
Grounding	
Grounding of communication channels are wired in	Satisfactory
accordance with Schneider recommendations.	
EPO	
Emergency Power Off is wired	N/A
2.4 Classic Battery Solution Inspection	
,	
Grounding	
Grounding straps (PE) of all Battery Cabinets are present and	Yes
secured.	
General	
Appearance of the Classic Retton, Salution	Voc
Appearance of the Classic Battery Solution  Direct contact of terminals between surrounding metal parts	Yes Yes
and connections is avoided	100
A floating voltage compensation with ambient temperature is	See comments
working	COC COMMUNIC

#### **Protection Device**

Type of DC protection device	DC circuit breaker
Compatibility of DC protections (breakers) have been	Yes
checked	
Each DC breaker device(s) include a tripping coil	MxCoil
Option	
Battery monitoring system is present	No

#### Section comments

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### 2.5 Communication options

Option Name	SKU ref.	Spare Part ref.	Firmware version	Level
Alarm relays electrician comm. Card	66069	51029380		
SNMP web card	66074	3400364100		
JBUS/ModBus communication card	66061	51029099		

#### 3 Pre Startup Check

#### 3.1 System Preparation

#### General

System is ready to be energized	Satisfactory	
AC Mains		
Upstream Mains verification	Satisfactory	
If load is already connected, check that inputs cables and	N/A	
output cables are not swapped by measuring Power flow.		

#### 3.2 Classic battery Pre startup check

#### Block

Block to block battery voltage (and Impedance)	Satisfactory
DC Power cables	
Internal & external DC cabling of Battery Cabinet	Satisfactory
Every Battery string (voltage & polarity) has been checked	Yes
individually	
Parallel Battery Strings have been checked	N/A
Insulation	
There is no DC ground fault	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
Battery polarity to the protection device has been checked	Yes

#### 3.3 Measurements

Measure type	Phase 1	Phase 2	Phase 3	
AC Normal voltage	484 V	485 V	483 V	
ACNormal frequency	60 Hz	0 Hz	0 Hz	
AC ByPass voltage	484 V	485 V	483 V	
AC Bypass frequency	60 Hz	0 Hz	0 Hz	
AC Load voltage	0 V	0 V	0 V	
AC Load frequency	0 Hz	0 Hz	0 Hz	
AC Load rms current	0 A	0 A	0 A	
AC Load crest current	0 A	0 A	0 A	
Charger voltage	0 V	0 V	0 V	

#### 4 Unit Functional Check

#### 4.1 Initial Functional Check

#### Input

EPO is activated	Yes
Unit operation with only Input breaker closed	Yes
Power up system following product start up procedure in	Unsatisfactory
service manual and training	
Settings	
System is set according to installation	Yes
LCM settings are OK	Yes
EPO	
Emergency Power Off (EPO) is operational	N/A
Breakers	
DC protection device is operational	Yes
Generator	

Satisfactory

#### Section comments

Unit operation on Genset without load

Battery 3 (from most positive) is bad. The battery has very high impedance and is causing the charger to fail.

#### **5 Final Inspection**

#### 5.1 Final Inspection

#### **Equipment operation**

The state and revision of parts insured proper operation of the	Unsatisfactory
unit	
The unit firmware has been upgraded	N/A
All operational tests are passed	Unsatisfactory
The system has been tested and is satisfactorilly operational	No

#### **Customer Relationship**

List any customer concerns about the unit.	The unit's charger keeps	Yes
	faulting.	
The Customer Relationship Management has been updated		No
Basic customer training completed		N/A

Leave the site clean and tidy

#### 5.2 Comments

General comments

No comment

Battery characteristics

Batteries were taken off float charge Mar 2014.

Classic Battery Solution Inspection

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

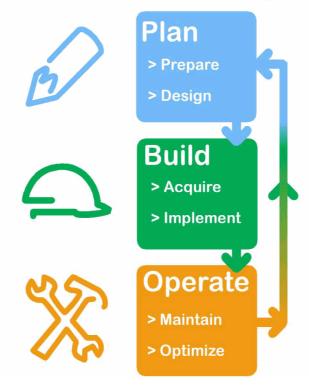
Initial Functional Check

Battery 3 (from most positive) is bad. The battery has very high impedance and is causing the charger to fail.

# Schneider Electric



## **Critical Power and Cooling Services**



#### Install report - Start up

Site Contact Randy Perry

Site Company

NORTH CAROLINA NATIONAL GUARD

Site Address

5132 Departure Dr, Raleigh, NC, 27604

Site Country United-States

Date 21 July 2014

#### Field Service Engineer

FSE Jonathan Langley

Service district NC/SC

Address 132 Fairgrounds Road

West Kingston, RI 02892





Service Request # / Activity : C1-5680434698/1-2LY4HLJ

Service District : NC/SC

Entitlement # : 1-2LXZFF0 Entitlement Name : Start-Up Service 5x8 - 1
Account ID : 1-1MLPODZ ISX Solution : ISX0001101122-0002

Customer Company : NORTH CAROLINA NATIONAL GUARD

Customer Address : 7410 Chapel Hill Road

Customer City : RALEIGH, North Carolina, 27607

Customer Name : Randy Perry

Phone / Fax Number / E-Mail : / /

Site Company : NORTH CAROLINA NATIONAL GUARD

Site Address : 5132 Departure Dr Site Town : Raleigh, NC, 27604 Site Contact : Randy Perry

Phone / Fax Number / E-Mail : / /

Actual Start Time : 22 July 2014 14:32 Actual End Time : 22 July 2014 14:32

Equipment concerned : Galaxy 5000 Install/Startup date : 21 July 2014

Power : 40 kVA Serial number : 3AEQ04005001

Phase Type : 3:3

Configuration : Single unit

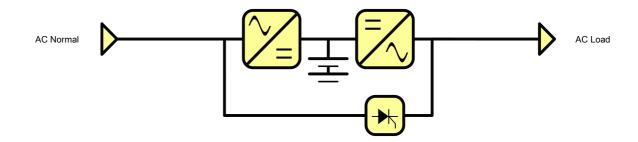
The battery has been replaced. The customer training is complete. No further discrepancies were noted with the unit. The unit is online. Please see comment sections.

Customer signature Schneider Electric signature

Randy Perry Jonathan Langley

#### Maintenance summary

#### Installation configuration



#### Checks carried out

Room & Environment Check	<b>⊘</b>
Battery characteristics	lacktriangle
Unit & System Inspection	<b>⊘</b>
Power Cables	<b>⊘</b>
Low Voltage Option Inspection	<b>⊘</b>
Classic Battery Solution Inspection	<b>⊘</b>
Communication options	<b>⊘</b>
System Preparation	<b>⊘</b>
Classic battery Pre startup check	<b>©</b>
Measurements	<b>⊘</b>
Initial Functional Check	<b>©</b>
Personalization	<b>⊘</b>
UPS Source transfer	<b>⊘</b>
Charger voltage	<b>©</b>
Calibration	<b>⊘</b>
Battery Check	<b>⊘</b>
Communication Option Check	<b>©</b>
Parts swap	<b>©</b>
Final Inspection	<b>©</b>
Comments	<b>©</b>

#### Comments

Customer

No comment

#### **Customer issues**

Customer

No comment

Schneider Electric

No comment

#### List of measurement devices



Device type	Device model	Serial number	Last calibration date
Battery Tester	Alber CRT-400	CRT-400-653729	13 November 2013
Multimeter	Fluke 87 V	13950377	14 November 2013
Oscilloscope	Fluke 43B	06163	13 November 2013

#### 1 System Room Check

#### 1.1 Room & Environment Check

#### **Unit Check**

Ensure you are working on correct unit	Yes	
The equipment sitting in the room matches what was	Yes	
purchased by customer		

#### **Battery Check**

The battery characteristics and its corresponding parameters	Yes
are matching with customer order  Battery Location	Same as equipment room

#### Equipment

List/Verify all auxiliary cabinets as part of the system	MBC, Battery Frame
Compatibility of upstream and downstream AC protections	Satisfactory
(breakers) have been checked	
Compatibility of upstream and downstream equipment and	Satisfactory
settings have been checked	

#### **Unit Room Condition**

The environment of the UPS is suitable for service operation		Yes	
The general appearance and cleanliness of the room are		Satisfactory	
acceptable			
Identify the type of room		Data Room	
Identify the type of room  Identify the type of ventilation used in the room	By air-conditioning	Data Room Satisfactory	

#### Grounding

Check Grounding system of the installation and Neutral	Yes	
Conductors		

#### 1.2 Battery characteristics

Battery capacity	40 Ah
Quantity of battery blocks per strings	36
Type of battery block	12 V
Quantity of battery cells (2V/Cell) per string	216
Quantity of battery strings	1
Backup time	11 min
Float voltage	490.2 V
Minimum battery voltage	356.4 V
Ambient temperature	74 °F
Cabinet temperature	76 °F
· · · · · · · · · · · · · · · · · · ·	

#### Section comments

Batteries were taken off float charge Mar 2014.	ı
	- 1
	•

#### 2 System Check

#### 2.1 Unit & System Inspection

#### Visual Check

Describe the system status when arriving	System on
Appearance of the exterior of the cabinets (unit and	Satisfactory
auxiliaries)	

#### Internal Inspection

Internal Inspection	
Appearance of the interior of the cabinets (unit and	Satisfactory
auxiliaries)	,
All cabinets (including auxiliaries) are free of foreign items	Yes
The Air filters are clean and properly installed.	N/A
Condition of windings, chemical capacitors and internal	Satisfactory
power connections	
Visual inspection of the ventilation has been done	Satisfactory
Condition of boards, subassemblies and their connections	Satisfactory
Grounding	
Crowndian above (DE) of all achieves are account and	Vaa
Grounding straps (PE) of all cabinets are present and	Yes
secured.	
Breakers	
Breakers of the unit are set according to Schneider	N/A
specifications.	
2.2 Power Cables	
AC Power cables	
Length and size of AC Power cabling are adapted	Satisfactory
DC Power cables	
Size of DC cables are compliant with Schneider	Yes
recommendations.	
DC Power Cables wiring are correctly installed and	Satisfactory
connected	
2.3 Low Voltage Option Inspection	
Low Voltage	
Length and size of Low Voltage cabling are adapted	Satisfactory
Low Voltage Cables are wired compliant with State-of-the-art.	Yes
Grounding	
Grounding of communication channels are wired in	Satisfactory
accordance with Schneider recommendations.	Garistaciot y
accordance with connector recommendations.	
EPO	
Emergency Power Off is wired	N/A
	IV/A
2.4 Classic Battery Solution Inspection	
Grounding	
Grounding straps (PE) of all Battery Cabinets are present and	Yes
secured.	
General	
Appearance of the Classic Battery Solution	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
A floating voltage compensation with ambient temperature is	See comments
working	

#### **Protection Device**

Type of DC protection device	DC circuit breaker
Compatibility of DC protections (breakers) have been	Yes
checked	
Each DC breaker device(s) include a tripping coil	MxCoil
Option	
Battery monitoring system is present	No

#### Section comments

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### 2.5 Communication options

Option Name	SKU ref.	Spare Part ref.	Firmware version	Level
Alarm relays electrician comm. Card	66069	51029380		
SNMP web card	66074	3400364100		
JBUS/ModBus communication card	66061	51029099		

#### 3 Pre Startup Check

#### 3.1 System Preparation

#### General

System is ready to be energized	Satisfactory
AC Mains	
Upstream Mains verification	Satisfactory
If load is already connected, check that inputs cables and	N/A
output cables are not swapped by measuring Power flow.	

#### 3.2 Classic battery Pre startup check

#### Block

Block to block battery voltage (and Impedance)	Satisfactory
DC Power cables	
Internal & external DC cabling of Battery Cabinet	Satisfactory
Every Battery string (voltage & polarity) has been checked	Yes
individually	
Parallel Battery Strings have been checked	N/A
Insulation	
There is no DC ground fault	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
Battery polarity to the protection device has been checked	Yes

#### 3.3 Measurements

Measure type	Phase 1	Phase 2	Phase 3	
AC Normal voltage	484 V	485 V	483 V	
ACNormal frequency	60 Hz	0 Hz	0 Hz	
AC ByPass voltage	484 V	485 V	483 V	
AC Bypass frequency	60 Hz	0 Hz	0 Hz	
AC Load voltage	480 V	479 V	479 V	
AC Load frequency	60 Hz	0 Hz	0 Hz	
AC Load rms current	0 A	0 A	0 A	
AC Load crest current	0 A	0 A	0 A	
Charger voltage	490 V	0 V	0 V	
Charger voltage	490 V	0 V	0 V	

#### 4 Unit Functional Check

#### 4.1 Initial Functional Check

DC protection device is operational

#### Input

EPO is activated	Yes
Unit operation with only Input breaker closed	Yes
Power up system following product start up procedure in	Satisfactory
service manual and training	
Settings	
System is set according to installation	Yes
LCM settings are OK	Yes
Sequences	
Unit operation without load	Satisfactory
EPO	
Emergency Power Off (EPO) is operational	N/A
Breakers	

Yes

#### 4.2 Personalization

#### Alarms

Battery charge default	Not present
UPS overload	Not present 0
EPO fault on MIZR	0
EEPROM fault on MIZR	0
Autotest fault on MIZR	0
Nber of UPS too low for coupling	0
Battery to check	0
Battery fault	0
Battery used fault	0
EEPROM CHAR fault	0
Autotest CHAR fault	0
DC maxi fault reference	0
DC mini fault reference	0
Pre-alarm battery to replace	0
Charge current measurement fault	0
Battery temperature fault	0
LA Fuse fault	0
Battery voltage measurement	0
AC Normal out of tolerance	0
AC Normal Fuses blown fault	0
AC Normal frequency out of tolerance	0
AC Normal phase rotation fault	0
Load short circuit	0
Vigitherm detection SS AC Bypass	0
SS AC Bypass fault	0
SS AC Bypass supply fault	0
AC Bypass voltage out of tolerance	0
AC Bypass frequency out of tolerance	0
Inverter / AC By-Pass voltage phase difference	0
AC Bypass overload	0
AC Bypass thermal overload	0
AC Bypass phase rotation fault	0
Perso code fault	0
EEPROM fault on GA	0
Battery chanel status calibrated	0
Board CH status calibrated	0
Q3BP/Q5N external fault	0
Fuse LA mains status	0
Watchdog FPGA fault	0
Battery Parameters absents	0
Battery Parameters used	0
Battery circuit fault	0
Disc Battery circuit breaker 2	0
Deep discharge fault	0
LA charger fault	0
Autonometer fault	0
Disc Battery circuit breaker 1	0
Charger vigitherm fault  Diag Pattery girsuit brooker 2	0
Disc Battery circuit breaker 3	0
EPO falt on CHAR	0
CLA rectifier fault	0
Battery parameter ageing pre-alarme	0
MIZR board status calibrated	0
AC Normal channel status calibrated	0
Rectifier overload	0
AC Bypass channel status calibrated	0
Inverter channel status calibrated	0
Battery SS temperature fault	0
DC ramp fault	0
Min DC voltage fault	0

DC Bus fault	0
AC Normal Under voltage fault	0
AC Normal loss fault	0
Rectifier phasing fault	0
AC Normal SS ramp fault	0
Rectifier limitation	0
Rectifier limitation fault in under voltage	0
Maxi charger voltage fault	0
Maxi charger current fault	0
Rectifier vigitherm fault	0
Inverter overload	0
Thermal inverter overload	0
UPS in limitation	0
Inverter temperature fault	0
Phase 1 inverter voltage out of tolerance	0
Phase 2 inverter voltage out of tolerance	0
Phase 3 inverter voltage out of tolerance	0
Phase 1 load voltage out of tolerance	0
Phase 2 load voltage out of tolerance	0
Phase 3 load voltage out of tolerance	0
External frequency out of tolerance	0
Mains 2 loss fault	0
Load loss fault	0
Load frequency out of tolerance	0
Q3BP/Q5N fault	0
Phase 1 inverter fuse fault	0
Phase 2 inverter fuse fault	0
Phase 3 inverter fuse fault	0
AC Bypass presence fault	0
Inverter relay fault	0
Inverter SS vigitherm fault	0
Neutral leg high maxi fault	0
Neutral leg low maxi fault	0
Residual current fault BN	0
Neutral leg temperature fault	0
Rectifier thermal overload	0
IGBT socket temperature fault	0
Cooling system fault	0
Autotest fault on GA	0
Coil temperature fault	0

#### Measurements

High DC bus voltage	399 V
Low DC bus voltage	400 V
Neutral leg current	0 A
AC Normal phase 1 power	1533 W
AC Normal phase 2 power	1596 W
AC Normal phase 3 power	1522 W
Phase 1/Neutral inverter voltage	277.2 V
Phase 2/Neutral inverter voltage	276.9 V
Phase 3/Neutral inverter voltage	277.0 V
Inverter frequency	60.1 Hz
Neutral current	0 A
External frequency	Not selected
Working mode status	3
Total battery security voltage	0.0 V
AC Normal voltage	482.8 V
AC Normal Phase 1 current	5.5 A
AC Normal Phase 2 current	5.7 A
AC Normal Phase 3 current	5.4 A
AC Normal frequency	60.0 Hz
AC Bypass voltage	482.3 V
AC Bypass frequency	60.0 Hz
Load Phase 1 current	0 A
Load Phase 2 current	0 A

Load Phase 3 current	3.5 A
Phase 1/Neutral load voltage	278 V
Phase 2/Neutral load voltage	279 V
Phase 3/Neutral load voltage	278 V
Load frequency	60.0 Hz
Load phase 1 crest current	0 A
Load phase 2 crest current	0 A
Load phase 3 crest current	5.7 A
Phase 1 load power	0 W
Phase 2 load power	0 W
Phase 3 load power	365 W
AC Normal voltage UA-B	483.5 V
AC Normal voltage UB-C	483.5 V
AC Normal voltage UC-A	483.5 V

#### Battery measurements

Autonomy battery time remaining	87 min
Battery current	0.1 A
Battery voltage	490.2 V
Battery charge rate	76 %
Instantaneous battery temperature	30 °C
Battery time recharge expected	27 Hour(s)
Battery life span calculated	1801 Day(s)
Battery cell voltage	2.27 V
Total battery power	4487 W
Battery cell power	20 W
Battery cell discharge current	9.2 A
Battery cell charge current	0.3 A
Average battery temperature on 24 h	20 °C
Battery capacity: C10 current	0 Ah

#### **UPS Measurements**

Battery end of autonomy voltage threshold	1.9 V
Min DC voltage threshold	660 V
DC voltage reference	800 V
Inverter synchronisation speed	2 Hz/s
Limitation mask duration	3 ms
AC Bypass frequency tolerance	8 %
Rectifier synchronisation speed	1 Hz/s
Load frequency tolerance	8 %
External frequency tolerance	0 %
Pre-end of autonomy coefficient	20 %
Pre-end of autonomy time	4 min
Min coupled AC byPass voltage threshold	10 %
Maxi coupled AC byPass voltage threshold	10 %
AC normal min voltage threshold	250 V
AC normal max voltage threshold	528 V
Max IGBT Charger Cooler temperature / neutral leg	60
PSP: 10s forced stop	Enable
PSP: automatic starting	Enable
PSP: battery starting	Disable
PSP: remote commands	Forbidden
Low limitation threshold	230
Rectifier current limitation threshold on mains	200
Rectifier current limitation threshold on battery	92
Inverter limitation threshold 2	315
Battery cell voltage equalization threshold	2.27
Floating reference of one battery cell	2.27 V
Charge reference of one battery cell	2.27 V
Equalization reference of one battery cell	2.27 V
Maxi not coupled AC byPass voltage threshold	0 %

#### State

Inverter coupled Yes

Battery operation	No
End of Fin Autonomie batterie	No
Battery equalization in progress	Yes
End of battery autonomy pre-alarme	No
AC inter status normal	Closed
Q3BP status	Open
SS functionning	No
Q4S inter status	Closed
Out of synchronisation forced	No
Battery circuit breaker 1 status	Closed
Battery circuit breaker 2 status	Open
Battery circuit breaker 3 status	Closed
End of sleep mode satus	Open
SS AC Normal end of ramp	Yes
AC Normal functionning	Yes
Rectifier on/off	On
DC bus end of ramp	Yes
Inverter on/off status	On
UPS in mask limitation	No
AC Bypass phase sequence done	Yes
External Q3BP status	Open
External Q4S status	Open
External Q5N status	Open
Q5N status	Open
KA1 status	Closed
KA2 status	Closed
Installation coupled	No
Neutral leg on/off	On

#### 4.3 UPS Source transfer

Test done OK

#### 4.4 DC measurements

#### 4.4.1 Charger and battery voltage

#### 4.4.1.1 Charger voltage

		Min	Max	
Measured DC Voltage	490 V	480 V	500 V	Within tolerance
DC Voltage from perso/display	490.2 V	480 V	500 V	Within tolerance
T° measure	0 °F			

#### CAUTION: Battery life is halved for every 10°C above 25°C

#### 4.5 Calibration

	Oscillo.	Perso. / Display	Min	Max
Battery charger Voltage	490 V	490.2 V	480 V	500 V

#### 4.6 Battery Check

Verify the ability of the UPS to return to normal operation Pass

#### Section comments

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

#### 5 Service and parts

#### 5.1 Parts swap

#### Defective

Product	Qty	Serial #	Tracking #	Used product	Used serial #
04-04060-05	1	L		04-04060-05	
Description					
BATTERY 12V NPX150R					

#### **6 Final Inspection**

#### 6.1 Final Inspection

#### **Equipment operation**

Satisfactory	
N/A	
Satisfactory	
No	

#### **Customer Relationship**

List any customer concerns about the unit.	N/A
The Customer Relationship Management has been updated	No
Basic customer training completed	N/A

#### Site

Eduto tilo dito dicari ana tiay	Leave the site clean and tidy	Yes	
---------------------------------	-------------------------------	-----	--

#### Section comments

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.

#### 6.2 Comments

#### General comments

The startup was halted yesterday due to a faulty battery. The battery is on-site now. The unit is ready to be started.

#### Battery characteristics

Batteries were taken off float charge Mar 2014.

#### Classic Battery Solution Inspection

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### Communication Option Check

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

#### Final Inspection

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.



# AMERICAN POWER CONVERSION LIMITED FACTORY WARRANTY

#### Three Phase Power Products or Cooling Solutions One-Year Factory Warranty<sup>1</sup>

The limited warranty provided by American Power Conversion (APC<sup>®</sup>) in this Statement of Limited Factory Warranty applies only to products you purchase for your commercial or industrial use in the ordinary course of your business.

#### **Terms of Warranty**

American Power Conversion warrants that the product shall be free from defects in materials and workmanship for a period of one year from the date of product start-up when start-up is performed by APC authorized service personnel and occurs within six months of The APC shipment date. This warranty covers repairing or replacing any defective parts including on-site labor and travel. In the event that the product fails to meet the foregoing warranty criteria, the warranty covers repairing or replacing defective parts at the sole discretion of APC for a period of one year from the shipment date. For APC cooling solutions, this warranty does not cover circuit breaker resetting, loss of refrigerant, consumables, or preventive maintenance items. Repair or replacement of a defective product or part thereof does not extend the original warranty period. Any parts furnished under this warranty may be new or factory-remanufactured.

#### **Non-transferable Warranty**

This warranty is extended to the first person, firm, association or corporation (herein referred to by "You" or "Your") for whom the APC product specified herein has been purchased. This warranty is not transferable or assignable without the prior written permission of APC.

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## Drawings, descriptions

APC warrants for the warranty period and on the terms of the warranty set forth herein that the APC product will substantially conform to the descriptions contained in the APC Official Published Specifications or any of the drawings certified and agreed to by contract with APC if applicable thereto ("Specifications"). It is understood that the Specifications are not warranties of performance and not warranties of fitness for a particular purpose.

#### **Exclusions**

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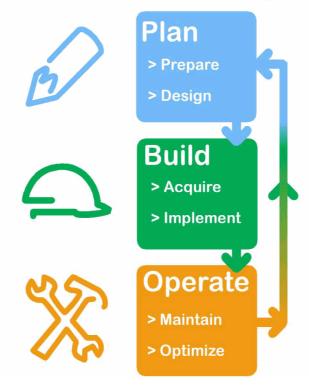
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# Schneider Electric



# **Critical Power and Cooling Services**



## Install report - Start up

Site Contact Randy Perry

Site Company

NORTH CAROLINA NATIONAL GUARD

Site Address

5132 Departure Dr, Raleigh, NC, 27604

Site Country United-States

Date 21 July 2014

#### Field Service Engineer

FSE Jonathan Langley

Service district NC/SC

Address 132 Fairgrounds Road

West Kingston, RI 02892





Service Request # / Activity : C1-5680434698/1-2LY4HLJ

Service District : NC/SC

Entitlement # : 1-2LXZFF0 Entitlement Name : Start-Up Service 5x8 - 1
Account ID : 1-1MLPODZ ISX Solution : ISX0001101122-0002

Customer Company : NORTH CAROLINA NATIONAL GUARD

Customer Address : 7410 Chapel Hill Road

Customer City : RALEIGH, North Carolina, 27607

Customer Name : Randy Perry

Phone / Fax Number / E-Mail : / /

Site Company : NORTH CAROLINA NATIONAL GUARD

Site Address : 5132 Departure Dr Site Town : Raleigh, NC, 27604 Site Contact : Randy Perry

Phone / Fax Number / E-Mail : / /

Equipment concerned : Galaxy 5000 Install/Startup date : 21 July 2014

Power : 40 kVA Serial number : 3AEQ04005001

Phase Type : 3:3

Configuration : Single unit

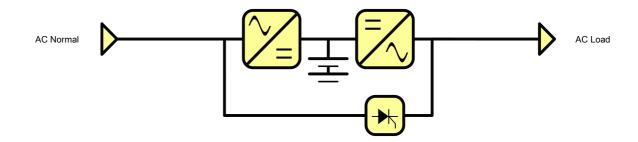
The battery has been replaced. The customer training is complete. No further discrepancies were noted with the unit. The unit is online. Please see comment sections.

Customer signature Schneider Electric signature

Randy Perry Jonathan Langley

## Maintenance summary

## Installation configuration



#### Checks carried out

Room & Environment Check	<b>⊘</b>
Battery characteristics	lacktriangle
Unit & System Inspection	<b>⊘</b>
Power Cables	<b>⊘</b>
Low Voltage Option Inspection	<b>⊘</b>
Classic Battery Solution Inspection	<b>⊘</b>
Communication options	<b>⊘</b>
System Preparation	<b>⊘</b>
Classic battery Pre startup check	<b>©</b>
Measurements	<b>⊘</b>
Initial Functional Check	<b>©</b>
Personalization	<b>⊘</b>
UPS Source transfer	<b>⊘</b>
Charger voltage	<b>©</b>
Calibration	<b>⊘</b>
Battery Check	<b>⊘</b>
Communication Option Check	<b>©</b>
Parts swap	<b>©</b>
Final Inspection	<b>©</b>
Comments	<b>©</b>

#### Comments

Customer

No comment

### **Customer issues**

Customer

No comment

Schneider Electric

No comment

#### List of measurement devices



Device type	Device model	Serial number	Last calibration date
Battery Tester	Alber CRT-400	CRT-400-653729	13 November 2013
Multimeter	Fluke 87 V	13950377	14 November 2013
Oscilloscope	Fluke 43B	06163	13 November 2013

## 1 System Room Check

#### 1.1 Room & Environment Check

#### **Unit Check**

Ensure you are working on correct unit	Yes	
The equipment sitting in the room matches what was	Yes	
purchased by customer		

#### **Battery Check**

The battery characteristics and its corresponding parameters	Yes
are matching with customer order  Battery Location	Same as equipment room

#### Equipment

List/Verify all auxiliary cabinets as part of the system	MBC, Battery Frame
Compatibility of upstream and downstream AC protections	Satisfactory
(breakers) have been checked	
Compatibility of upstream and downstream equipment and	Satisfactory
settings have been checked	

#### **Unit Room Condition**

The environment of the UPS is suitable for service operation		Yes	
The general appearance and cleanliness of the room are		Satisfactory	
acceptable			
Identify the type of room		Data Room	
Identify the type of ventilation used in the room	By air-conditioning	Satisfactory	
Measure Room Temperature (and humidity)	76 °F	Satisfactory	

## Grounding

Check Grounding system of the installation and Neutral	Yes
Conductors	

## 1.2 Battery characteristics

Battery capacity	40 Ah
Quantity of battery blocks per strings	36
Type of battery block	12 V
Quantity of battery cells (2V/Cell) per string	216
Quantity of battery strings	1
Backup time	11 min
Float voltage	490.2 V
Minimum battery voltage	356.4 V
Ambient temperature	74 °F
Cabinet temperature	76 °F

## Section comments

Batteries were taken off float charge Mar 2014.

## 2 System Check

## 2.1 Unit & System Inspection

## Visual Check

Describe the system status when arriving	System on
Appearance of the exterior of the cabinets (unit and	Satisfactory
auxiliaries)	

#### Internal Inspection

Internal Inspection	
Appearance of the interior of the cabinets (unit and	Satisfactory
auxiliaries)	,
All cabinets (including auxiliaries) are free of foreign items	Yes
The Air filters are clean and properly installed.	N/A
Condition of windings, chemical capacitors and internal	Satisfactory
power connections	
Visual inspection of the ventilation has been done	Satisfactory
Condition of boards, subassemblies and their connections	Satisfactory
Grounding	
Crowndian above (DE) of all achieves are account and	Vaa
Grounding straps (PE) of all cabinets are present and	Yes
secured.	
Breakers	
Breakers of the unit are set according to Schneider	N/A
specifications.	
2.2 Power Cables	
AC Power cables	
Length and size of AC Power cabling are adapted	Satisfactory
DC Power cables	
Size of DC cables are compliant with Schneider	Yes
recommendations.	
DC Power Cables wiring are correctly installed and	Satisfactory
connected	
2.3 Low Voltage Option Inspection	
Low Voltage	
Length and size of Low Voltage cabling are adapted	Satisfactory
Low Voltage Cables are wired compliant with State-of-the-art.	Yes
Grounding	
Grounding of communication channels are wired in	Satisfactory
accordance with Schneider recommendations.	Garistaciot y
accordance with connector recommendations.	
EPO	
Emergency Power Off is wired	N/A
	IV/A
2.4 Classic Battery Solution Inspection	
Grounding	
Grounding straps (PE) of all Battery Cabinets are present and	Yes
secured.	
General	
Appearance of the Classic Battery Solution	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
A floating voltage compensation with ambient temperature is	See comments
working	

#### **Protection Device**

Type of DC protection device	DC circuit breaker	
Compatibility of DC protections (breakers) have been	Yes	
checked		
Each DC breaker device(s) include a tripping coil	MxCoil	
Option		
Battery monitoring system is present	No	

#### Section comments

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### 2.5 Communication options

Option Name	SKU ref.	Spare Part ref.	Firmware version	Level
Alarm relays electrician comm. Card	66069	51029380		
SNMP web card	66074	3400364100		
JBUS/ModBus communication card	66061	51029099		

## 3 Pre Startup Check

## 3.1 System Preparation

#### General

System is ready to be energized	Satisfactory
AC Mains	
Upstream Mains verification	Satisfactory
If load is already connected, check that inputs cables and	N/A
output cables are not swapped by measuring Power flow.	

## 3.2 Classic battery Pre startup check

### Block

Block to block battery voltage (and Impedance)	Satisfactory
DC Power cables	
Internal & external DC cabling of Battery Cabinet	Satisfactory
Every Battery string (voltage & polarity) has been checked	Yes
individually	
Parallel Battery Strings have been checked	N/A
Insulation	
There is no DC ground fault	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
Battery polarity to the protection device has been checked	Yes

#### 3.3 Measurements

Measure type	Phase 1	Phase 2	Phase 3	
AC Normal voltage	484 V	485 V	483 V	
ACNormal frequency	60 Hz	0 Hz	0 Hz	
AC ByPass voltage	484 V	485 V	483 V	
AC Bypass frequency	60 Hz	0 Hz	0 Hz	
AC Load voltage	480 V	479 V	479 V	
AC Load frequency	60 Hz	0 Hz	0 Hz	
AC Load rms current	0 A	0 A	0 A	
AC Load crest current	0 A	0 A	0 A	
Charger voltage	490 V	0 V	0 V	

## 4 Unit Functional Check

## 4.1 Initial Functional Check

DC protection device is operational

## Input

EPO is activated	Yes
Unit operation with only Input breaker closed	Yes
Power up system following product start up procedure in	Satisfactory
service manual and training	
Settings	
System is set according to installation	Yes
LCM settings are OK	Yes
Sequences	
Unit operation without load	Satisfactory
EPO	
Emergency Power Off (EPO) is operational	N/A
Breakers	

Yes

#### 4.2 Personalization

#### Alarms

Battery charge default	Not present
UPS overload	Not present 0
EPO fault on MIZR	0
EEPROM fault on MIZR	0
Autotest fault on MIZR	0
Nber of UPS too low for coupling	0
Battery to check	0
Battery fault	0
Battery used fault	0
EEPROM CHAR fault	0
Autotest CHAR fault	0
DC maxi fault reference	0
DC mini fault reference	0
Pre-alarm battery to replace	0
Charge current measurement fault	0
Battery temperature fault	0
LA Fuse fault	0
Battery voltage measurement	0
AC Normal out of tolerance	0
AC Normal Fuses blown fault	0
AC Normal frequency out of tolerance	0
AC Normal phase rotation fault	0
Load short circuit	0
Vigitherm detection SS AC Bypass	0
SS AC Bypass fault	0
SS AC Bypass supply fault	0
AC Bypass voltage out of tolerance	0
AC Bypass frequency out of tolerance	0
Inverter / AC By-Pass voltage phase difference	0
AC Bypass overload	0
AC Bypass thermal overload	0
AC Bypass phase rotation fault	0
Perso code fault	0
EEPROM fault on GA	0
Battery chanel status calibrated	0
Board CH status calibrated	0
Q3BP/Q5N external fault	0
Fuse LA mains status	0
Watchdog FPGA fault	0
Battery Parameters absents	0
Battery Parameters used	0
Battery circuit fault	0
Disc Battery circuit breaker 2	0
Deep discharge fault	0
LA charger fault	0
Autonometer fault	0
Disc Battery circuit breaker 1	0
Charger vigitherm fault  Diag Pattery girsuit brooker 2	0
Disc Battery circuit breaker 3	0
EPO falt on CHAR	0
CLA rectifier fault	0
Battery parameter ageing pre-alarme	0
MIZR board status calibrated	0
AC Normal channel status calibrated	0
Rectifier overload	0
AC Bypass channel status calibrated	0
Inverter channel status calibrated	0
Battery SS temperature fault	0
DC ramp fault	0
Min DC voltage fault	0

DC Bus fault	0
AC Normal Under voltage fault	0
AC Normal loss fault	0
Rectifier phasing fault	0
AC Normal SS ramp fault	0
Rectifier limitation	0
Rectifier limitation fault in under voltage	0
Maxi charger voltage fault	0
Maxi charger current fault	0
Rectifier vigitherm fault	0
Inverter overload	0
Thermal inverter overload	0
UPS in limitation	0
Inverter temperature fault	0
Phase 1 inverter voltage out of tolerance	0
Phase 2 inverter voltage out of tolerance	0
Phase 3 inverter voltage out of tolerance	0
Phase 1 load voltage out of tolerance	0
Phase 2 load voltage out of tolerance	0
Phase 3 load voltage out of tolerance	0
External frequency out of tolerance	0
Mains 2 loss fault	0
Load loss fault	0
Load frequency out of tolerance	0
Q3BP/Q5N fault	0
Phase 1 inverter fuse fault	0
Phase 2 inverter fuse fault	0
Phase 3 inverter fuse fault	0
AC Bypass presence fault	0
Inverter relay fault	0
Inverter SS vigitherm fault	0
Neutral leg high maxi fault	0
Neutral leg low maxi fault	0
Residual current fault BN	0
Neutral leg temperature fault	0
Rectifier thermal overload	0
IGBT socket temperature fault	0
Cooling system fault	0
Autotest fault on GA	0
Coil temperature fault	0

#### Measurements

High DC bus voltage	399 V
Low DC bus voltage	400 V
Neutral leg current	0 A
AC Normal phase 1 power	1533 W
AC Normal phase 2 power	1596 W
AC Normal phase 3 power	1522 W
Phase 1/Neutral inverter voltage	277.2 V
Phase 2/Neutral inverter voltage	276.9 V
Phase 3/Neutral inverter voltage	277.0 V
Inverter frequency	60.1 Hz
Neutral current	0 A
External frequency	Not selected
Working mode status	3
Total battery security voltage	0.0 V
AC Normal voltage	482.8 V
AC Normal Phase 1 current	5.5 A
AC Normal Phase 2 current	5.7 A
AC Normal Phase 3 current	5.4 A
AC Normal frequency	60.0 Hz
AC Bypass voltage	482.3 V
AC Bypass frequency	60.0 Hz
Load Phase 1 current	0 A
Load Phase 2 current	0 A

Load Phase 3 current	3.5 A
Phase 1/Neutral load voltage	278 V
Phase 2/Neutral load voltage	279 V
Phase 3/Neutral load voltage	278 V
Load frequency	60.0 Hz
Load phase 1 crest current	0 A
Load phase 2 crest current	0 A
Load phase 3 crest current	5.7 A
Phase 1 load power	0 W
Phase 2 load power	0 W
Phase 3 load power	365 W
AC Normal voltage UA-B	483.5 V
AC Normal voltage UB-C	483.5 V
AC Normal voltage UC-A	483.5 V

## Battery measurements

Autonomy battery time remaining	87 min
Battery current	0.1 A
Battery voltage	490.2 V
Battery charge rate	76 %
Instantaneous battery temperature	30 °C
Battery time recharge expected	27 Hour(s)
Battery life span calculated	1801 Day(s)
Battery cell voltage	2.27 V
Total battery power	4487 W
Battery cell power	20 W
Battery cell discharge current	9.2 A
Battery cell charge current	0.3 A
Average battery temperature on 24 h	20 °C
Battery capacity: C10 current	0 Ah

#### **UPS Measurements**

Min DC voltage reference         660 V           DC voltage reference         800 V           Inverter synchronisation speed         2 Hz/s           Limitation mask duration         3 ms           AC Bypass frequency tolerance         8 %           Rectifier synchronisation speed         1 Hz/s           Load frequency tolerance         8 %           External frequency tolerance         0 %           Fre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Max icoupled AC byPass voltage threshold         10 %           AC normal min voltage threshold         250 V           AC normal max voltage threshold         528 V           Max IGBT Charger Cooler temperature / neutral leg         60           PSP: automatic starting         Enable           PSP: sativny starting         Disable           PSP: shettery starting         Disable           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold on battery         227           Floating reference of one battery cell         227 V           Chair gereference of one battery cel	Battery end of autonomy voltage threshold	1.9 V
Inverter synchronisation speed         2 Hz/s           Limitation mask duration         3 ms           AC Bypass frequency tolerance         8 %           Rectifier synchronisation speed         1 Hz/s           Load frequency tolerance         8 %           External frequency tolerance         0 %           Pre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Max icoupled AC byPass voltage threshold         250 V           AC normal min voltage threshold         250 V           AC normal max voltage threshold         528 V           Max IGBT Charger Cooler temperature / neutral leg         60           PSP: 10 forced stop         Enable           PSP: battery starting         Disable           PSP: battery starting         Disable           PSP: remote commands         Forbidden           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold on battery         92           Inverter limitation threshold on battery cell         2.27 V           Charge reference of one battery cell         2.27 V           Equalization ref	Min DC voltage threshold	660 V
Limitation mask duration         3 ms           AC Bypass frequency tolerance         8 %           Rectifier synchronisation speed         1 Hz/s           Load frequency tolerance         8 %           External frequency tolerance         0 %           Pre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Maxi coupled AC byPass voltage threshold         10 %           AC normal min voltage threshold         250 V           AC normal max voltage threshold         250 V           Max IGBT Charger Cooler temperature / neutral leg         60           PSP: 10s forced stop         Enable           PSP: automatic starting         Enable           PSP: automatic starting         Disable           PSP: sterny starting         Disable           PSP: enterote commands         Forbidden           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold 2         315           Battery cell voltage equalization threshold         2.27           Floating reference of one battery cell         2.27 V           Charge reference of one batter	DC voltage reference	800 V
AC Bypass frequency tolerance         8 %           Rectifier synchronisation speed         1 Hz/s           Load frequency tolerance         8 %           External frequency tolerance         0 %           Pre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Max icoupled AC byPass voltage threshold         10 %           AC normal min voltage threshold         250 V           AC normal max voltage threshold         528 V           Max IGBT Charger Cooler temperature / neutral leg         60           PSP: 10s forced stop         Enable           PSP: automatic starting         Enable           PSP: automatic starting         Enable           PSP: nemote commands         Forbidden           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold 2         315           Battery cell voltage equalization threshold         2.27 V           Charge reference of one battery cell         2.27 V           Charge reference of one battery cell         2.27 V           Equalization reference of one battery cell         2.27 V	Inverter synchronisation speed	2 Hz/s
Rectifier synchronisation speed         1 Hz/s           Load frequency tolerance         8 %           External frequency tolerance         0 %           Pre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Max ic coupled AC byPass voltage threshold         10 %           AC normal min voltage threshold         250 V           AC normal max voltage threshold         528 V           Max IGBT Charger Cooler temperature / neutral leg         60           PSP: 10s forced stop         Enable           PSP: battery starting         Disable           PSP: battery starting         Disable           PSP: remote commands         Forbidden           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold 2         315           Battery cell voltage equalization threshold         2.27           Floating reference of one battery cell         2.27 V           Charge reference of one battery cell         2.27 V           Equalization reference of one battery cell         2.27 V	Limitation mask duration	3 ms
Load frequency tolerance         8 %           External frequency tolerance         0 %           Pre-end of autonomy coefficient         20 %           Pre-end of autonomy time         4 min           Min coupled AC byPass voltage threshold         10 %           Max loaded AC byPass voltage threshold         250 V           AC normal min voltage threshold         250 V           AC normal max voltage threshold         528 V           Max (BBT Charger Cooler temperature / neutral leg         60           PSP: 10s forced stop         Enable           PSP: automatic starting         Enable           PSP: atterty starting         Disable           PSP: tenter commands         Forbidden           Low limitation threshold         230           Rectifier current limitation threshold on mains         200           Rectifier current limitation threshold on battery         92           Inverter limitation threshold 2         315           Battery cell voltage equalization threshold         2.27 V           Charge reference of one battery cell         2.27 V           Equalization reference of one battery cell         2.27 V	AC Bypass frequency tolerance	8 %
External frequency tolerance 0 % Pre-end of autonomy coefficient 20 % Pre-end of autonomy time 4 min Min coupled AC byPass voltage threshold 10 % Maxi coupled AC byPass voltage threshold 10 % AC normal min voltage threshold 250 V AC normal max voltage threshold 528 V Max IGBT Charger Cooler temperature / neutral leg 60 PSP: 10s forced stop Enable PSP: automatic starting Enable PSP: battery starting Disable PSP: remote commands Forbidden Low limitation threshold 230 Rectifier current limitation threshold on mains 200 Rectifier current limitation threshold 2 315 Battery cell voltage equalization threshold 2 2.27 V Charge reference of one battery cell 2.27 V Equalization reference of one battery cell 2.27 V	Rectifier synchronisation speed	1 Hz/s
Pre-end of autonomy coefficient 20 % Pre-end of autonomy time 4 min Min coupled AC byPass voltage threshold 10 % Maxi coupled AC byPass voltage threshold 10 % AC normal min voltage threshold 250 V AC normal min voltage threshold 528 V Max (BET Charger Cooler temperature / neutral leg 60 PSP: 10s forced stop Enable PSP: automatic starting Enable PSP: automatic starting Enable PSP: remote commands Frobidden Low limitation threshold 230 Rectifier current limitation threshold on battery 92 Inverter limitation threshold 2.27 Floating reference of one battery cell 2.27 V Charge reference of one battery cell 2.27 V Equalization reference of one battery cell 2.27 V	Load frequency tolerance	8 %
Pre-end of autonomy time     4 min       Min coupled AC byPass voltage threshold     10 %       Maxi coupled AC byPass voltage threshold     10 %       AC normal min voltage threshold     250 V       AC normal max voltage threshold     528 V       Max IGBT Charger Cooler temperature / neutral leg     60       PSP: 10s forced stop     Enable       PSP: automatic starting     Enable       PSP: battery starting     Disable       PSP: remote commands     Forbidden       Low limitation threshold     230       Rectifier current limitation threshold on mains     200       Rectifier current limitation threshold 2     315       Battery cell voltage equalization threshold     2.27       Floating reference of one battery cell     2.27 V       Charge reference of one battery cell     2.27 V       Equalization reference of one battery cell     2.27 V	External frequency tolerance	0 %
Min coupled AC byPass voltage threshold  Maxi coupled AC byPass voltage threshold  AC normal min voltage threshold  AC normal max voltage threshold  AC normal max voltage threshold  AC normal max voltage threshold  Enable  PSP: 10s forced stop  Enable  PSP: automatic starting  Enable  PSP: battery starting  Disable  PSP: remote commands  Forbidden  Low limitation threshold  Rectifier current limitation threshold on battery  PSP: low reference of one battery cell  Enable  220  Rectifier current one battery cell  Enable  227  Floating reference of one battery cell  Equalization reference of one battery cell  Equalization reference of one battery cell  Equalization reference of one battery cell  Enable  227 V	Pre-end of autonomy coefficient	20 %
Maxi coupled AC byPass voltage threshold 250 V  AC normal min voltage threshold 528 V  Max IGBT Charger Cooler temperature / neutral leg 60  PSP: 10s forced stop Enable  PSP: automatic starting Enable  PSP: battery starting Disable  PSP: remote commands Forbidden  Low limitation threshold 230  Rectifier current limitation threshold on mains 200  Rectifier current limitation threshold 2 315  Battery cell voltage equalization threshold 2 2.27  Floating reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	Pre-end of autonomy time	4 min
AC normal min voltage threshold 250 V  AC normal max voltage threshold 528 V  Max IGBT Charger Cooler temperature / neutral leg 60  PSP: 10s forced stop Enable  PSP: automatic starting Enable  PSP: battery starting Disable  PSP: remote commands Forbidden  Low limitation threshold 230  Rectifier current limitation threshold on mains 200  Rectifier current limitation threshold 2 315  Battery cell voltage equalization threshold 2 2.27  Floating reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	Min coupled AC byPass voltage threshold	10 %
AC normal max voltage threshold 528 V  Max IGBT Charger Cooler temperature / neutral leg 60  PSP: 10s forced stop Enable  PSP: automatic starting Enable  PSP: battery starting Disable  PSP: remote commands Forbidden  Low limitation threshold 230  Rectifier current limitation threshold on mains 200  Rectifier current limitation threshold 2 315  Battery cell voltage equalization threshold 2 315  Battery cell voltage equalization threshold 2 2.27  Floating reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	Maxi coupled AC byPass voltage threshold	10 %
Max IGBT Charger Cooler temperature / neutral leg60PSP: 10s forced stopEnablePSP: automatic startingEnablePSP: battery startingDisablePSP: remote commandsForbiddenLow limitation threshold230Rectifier current limitation threshold on mains200Rectifier current limitation threshold on battery92Inverter limitation threshold 2315Battery cell voltage equalization threshold2.27Floating reference of one battery cell2.27 VCharge reference of one battery cell2.27 VEqualization reference of one battery cell2.27 V	AC normal min voltage threshold	250 V
PSP: 10s forced stop PSP: automatic starting Enable PSP: battery starting Disable PSP: remote commands Forbidden Low limitation threshold Low limitation threshold on mains Rectifier current limitation threshold on battery Rectifier current limitation threshold on battery 92 Inverter limitation threshold 2 315 Battery cell voltage equalization threshold 2.27 Floating reference of one battery cell Charge reference of one battery cell Equalization reference of one battery cell 2.27 V	AC normal max voltage threshold	528 V
PSP: automatic starting Enable PSP: battery starting Disable PSP: remote commands Forbidden Low limitation threshold 230 Rectifier current limitation threshold on mains 200 Rectifier current limitation threshold on battery 92 Inverter limitation threshold 2 315 Battery cell voltage equalization threshold 2 2.27 Floating reference of one battery cell 2.27 V Charge reference of one battery cell 2.27 V Equalization reference of one battery cell 2.27 V	Max IGBT Charger Cooler temperature / neutral leg	60
PSP: battery starting PSP: remote commands Forbidden  Low limitation threshold 230  Rectifier current limitation threshold on mains 200  Rectifier current limitation threshold on battery 92  Inverter limitation threshold 2  Battery cell voltage equalization threshold 2.27  Floating reference of one battery cell 2.27 V  Charge reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	PSP: 10s forced stop	Enable
PSP: remote commands  Low limitation threshold  Rectifier current limitation threshold on mains  Rectifier current limitation threshold on battery  Rectifier current limitation threshold on battery  92  Inverter limitation threshold 2  Battery cell voltage equalization threshold  2.27  Floating reference of one battery cell  Charge reference of one battery cell  2.27 V  Equalization reference of one battery cell  2.27 V	PSP: automatic starting	Enable
Low limitation threshold       230         Rectifier current limitation threshold on mains       200         Rectifier current limitation threshold on battery       92         Inverter limitation threshold 2       315         Battery cell voltage equalization threshold       2.27         Floating reference of one battery cell       2.27 V         Charge reference of one battery cell       2.27 V         Equalization reference of one battery cell       2.27 V	PSP: battery starting	Disable
Rectifier current limitation threshold on mains  Rectifier current limitation threshold on battery  92 Inverter limitation threshold 2  Battery cell voltage equalization threshold  2.27 Floating reference of one battery cell  Charge reference of one battery cell  2.27 V  Equalization reference of one battery cell  2.27 V	PSP: remote commands	Forbidden
Rectifier current limitation threshold on battery  Inverter limitation threshold 2  Battery cell voltage equalization threshold  Eloating reference of one battery cell  Charge reference of one battery cell  Equalization reference of one battery cell  2.27 V  Equalization reference of one battery cell  2.27 V	Low limitation threshold	230
Inverter limitation threshold 2 315  Battery cell voltage equalization threshold 2.27  Floating reference of one battery cell 2.27 V  Charge reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	Rectifier current limitation threshold on mains	200
Battery cell voltage equalization threshold  2.27  Floating reference of one battery cell  Charge reference of one battery cell  Equalization reference of one battery cell  2.27 V  2.27 V	Rectifier current limitation threshold on battery	92
Floating reference of one battery cell 2.27 V  Charge reference of one battery cell 2.27 V  Equalization reference of one battery cell 2.27 V	Inverter limitation threshold 2	315
Charge reference of one battery cell 2.27 V Equalization reference of one battery cell 2.27 V	Battery cell voltage equalization threshold	2.27
Equalization reference of one battery cell 2.27 V	Floating reference of one battery cell	2.27 V
<u> </u>	Charge reference of one battery cell	2.27 V
Maxi not coupled AC byPass voltage threshold 0 %	Equalization reference of one battery cell	2.27 V
	Maxi not coupled AC byPass voltage threshold	0 %

## State

Inverter coupled Yes

Battery operation	No
End of Fin Autonomie batterie	No
Battery equalization in progress	Yes
End of battery autonomy pre-alarme	No
AC inter status normal	Closed
Q3BP status	Open
SS functionning	No
Q4S inter status	Closed
Out of synchronisation forced	No
Battery circuit breaker 1 status	Closed
Battery circuit breaker 2 status	Open
Battery circuit breaker 3 status	Closed
End of sleep mode satus	Open
SS AC Normal end of ramp	Yes
AC Normal functionning	Yes
Rectifier on/off	On
DC bus end of ramp	Yes
Inverter on/off status	On
UPS in mask limitation	No
AC Bypass phase sequence done	Yes
External Q3BP status	Open
External Q4S status	Open
External Q5N status	Open
Q5N status	Open
KA1 status	Closed
KA2 status	Closed
Installation coupled	No
Neutral leg on/off	On

# 4.3 UPS Source transfer

Test done OK

#### 4.4 DC measurements

## 4.4.1 Charger and battery voltage

## 4.4.1.1 Charger voltage

		Min	Max	
Measured DC Voltage	490 V	480 V	500 V	Within tolerance
DC Voltage from perso/display	490.2 V	480 V	500 V	Within tolerance
T° measure	0 °F			

#### CAUTION: Battery life is halved for every 10°C above 25°C

#### 4.5 Calibration

	Oscillo.	Perso. / Display	Min	Max
Battery charger Voltage	490 V	490.2 V	480 V	500 V

#### 4.6 Battery Check

Verify the ability of the UPS to return to normal operation Pass

#### Section comments

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

#### 5 Service and parts

#### 5.1 Parts swap

#### Defective

Product	Qty	Serial #	Tracking #	Used product	Used serial #
04-04060-05	1	L		04-04060-05	
Description					
BATTERY 12V NPX150R					

#### **6 Final Inspection**

#### 6.1 Final Inspection

#### **Equipment operation**

Satisfactory
N/A
Satisfactory
No

#### **Customer Relationship**

List any customer concerns about the unit.	N/A
The Customer Relationship Management has been updated	No
Basic customer training completed	N/A

#### Site

|--|

#### Section comments

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.

#### 6.2 Comments

#### General comments

The startup was halted yesterday due to a faulty battery. The battery is on-site now. The unit is ready to be started.

#### Battery characteristics

Batteries were taken off float charge Mar 2014.

#### Classic Battery Solution Inspection

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### Communication Option Check

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

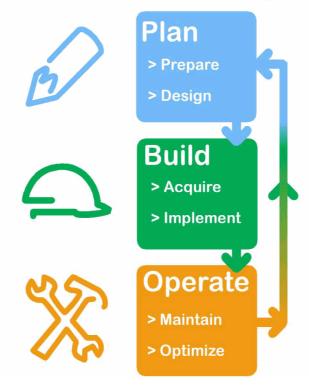
#### Final Inspection

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.

# Schneider Electric



# **Critical Power and Cooling Services**



## Install report - Start up

Site Contact Randy Perry

Site Company

NORTH CAROLINA NATIONAL GUARD

Site Address

5132 Departure Dr, Raleigh, NC, 27604

Site Country United-States

Date 21 July 2014

#### Field Service Engineer

FSE Jonathan Langley

Service district NC/SC

Address 132 Fairgrounds Road

West Kingston, RI 02892





Service Request # / Activity : C1-5680434698/1-2LY4HLJ

Service District : NC/SC

Entitlement # : 1-2LXZFF0 Entitlement Name : Start-Up Service 5x8 - 1
Account ID : 1-1MLPODZ ISX Solution : ISX0001101122-0002

Customer Company : NORTH CAROLINA NATIONAL GUARD

Customer Address : 7410 Chapel Hill Road

Customer City : RALEIGH, North Carolina, 27607

Customer Name : Randy Perry

Phone / Fax Number / E-Mail : / /

Site Company : NORTH CAROLINA NATIONAL GUARD

Site Address : 5132 Departure Dr Site Town : Raleigh, NC, 27604 Site Contact : Randy Perry

Phone / Fax Number / E-Mail : / /

Equipment concerned : Galaxy 5000 Install/Startup date : 21 July 2014

Power : 40 kVA Serial number : 3AEQ04005001

Phase Type : 3:3

Configuration : Single unit

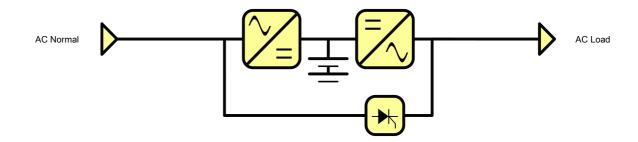
The battery has been replaced. The customer training is complete. No further discrepancies were noted with the unit. The unit is online. Please see comment sections.

Customer signature Schneider Electric signature

Randy Perry Jonathan Langley

## Maintenance summary

## Installation configuration



#### Checks carried out

Room & Environment Check	<b>⊘</b>
Battery characteristics	lacktriangle
Unit & System Inspection	<b>⊘</b>
Power Cables	<b>⊘</b>
Low Voltage Option Inspection	<b>⊘</b>
Classic Battery Solution Inspection	<b>⊘</b>
Communication options	<b>⊘</b>
System Preparation	<b>⊘</b>
Classic battery Pre startup check	<b>©</b>
Measurements	<b>⊘</b>
Initial Functional Check	<b>©</b>
Personalization	<b>⊘</b>
UPS Source transfer	<b>⊘</b>
Charger voltage	<b>©</b>
Calibration	<b>⊘</b>
Battery Check	<b>⊘</b>
Communication Option Check	<b>©</b>
Parts swap	<b>©</b>
Final Inspection	<b>©</b>
Comments	<b>©</b>

#### Comments

Customer

No comment

### **Customer issues**

Customer

No comment

Schneider Electric

No comment

#### List of measurement devices



Device type	Device model	Serial number	Last calibration date
Battery Tester	Alber CRT-400	CRT-400-653729	13 November 2013
Multimeter	Fluke 87 V	13950377	14 November 2013
Oscilloscope	Fluke 43B	06163	13 November 2013

## 1 System Room Check

#### 1.1 Room & Environment Check

#### **Unit Check**

Ensure you are working on correct unit	Yes	
The equipment sitting in the room matches what was	Yes	
purchased by customer		

#### **Battery Check**

The battery characteristics and its corresponding parameters	Yes
are matching with customer order  Battery Location	Same as equipment room

## Equipment

List/Verify all auxiliary cabinets as part of the system	MBC, Battery Frame
Compatibility of upstream and downstream AC protections	Satisfactory
(breakers) have been checked	
Compatibility of upstream and downstream equipment and	Satisfactory
settings have been checked	

#### **Unit Room Condition**

The environment of the UPS is suitable for service operation		Yes	
The general appearance and cleanliness of the room are		Satisfactory	
acceptable			
Identify the type of room		Data Room	
Identify the type of room  Identify the type of ventilation used in the room	By air-conditioning	Data Room Satisfactory	

## Grounding

Check Grounding system of the installation and Neutral	Yes	
Conductors		

## 1.2 Battery characteristics

Battery capacity	40 Ah
Quantity of battery blocks per strings	36
Type of battery block	12 V
Quantity of battery cells (2V/Cell) per string	216
Quantity of battery strings	1
Backup time	11 min
Float voltage	490.2 V
Minimum battery voltage	356.4 V
Ambient temperature	74 °F
Cabinet temperature	76 °F
· · · · · · · · · · · · · · · · · · ·	

## Section comments

Batteries were taken off float charge Mar 2014.	ı
	- 1
	•

## 2 System Check

## 2.1 Unit & System Inspection

## Visual Check

Describe the system status when arriving	System on
Appearance of the exterior of the cabinets (unit and	Satisfactory
auxiliaries)	

#### Internal Inspection

Internal Inspection	
Appearance of the interior of the cabinets (unit and	Satisfactory
auxiliaries)	,
All cabinets (including auxiliaries) are free of foreign items	Yes
The Air filters are clean and properly installed.	N/A
Condition of windings, chemical capacitors and internal	Satisfactory
power connections	
Visual inspection of the ventilation has been done	Satisfactory
Condition of boards, subassemblies and their connections	Satisfactory
Grounding	
Crowndian above (DE) of all achieves are account and	Vaa
Grounding straps (PE) of all cabinets are present and	Yes
secured.	
Breakers	
Breakers of the unit are set according to Schneider	N/A
specifications.	
2.2 Power Cables	
AC Power cables	
Length and size of AC Power cabling are adapted	Satisfactory
DC Power cables	
Size of DC cables are compliant with Schneider	Yes
recommendations.	
DC Power Cables wiring are correctly installed and	Satisfactory
connected	
2.3 Low Voltage Option Inspection	
Low Voltage	
Length and size of Low Voltage cabling are adapted	Satisfactory
Low Voltage Cables are wired compliant with State-of-the-art.	Yes
Grounding	
Grounding of communication channels are wired in	Satisfactory
accordance with Schneider recommendations.	Garistaciot y
accordance with connector recommendations.	
EPO	
Emergency Power Off is wired	N/A
	IV/A
2.4 Classic Battery Solution Inspection	
Grounding	
Grounding straps (PE) of all Battery Cabinets are present and	Yes
secured.	
General	
Appearance of the Classic Battery Solution	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
A floating voltage compensation with ambient temperature is	See comments
working	

#### **Protection Device**

Type of DC protection device	DC circuit breaker
Compatibility of DC protections (breakers) have been	Yes
checked	
Each DC breaker device(s) include a tripping coil	MxCoil
Option	
Battery monitoring system is present	No

#### Section comments

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### 2.5 Communication options

Option Name	SKU ref.	Spare Part ref.	Firmware version	Level
Alarm relays electrician comm. Card	66069	51029380		
SNMP web card	66074	3400364100		
JBUS/ModBus communication card	66061	51029099		

## 3 Pre Startup Check

## 3.1 System Preparation

#### General

System is ready to be energized	Satisfactory
AC Mains	
Upstream Mains verification	Satisfactory
If load is already connected, check that inputs cables and	N/A
output cables are not swapped by measuring Power flow.	

## 3.2 Classic battery Pre startup check

### Block

Block to block battery voltage (and Impedance)	Satisfactory
DC Power cables	
Internal & external DC cabling of Battery Cabinet	Satisfactory
Every Battery string (voltage & polarity) has been checked	Yes
individually	
Parallel Battery Strings have been checked	N/A
Insulation	
There is no DC ground fault	Yes
Direct contact of terminals between surrounding metal parts	Yes
and connections is avoided	
Battery polarity to the protection device has been checked	Yes

#### 3.3 Measurements

Measure type	Phase 1	Phase 2	Phase 3	
AC Normal voltage	484 V	485 V	483 V	
ACNormal frequency	60 Hz	0 Hz	0 Hz	
AC ByPass voltage	484 V	485 V	483 V	
AC Bypass frequency	60 Hz	0 Hz	0 Hz	
AC Load voltage	480 V	479 V	479 V	
AC Load frequency	60 Hz	0 Hz	0 Hz	
AC Load rms current	0 A	0 A	0 A	
AC Load crest current	0 A	0 A	0 A	
Charger voltage	490 V	0 V	0 V	
Charger voltage	490 V	0 V	0 V	

## 4 Unit Functional Check

## 4.1 Initial Functional Check

DC protection device is operational

## Input

EPO is activated	Yes
Unit operation with only Input breaker closed	Yes
Power up system following product start up procedure in	Satisfactory
service manual and training	
Settings	
System is set according to installation	Yes
LCM settings are OK	Yes
Sequences	
Unit operation without load	Satisfactory
EPO	
Emergency Power Off (EPO) is operational	N/A
Breakers	

Yes

#### 4.2 Personalization

#### Alarms

Battery charge default	Not present
UPS overload	Not present 0
EPO fault on MIZR	0
EEPROM fault on MIZR	0
Autotest fault on MIZR	0
Nber of UPS too low for coupling	0
Battery to check	0
Battery fault	0
Battery used fault	0
EEPROM CHAR fault	0
Autotest CHAR fault	0
DC maxi fault reference	0
DC mini fault reference	0
Pre-alarm battery to replace	0
Charge current measurement fault	0
Battery temperature fault	0
LA Fuse fault	0
Battery voltage measurement	0
AC Normal out of tolerance	0
AC Normal Fuses blown fault	0
AC Normal frequency out of tolerance	0
AC Normal phase rotation fault	0
Load short circuit	0
Vigitherm detection SS AC Bypass	0
SS AC Bypass fault	0
SS AC Bypass supply fault	0
AC Bypass voltage out of tolerance	0
AC Bypass frequency out of tolerance	0
Inverter / AC By-Pass voltage phase difference	0
AC Bypass overload	0
AC Bypass thermal overload	0
AC Bypass phase rotation fault	0
Perso code fault	0
EEPROM fault on GA	0
Battery chanel status calibrated	0
Board CH status calibrated	0
Q3BP/Q5N external fault	0
Fuse LA mains status	0
Watchdog FPGA fault	0
Battery Parameters absents	0
Battery Parameters used	0
Battery circuit fault	0
Disc Battery circuit breaker 2	0
Deep discharge fault	0
LA charger fault	0
Autonometer fault	0
Disc Battery circuit breaker 1	0
Charger vigitherm fault  Diag Pattery girsuit brooker 2	0
Disc Battery circuit breaker 3	0
EPO falt on CHAR	0
CLA rectifier fault	0
Battery parameter ageing pre-alarme	0
MIZR board status calibrated	0
AC Normal channel status calibrated	0
Rectifier overload	0
AC Bypass channel status calibrated	0
Inverter channel status calibrated	0
Battery SS temperature fault	0
DC ramp fault	0
Min DC voltage fault	0

DC Bus fault	0
AC Normal Under voltage fault	0
AC Normal loss fault	0
Rectifier phasing fault	0
AC Normal SS ramp fault	0
Rectifier limitation	0
Rectifier limitation fault in under voltage	0
Maxi charger voltage fault	0
Maxi charger current fault	0
Rectifier vigitherm fault	0
Inverter overload	0
Thermal inverter overload	0
UPS in limitation	0
Inverter temperature fault	0
Phase 1 inverter voltage out of tolerance	0
Phase 2 inverter voltage out of tolerance	0
Phase 3 inverter voltage out of tolerance	0
Phase 1 load voltage out of tolerance	0
Phase 2 load voltage out of tolerance	0
Phase 3 load voltage out of tolerance	0
External frequency out of tolerance	0
Mains 2 loss fault	0
Load loss fault	0
Load frequency out of tolerance	0
Q3BP/Q5N fault	0
Phase 1 inverter fuse fault	0
Phase 2 inverter fuse fault	0
Phase 3 inverter fuse fault	0
AC Bypass presence fault	0
Inverter relay fault	0
Inverter SS vigitherm fault	0
Neutral leg high maxi fault	0
Neutral leg low maxi fault	0
Residual current fault BN	0
Neutral leg temperature fault	0
Rectifier thermal overload	0
IGBT socket temperature fault	0
Cooling system fault	0
Autotest fault on GA	0
Coil temperature fault	0

#### Measurements

High DC bus voltage	399 V
Low DC bus voltage	400 V
Neutral leg current	0 A
AC Normal phase 1 power	1533 W
AC Normal phase 2 power	1596 W
AC Normal phase 3 power	1522 W
Phase 1/Neutral inverter voltage	277.2 V
Phase 2/Neutral inverter voltage	276.9 V
Phase 3/Neutral inverter voltage	277.0 V
Inverter frequency	60.1 Hz
Neutral current	0 A
External frequency	Not selected
Working mode status	3
Total battery security voltage	0.0 V
AC Normal voltage	482.8 V
AC Normal Phase 1 current	5.5 A
AC Normal Phase 2 current	5.7 A
AC Normal Phase 3 current	5.4 A
AC Normal frequency	60.0 Hz
AC Bypass voltage	482.3 V
AC Bypass frequency	60.0 Hz
Load Phase 1 current	0 A
Load Phase 2 current	0 A

Load Phase 3 current	3.5 A
Phase 1/Neutral load voltage	278 V
Phase 2/Neutral load voltage	279 V
Phase 3/Neutral load voltage	278 V
Load frequency	60.0 Hz
Load phase 1 crest current	0 A
Load phase 2 crest current	0 A
Load phase 3 crest current	5.7 A
Phase 1 load power	0 W
Phase 2 load power	0 W
Phase 3 load power	365 W
AC Normal voltage UA-B	483.5 V
AC Normal voltage UB-C	483.5 V
AC Normal voltage UC-A	483.5 V

## Battery measurements

Autonomy battery time remaining	87 min
Battery current	0.1 A
Battery voltage	490.2 V
Battery charge rate	76 %
Instantaneous battery temperature	30 °C
Battery time recharge expected	27 Hour(s)
Battery life span calculated	1801 Day(s)
Battery cell voltage	2.27 V
Total battery power	4487 W
Battery cell power	20 W
Battery cell discharge current	9.2 A
Battery cell charge current	0.3 A
Average battery temperature on 24 h	20 °C
Battery capacity: C10 current	0 Ah

#### **UPS Measurements**

Battery end of autonomy voltage threshold	1.9 V
Min DC voltage threshold	660 V
DC voltage reference	800 V
Inverter synchronisation speed	2 Hz/s
Limitation mask duration	3 ms
AC Bypass frequency tolerance	8 %
Rectifier synchronisation speed	1 Hz/s
Load frequency tolerance	8 %
External frequency tolerance	0 %
Pre-end of autonomy coefficient	20 %
Pre-end of autonomy time	4 min
Min coupled AC byPass voltage threshold	10 %
Maxi coupled AC byPass voltage threshold	10 %
AC normal min voltage threshold	250 V
AC normal max voltage threshold	528 V
Max IGBT Charger Cooler temperature / neutral leg	60
PSP: 10s forced stop	Enable
PSP: automatic starting	Enable
PSP: battery starting	Disable
PSP: remote commands	Forbidden
Low limitation threshold	230
Rectifier current limitation threshold on mains	200
Rectifier current limitation threshold on battery	92
Inverter limitation threshold 2	315
Battery cell voltage equalization threshold	2.27
Floating reference of one battery cell	2.27 V
Charge reference of one battery cell	2.27 V
Equalization reference of one battery cell	2.27 V
Maxi not coupled AC byPass voltage threshold	0 %

## State

Inverter coupled Yes

Battery operation	No
End of Fin Autonomie batterie	No
Battery equalization in progress	Yes
End of battery autonomy pre-alarme	No
AC inter status normal	Closed
Q3BP status	Open
SS functionning	No
Q4S inter status	Closed
Out of synchronisation forced	No
Battery circuit breaker 1 status	Closed
Battery circuit breaker 2 status	Open
Battery circuit breaker 3 status	Closed
End of sleep mode satus	Open
SS AC Normal end of ramp	Yes
AC Normal functionning	Yes
Rectifier on/off	On
DC bus end of ramp	Yes
Inverter on/off status	On
UPS in mask limitation	No
AC Bypass phase sequence done	Yes
External Q3BP status	Open
External Q4S status	Open
External Q5N status	Open
Q5N status	Open
KA1 status	Closed
KA2 status	Closed
Installation coupled	No
Neutral leg on/off	On

# 4.3 UPS Source transfer

Test done OK

#### 4.4 DC measurements

## 4.4.1 Charger and battery voltage

## 4.4.1.1 Charger voltage

		Min	Max	
Measured DC Voltage	490 V	480 V	500 V	Within tolerance
DC Voltage from perso/display	490.2 V	480 V	500 V	Within tolerance
T° measure	0 °F			

#### CAUTION: Battery life is halved for every 10°C above 25°C

#### 4.5 Calibration

	Oscillo.	Perso. / Display	Min	Max
Battery charger Voltage	490 V	490.2 V	480 V	500 V

#### 4.6 Battery Check

Verify the ability of the UPS to return to normal operation Pass

#### Section comments

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

#### 5 Service and parts

#### 5.1 Parts swap

#### Defective

Product	Qty	Serial #	Tracking #	Used product	Used serial #
04-04060-05	1	L		04-04060-05	
Description					
BATTERY 12V NPX150R					

#### **6 Final Inspection**

#### 6.1 Final Inspection

#### **Equipment operation**

Satisfactory
N/A
Satisfactory
No

#### **Customer Relationship**

List any customer concerns about the unit.	N/A
The Customer Relationship Management has been updated	No
Basic customer training completed	N/A

#### Site

|--|

#### Section comments

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.

#### 6.2 Comments

#### General comments

The startup was halted yesterday due to a faulty battery. The battery is on-site now. The unit is ready to be started.

#### Battery characteristics

Batteries were taken off float charge Mar 2014.

#### Classic Battery Solution Inspection

Optional ATIZ is not present. In accordance with Field Advisory FA-G5K-015 the temperature compensation is disabled.

#### Communication Option Check

The network card has been set to a normal static address 192.168.1.2. The customer has not gotten an network connection into the UPS at this time.

#### Final Inspection

The unit has been started. The training has been completed. No further discrepancies were noted during the startup.

# **Generator & ATS**

# **NC National Guard TAC OPS**

KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/5/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

**Supplier:** Nixon Power Services

Manufacturer: Kohler

**Specification:** Enclosed Transfer Switch

**Packaged Engine Generator System** 

Submittal #: 1



#### **COMMENTS:**

- 1. BATTERY CHARGER 208V/1/60HZ AS SHOWN ON DRAWINGS
- 2. MAIN CIRCUIT BREAKER UL SE RATED.
- 3. PROVIDE MONITOR III SOFTWARE



# Submittal Drawings for NC National Guard TAC OPS

""'APPROVED """
X"'APPROVED AS NOTED
""'REVISE AND RESUBMIT

Reference: Kohler Model 350REOZ

REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY. FOR ANY ERRORS THEREIN OR FOR FURNISHMS THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC

DATE 2-6-14

2/6/2014

## PROJECT: NC NATIONAL GUARD TAC OPS

## TABLE OF CONTENTS

## <u>LITERATURE NUMBER</u> <u>DESCRIPTION</u>

GENERATOR B	ILL OF	MATERIAL
-------------	--------	----------

G5-353 KOHLER MODEL 350REOZJ SPEC SHEET

TIB-102 ALTERNATOR DATA SHEET

EMISSIONS DATA
TIB-114 SOUND DATA SHEET

----- PROTOTYPE SUMMARY REPORT

G6-117 WEATHER ENCLOSURE/TANK SPEC SHEET

ADV-7991 SUBBASE TANK DIMENSION PRINT

ADV-7991 DIMENSION PRINT WEATHER ENCLOSURE ADV-7916 ENGINE/GENERATOR DIMENSION PRINT

ADV-7917 ACCESSORY DRAWING

G6-88 CIRCUIT BREAKER SPEC SHEET

----- CIRCUIT BREAKER INFO

G6-58 VOLTAGE REGULATOR SPEC SHEET G6-100 DEC 3000 CONTROLLER SPEC SHEET

ADV-8000 DEC 3000 CONTROLLER SCHEMATIC DIAGRAM
GM77987 DEC 3000 CONTROLLER WIRING DIAGRAM

G6-15 BATTERY CHARGER SPEC SHEET

233968 WIRING DIAGRAM BATTERY CHARGER

G6-95 REMOTE ANNUNCIATOR
----- WIRE SIZE ANNUNCIATOR

G11-108 AUTOMATIC TRANSFER SWITCH SPEC SHEET

ADV-7195 DIMENSION PRINT ATS
GM46266 SCHEMATIC DIAGRAM ATS
WIRDIG DIAGRAM ATS

GM46288 WIRING DIAGRAM ATS

TP-5561 FIVE YEAR COMPREHENSIVE WARRANTY



# **NC National Guard TAC OPS**

Qty: 1 **KOHLER** Model 350REOZJ Emergency Stationary Diesel Engine Driven Generator System rated **350 kW**, 438 KVA @ 0.8 PF, 277/480 VAC, 3Ø/4W, 60 Hz

To include:

### ENGINE/FUEL SYSTEM

• John Deere / Diesel Fueled Engine

## **UNIT ACCESSORIES**

- Housing Weather resistant steel enclosure
- Stainless steel flexible exhaust connector, critical grade exhaust silencer, Tail pipe and rain cap

### **COOLING SYSTEM ACCESSORIES**

- Unit mounted radiator 50°C ambient capability
- Engine block heater 2.5kW, 120V/1Ø/60 Hz

208v/1/60hz

## FUEL SYSTEM ACCESSORIES

- U. L. 142 listed, Flexible fuel lines
- Sub-base fuel tank: 774 gallon capacity, { ~ 29 hour run time}, double wall construction,
   Day Tank operation configuration by others.
  - We will be providing QTY: (4) 2in.fittings at the radiator end of the GenSet for the fuel delivery system.
- Leak detection monitor, Mushroom vent, Emergency vent, Fuel level gauge, Low fuel level alarm

#### GENERATOR ACCESSORIES

- Main Line Circuit Breaker 600Amp/3Pole, 80% rated (Electronic), installed on generator
- Voltage regulator +/- 0.5%

# JUL'SE Rated

## ENGINE ELECTRICAL ACCESSORIES

- Electronic/Isochronous governor
- Battery rack, cables and starting battery system lead acid
- Battery charger Automatic float, 10 amps with alarms

## KOHLER DEC 3000 MICROPROCESSOR CONTROL

→ NFPA 110 compliant

#### **CONTROLLER ACCESSORIES**

- Remote annunciator
- Engine run relay

## ADDITIONAL ACCESSORIES

- U. L. 2200 listed
- Vibration isolators standard between engine/generator and skid base
- 3 Sets of owners/operators manuals
- 1 Year Kohler standard warranty

## **AUTOMATIC TRANSFER SWITCH**

- Qty: 1 KOHLER Model: KSS-DMTC-0100S Standard, open-transition Automatic Transfer Switch rated 277/480 VAC, 600 Amps, 3Ø/4W, 3 Pole, NEMA 3R enclosure, with all standard features and accessories included as well as the following optional accessories:
  - MPAC-1500 Control, Plant exerciser with load/no load selector
  - 5 Year Kohler comprehesive warranty

## DISTRIBUTOR SITE WORK

- System checkout and start up service after installation is complete
- Operator training at time of start-up
- System load testing utilizing portable load banks 4 hours

**EXCEPTIONS:** 

INSTALLATION, EXHAUST INSULATION, EXTENDED WIRING, FUEL, EXTENDED EXHAUST OR **CO**OLING PIPING AND INSULATION <u>NOT</u> INCLUDED UNLESS SPECIFICALLY LISTED

# Model: 350REOZJ

# **KOHLER**.POVVER SYSTEMS

208-600 V

Diesel



Tier 3 EPA-Certified for Stationary Emergency Applications

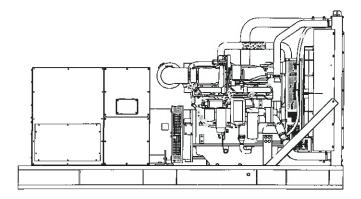
## **Ratings Range**

 Standby:
 kW
 280-350

 kVA
 280-438

 Prime:
 kW
 275-320

 kVA
 275-400



## Standard Features

- Kohler Co. provides one-source responsibility for the generating system and accessories.
- The generator set and its components are prototype-tested, factory-built, and production-tested.
- The 60 Hz generator set offers a UL 2200 listing.
- The generator set accepts rated load in one step.
- The 60 Hz emergency generator set meets NFPA 110, Level 1, when equipped with the necessary accessories and installed per NFPA standards.
- A one-year limited warranty covers all systems and components. Two- and five-year extended warranties are also available.
- Alternator features:
  - The pilot-excited, permanent magnet (PM) alternator provides superior short-circuit capability.
  - The brushless, rotating-field alternator has broadrange reconnectability.
- Other features:
  - Kohler designed controllers for guaranteed system integration and remote communication. See Controllers on page 3.
  - The low coolant level shutdown prevents overheating (standard on radiator models only).
  - Integral vibration isolation eliminates the need for under-unit vibration spring isolators.
  - An electronic, isochronous governor delivers precise frequency regulation.
  - o Multiple circuit breaker configurations.

# **Generator Set Ratings**

				150°C Standby	Rise Rating	130°C Standby		125°C Prime	Rise Rating	105°C Prime	: Rise Rating
Alternator	Voltage	Ph	Hz	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps	kW/kVA	Amps
	120/208	3	60	350/438	1214	350/438	1214	320/400	1110	320/400	1110
	127/220	3	60	350/438	1148	350/438	1148	320/400	1050	320/400	1050
4M4019	139/240	3	60	350/438	1052	350/438	1052	320/400	962	320/400	962
41014019	220/380	3	60	305/381	579	305/381	579	275/344	522	275/344	522
	240/416	3	60	350/438	607	350/438	607	320/400	555	320/400	555
	277/480	3	60	350/438	526	350/438	526	320/400	481	320/400	481
	120/208	3	60	350/438	1214	350/438	1214	320/400	1110	320/400	1110
	127/220	3	60	350/438	1148	350/438	1148	320/400	1050	320/400	1050
4M4021	139/240	3	60	350/438	1052	350/438	1052	320/400	962	320/400	962
41014021	220/380	3	60	315/394	598	315/394	598	285/356	541	285/356	541
	240/416	3	60	350/438	607	350/438	607	320/400	555	320/400	555
	277/480	3	60	350/438	526	350/438	526	320/400	481	320/400	481
	120/208	3	60	350/438	1214	350/438	1214	320/400	1110	320/400	1110
	127/220	3	60	350/438	1148	350/438	1148	320/400	1050	320/400	1050
	120/240	1	60	305/305	1271	280/280	1167	275/275	1146	275/275	1146
5M4027	139/240	3	60	350/438	1052	350/438	1052	320/400	962	320/400	962
	220/380	3	60	350/438	665	350/438	665	320/400	608	320/400	608
	240/416	3	60	350/438	607	350/438	607	320/400	555	320/400	555
	277/480	3	60	350/438	526	350/438	526	320/400	481	320/400	481
4M4266	347/600	3	60	350/438	421	350/438	421	320/400	385	320/400	385
5M4272	347/600	3	60	350/438	421	350/438	421	320/400	385	320/400	385

RATINGS: All three-phase units are rated at 0.8 power factor. Standby Ratings: The standby rating is applicable to varying loads for the duration of a power outage. There is no overload capability for this rating. Prime Power Ratings: At varying load, the number of generator set operating hours is unlimited. A 10% overload capability is available for one hour in twelve. Ratings are in accordance with ISO-8528-1 and ISO-3046-1. For Ilmited running time and continuous ratings, consult the factory. Obtain technical information bulletin (TIB-101) for ratings guidelines, complete retings definitions, and site condition derates. The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or ilability whatsoever.

# **Alternator Specifications**

Specifications	•	Alternator	
Туре		4-Pole, Rotating-Field	
Exciter type		Brushless, Permanent- Magnet, Pilot Exciter	
Leads: quantity	, type	12, Reconnectable	
Voltage regulat	or	Solid State, Volts/Hz	
Insulation:		NEMA MG1	
Material		Class H, Synthetic, Nonhygroscopic	
Temperatu	ıre rise	130°C, 150°C Standby	
Bearing: quanti	ty, type	1, Sealed	
Coupling		Flexible Disc	
Amortisseur wir	ndings	Full	
Rotor balancing	I	125%	
Voltage regulati	on, по-load to full-load	Controller Dependent	
One-step load a	acceptance	100% of Rating	
Unbalanced loa	d capability	100% of Rated Standby Current	
Peak motor starting kVA:		(35% dip for voltages below)	
480 V	4M4019 (12 lead)	1325	
480 V	4M4021 (12 lead)	1350	
480 V	5M4027 (12 lead)	1550	
600 V	4M4266 (4 lead)	1300	

1750

- NEMA MG1, IEEE, and ANSI standards compliance for temperature rise and motor starting.
- Sustained short-circuit current of up to 300% of the rated current for up to 10 seconds.
- Sustained short-circuit current enabling downstream circuit breakers to trip without collapsing the alternator field.
- Self-ventilated and dripproof construction.
- · Superior voltage waveform from a two-thirds pitch stator and skewed rotor.
- Brushless alternator with brushless pilot exciter for excellent load response.

# **Application Data**

## **Engine**

600 V

Engine Specifications	
Engine manufacturer	John Deere
Engine model	6135HF485
Engine type	4-Cycle, Turbocharged, Charge Air-Cooled
Cylinder arrangement	6, inline
Displacement, L (cu. in.)	13.5 (824)
Bore and stroke, mm (in.)	132 x 165 (5.2 x 6.5)
Compression ratio	16.0:1
Piston speed, m/min. (ft./min.)	594 (1950)
Main bearings: quantity, type	7, Replaceable Insert
Rated rpm	1800
Max. power at rated rpm, kWm (BHP)	401 (538)
Crankshaft material	Forged Steel
Valve material	
intake/Exhaust	Nickel-Chromium Head
	Chromium-Silicone Stem
Governor: type, make/model	JDEC Electronic L15
Frequency regulation, no-load to full-load	Isochronous
Frequency regulation, steady state	±0.25%
Frequency	Fixed
Air cleaner type, all models	Dry

5M4272 (4 lead)

#### **Exhaust**

Exhaust System	
Exhaust manifold type	Dry
Exhaust flow at rated kW, m <sup>3</sup> /min. (cfm)	75 (2649)
Exhaust temperature at rated kW, dry exhaust, ^C (°F)	446 (835)
Maximum allowable back pressure, kPa (in. Hg)	Min. 4 (1.2) Max. 10 (3.0)
Engine exhaust outlet size, mm (in.)	See ADV drawing

# **Engine Electrical**

Engine Electrical System	
Battery charging alternator:	
Ground (negative/positive)	Negative
Volts (DC)	24
Ampere rating	60
Starter motor rated voltage (DC)	24
Battery, recommended cold cranking amps (CCA):	
Qty., CCA rating each	Two, 950
Battery voltage (DC)	12
Fuel	
Fuel System	
Final avenue line rule ID may 6-3	10.00.50

Fuel System	
Fuel supply line, min. ID, mm (in.)	13 (0.50)
Fuel return line, min. ID, mm (in.)	10 (0.38)
Max. lift, fuel pump: type, m (ft.)	Electronic 2.1 (6.8)
Max. fuel flow, Lph (gph)	180.6 (47.7)
Max. return line restriction, kPa (in. Hg)	35 (10.3)
Fuel prime pump	Electronic
Fuel filter	
Secondary	2 Microns @ 98% Efficiency
Primary	10 Microns
Water Separator	Yes
Recommended fue!	#2 Diesel

#### Lubrication

Lubricating System			
Туре	Full Pressure		
Oil pan capacity, L (qt.)	40.0 (42.3)		
Oil pan capacity with filter, L (qt.)	42.0 (44.4)		
Oil filter: quantity, type	1, Cartridge		
Oil cooler	Water-Cooled		

## **Application Data**

## Cooling

Radiator System	
Ambient temperature, °C (°F)*	50 (122)
Engine jacket water capacity, L (gal.)	18 (4.8)
Radiator system capacity, including	
engine, L (gal.)	67.2 (17.8)
Engine jacket water flow, Lpm (gpm)	469 (124)
Heat rejected to cooling water at rated kW, dry exhaust, kW (Btu/min.)	194 (11042)
Heat rejected to air charge cooler at rated kW, dry exhaust, kW (Btu/min.)	106 (6033)
Water pump type	Centrifugal
Fan diameter, including blades, mm (in.)	965 (38)
Fan, kWm (HP)	18 (24)
Max. restriction of cooling air, intake and discharge side of radiator, kPa (in. H <sub>2</sub> O)	0.125 (0.5)

 \* Enclosure with internal silencer reduces ambient temperature capability by 5°C (9°F).

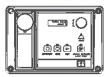
## **Operation Requirements**

Air Requirements	
Radiator-cooled cooling air, m³/min. (scfm)*	651 (23000)
Cooling air required for generator set when equipped with city water cooling or remote radiator, based on 14°C (25°F) rise, m <sup>3</sup> /min. (cfm) <sup>†</sup>	297 (10500)
Combustion air, m3/min. (cfm)	33 (1165)
Heat rejected to ambient air:	
Engine, kW (Btu/min.)	83 (4724)
Alternator, kW (Btu/min.)	36.6 (2082)

† Air density = 1.20 kg/m3 (0.075 lbm/ft3)

Diesel, Lph (gph) at % load	Standby Rating
100%	100.3 (26.5)
75%	73.2 (19.3)
50%	51.9 (13.7)
25%	30.7 (8.1)
Diesel, Lph (gph) at % load	Prime Rating
100%	88.3 (23.3)
75%	66.1 (17.5)
50%	47.6 (12.6)
25%	27.2 (7.2)

## Controllers



#### Decision-Maker 3000 Controller

Provides advanced control, system monitoring, and system diagnostics for optimum performance and compatibility.

- Digital display and menu control provide easy local data access
- · Measurements are selectable in metric or English units
- Remote communication thru a PC via network or serial configuration
- Controller supports Modbus® protocol
- Integrated hybrid voltage regulator with ±0.5% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-100 for additional controller features and accessories.

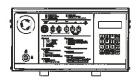


#### Decision-Maker® 550 Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities.

- · Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-46 for additional controller features and accessories.



#### Decision-Maker<sup>®</sup> 6000 Paralleling Controller

Provides advanced control, system monitoring, and system diagnostics with remote monitoring capabilities for paralleling multiple generator sets.

- Paralleling capability with first-on logic, synchronizer, kW and kVAR load sharing, and protective relays
- Digital display and keypad provide easy local data access
- Measurements are selectable in metric or English units
- Remote communication thru a PC via network or modem configuration
- Controller supports Modbus® protocol
- Integrated voltage regulator with ±0.25% regulation
- · Built-in alternator thermal overload protection
- NFPA 110 Level 1 capability

Refer to G6-107 for additional controller features and accessories.

KOHLER CO., Kohler, Wisconsin 53044 USA Phone 920-457-4441, Fax 920-459-1646 For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444 KohlerPower.com

Kohler Power Systems Asia Pacific Headquarters 7 Jurong Pier Road Singapore 619159 Phone (65) 6264-6422, Fax (65) 6264-6455

St	andard Features		Perolloling System
	Alternator Protection	п	Paralleling System  Manual Speed Adjust
	Battery Rack and Cables		
	Customer Connection (standard with Decision-Maker® 6000 controller only)	_	Miscellaneous
•	Local Emergency Stop Switch		Air Cleaner, Heavy Duty
	Oll Drain Extension		Air Cleaner Restriction Indicator
•	Operation and Installation Literature		Crankcase Emissions Canister
Α۱	vailable Options		Engine Fluids Added Rated Power Factor Testing
	Approvals and Listings		Literature
	California OSHPD Approval		General Maintenance
	CSA Approval		NFPA 110
	IBC Seismic Certification		Overhaul
	UL 2200 Listing	7	Production
	Enclosed Unit	_	
	Sound Enclosure Level 1 and Subbase Fuel Tank Packages		Warranty
ō	Sound Enclosure Level 2 and Subbase Fuel Tank Packages		2-Year Basic
	Weather Enclosure and Subbase Fuel Tank Packages		5-Year Basic
	Open Unit		5-Year Comprehensive
	Exhaust Silencer, Critical (kit: PA-354880)		Other Options
H	Flexible Exhaust Connector, Stainless Steel		-
_		_	
	Fuel System	<u> </u>	
Ш	Flexible Fuel Lines (Select rubber or stainless steel)		
	Controller	ň	
	,	_	
	(Decision-Maker® 550 and 6000 controllers only)		
	Customer Connection (Decision-Maker® 550 controller only)		
			mensions and Weights
_	(Decision-Maker® 6000 controller only)	Ovi	erall Size, L x W x H, max., mm (in.): 3630 x 1725 x 1993 (142.9 x 67.9 x 78.5)
Ш	Dry Contact (isolated alarm) (Decision-Maker® 550 and 6000 controllers only)	We	light (radiator model), wet, max., kg (lb.): 3901 (8600)
	Input/Output Module (Decision-Maker® 3000 controller only)	_	
	Remote Audiovisual Alarm Panel (Decision-Maker® 550 controller only)	Ir	
		Ш	
9	Remote Serial Annunciator Panel	Ш	
L	Run Relay	Ш	
	Cooling System 208/1/60hz	ΙL	
Д	Block Heater 2500 W 90-120 V 1 Ph	$\vdash$	
묽	Block Heater, 2500 W, 190-208 V, 1 Ph Block Heater, 2500 W, 210-240 V, 1 Ph	 	-w
	Block Heater, 2500 W, 380-480 V, 1 Ph	NOT	E: This drawing is provided for reference only and should not be used for planning
	[recommended for ambient temperatures below 0°C (32°F)]	insta	illation. Contact your local distributor for more detailed information.
	Radiator Duct Flange	DIS	STRIBUTED BY:
	Electrical System		
	Alternator Strip Heater		
	Battery		
	Battery Charger, Equalize/Float Type		
	Battery Heater		
	Line Circuit Breaker (NEMA type 1 enclosure)		
	Line Circuit Breaker with Shunt Trip (NEMA type I enclosure)		

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# **TECHNICAL INFORMATION BULLETIN**

# Alternator Data Sheet

**Alternator Model:** 

4M4019

Kilowatt ra	Kilowatt ratings at 1800 RPM			60 Hertz		12 LEADS	Standard 3 phase				
kW (kVA)		3 Phase		0.8 Power Fa	ctor		Dripproof or	Open Enclos	ure		
	Class B			Class F		_	Class H  125° C				
Voltage*	80° C ① Continuous	96° C (I) Lloyds	95° C ⊕ ABS	105°C British Standerd	105° C Continuous	130° C ① Standby		125° C Continuous	150° C ① Standby		
480/240	305 (381)	325 (406)	335 (419)	350 (438)	350 (438)	375 (469)	375 (469)	375 (469)	415 (519)		
460/230	305 (381)	325 (406)	330 (413)	345 (431)	345 (431)	370 (463)	370 (463)	370 (463)	395 (494)		
440/220	300 (375)	310 (388)	320 (400)	335 (419)	335 (419)	360 (450)	360 (450)	360 (450)	375 (469)		
416/208	290 (363)	300 (375)	310 (388)	325 (406)	325 (406)	350 (438)	350 (438)	350 (438)	360 (450)		
380/190	275 (344)	285 (356)	300 (375)	305 (381)	305 (381)	305 (381)	305 (381)	305 (381)	305 (381)		

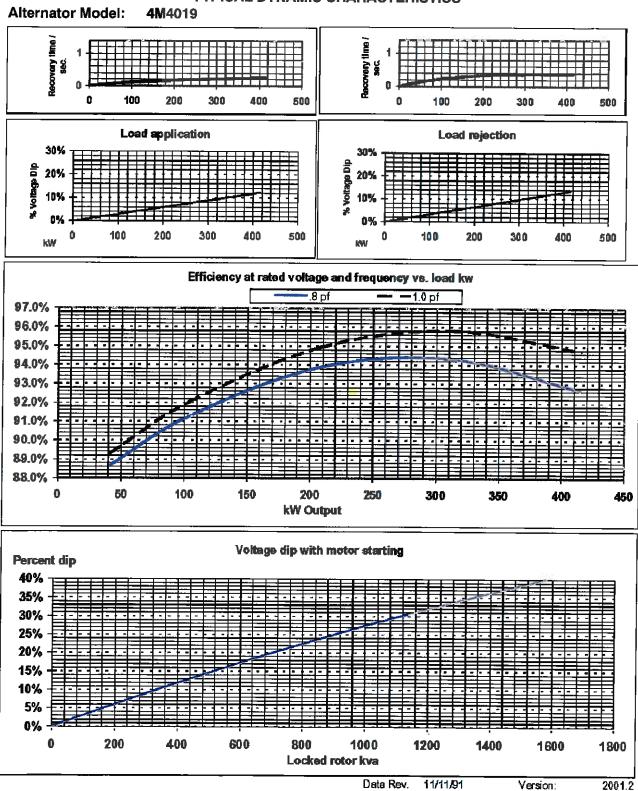
©Rise by resistance method, Mil-Std-705, Method 680.1b.

British Standard Rating per BS 5000

	Data: 480 Volts*, 375.2 kw, 469 k				NNECTION
VIII-Std-70			MII-Std-705		17-1
Method	Description	Value	Method	Description	Value
301.1b	Insulation Resistance	>1.5 Meg	505.3b	Overspeed	2250 RPM
302.1a	High Potential Test	0000 17-11-	507.1c	Phase Sequence CCW-ODE	ABC
	Main Stator	2000 Volts	508.1c	Voltage Balance, L-L or L-N	0.20%
	Main Rotor	1500 Volts	601.4a	L-L Harmonic Maximum - Total	5.0%
	Exciter Stator	1500 Volts	004.4-	(Distortion Factor)	0.007
	Exciter Rotor	1500 Volts	601.4a	L-L Harmonic Maximum - Single	3.0%
10.1.1	PMG Stator	1500 Volts	601.1c	Deviation Factor	5.0%
401.1a	Stator Resistance, Line to Line	004404		TIF (1960 Weightings)	< 50
	High Wye Connection	0.014 Ohms	0.50	THF (IEC, BS & NEMA Weightings)	< 2 %
	Rotor Resistance	0.286 Ohms	652.1a	Shaft Current	< 0.1 ma
	Exciter Stator	22.5 Ohms		Main Clater Consolitance to servind	0.040 (4
	Exciter Rotor	0.022 Ohms	-	Main Stator Capacitance to ground	0.019 mfd
	PMG Stator	2.1 Ohms			
410.1a	No Load Exciter Field Amps	0.75 A DC			
	at 240/480 Volts Line to Line			Additional Prototype Mil-Std Method	9
420.1 <b>a</b>	Short Circuit Ratio	0.620		are Available on Request.	
421.1 <b>a</b>	Xd Synchronous Reactance	2.469 p.u.	_	Generator Frame	433
		1.213 ohms	_		NAMAXDVR
422.1a	X2 Negative Sequence React.	0.197 ри	_	Insulation	Class H
	400	0.097 ohms	**	Coupling - Single Bearing	Flexible
423.1a	X0 Zero Sequence Reactance	0.036 pu	77	Amortisseur Windings	Full
		0.018 ohms		Excitation Ext. Voltage Regula	
425.1a	X'd Transient Reactance	0.111 pu	++	Voltage Regulator	DVR2000
		0.055 ohms		Voltage Regulation	0.25%
426.1a	X"d Subtransient Reactance	0.096 pu			
		0.047 ohms			
- marin	Хq Quadrature Synch. React.	0.658 pu	_	Cooling Air Volume	1050 CFM
		0.323 ohms			
427.1a	T'd Transient Short Circuit			Heat rejection rate	1474 Btu's/mi
	Time Constant	0.075 sec.			
428.1a	T'd Subtransient Short Circuit		-	Full load current	564 amps
	Time Constant	0.008 sec.			
430.1a	Tdo Transient Open Circuit		22	Minimum Input hp required	537.7
	Time Constant	1.55 sec.		Efficiency at rated load	93.5%
432.1a	Ta Short Circuit Time				
	Constant of Armature Winding	0.009 sec.	_	Full load torque	1568 Lb-ft

<sup>\*</sup> Voltage refers to wye (star) connection, unless otherwise specified. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

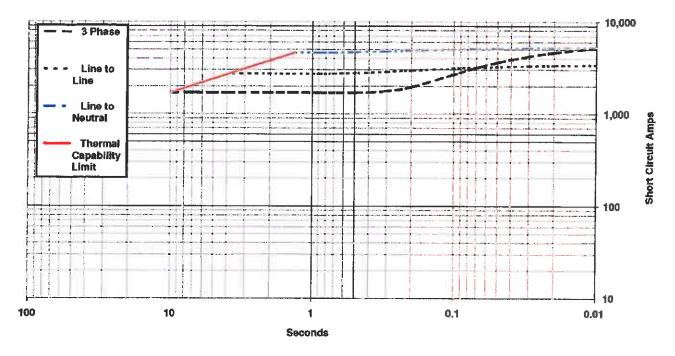
#### TYPICAL DYNAMIC CHARACTERISTICS



Voltage refers to wye (star) connection, unless otherwise specified. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever.

# 4M4019, 60 Hz, High Wye Connection SHORT CIRCUIT DECREMENT CURVE

Full Load Current: 564 Amps Steady State S.C. Current: 1692 Amps Max. 3 ph. Symm. S.C. Current: 5875 Amps



NOTE: Symmetrical component values are shown, maximum asymmetrical values are 1.732 times the symmetrical values.



### 350REOZJ

446.00

# 60 HZ. DIESEL INDUSTRIAL GENERATOR SET **EMISSION DATA SHEET**

**ENGINE INFORMATION** 

Model:

John Deere, 6135HF485T

Bore:

132mm (5.2 in.)

Nameplate BHP @ 1800 RPM:

538

Stroke:

165mm (6.5 in.)

4-Cycle, 6 Cylinder, Inline

Displacement:

13.5 L (824 cu. in.)

Aspiration:

Turbocharged, Charge Air-Cooled

EPA Family:

DJDXL13.5103

Compression Ratio

16.0:1

EPA Certificate: DJDXL13.5103-006

PERFORMANCE DATA:
Engine bkW @ Stated Load
Fuel Consumption (g/kWh)
Exhaust Gas Flow (m³/min)
Exhaust Temperature (°C)

	Tab	le 1						
1/4	1/2	1/2 3/4						
Standby	<u>Standby</u>	Standby	<u>Standby</u>					
100.25	200.50	300.75	401.00					
255.50	219.30	206.10	210.80					
			75.00					

Table 2	_
EPA CERTIFICATE DATA	
0.1	_
3.3	
0.6	
0.10	

Values are in g/kWh unless otherwise noted

# **EXHAUST EMISSION DATA:**

HC (Total Unburned Hydrocarbons) NOx (Oxides of Nitrogen as NO2)

CO (Carbon Monoxide) PM (Particular Matter)

#### **TEST METHODS AND CONDITIONS**

The EPA Certificate Data in Table 2 is a weighted average value per ISO 8528 D2.

Data and specifications subject to change without notice

For further information, please contact Todd Loes at John Deere Power Systems, 319-292-6050



# UNITED STATES ENVIRONMENTAL PROTECTION AGENCY WITH THE CLEAN AIR ACT OF 1990 CERTIFICATE OF CONFORMITY 2013 MODEL YEAR

OFFICE OF TRANSPORTATION ANN ARBOR, MĬCHIGAN 48105 AND AIR QUALITY

> (U.S. Manufacturer or Importer) Certificate Issued To: Deere & Company Certificate Number: DJDXL13,5103-006

Expiration Date: Effective Date: 10/05/2012

Byron J. Bunker, Acting Division Director

10/05/2012 Issue Date:

Compliance Division

12/31/2013

Revision Date:

Manufacturer Type: Original Engine Manufacturer Engine Family: DJDXL13.5103 Model Year: 2013

Emissions Power Category: 225<=kW<450 Mobile/Stationary Indicator: Stationary

Fuel Type: Diesel

After Treatment Devices: No After Treatment Devices Installed

Non-after Treatment Devices: Engine Design Modification, Non-standard Non-After Treatment Device Installed, Electronic/Electric EGR - Cooled, Smoke Puff Limiter, Electronic Control

conformity is hereby issued with respect to the test engines which have been found to conform to applicable requirements and which represent the following engines, by engine family, more fully described in Pursuant to Section 111 and Section 213 of the Clean Air Act (42 U.S.C. sections 7411 and 7547) and 40 CFR Part 60, and subject to the terms and conditions prescribed in those provisions, this certificate of the documentation required by 40 CFR Part 60 and produced in the stated model year.

This certificate of conformity covers only those new compression-ignition engines which conform in all material respects to the design specifications that applied to those engines described in the documentation required by 40 CFR Part 60 and which are produced during the model year stated on this certificate of the said manufacturer, as defined in 40 CFR Part 60.

warrant or court order may lead to revocation or suspension of this certificate for reasons specified in 40 CFR Part 60. It is also a term of this certificate that this certificate may be revoked or suspended or It is a term of this certificate that the manufacturer shall consent to all inspections described in 40 CFR 1068 and authorized in a warrant or court order. Failure to comply with the requirements of such a rendered void ab initio for other reasons specified in 40 CFR Part 60.

This certificate does not cover engines sold, offered for sale, or introduced, or delivered for introduction, into commerce in the U.S. prior to the effective date of the certificate.

The actual engine power may lie outside the limits of the Emissions Power Category shown above See the certificate application for details.



# **TECHNICAL INFORMATION BULLETIN**

# **Generator Set Sound Data Sheet**

		<u> </u>		Sound	Pressure Data	n dB(A)	
Generator Set Model	Hz	Load	Raw Exhaust	Open Unit, Isolated Exhaust	Weather Enclosure	Level 1 Sound Enclosure	Level 2 Sound Enclosure
350REOZJ	60	100% Load	119.2	94.5	92.6	81.6	74.4
SOUREUZJ	00	No Load	110.0	91.8	89.9	74.6	69.9

Note: Sound pressure data is the logarithmic average of eight perimeter measurement points at a distance of 7 m (23 ft.), except Raw Exhaust data which is a single measurement point at 1 m (3.3 ft.) from the mouth of a straight pipe exhaust.

350	REOZJ	60 Hz		Sound Pressure Levels dB(A)								
Load	Distance,	Enclosure	Measurement		ı	Octave I	Band Ce	nter Fra	quency	(Hz)		Overall
Loau	m (ft.)	Eliciosule	Position	63	125	250	500	1000	2000	4000	8000	Level
			Right	60.4	63.1	68.0	66.0	66.2	67.1	59.5	57.2	73.9
i			Front-Right	51.1	59.6	69.9	62.6	67.8	67.4	61.6	58.0	74.2
			Front	56.0	60.7	65.5	64.4	66.9	66.2	62,6	58.8	73.0
	l		Front-Left	60.0	68.3	65.1	66.5	67.9	68.6	61.4	59.9	75.0
100%	7 (23)	Level 2	Left	58.4	63.9	65.9	68.0	67.1	66.6	59.3	61.8	73.9 74.2 73.0
Load	' (==,	Sound	Back-Left	58.2	66.7	64.3	67.9	68.4	68.2	61.6	59.6	74.8
			Back	58.8	63.2	65.8	67.9	67.8	67.7	60.3	62.1	74.4
l i			Back-Right	57.2	61.0	66.7	71.6	67.3	68.5	60.9	59.3	75.6
			8-pos. log avg.	58.2	64.2	66.8	67.6	67.5	67.6	61.0	59.9	74.4

			Sound Pressure Levels dB(A)									
Load	Distance,	Enclosure	Measurement			Cictave	Band Ce	nter Fre	quency	(Hz)		Overall
Loau	m (ft.)	Lilciosule	Position	63	125	250	500	1000	2000	4000	8000	Level
			Right	56.2	67.2	76.0	71.7	75.3	75.0	69.1	60.2	81.3
	[ ]		Front-Right	60.4	69.2	72.1	74.7	77.1	78.2	74.8	63.3	83.1
			Front	61.1	68.6	73.9	76.1	76.7	82.1	76.3	66.1	85.2
			Front-Left	58.4	67.2	75.6	74.1	75.2	76.9	70.4	60.7	82.1
100%	7 (23)	Level 1	Left	59.1	68.4	74.4	70.5	70.8	69.5	63.6	56.3	78.5
Load	` ′	Sound	Back-Left	56.7	65.1	71.2	_70.5	72.8	71.9	67.2	59.6	78.4
	ŀ		Back	57.9	64.7	73.8	73.9	73.3	69.6	66.4	60.4	79.5
			Back-Right	57.8	67.5	75.0	74.8	72.8	72.0	68.1	59.0	80.4
			8-pos. log avg.	58.7	67.5	74.3	73.7	74.7	76.5	71.4	61.6	81.6

				Sound Pressure Levels dB(A)								
Load	Distance, m (ft.)	Enclosure	Measurement Position	Right	Front- Right	Front	Front- Left	Left	Back- Left	Black	Back- Hight	8-pos. log avg.
100% Load	7 (23)	Weather	Overall Levels	92.6	90.6	94.0	94.4	93.6	92.7	86.4	92.1	92.6

					Sound Pressure Levels dB(A)							
Load	Distance,		Measurement			Octave	Band Ce	nter Fre	quency	(Hz)		Overall
Loau	m (ft.)		Position	63	125	250	500	1990	2000	4000	8000	Level
			Right	60.3	69.8	76.9	83.2	88.4	91.0	85.3	84.3	94.5
			Front-Right	59.0	69.3	76.5	85.1	87.7	87.1	82.5	80,4	92.5
			Front	60.4	71.7	83.4	84.1	92.7	91.2	82.8	76.2	95.9
]	l i	Open Unit,	Front-Left	62.2	76,0	82.5	88.6	91.5	91.6	84.9	81.9	96.3
100%	7 (23)	Isolated	Left	67.8	76.0	79.9	86.6	89.1	92.2	85.4	Ove Lev 84.3 94. 80.4 92. 76.2 95. 81.9 96. 81.9 95. 79.7 94. 73.8 88. 78.8 94.	95.5
Load	` ′	Exhaust	Back-Left	65.0	74.2	80.6	83.7	88.8	91.2	84.4	79.7	94.6
l i	·		Back	62.2	69.3	75.8	79.6	83.0	84.1	78.0	73.8	88.3
			Back-Right	62.5	_71.7	78.0	81.8	89.4	90.3	84.0	78.8	94.0
			8-pos. log avg.	63.3	73.1	80.0	84.8	89.5	90.4	83.9	80.6	94.5

The generator set manufacturer reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. © 2013 by Kohler Co. All rights reserved.

	Sound Pressure Levels dB(A)										
Load	Distance,	Exhaust		(	Ociave E	Band Ce	nter Fre	quency	(Hz)		Overall
Load	m (ft.)	Extraust	63	125	250	500	1000	2000	4000	8000	Level
100% Load	1 (3.3)	Raw Exhaust (Open Unit)	87.3	96.7	107.9	107.9	114.7	113.4	110.2	108.3	119.2

### 350REOZJ 60 Hz

				Sound Pressure Levels dB(A)									
Load	Distance,	Enclosure	Measurement		ı	Octave I	Band Ce	nter Fre	quency	(Hz)		Overall	
Load	m (ft.)	LIIOOSGIE	Position	63	125	250	500	1000	2000	4000	9000	Level	
			Right	51.3	57.9	62.0	61.5	63.8	60.7	52.6	49.2	68.8	
	ļ		Front-Right	45.2	55.2	67.7	59.3	63.6	59.1	54.4	51.2	70.3	
	İ		Front	50.1	56.1	66.0	63.0	64.6	61.7	55.6	52.0	70.6	
١ ا			FrontLeft	50.3	62.2	63.3	63.4	64.0	62.8	54.2	52.5	70.4	
No	7 (23)	Level 2	Left	49.0	58.3	62.5	62.5	63.9	60.3	52.1	53.2	69.2	
Load	- (/	Sound	Back-Left	50.6	61.1	60.8	62.6	64.5	61.0	53.1	49.4	69.5	
	i		Back	53.0	60.9	61.6	63.7	64.5	61.6	53.0	52.8	70.0	
			Back-Right	51.1	58.4	62.1	65.3	64.6	61.5	53.7	50.8	70.2	
			8-pos. log avg.	50.5	59.4	63.9	63.0	64.2	61.2	53.7	51.6	69.9	

							Sound P	ressure	Levels	dB(A)		
Load	Distance,	Enclosure	Measurement		(	Octave	Band Ce	nter Fre	quency	(Hz)		Overall
Load	m (ft.)	Likiosure	Position	63	125	250	500	1000	2000	4000	8000	Level
			Right	55.7	65.1	70.8	65.4	66.3	60.7	54.7	44.2	73.9
	· .		Front-Right	50.2	61.0	63.7	67.9	65.6	64.2	58.6	47.8	73.9
			Front	51.6	60.8	70.5	68.9	68.2	66.4	60.8	51.2	72.3
i I			FrontLeft	51.0	61.7	70.1	69.2	67.3	62.0	56.8	46.9	75.2
No.	7 (23)	Level1	Left	51.6	62.0	72.5	66.8	67.9	59.3	54.4	44.3	74.4
Load	``	Sound	Back-Left	53.7	63.1	70.7	66.8	70.4	63.3	59.2	46.8	75.0
			Back	55.1	63.5	71.5	70.5	70.7	61.0	58.4	48.5	75.1
1			Back-Right	52.5	62.4	67.2	69.4	69.0	61.1	57.9	45.0	76.2
			8-pos. log avg.	53.1	62.7	70.2	68.4	68.5	62.8	58.1	47.4	74.6

				Sound Pressure Levels dB(A)								
Load	Distance, m (ft.)	Enclosure	Measurement Position	Right	Frent- Right	Front	Front- Left	Left	Back- Left	Back	Back- Right	8-pos. log avg.
No Load	7 (23)	Weather	Overali Levels	89.1	88.6	92.3	92.0	89.4	89.1	82,9	90.3	89.9

							Sound P	ressure	Levels	dB(A)		
Distance,			Measurement		Octave Band Center Frequency (Hz)							Overall
Load m (ft.)	m (ft.)		Position	63	125	250	500	1000	2000	4000	8900	Level
			Right	55.7	68.5	75.8	79.9	86.6	87.2	79.9	76.0	91.0
			Front-Right	53.2	65.8	76.1	83.7	86.9	83.8	78.9	74.1	90.5
,			Front	55.5	68.7	83.4	82.6	91.3	88.7	79.4	73.6	94.2
l		Open Unit.	FrontLeft	55.7	71.7	81.3	86.5	90.2	88.2	80.7	76.1	93.9
No	7 (23)	isolated	Left	53.7	71.7	75.8	83.3	86.9	86.7	79.9	75.5	91.3
Load	- (/	Exhaust	Back-Left	55.2	68.8	81.1	79.4	86.6	86.8	78.5	73.9	91.0
			Back	55.2	66.2	74.5	76.1	81.0	79.3	71.5	67.3	84.8
]			Back-Right	54.5	67.6	77.0	79.4	89.1	87.7	79.2	72.4	92.2
			8-pos. log avg.	54.9	69.1	79.3	82.4	88.2	86.7	79.1	74.2	91.8

				Sound Pressure Levels dB(A)							
Load Distance,	Exhaust		Octave Band Center Frequency (Hz)								
LUQU	m (ft.)	63	125	250	500	1000	2000	4000	8000	Level	
No Load	1 (3.3)	Raw Exhaust (No Silencer)	70.8	85.1	99.0	94.0	100.3	105.5	102.4	101.8	110.0

#### **Kohler Power Systems**

# Division Test Lab - Prototype Summary Report

**Genset Model Number:** 

Date: 5/17/2011 Updated: 5/26/2011 350REOZJ

Fuel Type:		Di	esel	T		<del></del> -		
		50Hz		OHz		50Hz		60Hz
	Data	Test Report #		Test Report #	Data	Test Report #	Data	Test Report
Rated Power			350	350REOZJ-3				
Max Power (kW @ 0.8 PF)	_		386.5	350REOZJ-2	_			
Radiator Cooling								
°F A.T.B., Unhoused @ kW		1	138.4	400REOZJ-2	-	T - T		_
°F A.T.B., Weather housing @ kW			_					
°F A.T.B., Sound Housing @kW			124.5	400REOZJ-16		1	_	
Ft³/mln. Radiator Air Flow			27,000	per engineering				
Gallons Cooling Capacity			17.7	400REOZJ-1				
Fuel Consumption			-					
Gal./hr. @ 25% load	-		7.8	per engineering				T
Gal./hr. @ Rated Load			27	per engineering			-	
Ft <sup>3</sup> /hr. @ Rated Load Nat Gas							•	
Ft <sup>3</sup> /hr. @ Rated load LP								
Frequency & Voltage Regulation								
Controller p/n:	_		GM65741-1	350REOZJ-3				
+/-% Freq. Regulation Overall			0.05	350REOZJ-3				
Hz Max.			60.03	350REOZJ-3				
Hz Min.			59.97	350REOZJ-3				
Gov. Type			electronic	350REOZJ-3				
+/-% Volt. regulation Overall			0.96	350REOZJ-3				
AC Volts Max.			208.6	350REOZJ-3				
AC Volts Min.			204.6	350REOZJ-3				
ISO8£28-5 Class (G1, G2, G3)		<u> </u>	G2	350REOZJ-3				
NFPA 110 Acceptable Power				,				
Seconds to 90% Volt or Freq.			4.8 sec	400REOZJ-3			<u> </u>	
% load pickup, NFPA 110 hot restart			N/A picked up					
			100% load cold			┷		
Air Cir. Restriction					_			
In. H₂O Normal Duty @ Rated Load		_	6.5	400REOZJ-8				
in. H <sub>2</sub> O Heavy Duty @ Rated Load								
Exhaust Back Pressure								
In. Hg @ Rated Load			1.60	400REOZJ-19				
			GM78400 &					
Muffler p/n:			GM78401	400REOZJ-19				
Weight & Center of Balance								
Dry Weight lbs.								
			7,740 open &	400REOZJ-13 &				
Wet Weight (bs.( includes oil & coolant)		ļ	10,760 housed	400REOZJ-23				
Ctr. Bal. Dry, Inches from Alt. End		ļ		100000000000000000000000000000000000000				
8: B-1 W. 1-1-1-1-1			77.5 open &	400REOZJ-13 &				
Ctr. Bal. Wet, Inches from Alt. End		<u> </u>	95.5 housed	400REOZJ-23		<u> </u>	_	
Sound and Vibration								
Vibration Class (ISO8528-9)			=					
Housed Sound, dBA (7m/10m)		<del> </del>	73.0	Engineering Calc				
Unhoused Sound, dBA (7m/10m)			94.5	400REOZJ-14		<u></u>	_	

Comments:

The 350REOZJ and 400REOZJ are of the same engine family. Sum or all data in certain instances may be interchanged. Sum of the data was taken from graphs created from the 400REOZJ testing.

Note: This data is obtained from prototype test units undergoing development testing and is subject to change at any time without prior notice.

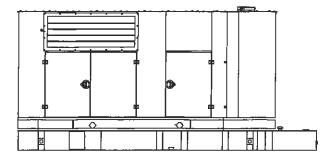
#### **Industrial Generator Set Accessories**

# **KOHLER.** Power Systems

Aluminum and Steel Enclosure and Subbase Fuel Tank Package



All Generator Set, Enclosure, and Fuel Tank Options are UL 2200 Certified.



# Applicable to the following: 350-500REOZJ

#### **Weather Enclosure Standard Features**

- Internal silencer, flexible exhaust connector and rain cap.
- Mounts to generator set skid. Aluminum or steel construction with hinged and removable doors.
- Fade-, scratch-, and corrosion-resistant Kohler<sup>c</sup>
   Power Armor<sup>™</sup> cream beige automotive-grade textured finish.
- Enclosure has six large access doors which allow for easy maintenance.
- Lockable, flush-mounted door latches.
- · Air inlet louvers reduce rain entry.
- High wind bracing, 241 kph (150 mph).

#### Sound Enclosures Standard Features

- Includes all of the weather enclosure features with the addition of acoustic insulation material.
- Internal vertical discharge plenum directs air up to reduce noise.
- Acoustic insulation that meets UL 94 HF1 flammability classification.
- Sound enclosure offering level 1 or level 2 sound reduction using acoustic insulation. See specification at the back of this document for sound pressure dB(A) at 7 m (23 ft.).

#### Subbase Fuel Tank Features

- The fuel tank has a Power Armor Plus™ textured epoxy-based rubberized coating.
- The above-ground rectangular secondary containment tank mounts directly to the generator set, below the generator set skid (subbase).
- Both the inner and outer tanks have emergency relief vents.
- Flexible fuel lines are provided with subbase fuel tank selection. Stainless steel fuel lines are an available option.
- The secondary containment tank's construction protects against fuel leaks or ruptures. The inner (primary) tank is sealed inside the outer (secondary) tank. The outer tank contains the fuel if the inner tank leaks or ruptures.
- State tanks with varying capacities are an available option.

# **Enclosure and Subbase Fuel Tank Combinations**

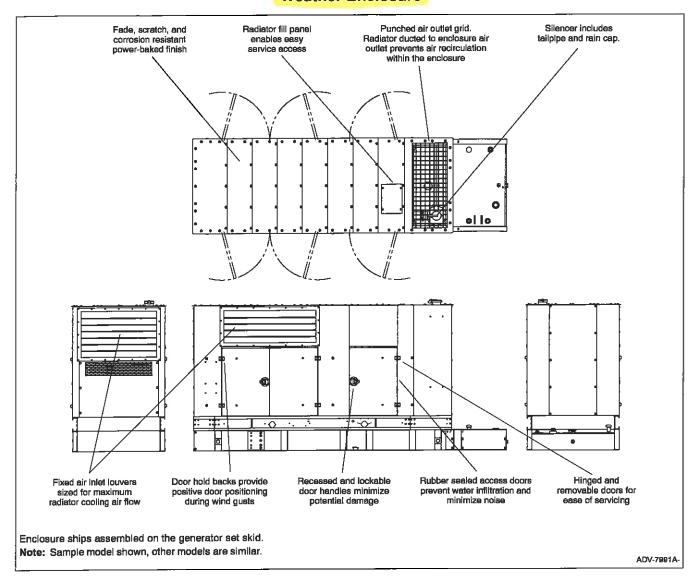
There are three enclosure configurations available with the subbase fuel tanks.

Weather Enclosure with Internal Silencer
Sound Enclosure Level 1 with Internal Silencer
Sound Enclosure Level 2 with Internal Dual Silencers
(connected in series)

#### **Available Approvals and Listings**

- UL 2200 Listing
- CSA Approval
- ☐ IBC Seismic Certification☐ California OSHPD Approval
- cul Listing (fuel tanks only)

#### Weather Enclosure

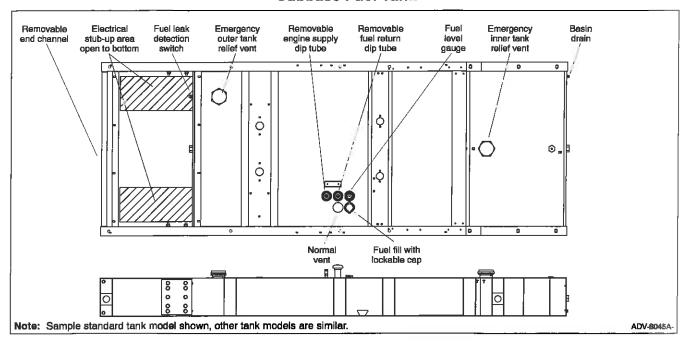


#### Weather Enclosure Features

- Heavy-duty formed panels, solid construction.
   Preassembled package offering corrosion resistant, dent resilient structure mounting directly to the generator set skid.
   Available in 3 mm (0.125 in.) aluminum or 14 gauge steel.
- Power Armor™ automotive-grade finish resulting in advanced corrosion and abrasion protection as well as enhanced edge coverage and color retention.
- Internal exhaust silencer. Offers maximum component life, operator safety, and includes rain shield and cap.
  - **NOTE:** Installing an additional length of exhaust tail pipe may increase backpressure levels. Please refer to the generator set spec sheet for the maximum backpressure value.
- Service access. Multi-personnel doors for easy access to generator set control and servicing of the fuel fill, fuel gauge, oil fill, and battery.

- Interchangeable modular panel construction allows design flexibility without compromising building standards.
- Boited panels facilitate service, future modification upgrades, or field replacement.
- Cooling/combustion air intake. Weather protective designs using fixed air inlet louvers. Sized for maximum cooling airflow
- Cooling air discharge. Weather protective design featuring vertical air discharge. Exhausts air through a punched air outlet grille.

#### Subbase Fuel Tank



#### Standard Subbase Fuel Tank Features

- Extended operation. Optional tank capacities for multiple hour requirements.
- Power Armor Plus™ textured epoxy-based rubberized coating that creates an ultra-thick barrier between the tank and harsh environmental conditions like humidity, saltwater, and extreme temperatures, and provides advanced corrosion and abrasion protection.
- UL listed. Secondary containment generator set base tank meeting UL 142 requirements.
- NFPA compliant. Designed to comply with the installation standards of NFPA 30 and NFPA 37.
- Integral external lift lugs. Enables crane with spreader-bar lifting of the complete package (empty tank, mounted generator set, and enclosure) to ensure safety.
- Emergency pressure relief vents. Vents ensure adequate venting of inner and outer tank under extreme pressure and/or emergency conditions.
- Normal vent with cap. Vent is raised above lockable fuel fill.
- Fuel level sender with fuel level and low and high fuel warning annunciated through the generator set controller.
- Leak detection switch. Annunciates a contained primary tank fuel leak condition at generator set control.
- Electrical stub-up area.

#### **State Subbase Fuel Tank Options**

#### **Bottom Clearance/Coating**

□ I-beams, provides 106 mm (4.2 in.) of ground clearance

#### Fuel in Basin Options

Fuel in basin switch, Florida Dept. of Environmental Protection (FDEP) File No. EQ-456 approved

#### **Fuel Fill Options**

- Fill pipe extension to within 152 mm (6 in.) of bottom of fuel tank
- ☐ 18.9 L (5 gallon) spill containment with 95% shutoff

- 18.9 L (5 gallon) spill containment
- 18.9 L (5 gallon) spill containment fill to within 152 mm (6 in.) of bottom of fuel tank
- 28.4 L (7.5 gallon) spill containment, Florida Dept. of Environmental Protection (FDEP) File No. EQ-567 approved
- 28.4 L (7.5 gallon) spill containment with 95% shutoff, Florida Dept. of Environmental Protection (FDEP) File No. EQ-567 approved

#### **Fuel Supply Options**

- Fire safety valve (installed on fuel supply line)
- Ball valve (installed on fuel supply line)

#### **High Fuel Level Switch**

- ☐ High fuel level switch, Florida Dept. of Environmental Protection (FDEP) File No. EQ-456 approved
- Three-alarm fuel tank panel
- Three-alarm fuel tank panel, Florida Dept. of Environmental Protection (FDEP) File No. EQ-456 approved

#### **Normal Vent Options**

- 3.7 m (12 ft.) above grade (without spill containment)
- 3.7 m (12 ft.) above grade (with spill containment)

#### **Tank Marking Options**

- ☐ Decal, Combustible Liquids Keep Fire Away (qty. 2)
- Decal, NFPA 704 identification (qty. 2)
- ☐ Decal, tank number and safe fuel fill height (qty. 2)
- Decal, tank number and safe fuel fill height, NFPA 704 identification

#### Freestanding Stairs

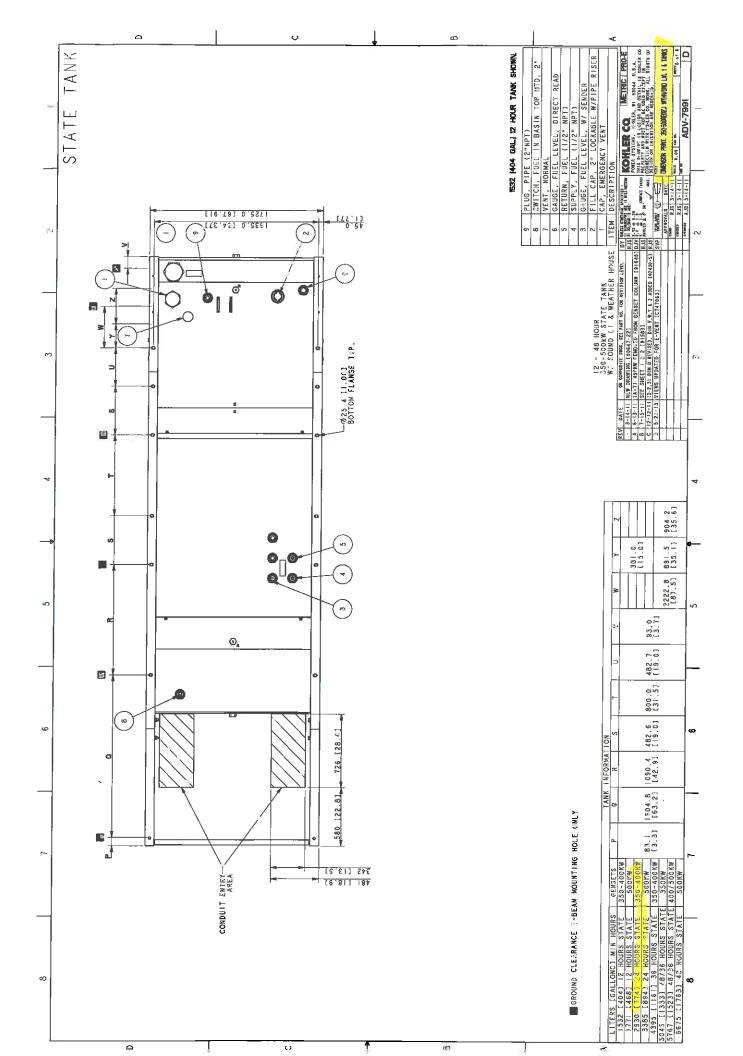
- Stairs only
- Stairs with platform
- Stairs with catwalk

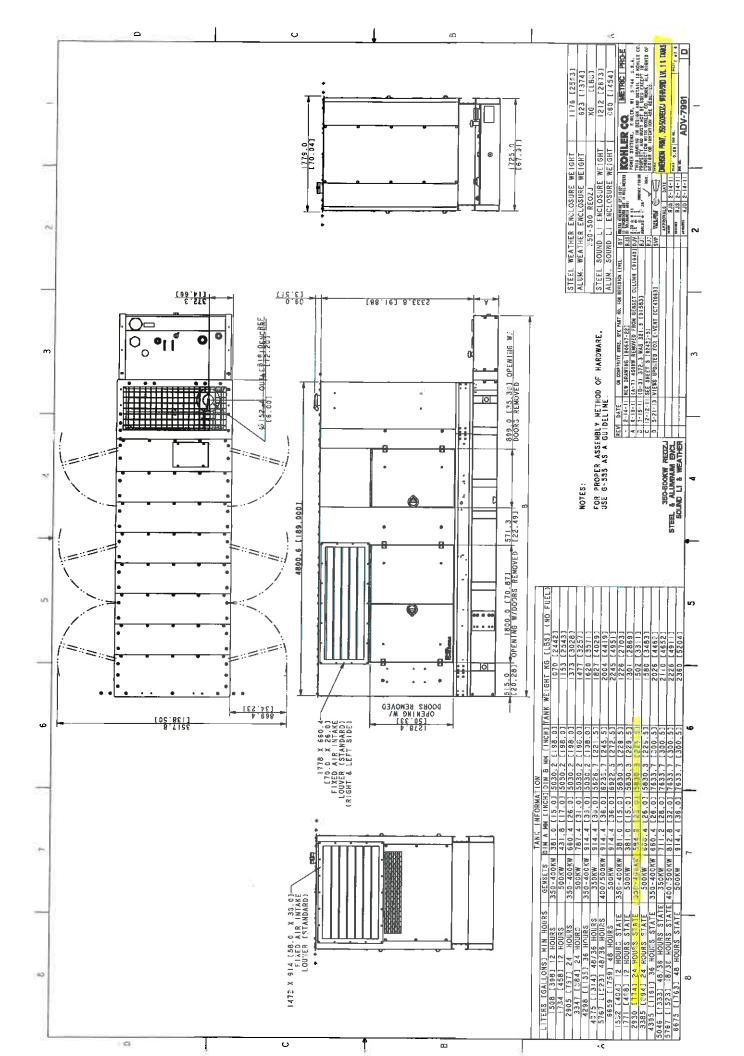
	Est. Fuel Supply			350REOZ	ل <u>ہٰ</u>					Sound Pressure	
Fred Tools	Hours at	Max. C	Dimensions, mm	ı (in.)	N	lax. Weigl	ht, kg (lb.)	*	1	with Fuli	
Fuel Tank Capacity, L (gal.)	with Full	Length	Width	Height	With	Steel osure	With Al	uminum osure	Fuel Tank Height, mm (in.)	Load at 7 m (23 ft.), dB(A)	
Weather Enclo	sure and Sta	andard Subbase	Fuel Tank								
No Tank	0	4801 (189)		2423 (95)	5077	(11193)	4524	(9974)	0 (0)		
1508 (398)	12			2804 (110)	6147	(13635)	5594	(12416)	381 (15)	1	
2905 (767)	24	5030 (198)	1779 (70)	3083 (121)	6450	(14221)	5897	(13002)	660 (26)	92	
4298 (1135)	36				6697	(14764)	6144	(13545)		1	
4975 (1314)	48	5627 (222)		3337 (131)	6904	(15222)	6351	(14003)	914 (36)		
Weather Enclo	sure and Sta	te Subbase Fu	al Tank						·	•	
1532 (404)	12			2804 (110)	6303	(13896)	5750	(12677)	381 (15)		
2930 (774)	24	5830 (230)		3007 (118)	6579	(14504)	6026	(13285)	584 (23)	1	
4395 (1161)	36		1779 (70)	3083 (121)	7103	(15659)	6550	(14440)	660 (26)	92	
5046 (1333)	48	7634 (301)		3134 (123)	7187	(15845)	6634	(14626)	711 (28)		
10009 (2644)	72	6731 (265)	2591 (102)	3499 (138)	8576	(18906)	8023	(17687)	914 (36)		
	re (Level 1)		ubbase Fuel Ta			(/		(	017 (00)	1	
No Tank		4801 (189)		2423 (95)	5113	(11273)	4561	(10054)	0 (0)	· · · · · · · ·	
1508 (398)	12		-	2804 (110)	6183	(13715)	5631	(12496)	0 (0) 381 (15)	81	
2905 (767)	24	5030 (198)	1779 (70)	3083 (121)	6486	(14301)	5934	(13082)			
4298 (1135)	36	3030 (130)	1775 (70)	3063 (121)	6733	(14844)	6181	(13625)	660 (26)	81	
4975 (1314)	48	5627 (222)		3337 (131)	6940	(15302)	6388	(14083)	914 (36)		
					0340	(15502)	0366	(14063)			
	<del>,                                      </del>	and State Subb	ase fuel lank	0004 (440)	2000	(4.0070)					
1532 (404)	12	5830 (230)		2804 (110)	6339	(13976)	5787	(12757)	381 (15)		
2930 (774)	24	· · ·	1779 (70)	3007 (118)	6615	(14584)	6063	(13365)	584 (23)		
4395 (1161)	36	7634 (301)	. ,	3083 (121)	7139	(15739)	6587	(14520)	660 (26)	81	
5046 (1333)	48	0704 (005)	0504 (400)	3134 (123)	7223	(15925)	6671	(14706)	711 (28)		
10009 (2644)	72	6731 (265)	2591 (102)	3499 (138)	8612	(18986)	8060	(17767)	914 (36)		
			ubbase Fuel Ta	,-··							
No Tank	0	5029 (198)		2423 (95)	5227	(11523)	4669	(10294)	0 (0)		
1508 (398)	12			2804 (110)	6297	(13965)	5739	(12736)	381 (15)		
2905 (767)	24	5030 (198)	1779 (70)	3083 (121)	6600	(14551)	6042	(13322)	660 (26)	74	
4298 (1135)	36			3337 (131)	6847	(15094)	6289	(13865)	914 (36)		
4975 (1314)	48	5627 (222)		0007 (107)	7054	(15552)	6496	(14323)	914 (30)		
Sound Enclosu	re (Level 2)	and State Subb	ase Fuel Tank								
1532 (404)	12	5000 (000)		2804 (110)	6453	(14226)	5895	(12997)	381 (15)		
2930 (774)	24	5830 (230)	1770 /70	3007 (118)	6729	(14834)	6171	(13605)	584 (23)		
4395 (1161)	36	7004 (004)	1779 (70)	3083 (121)	7253	(15989)	6695	(14760)	660 (26)	74	
5046 (1333)	48	7634 (301)		3134 (123)	7337	(16175)	6779	(14946)	711 (28)		
10009 (2644)	72	6731 (265)	2591 (102)	3499 (138)	8726	(19236)	8168	(18007)	914 (36)		

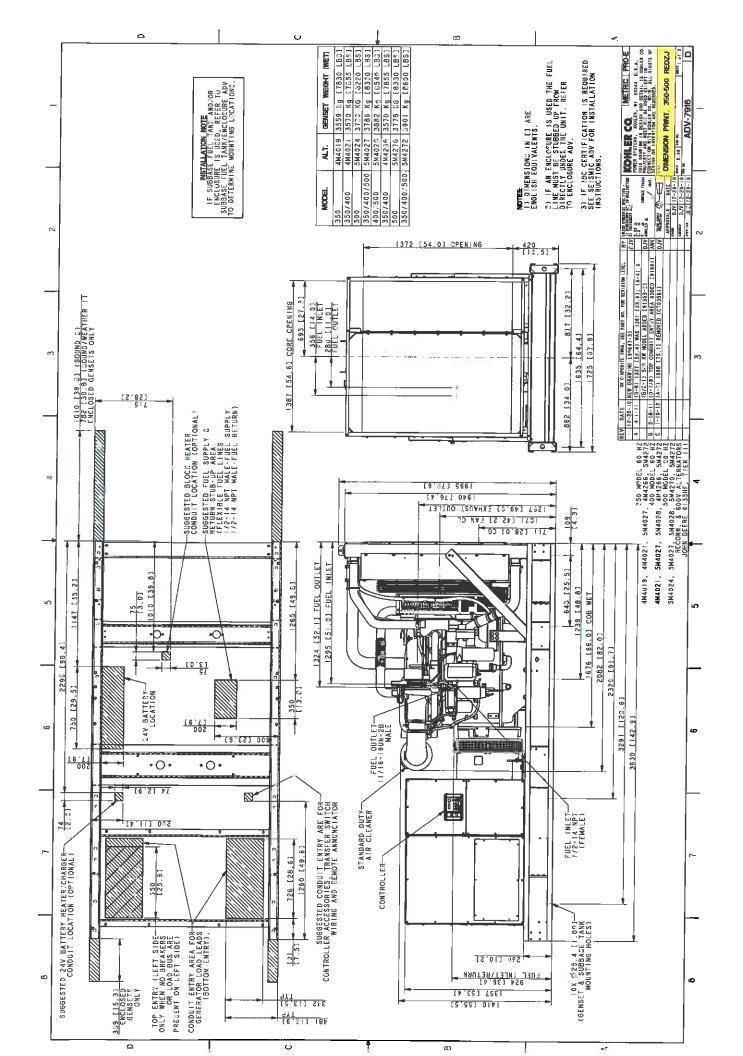
Note: Data in table is for reference only, refer to the respective ADV drawings for details.

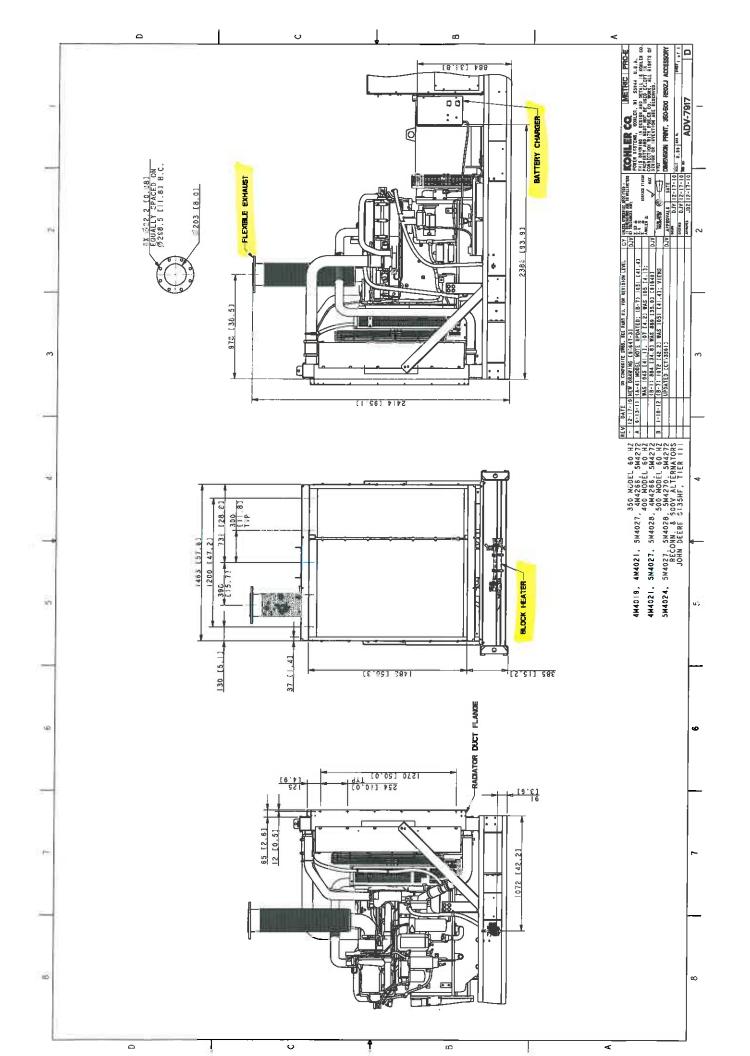
Note: Refer to TIB-114 for generator set sound data.

\* Max. weight includes the generator set (wet) with largest alternator option, enclosure, silencer, and tank (no fuel).







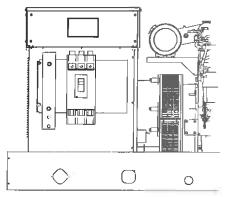


#### **Industrial Generator Set Accessories**

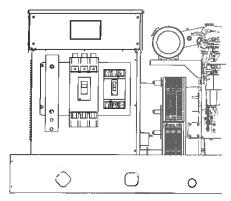
# **KOHLER.** Power Systems

Line Circuit Breakers 20-2250 kW

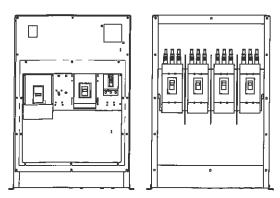




Single Circuit Breaker Kit with Neutral Bus Bar 20-300 kW Model Shown



Dual Circuit Breaker Kit with Neutral Bus Bar 20-300 kW Model Shown



Multiple Circuit Breaker Kits with Neutral Bus Bar 350-2250 kW Model Shown (also applies to some 300 kW models)

#### Standard Features

- The line circuit breaker interrupts the generator set output during a short circuit and protects the wiring when an overload occurs. Use the circuit breaker to manually disconnect the generator set from the load during generator set service.
- Circuit breaker kits are mounted to the generator set and are provided with load-side lugs and neutral bus bar.
- Kohler Co. offers a wide selection of molded-case line circuit breaker kits including single, dual, and multiple configurations for each generator set.
- Four types of line circuit breakers are available: (see page 2 for definitions and pages 3 and 4 for application details)
  - Magnetic trip
  - o Thermal magnetic trip
  - Electronic trip
  - C Electronic with ground fault (LSIG) trip
- In addition, line circuit breakers are offered with 80% and 100% ratings.
- Single line circuit breaker kits allow circuit protection of the entire electrical system load.
- Dual line circuit breaker kits allow circuit protection of selected priority loads from the remaining electrical system load.
- Multiple line circuit breaker kits with field connection barrier allow circuit protection for special applications (350-2250 kW).
- Line circuit breakers comply with the following codes and standards unless otherwise stated.
  - O UL 489 Molded Case Circuit Breakers
  - UL 1077 Supplementary Protectors
  - UL 2200 Stationary Engine Generator Assemblies

### **Line Circuit Breaker Types**

### **Magnetic Trip**

The magnetic trip features an electromagnet in series with the load contacts and a moveable armature to activate the trip mechanism. When a sudden and excessive current such as a short circuit occurs, the electromagnet attracts the armature resulting in an instantaneous trip (UL 1077 circuit breakers).

#### **Thermal Magnetic Trip**

Thermal magnetic trip contains a thermal portion with a bimetallic strip that reacts to the heat produced from the load current. Excessive current causes it to bend sufficiently to trip the mechanism. The trip delay is dependant on the duration and excess of the overload current. Elements are factory-calibrated. A combination of both thermal and magnetic features allows a delayed trip on an overload and an instantaneous trip on a short circuit condition.

#### **Electronic Trip**

These line circuit breakers use electronic controls and miniature current transformers to monitor electrical currents and trip when preset limits are exceeded.

#### **Electronic with Ground Fault Trip**

fault condition and is part of a ground fault alarm.

The ground fault trip feature is referred to as LSIG in this document. Models with LSIG compare current flow in phase and neutral lines, and trip when current unbalance exists.

Ground fault trip units are an integral part of the circuit breaker and are not available as field-installable kits. The ground fault pickup switch sets the current level at which the circuit breaker will trip after the ground fault delay. Ground fault pickup values are based on circuit breaker sensor plug only and not on the rating plug multiplier. Changing the rating plug multiplier has no effect on the ground fault pickup values.

#### 80% Rated Circuit Breaker

Most molded-case circuit breakers are 80% rated devices. An 80% rated circuit breaker can only be applied at 80% of its rating for continuous loads as defined by NFPA 70. Circuit conductors used with 80% rated circuit breakers are required to be rated for 100% of the circuit breaker's rating.

The 80% rated circuit breakers are typically at a lower cost than the 100% rated circuit breaker but load growth is limited.

#### 100% Rated Circuit Breaker

Applications where all UL and NEC restrictions are met can use 100% rated circuit breakers where 100% rated circuits can carry 100% of the circuit breaker and conductor current rating.

The 100% rated circuit breakers are typically at a higher cost than the 80% rated circuit breaker but have load growth possibilities.

When applying 100% rated circuit breakers, comply with the various restrictions including UL Standard 489 and NEC Section 210. If any of the 100% rated circuit breaker restrictions are not met, the circuit breaker becomes an 80% rated circuit breaker.

### **Line Circuit Breaker Options**

☐ Alarm Switch	Lockout Device (padlock attachment)
The alarm switch indicates that the circuit breaker is in a tripped position caused by an overload, short circuit, ground fault, the operation of the shunt trip, an undervoltage trip, or the push-to-trip pushbutton. The alarm resets when the circuit breaker is	This field-installable handle padlock attachment is available for manually operated circuit breakers. The attachment can accommodate three padlocks and will lock the circuit breaker in the OFF position only.
reset.	☐ Neutral Lugs
Auxiliary Contacts	Various neutral lug sizes are available to accommodate multiple
These switches send a signal indicating whether the main circuit breaker contacts are in the open or closed position.	cable sizes for connection to the bus bar only.
☐ Breaker Separators (350-2250 kW)	Overcurrent Trip Switch
_ , , ,	The overcurrent trip switch indicates that the circuit breaker has
Provides adequate clearance between breaker circuits.	tripped due to overload, ground fault, or short circuit and returns to the deenergized state when the circuit breaker is reset.
☐ Bus Bars	☐ Shunt Trip, 12 VDC or 24 VDC
Bus bar kits offer a convenient way to connect load leads to the	<del></del>
generator set when a circuit breaker is not present.  20-300 kW. Bus bar kits are available on alternators with leads for connection to the generator set when circuit breakers are not ordered.  350-2250 kW. A bus bar kit is provided on the right side of the unit when no circuit breaker is ordered. Bus bars are also available in combination with circuit breakers or other bus bars.	A shunt trip option provides a solenoid within the circuit breaker case that, when momentarily energized from a remote source, activates the trip mechanism. This feature allows the circuit breaker to be tripped by customer-selected faults such as alternator overload or overspeed. The circuit breaker must be reset locally after being tripped. Tripping has priority over manual or motor operator closing.
on the opposite side of the junction box. On medium voltage (3.3 kV and above) units, a bus bar kit is standard.	☐ Shunt Trip Wiring
☐ Field Connection Barrier	Connects the shunt trip to the generator set controller.
Provides installer wiring isolation from factory connections.	☐ Undervoltage Trip, 12 VDC or 24 VDC
☐ Ground Fault Annunciation	The undervoltage trips the circuit breaker when the control voltage drops below the preset threshold of 35%-70% of the
A relay contact for customer connection indicates a ground	rated voltage.

# 350-2250 kW Line Circuit Breaker Specifications

### 80% Rating Circuit Breaker

#### C. B. Gen. Set kW Alt. Model Ampere Size Range Trip Type 15-150 Thermal Magnetic 60-150 Electronic LI HD 60-150 Electronic LSIG 175-250 Thermal Magnetic Electronic LI JD 250 Electronic LSIG 60-150 Electronic LI HG 60-150 Electronic LSIG Electronic LI 250 JG Electronic LSIG 30 9-325 A. Mag. Trip 50 84-546 A. Mag. Trip HJ 100 180-1040 A. Mag. Trip 150 348-1690 A. Mag. Trip 250 JJ 684-2500 A. Mag. Trip 300-400 Thermal Magnetic 350-2250 500-1000 A. Mag. Trip kW 4M/ 750-1600 A. Mag. Trip (also 5M/ available on 1000-2000 A. Mag. Trip 7M some 1125-2250 A. Mag. Trip LA 300 kW) 400 1250-2500 A. Mag. Trip 1500-3000 A. Mag. Trip 1750-3500 A. Mag. Trip 2000-4000 A. Mag. Trip 400-600 Electronic Li LG 400-600 Electronic LSIG 700-800 Thermal Magnetic MG 1000-1200 Thermal Magnetic 800-1200 Electronic LSI PG 800-1200 Electronic LSIG 1200 Thermal Magnetic 1200 Electronic LSI ΡJ 1200 Electronic LSIG 1600-2500 Thermal Magnetic 1600-2500 | Electronic LSI RJ 1600-2500 Electronic LSIG

#### **Interrupting Ratings**

Circuit Breaker Frame Size	240 Volt, kA	480 Volt, kA	600 Volt, kA
HD	25	18	14
HG	65	35	18
HJ	100	65	25
JD	25	18	14
JG	65	35	18
JJ	100	65	25
LA	42	30	22
LG			
MG	65	35	18
PG		-	
PJ	100		
RJ	100	65	25
NW	100	100	85

### 100% Rating Circuit Breaker

Gen. Set kW	Alt. Model	Ampere Range	Trip Type	C. B. Frame Size	
		15-150	Thermal Magnetic		
		60-150	Electronic LI	HD	
		60-150			
		175-250	Thermal Magnetic		
		050	Electronic LI	JD	
		250	Electronic LSIG		
		60-150	Electronic LI		
		60-150	Electronic LSIG	HG	
350-2250 kW		250	Electronic Li		
(also	4M/	250	Electronic LSIG	JG	
available on	5M/ 7M		Electronic LI		
some 300 kW)		400	Electronic LSIG	LG	
555,		600-1200	Electronic LSI		
		600-1200	Electronic LSIG	PG	
		1200	Electronic LSI		
	'	1200	Electronic LSIG	PJ	
		1600-2500	Electronic LSI		
		1600-2500	Electronic LSIG	RJ	
	j	3000	Electronic LSI		
		3000	Electronic LSIG	NW	

# Circuit Breaker Lugs Per Phase (Al/Cu)

Frame Size	Ampere Range	Wire Range
HD (80%)	15~150	One #14 to 3/0
HD (100%)	15-150	One #14 to 2/0 Cu only
HG	60-150	One #14 to 3/0
HJ	30-150	One #14 to 3/0
JD (80%)	175	One 1/0 to 4/0
JD (80%)	200-250	One 3/0 to 350 kcmil
_ JD (100%)	175-250	One 3/0 to 300 kcmil Cu only
JG (80%)	250	One 3/0 to 350 kcmil
JG (100%)	250	One 3/0 to 300 kcmll Cu only
JJ	250	One 3/0 to 350 kcmil
LA	300-400	One #1 to 600 kcmil or Two #1 to 250 kcmil
LG	400-600	Two 2/0 to 500 kcmil
MG	700-800	Three 3/0 to 500 kcmil
	600-800	Three 3/0 to 500 kcmil
PG	1000-1200	Four 3/0 to 500 kcmil
PJ	1200	Four 3/0 to 500 kcmil
RJ	1600-2500	Eight 1/0 to 750 kcmil or (16) 1/0 to 300 kcmil
NW	3000	Eight 1/0 to 750 kemil or (16) 1/0 to 300 kemil

# 10000 9000 8000 7000 10000 8000 8000 7000 6000 5000 5000 4000 4000 1500 1000 900 800 700 881 500 500 400 400 300 300 200 200 150 150 100 90 80 70 100 90 80 70 63 18 INSTANTANEOUS PICKUP x In 10: 10 9 8 7 TIME IN SECONDS 5 .5 .16 .09 .08 .07 .1 .09 .08 .07 .08 1CYCLE 1/2 CYCLE ,006 **MULTIPLES OF In**

#### MICROLOGIC™ ELECTRONIC TRIP UNITS Micrologic™ 3.3/3.38/5.3A or E/6.3A or E Instantaneous Trip Curve 600A L-Frame

The time-current curve information is to be used for application and coordination purposes only.

#### Notes:

- 1. There is a thermal-imaging effect that can act to shorten the long-time delay. The thermal imaging effect comes into play if a current above the long-time delay pickup value exists for a time and then is cleared by the tripping of a downstream device or the circuit breaker itself. A subsequent overload will cause the circuit breaker to trip in a shorter time than normal. The amount of time delay reduction is inverse to the amount of time that has elapsed since the previous overload. Approximately 20 minutes is required between overloads to completely reset thermal-imaging.
- Total clearing times shown include the response times of the trip unit, the circuit breaker opening, and the extinction of the current.
- 3. In = Maximum dial setting of Ir. 600A L-Frame: In = 600A = Max Ir setting

Curves apply from -35°C to +70°C (-31°F to +158°F) ambient temperature.



#### PowerPact™ H-, J-, and L-Frame Circuit Breakers General Information

### Section 2—General Information

The PowerPact H-, J-, and L-frame circuit breakers **are** designed to protect electrical systems from damage caused by overloads and short circuits. H- and J-frame circuit breakers are available with either thermal-magnetic or Micrologic™ electronic trip units. L-frame circuit breakers are available with Micrologic electronic trip unit.

H- and J-frame circuit breakers with thermal-magnetic trip units contain individual thermal (overload) and instantaneous (short circuit) sensing elements in each pole. The amperage ratings of the thermal trip elements are calibrated at 104°F (40°C) free air ambient temperature. Per the National Electric Code® (NEC®) and the Canadian Electrical Code, standard circuit breakers may only be applied continuously at up to 80% of their rating. Circuit breakers rated for 100% operation are available but require specially-designed enclosures, copper lugs, and 194°F (90°C) rated wire.

Devices with the Micrologic electronic trip unit provide adjustable protection settings for greater system flexibility. In addition to electronic protection, Micrologic trip units allow users to monitor both energy and power. Through direct access to in-depth information and networking using open protocols, PowerPact circuit breakers with Micrologic trip units let operators optimize the management of their electrical installations. Far more than a circuit breaker, these circuit breakers are a measurement and communication tool ready to meet energy-efficiency needs through optimized power requirements, increased energy availability, and improved installation management.

# **Applications**

PowerPact H-, J-, and L-frame circuit breakers offer high performance and a wide range of interchangeable trip units to protect most applications.

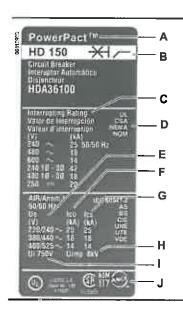
Electronic trip units provide highly accurate protection with wide setting ranges and can integrate measurement, metering and communication functions. They can be combined with the front display module (FDM121) to provide functions similar to a power meter.

Table 3: Applications

	Power Meter	PowerPact H-, J-, and L-frame circuit breakers equipped with Micrologic 5 / 6 trip units offer type A (ammeter) or E (energy) metering functions as well as communication capability. Using Micrologic trip unit sensors and intelligence, PowerPact H-, J-, and L-frame circuit breakers provide access to measurements of all the main electrical parameters on the built-in screen, on a dedicated front display module (FDM121) or through the communication network.					
100 mm	Operating assistance	Integration of measurement functions provides operators with operating assistance functions including alarms tripped by user-selected measurement values, time-stamped event tables and histories, and maintenance indicators.					
OHER	Front display module	The main measurements can be read on the built-in screen of Micrologic 5 / 6 trip units. They can also be displayed on the equipment FDM121 along with pop-up windows signalling the main alarms.					
	Communication Network	PowerPact H-, J-, and L-frame circuit breakers equipped with Micrologic 5 / 6 trip units provide communication capabilities. Simple RJ45 cables connect to a Modbus™ communication interface module.					

#### **General Characteristics**

#### **Faceplate Label**



Characteristics indicated on the faceplate label:

- A. Circuit breaker type
- B. Circuit breaker disconnector symbol
- C. Performance levels
- D. Standards
- E. Ue: Operating voltage per IEC
- F. Icu: Ultimate breaking capacity per IEC
- G. Ics: Service breaking capacity per IEC
- H. Uimp: Rated impulse withstand voltage per IEC
- I. Ui: Insulation voltage per IEC
- J. Certification marks

**NOTE:** When the circuit breaker is equipped with an extended rotary handle, the door must be opened to view the faceplate.

#### Codes and Standards

H-, J-, and L-frame circuit breakers, automatic switches and electronic motor circuit protectors are manufactured and tested in accordance with the following standards.

**NOTE:** Apply circuit breakers according to guidelines detailed in the National Electric Code (NEC) and other local wiring codes.

Table 4: Codes and Standards (Domestic)

PowerPact H-, J-, and L-Frame Circuit Breakers	H-, J-, and L-Frame Switches	PowerPact H-, J-, and L-Frame Motor Circuit Protectors
UL 489 <sup>1</sup>	UL 489 <sup>3</sup>	UL 508
IEC 60947-2	IEC 60947-3	IEC 60947-2
CSA C22.2 No. 5 <sup>2</sup>	CSA C22.2 No. 5 <sup>4</sup>	CSA C22.2 No. 14
Federal Specification W-C-375B/GEN	Federal Specification W-C-375B/GEN	NEMA AB1
NEMA AB1	NEMA AB1	ccc
NMX J-266	NMX J-266	CE Marking
ccc	CE Marking	
CE Marking		

PowerPact H- and J-frame circuit breakers are in UL File E10027. PowerPact L-frame circuit breakers are in UL File E63335.



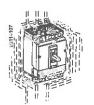
<sup>2</sup> PowerPact H- and J-frame circuit breakers are In CSA File LR40970. PowerPact L-frame circuit breakers are in CSA File 69561.

<sup>3</sup> PowerPact H- and J-frame switches are in UL File E87159.

PowerPact H- and J-frame switches are in CSA File LR32390.

# PowerPact™ H-, J-, and L-Frame Circuit Breakers General Information





PowerPact H-, J-, and L-frame devices resist mechanical vibration.

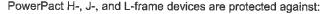
Tests are carried out in compliance with standard UL489 SA and SB for the levels required by merchant-marine inspection organizations (Veritas, Lloyd's, etc.):

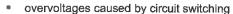
PowerPact H-, J-, and L-frame circuit breaker meet IEC 60068-2-6 for vibration:

- 2.0 to 25.0 Hz and amplitude +/- 1.6 mm
- 25.0 to 100 Hz acceleration +/- 4.0 g

Excessive vibration may cause tripping, breaks in connections or damage to mechanical parts.

#### Electromagnetic disturbances





- overvoltages caused by an atmospheric disturbances or by a distribution-system outage (such as from failure due to lightning)
- devices emitting radio waves (radios, walkie-talkies, radar, etc.)
- electrostatic discharges produced directly by users

PowerPact H-, J-, and L-frame devices have successfully passed the electromagnetic-compatibility tests (EMC) defined by the following international standards:

- IEC/EN 60947-2: Low-voltage switchgear and controlgear, part 2: Circuit breakers;
  - -- Annex F: Immunity tests for circuit breakers with electronic protection
  - Annex B: Immunity tests for residual current protection
- IEC/EN 61000-4-2: Electrostatic-discharge immunity tests
- IEC/EN 61000-4-3: Radiated, radio-frequency, electromagnetic-field immunity tests
- IEC/EN 61000-4-4: Electrical fast transient/burst immunity tests
- IEC/EN 61000-4-5: Surge immunity tests
- IEC/EN 61000-4-6: Immunity tests for conducted disturbances induced by radio frequency fields
- CISPR 11: Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment.

These tests ensure that:

- · no nuisance tripping occurs
- · tripping times are respected

#### **Tropicalization**

The materials used in PowerPact circuit breakers will not support the growth of fungus and mold.

PowerPact circuit breakers have passed the test defined below for extreme atmospheric conditions.

Dry cold and dry heat:

- IEC 68-2-1-dry cold at -55 °C
- IEC 68-2-2-dry heat at +85° C

Damp heat (tropicalization)

- IEC 68-2-30-damp heat (temperature + 55° C and relative humidity of 95%)
- IEC 68-2-52 level 2-salt mist



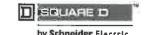
### PowerPact™ H-, J-, and L-Frame Circuit Breakers General Information

Table 6: Circuit Breakers

Circuit Breaker		15	0 A I	1-Fra	me		25	0 A	J-Fra	me		400	ΔAI	L-Fra	me		600	λI	L-Fra	me	
Circuit Breaker Type		HE	НС	HJ	HL	HR	JD	JG	IJ	JL	JR	Ш	ILG	LJ	LL	LR	LD	ILG	IJ	TLL	LR
Number of poles1		2,	3		-	3	2,	٠			3	3, 4	4	1		1	3, 4	_		1	
Amperage Range (A)		15	-150				70	-250	1			70-	400				200	0-60	0		
UL 489 Circuit Breaker Raim	gs																				
	240 Vac	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200	25	65	100	125	200
UL/CSA/NOM	480 Vac	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200	18	35	65	100	200
	600 Vac	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100	14	18	25	50	100
(kA rms)	250 Vdc <sup>2</sup>	20	20	20	20	_	20	20	20	20						<b> </b>			<u> </u>	<u> </u>	
	500 Vdc <sup>2, 3</sup>	-	_	_			_	20				-		_		1	-				
IEC 947-2 Circuit Breaker Ra	ings																			Z	
	220/240 Vac	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150	25	65	100	125	150
	380/415 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
Ultimate breaking capacity	440/480 Vac	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125	18	35	65	100	125
(Icu)	500/525 Vac	14	18	25	50	75	14	18	25	50	75	14	18	25	50	75	14	18	25	50	754
(kA rms)	690 Vac	-	<u> </u>			20	-				20					20					20
	250 Vdc <sup>2</sup>				]		20	20	20	20	-	=	E				-			<u>[</u>	_
77 152	500 Vdc <sup>2, 3</sup>		Ĭ	]	-	_	20	20	20	20		_	<u> </u>								
Service breaking capacity (los	) % lcu	100	)%	. No			100	0%			-	100	1%			- 1	100	%			
Insulation Voltage	Vi	750	) Vac	;		🗆	750	) Va	С			750	Vac	3			750	Vac	2		
Impulse Withstand Voltage	V <sub>imp</sub>	8 k	Vac				8 k	Vac				8 k\	√ac				8 k	/ac			
Operational Voltage	Ve	690	) Vac	;			690	) Va	c			690	Vac	3			690	Vac	-		
Sensor Rating	In	150	Α (				250	) A				400	Α				600	Ā			
Utilization Category	<u> </u>	Α			-		Α					Α					Α				
Operations (Open-Cluse Cycl	es)					0.00				72											
Without Current		400	0	_			500	00				500	0				500	0			
With Current		400	10				1000				1000			1000							
Protection and Measurement	3																				
Short-circuit protection	Magnetic only	8.	<b>8</b> 6	36	•	*.	<b>36</b>			200	#1	• 7		10		162			**)	2	a .
	Thermal-magnetic	•	26	lii .	*:	a	*	je.	н	B :	•	$\equiv$	_	_	-		_	_	_	$\Box$	_
	Electronic		86	-		*				6	51.	•	<u>0.1</u>	=	•	-	•		7.3	4	
	with neutral protection (Off-0.5-1-OSN)5	•	10	*	<b>a</b>	£	*		9	a)	业	FI		pJ	=	15	•	2		Dil.	-
Impulse Withstand Voltage Operational Voltage Sensor Rating Utilization Category Operations (Open-Cluse Cycles Without Current With Current With Current Protection and Measurements Short-circuit protection  Display / I, V, f, P, E, THD measurement  Display / I, V, f, P, E, THD measurement  Options  From Options	with ground fault protection			9.		8		*	E		•		•	-	•	ĮĮ,	ei.	166	16	與	W
	with zone selective interlocking (ZSI) <sup>6</sup>	10	•	•		•	90		•		S)	<b>=</b>	-		E)	p) .	3%	16	•	60	200 100  125 125 754 20 
Display / I, V, f, P, E, THD mea measurement	surements / interrupted-current	-	5	El .	Ŧ		•	-	•	F	ii.	S.	-	•	-	ai .	•	Ð	-	•	•
	Front display module (FDM121)	<b>*</b> 3	8	2è	D#	ă T	•	8	•	62	At .	•7	ij.			W.	'n	n n	E	В	_
	Operating assistance	78	•	26			-	*	<b>16</b>	16	•		•	21		此	•	텧	r		
Ontions	Counters	68	fil.	*	•			Fi.	ম	•	<b>1</b>	• 1	2	•	•	p.)	•	alk.	N)	S.	
Options	Histories and alarms			-	U6	ž.		=	<b>=</b>	-		•	•	•	•	g	m.		<i>1</i> 6	96	•
[	Metering Com	2	2	•	-	•	-	•	2	n	<u> </u>	78	6		1	F	100	E		<b>E</b>	
	Device status/control com	3	-	39	08	•	•	2	26	<b>10</b> 5	jui j	F.	•	•		•	B	•	•	E	95
Dimensions / Weight / Connec	tions																				
Dimensions 3P	Height	6.4	(163	)			7.5	(191	)		$\neg$	13.3	8 (3	40)			13.3	8 (3	40)		
	Nidth	4.1	(104	)		$\neg$	4.1	(104	.)		:	5.51	(14	0)			5.51	(14	0)		
in. (mm)	Depth	<u> </u>		3.4 (86)			-	— · · · · ·			T	4.33 (110)									
Weight 3P - lb. (Kg)		4.8 (2.2)				5.3 (2.4)				13.2 (6.0)			13.7 (6.2)								
Ţ	Jnit Mount	W					•			7	•					•					
Ī	-Line™									٦,					$\neg$	-					
Connections / Torreit	Rear Connection	-					-				<b></b>	_									
Connections / Terminations	Plug-In	*				1	DE .								-						
ļī.	Drawout	23					*:				_				*:						
Ī	Optional Lugs	M				_	-					_			-						_
												_									

H and J-frame breakers with Micrologic™ trip units available only with 3P. The HJ, HL and the J-Frame 2P breakers are 3P modules.

I<sub>cs</sub> for 600 A L-frame circuit breaker at 525 V is 19 kA.



<sup>&</sup>lt;sup>2</sup> DC not available with PowerPact H, J or L-frame circuit breakers with Micrologic trip units.

<sup>500</sup> Vdc specific catalog numbers, ungrounded UPS systems only.

# PowerPact™ H-, J-, and L-Frame Circuit Breakers General Information

- 5 OSN: Over Sized Neutral protection for neutrals carrying high currents (e.g. 3rd harmonics).
- ZSI using restraint wires.

# PowerPact H-, J-, and L-frame Circuit Breaker Trip Units

Table 7: Micrologic™ Trip Unit Features

	Micrologic	Trip Unit (X	= Standard F	eature, O = A	Avallable Op	tion	
Features	Sta	ndard	Атг	neter	Energy		
	3.2/3.3	3.25/3.35	5.2A/5.3A	6.2A/6.3A	5.2E/5.3E	6.2E/6.3E	
LI	X						
LSI <sup>1</sup>		X	Х		Х		
LSIG/Ground Fault Trip <sup>2</sup>				Х		Х	
Ground-Fault Alarm Trip		1		Х		Х	
Current Settings Directly in Amperes	Х	×	Х	Х	X	X	
True RMS Sensing	Х	X	Х	Х	Х	Х	
UL Listed	X	X	Х	X	Х	Х	
Thermal Imaging	X	X	Χ	X	Х	X	
LED for Long-Time Pickup	Х	X	Х	Х	Х	X	
LED for Long-Time Alarm	х	X	Χ	Х	Х	Х	
LED Green "Ready" Indicator	Х	Х	Х	Х	Х	Х	
Up to 12 Alarms Used Together			X	_ == X	X _	Х	
Digital Ammeter			Х	X	Х	Х	
Zone-Selective Interlocking <sup>3</sup>			Х	Х	Х	Х	
Communications	0	0	0	0	0	0	
LCD Display			Х	Х	X	X	
Front Display Module FDM121			0	0	0	0	
Advanced User Interface	Ī		Х	X -	х	Х	
Neutral Protection			Х	Х	Х	X UI	
Contact Wear Indication <sup>4</sup>	===		Х	Х	х	Х	
Incremental Fine Tuning of Settings			Х	Х	Х	Х	
Load Profile <sup>4</sup> , <sup>5</sup>			Х	Х	х	Х	
Power Measurement					X	Х	
Power Quality Measurements					×	х	

<sup>1</sup> The LSI with 3.2S/3.3S trip units have fixed short time and long time delays.

### Thermal-Magnetic or Electronic Trip Unit?

Thermal-magnetic trip units (available on H- and J-frame circuit breakers only) protect against overcurrents and short-circuits using tried and true techniques. For applications requiring installation optimization and energy efficiency, electronic trip units offering more advanced protection functions combined with measurements.

Trip units using digital electronics are faster as well as more accurate. Wide setting ranges make installation upgrades easier. Designed with processing capabilities, Micrologic trip units can provide measurement information and device operating assistance. With this information, users can avoid or deal more effectively with disturbances and can play a more active role in system operation. They can manage the installation, anticipate events and plan any necessary servicing.



<sup>&</sup>lt;sup>2</sup> Requires neutral current transformer on three-phase four-wire loads.

 $<sup>^{\</sup>rm 3}$   $\,$  ZSI for H/J-frame devices is only IN. ZSI for L-frame devices is IN and OUT.

<sup>4</sup> Indication available using the communication system only.

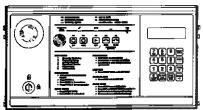
<sup>5 %</sup> of hours in 4 current ranges: 0-49%, 50-79%, 80-89%, and >90% In.

#### Industrial Generator Set Accessories

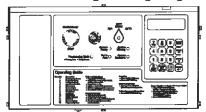
# **KOHLER** POWER SYSTEMS

20-3250 kW Industrial Generator Set Voltage Regulators

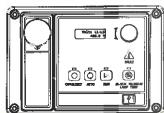




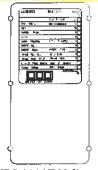
Decision-Maker® 6000 Controller with Menu-Driven Integral Voltage Regulator



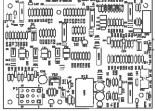
Decision-Maker® 550 Controller with Menu-Driven Integral Voltage Regulator



Decision-Maker® 3000 Controller with integral Voltage Regulator



Digital DVR® 2000E Voltage Regulator



Fast-Response ™ II PMG/RMS Voltage Regulator (RMS Voltage Regulator Circuit Board Shown)

### **Voltage Regulators**

The following information provides general features, specifications, and functions of available voltage regulators.

This information generally applies to a single generator set and multiple generator sets with paralleling applications. Refer to the respective generator set specification sheet and see your authorized distributor for information regarding specific voltage regulator applications and availability.

# Integral Voltage Regulator with Kohler® Decision-Maker® 550 and Decision-Maker® 6000 Controllers and Menu-Driven Selections (20-3250 kW Generator Set Models)

The voltage regulator is integral to the controller and uses microprocessor logic providing ±0.25% no-load to full-load regulation using root-mean-square (RMS) voltage sensing.

The voltage regulator features three-phase sensing and is available for 12- or 24-volt engine electrical systems.

# Integral Voltage Regulator with Kohler® Decision-Maker® 3000 Controller (20-1000 kW Generator Set Models)

The voltage regulator is integral to the controller and uses microprocessor logic providing  $\pm 0.5\%$  no-load to full-load regulation using root-mean-square (RMS) voltage sensing.

The voltage regulator features three-phase sensing and is available for 12- or 24-volt engine electrical systems.

# Digital DVR® 2000E Voltage Regulator (300-2250 kW Generator Set Models)

The digital voltage regulator has  $\pm 0.25\%$  no-load to full-load regulation using RMS voltage sensing.

The voltage regulator features three-phase sensing and is available for 12- or 24-volt engine electrical systems.

#### Fast Response ™ II PMG with Average Voltage Sensing Voltage Regulator (20-300 kW Generator Set Models)

The solid-state voltage regulator has ±2% no-load to full-load regulation using average voltage sensing.

The voltage regulator features single- or three-phase sensing options and is available for 12- or 24-volt engine electrical systems.

Available with optional ±1% no-load to full-load regulation using average single-phase voltage sensing.

# Fast Response ™II PMG with RMS Sensing Voltage Regulator (20-300 kW Generator Set Models)

The solid-state voltage regulator has  $\pm 0.5\%$  no-load to full-load regulation using RMS voltage sensing.

The voltage regulator features single- or three-phase sensing options and is available for 12- or 24-volt engine electrical systems.

Not available on all models.

DVR3 is a registered trademark of Marathon Electric Mfg. Corp.

Specifications and Features

		Vo	Itage Regulator Type	7		
Specification/Feature	Integral with DEC 6000/DEC 550	Integral with DEC 3000 Controller	Digital DVR® 2000E	Fast Response™II	Fast Response ™II w/RMS Sensing	
Generator Set Availability	20-3250 kW	20-1000 kW	350-2000 kW	20-300 kW	Selected 20-300 kW	
Туре		Microprocessor based		Analo	g/Discrete	
Status and Shutdown Indicators	LEDs and Di	gital Display	LEDs	— DC Power L		
Operating Temperature		-40°(	C to 70°C (-40°F to 158°F	<del>-</del> )		
Storage Temperature		-40°(	C to 85"C (-40°F to 185 F	<del>-</del> )		
Humidity	5-95% Non-	Condensing	MIL-STD-750, Method 711-1C Compliant	not a	not available  15 Amp Fuse  77 Volts. 100–160 Volts (L-N),	
Circuit Protection	Solid-State, Redundan	t Software and Fuses	5 Amp Fuse	15 A	mp Fuse	
Sensing, Nominal	100-240 Volts (	100-240 Volts (L-N), 50-60 Hz		190-277 Volts, (L-L) 50-60 Hz	100-160 Voits (L-N), 50-60 Hz	
Sensing Mode		RMS, Single- or 3-Phase	3	Average, Single- or Three-Phase	RMS, Single- or 3-Phase	
Input Requirements	8-36	VDC	180-240 VAC, 200-360 Hz (PMG)	8-32 VDC	9-18 or 18-36 VDC	
Continuous Output	100 mA a	t 12 VDC	3 Amps at 75 VDC	100 m	A at 2 VDC	
Maximum Output	100 mA a	t 12 VDC	7.5 Amps at 150 VDC (1 minute)	100 m	A at 2 VDC	
Transition Frequency	50-70 Hz 50-70 Hz		40-70 Hz	50	-70 Hz	
Exciter Field Resistance	not available		18-25 Ohms	not a	available	
No-Load to Full-Load Voltage Regulation	±0.25%	±0.5%	±0.25%	±2% * Linear Loads	±0.5% Linear Loads	
Thermal Drift	<0.5 (-40°C t [-40°F to 15	o 70°C)	Less than 0.5% for 40°C (72°F) Ambient Temperature Change (15°C to 70°C) [59°F to 158°F] Range	<1.0% 40°C (72°F) Change (-40°C to 70°C) [-40°F to 158°F] Range	<0.5% 40°C (72°F) Change (-40°C to 70°C) [-40°F to 158°F] Range	
Response Time	Less Th	an 5µS		Less Than 7μS		
System Voltage Adjust.		±10%			oltage connection), voltage connection)	
Voltage Adjustment	Controller Keypad	Controller Menu Knob	Pushbutton Switches	Pote	ntlometer	
Remote Voltage Adjustment	Digital Input Standard/ Analog 0-5 VDC Input Optional	not available	Remote-Mounted Digital or Analog Input Optional, 46 m (150 ft.) Max.	Remote-Mounted Potentiometer Optional	Remote-Mounted Potentiometer or Analog Input Optional	
Paralleling Capability	Reactive Droop plus Full Load Share and Control (DEC 6000)/ Reactive Droop Std. (DEC 550)	not available	Optional Reactive Droop Kit Required	Optional Reactiv	e Droop Kit Required	
VAR/PF Control input	Standard	not available	Optional	_	Optional VAR/PF Control Kit Required	
* A ±1% (linear loads) voltage r DVR® is a registered trademark	egulator with single-phase vo	oltage sensing is available o	n selected models.			

## Integral Voltage Regulator with Decision-Maker® 3000 Controller

Adjustment	Digital Display	Range Setting	Default Selection
Voltage Adjustment	Volt Adj.	±10% of System Voltage	System Voltage
Underfrequency Unload or Frequency Setpoint	Frequency Setpoint	42 to 62 Hz	2.5 Hz Below System Frequency
Underfrequency Unload Slope	Slope	0-10% of System Voltage (Volts per Cycle)	5 Volts per Cycle

#### Integral Voltage Regulator with Decision-Maker® 3000 Controller

- A digital display and pushbutton/rotary dial provide access to data. A two-line LCD display provides complete and concise information.
- The controller provides ISO 8528-5, Class G3, compliance for transient response on some 20–300 kW generator set models. See the respective generator set spec sheet for specific applications.
- See G6-100 Decision-Maker<sup>®</sup> 3000 for more information.

#### Generator Set Calibration Menu

- L1-L2 Volts
- L2-L3 Volts (3-phase)
- L3-L1 Volts (3-phase)
- L1-N Volts
- L2-N Volts
- L3-N Volts (3-phase)

#### Voltage Regulation Menu

Adjust voltage, ±10%

### Digital DVR® 2000E Voltage Regulator

- The sealed electronic, solid-state microprocessor-based digital voltage regulator controls the generator set output by regulating the current flow into the exciter field.
- The digital voltage regulator is equipped with single- and/or three-phase sensing. Single-phase sensing is achieved by connecting terminals E2 and E3 to the same generator set terminal.
- Provisions are included in the regulator to allow the paralleling of two or more generator sets using either reactive droop or reactive differential (cross current) compensation with the addition of an external 5-amp 5VA current transformer (paralleling capability with optional DVR® 2000EC model only).
- The underfrequency function allows the generator set to operate with a constant volts-per-hertz characteristic.
- The over-excitation function monitors the voltage regulator output voltage and causes the voltage regulator to shut down when the output voltage exceeds the preset trip level of 80 volts for 15 seconds.
- The overvoltage function monitors the voltage regulator sensed voltage and causes the voltage regulator to shut down when the sensed voltage exceeds the preset trip levels of 120% for 0.75 seconds.

- The voltage regulator is equipped with a sensor that monitors the ambient temperature and will turn itself off when the temperature exceeds 70°C (158°F).
- The loss of the sensing function causes the voltage regulator to shut down if an open circuit occurs in one or more of the sensing leads.
- The field current limit function monitors voltage regulator output current and limits current should a heavy load or short circuit occur across the field output terminals.
- The manual mode of field current controls aid in setup and troubleshooting.
- The alarm output contacts provide remote indication of fault condition.

#### **Status and Mode Adjustments**

#### Status and Shutdown Indicators

- Field Amp Limit
- Loss of Sensing
- Manual Mode
- Over Excitation
- Over Temperature
- Over Voltage
- Under Frequency
- VAR/PF Active

#### Adjustments

- Coarse Voltage Adjustment
- Droop
- Fine Voltage Adjustment
- Gain
- Manual Mode Adjustment
- Manual Mode On/Off
- Phase Sensing, 1-3
- Stability Range
- Under Frequency
- VAR/PF Adjustment
- VAR/PF Select

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### **Industrial Generator Set Accessories**

# **KOHLER.** Power Systems

**Generator Set Controller** 





Decision-Maker® 3000

# Kohler® Decision-Maker® 3000 Controller General Description and Function

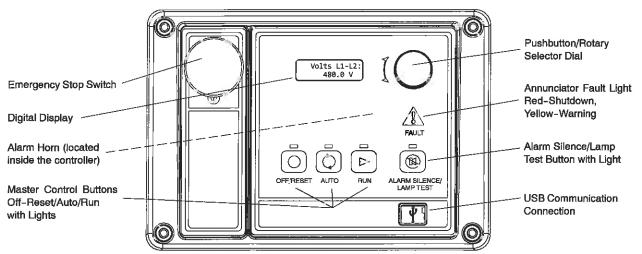
The Decision-Maker® 3000 generator set controller provides advanced control, system monitoring, and system diagnostics for optimum performance.

The Decision-Maker® 3000 controller meets NFPA 110, Level 1 when equipped with the necessary accessories and installed per NFPA standards.

The Decision-Maker 3000 controller uses patented software logic to manage sophisticated functions, such as voltage regulation and alternator thermal overload protection, normally requiring additional hardware. Additional features include:

- A digital display and pushbutton/rotary selector dial provide easy local access to data.
- Measurements selectable in metric or English units.
- The controller can communicate directly with a personal computer via a network or serial configuration using SiteTech™ or Monitor III software.
- The controller supports Modbus® protocol. Use with serial bus or Ethernet networks.
- Scrolling display shows critical data at a glance.
- Digital display of power metering (kW and kVA).
- Integrated hybrid voltage regulator providing ±0.5% regulation.
- Built-in alternator thermal overload protection.

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#### **User Interface Controls and Components**

- Emergency stop switch
- Backlit LCD digital display with two lines of 12 characters (see User Interface Displays for menus)
- Alarm horn indicates generator set shutdown and warning faults
- Environmentally sealed membrane keypad with three master control buttons with lights
  - Off/Reset (red)
- Auto (green)
- Run (yellow)
- Pushbutton/rotary selector dial for menu navigation
  - o Rotate dial to access main menus
  - Push dial and rotate to access sub menus
- Press dial for 3 seconds to return to top of main menu
- Annunciator fault light
  - System shutdown (red)
- System varning (yellow)
   Alarm silence/lamp test button
  - Alarm silence
  - Lamp test
- USB and RS-485 connections

  Allows software upgrades

  - Provides access for diagnostics
  - PC communication using SiteTech™ or Monitor III software
- Dedicated user inputs
  - Remote emergency stop switch
  - Remote 2-wire start for transfer switch
  - Auxiliary shutdown
- Integrated hybrid voltage regulator
- Auto-resettable circuit protection mounted on circuit board.
- One relay output standard. Optional five relay output available.
- One analog and three digital inputs standard. Optional two inputs available.

#### NFPA 110 Requirements

In order to meet NFPA 110, Level 1 requirements, the generator set controller monitors the engine/generator functions/faults shown below.

- Engine functions:
  - Overcrank
  - Low coolant temperature warning
  - High coolant temperature warning
  - High coolant temperature shutdown
  - Low oil pressure shutdown
  - Low oil pressure warning

  - High engine speed
    Low fuel (level or pressure) \*
    Low coolant level
    EPS supplying load
    High battery voltage
    Low battery voltage
- General functions:
  - Master switch not in auto
  - Battery charger fault '
  - Lamp test
  - Contacts for local and remote common alarm
  - Audible alarm silence button
- Remote emergency stop \*
- Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

#### **User Interface Displays**

The listing below has • denoting main menus and o denoting sub-menus.

- Overview
- Software version
- Active shutdowns and warnings (if any are present)
- Engine run time, total hours Average voltage line-to-line
- Frequency
- Average current Coolant temperature
- Fuel level or pressure \*
- Oil pressure
- Battery voltage
- Engine Metering

  Engine speed

- Oil pressure Coolant temperature
- Battery voltage
- Generator Metering

- Total power, VA
  Total power, W
  Rated power, %
  Voltage, L-L and L-N for all phases
  Current, L1, L2, L3
- Frequency
- GenSet Information
  - Generator set model number Generator set serial number Controller serial number
- GenSet Run Time
  - Engine run time, total hours

  - Engine loaded, hours Number of engine starts Total energy, kWh
- GenSet System
  - System voltage
  - System frequency, 50 or 60 Hz
  - System phase, single or three (wye or delta) Power rating, kW

  - Amp rating

  - Power type, standby or prime
    Measurement units, metric or English (user selectable)
    Alarm silence, always or auto only (NFPA 110)
    Manual speed adjust \*
- GenSet Calibration
- Voltage, L-L and L-N for all phases Current, L1, L2, L3
- Reset calibration Voltage Regulation
- Adjust voltage, ±10%
- Digital Inputs
  - Input settings and status
- Digital Outputs
  Output settings and status
- Analog Inputs Input settings and status
- Event Log
  - Event history (stores up to 1000 system events)
- Selector Switch (requires initial activation by SiteTech™)
- Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.

#### **Controller Features**

- AC Output Voltage Regulator Adjustment. The voltage adjustment provides a maximum of ±10% of the system voltage.
- Alarm Silence. The controller can be set up to silence the alarm horn only when in the AUTO mode for NFPA-110 application or Always for user convenience.
- Alternator Protection. The controller provides generator set overload and short circuit protection matched to each alternator for the particular voltage/phase configuration.
- Automatic Restart. The controller automatic restart feature initiates the start routine and recrank after a failed start attempt.
- Common Failure Relay. This relay is integrated on the controller circuit board. Contacts are rated 2 amps at 32 VDC or 0.5 amp at 120 VAC.
- Communication. Controller communication is available.
- · Cyclic Cranking. The controller has programmable cyclic cranking.
- ECM Diagnostics. The controller displays engine ECM fault code descriptions to help in engine troubleshooting.
- Engine Start Aid. The starting aid feature provides control for an optional engine starting aid.
- Event Logging. The controller keeps a record (up to 1000 entries) for warning and shutdown faults. This fault information becomes a stored record of system events and can be reset.
- Historical Data Logging. Total number of generator set successful starts is recorded and displayed.
- Integrated Hybrid Voltage Regulator. The voltage regulator provides ±0.5% no-load to full-load regulation with three-phase sensing.
- Lamp Test. Press the alarm silence/lamp test button to verify functionality of the indicator lights.
- LCD Display. Adjustable contrast for improving visibility.
- Measurement Units. The controller provides selection of English or metric displays.
- Power Metering. Controller digital display provides kW and kVA.
- Programming Access (USB). Provides software upgrades and diagnostics.
- Remote Reset. The remote reset function resets faults and allows restarting of the generator set without going to the master control switch off/reset position.
- RSA II Remote Monitoring Panel. The controller is compatible with the Kohler® Remote Serial Annunciator (RSA II).
- Run Time Hourmeter. The generator set run time is displayed.
- Time Delay Engine Cooldown (TDEC). The TDEC provides a time delay before the generator set shuts down.
- Time Delay Engine Start (TDES). The TDES provides a time delay before the generator set starts.
- Voltage Selection Menu. This menu provides the capability of quickly switching controller voltage calibrations. Requires initial activation using SiteTech™ software. NOTE: Generator set output leads require voltage reconnection.

#### **Controller Functions**

The following chart shows which functions cause a warning or shutdown. All functions are available as relay outputs.

Warning causes the fault light to show yellow and sounds the alarm horn signaling an impending problem.

**Shutdown** causes the fault light to show red, sounds the alarm horn, and stops the generator set.

	Warning Function	Shutdown Function
Engine Functions		
Critically high fuel level *	0	
ECM communication loss		•
ECM diagnostics	•	•
Engine over speed		• †
Engine start aid active		
Engine under speed		•
Fuel tank leak *	0	0
High battery voltage	•	
High coolant temperature	•	•÷
High fuel level *	0	
Low battery voltage	•	
Low coolant level	<u> </u>	•
Low coolant temperature	•	
Low cranking voltage	<b>—</b>	
Low engine oil level *	0	0
Low fuel level (diesel models) *		0
Low fuel pressure (gas models) *	-	
Low oil pressure	<u> </u>	•†
<u> </u>	<del></del>	•
No coolant temperature signal		•
No oil pressure signal		
Overcrank		•₽
Speed sensor fault	•	
General Functions		
Alarm horn silenced		_
Analog inputs	0	0
Battery charger fault *		
Chicago code active *	_	
Common fault (includes †)		•
Common warning	•	
Digital inputs	٥	
Emergency stop		•†
Engine cooldown (delay) active		
Engine start delay active		
Engine started		
Engine stopped		
EPS supplying load		
Generator running		
Input/output communication loss	•	
Internal failure		•
Master switch not in auto	•	
NFPA 110 alarm active		
Remote start		
System ready		
Generator Functions		
AC sensing loss	•	•
Alternator protection		•
Ground fault input *	•	
kW overload		•
Locked rotor		•
Overfrequency		•
Overvoltage (each phase)		•
Underfrequency		•
Undervoltage (each phase)		•
Standard functions		

- Standard functions
- Available user functions
- Function requires optional input sensors or kits and is engine dependent, see Controller Displays as Provided by the Engine ECM.
- items included with common fault shutdown

KOHLER CO., Kohler, Wisconsin 53044 USA Phone 920-457-4441, Fax 920-459-1646 For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444 KOHLERPower.com Kohler Power Systems Asia Pacific Headquarters 7 Jurong Pier Road Singapore 619159 Phone (65) 6264-6422, Fax (65) 6264-6455

Display	GM/PSI	Doosan	gine ECM (avallability so John Deere (JDEC)	Volvo (EMS II)	Volvo (EDC III)	DD/MTU (ADEC)
Ambient temperature		X			, , , , , , , , , , , , , , , , , , ,	,
Charge air pressure	Х	х		Х	Х	X
Charge air temperature	X	X	X	Х	Х	
Coolant level	· -			Х	Х	Х
Coolant pressure				Х	X	
Coolant temperature	Х	Х	X	Х	X	X
Crankcase pressure				X	Х	
ECM battery voltage	Х	Х				Х
ECM fault codes	X	X	X	X	X	Х
ECM serial number						Х
Engine model number			Х			X
Engine serial number			Х			X
Engine speed	Х	Х	X	X	Х	X
Fuel pressure				Х	Х	
Fuel rate	Х	X	X	X	X	Х
Fuel temperature			X	Х	Х	X
Oil level					X	
Oil pressure	Х	Х	X	Х	Х	Х
Oil temperature				Х	Х	Х
Trip fuel				X	X	Х

#### Controller Specifications

Decision-Maker® 3000-Software Version 3.11 or higher

- Power source with circuit protection: 12- or 24-volt DC
- Power drain: 200 milliamps
- Humidity range: 5% to 95% noncondensing
- Operating temperature range: -40°C to +70°C (-40°F to +158°F)
- Storage temperature range: -40°C to +85°C (-40°F to +185°F)
- Standards:
  - o CE Directive
  - NFPA 99
  - C NFPA 110, Level 1
  - o CSA 282-09
  - O UL 508
  - o ASTM B117 (salt spray test)
- Panel dimensions—W x H, 229 x 160 mm (9.0 x 6.3 in.)

### Communication and PC Software Available Options

Refer to G6-76 Monitor III Software and the communication literature for additional communication and PC software information including Modbus® communication.

- Monitor III Software for Monitoring and Control
  (Windows®-based user Interface)
- Converter, Modbus®/Ethernet. Supports a power system using controllers accessed via the Ethernet. Converter is supplied with an IP address by the site administrator. Refer to G6-79 for converter details
- Converter, RS-232/RS-485. Supports a power system using controllers accessed via a serial (RS-232) connection.

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### Decision-Maker® 3000 Available Options

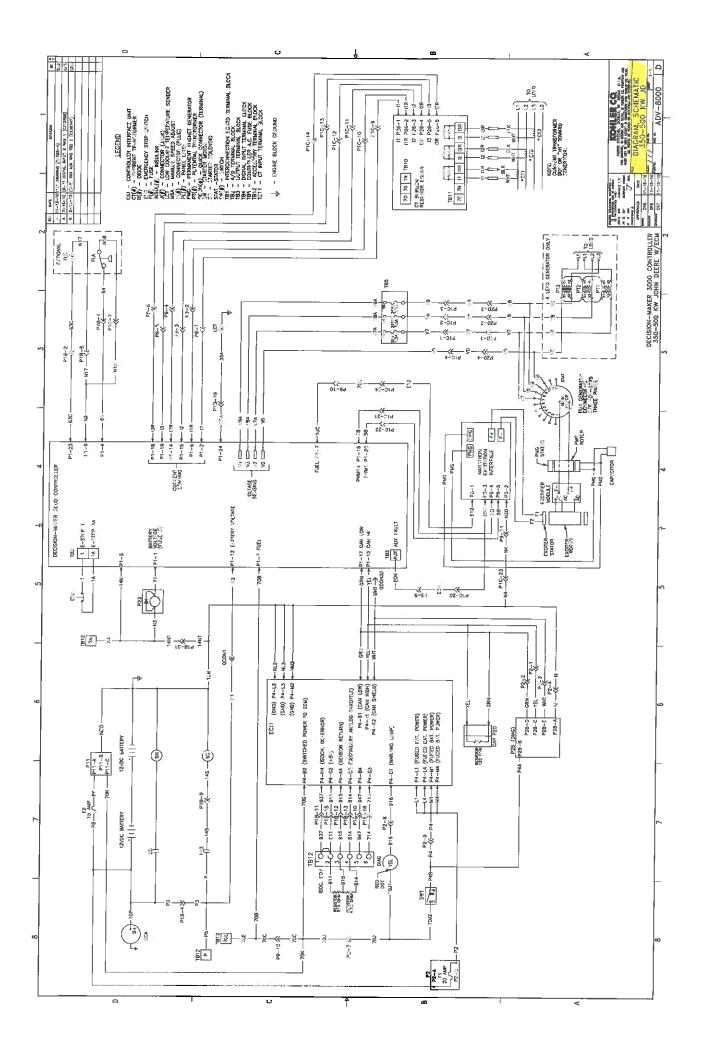
- Float/Equalize Battery Charger available with 6 or 10 amp DC volt output. The 10 amp models are available with and without NFPA alarm to signal a battery charger fault.
- Manual Speed Adjust available for applications using closed transition ATS.
- Prime Power Switch prevents battery drain during generator set non-operation periods and when the generator set battery cannot be maintained by an AC battery charger.
- Remote Emergency Stop Switch available as a wall mounted panel to remotely shut down the generator set.
- Remote Monitoring Panel. The Kohler® Remote Serial Annunciator (RSA) enables the operator to monitor the status of the generator set from a remote location, which may be required for NFPA 99 and NFPA 110 installations.
- Run Relay provides a relay indicating that the generator set is running.
- Shunt Trip Wiring provides relay outputs to trip a shunt trip circuit breaker and to signal the common fault shutdowns. Contacts rated at 10 amps at 28 VDC or 120VAC.
- ☐ Two Input/Five Output Module provides a generator set mounted panel with two inputs and five relay outputs.

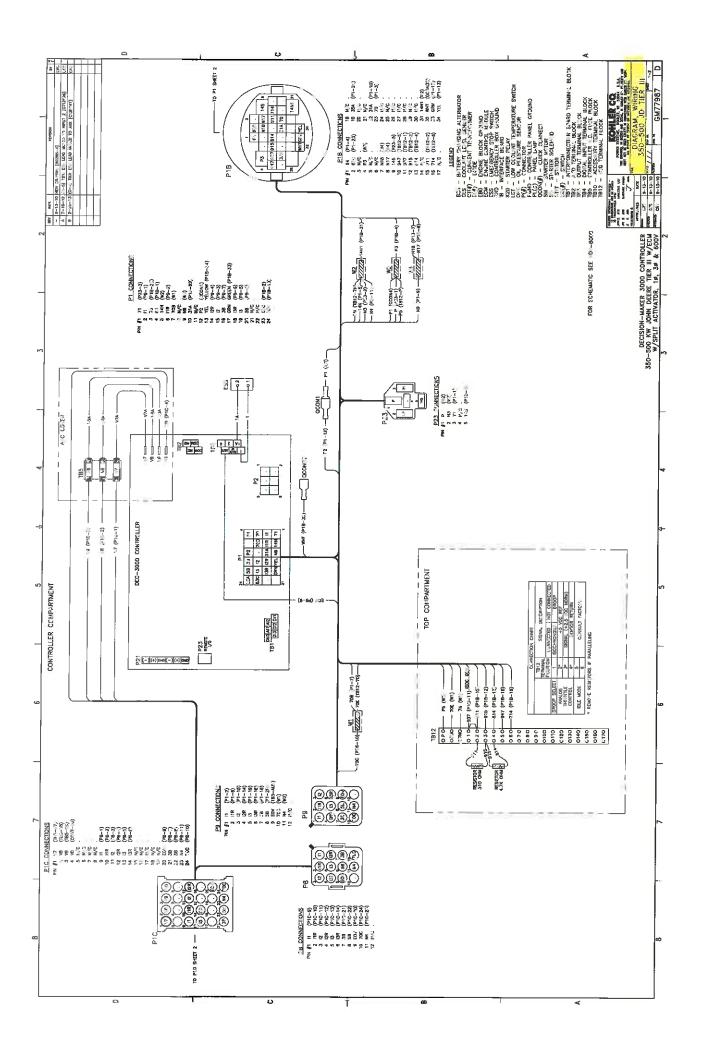
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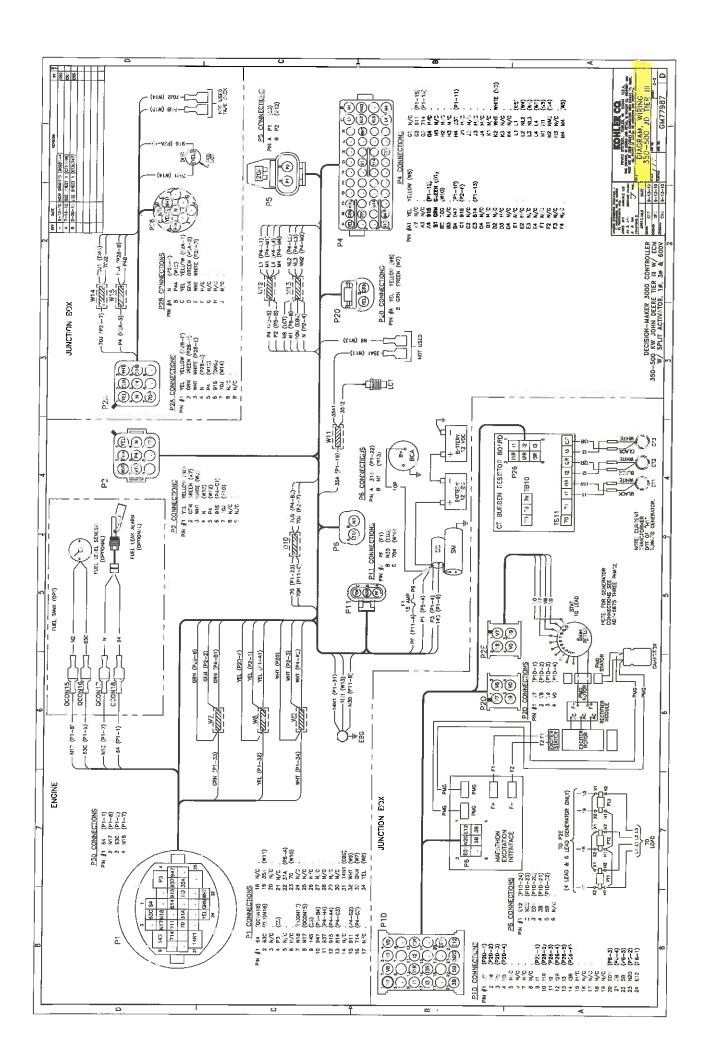
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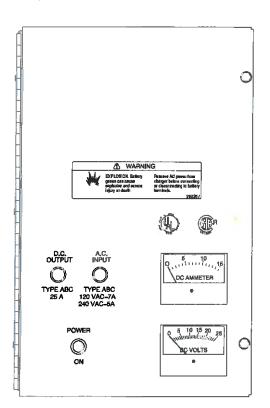




# **KOHLER.** Power Systems

Float/Equalize Battery Charger





#### Standard Features

- Kohler automatic battery chargers feature two charging modes to keep lead-acid and nickelcadmium batteries fully charged without overcharging. The battery charger automatic float-to-equalize operation maintains battery voltage with no manual intervention.
- Temperature compensation feature prevents overcharging or undercharging battery at high/low ambient temperatures.
- Current-limiting circuitry prevents battery charger from overload at low battery voltage and during a short circuit. The ten amp DC current limit allows the battery charger to remain connected to the battery during engine cranking.
- Battery charger complies with NFPA 110 code requirements when equipped with optional alarm circuit board. Alarm board features low battery voltage, high battery voltage, and battery charger malfunction alarm contacts.

# **Specifications**

Loose Battery	Installed Battery	NFPA 110	Out	put	Number of Cells		
Charger Kit No.	Charger Kit Nos.	Alarm Outputs	Voltage	Amps	Lead Acid	Ni-Cd	
PAD-292862	=	No					
PAD-292863	GM39705-KA1, GM42342-KA1	Yes	12		6	9	
PAD-292864, GM78809-KP2	GM28562-KA2, -KA4, -KA6, -KA8, GM51537-KA2, GM78809-KA2, GM87550-KA1	No	24	10	12		
PAD-292865, GM78809-KP1	GM28562-KA1, -KA3, -KA5, -KA7, GM51537-KA1 <mark>, GM78809-KA1,</mark> GM87550-KA2	Yes				18	
AC Input Voltage	, Frequency		1:	20/240 V	AC, 50/60 Hz		
DC Voltage Regulation				±1%			
Weight (battery charger without mounting brackets)			11.8 kg (26 lb.)				
Dimensions, L x (battery charger with	D x H out mounting brackets)	_	271 x 143 x 422 mm (10.67 x 5.63 x 16.63 in.)			)	

Note: Installed battery charger kits are available on selected generator set models. See your authorized distributor for availability.

#### **Automatic Float to Equalize**

When the battery loses its charge, the battery charger operates in the High Rate Constant Current Mode until the battery voltage rises to the preset equalize level.

At the preset equalize level, the battery charger switches to the constant voltage Equalize Mode until the current required to maintain this voltage drops to 50% of the battery charger's high rate current.

The battery charger then switches to the lower constant voltage Float Mode when the battery nears full charge. The battery charger continues to operate in this mode until AC input power disconnects or the current required to maintain the battery at the float voltage setting exceeds 6 amps.

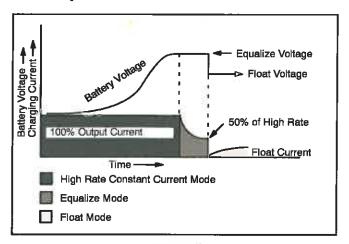


Figure 1

#### Temperature Compensation

The battery charger compensates for battery temperature using a negative temperature coefficient. The battery charger provides temperature compensation of -2 mv/°C per cell over the ambient temperature range of -40°C up to 60°C. The temperature compensation automatically adjusts the float and equalize voltage settings to prevent the battery from overcharging at high ambient temperatures and undercharging at low ambient temperatures.

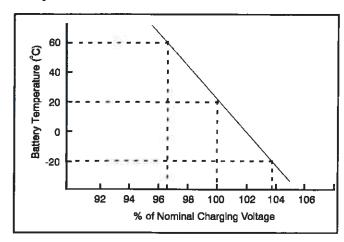


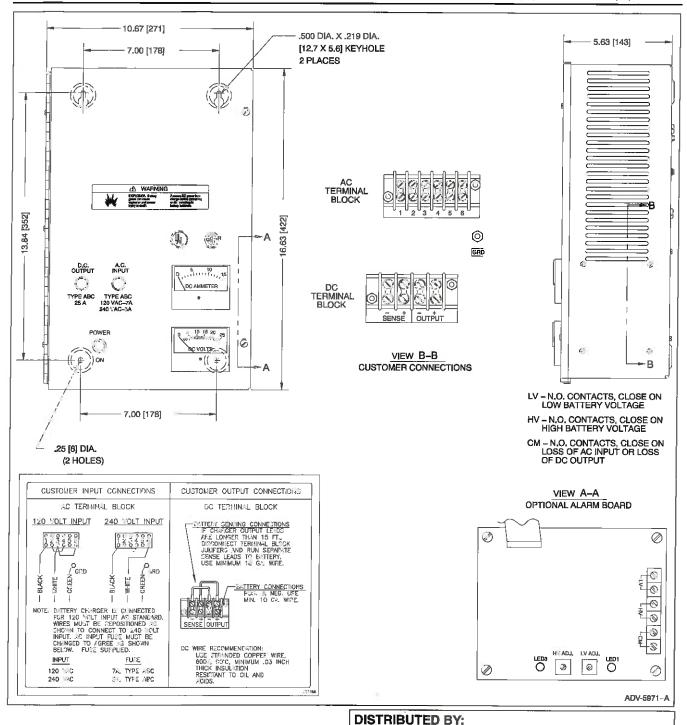
Figure 2

#### Standard Features

- Ammeter and voltmeter indicate battery charging rate with 5% full-scale accuracy. POWER ON lamp indicates battery charger is operating.
- AC input and DC output fuses prevent battery charger damage from abnormal overload and short-circuit conditions.
- Operational temperature range is from -40°C (-40°F) to 60°C (140°F). Battery charger float and equalize voltage automatically adjust throughout the temperature range.
- Reverse polarity protection circuitry prevents battery charger from energizing if improperly connected.
- Internal terminal blocks for AC input and DC output/ sensing lead connections.
- DC voltage regulation of ±1% from no load to full load and AC input line voltage variations of ±10%.
- UL-1012 listed/CSA certified.
- Wall-mount, slotted enclosure with knockouts for customer conduit installation.

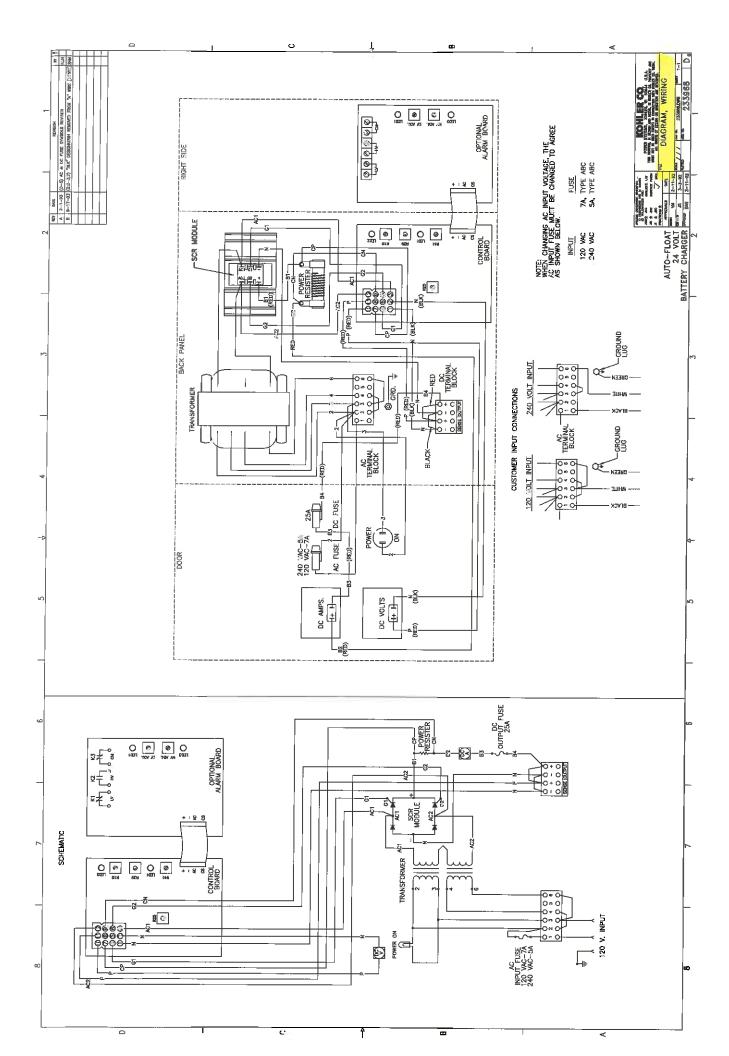
- Reconnection blocks allow operation at 120 or 240 volts AC, single phase, 50 or 60 hertz.
- Battery charger circuitry protected from AC line and DC load voltage spikes and transients.
- Terminal block for remote battery sensing leads.
- Automatic float-to-equalize operation with individual potentiometer adjustments. Charge up to 12 lead-acid or 18 nickel-cadmium battery cells.
- No adjustments are necessary for lead-acid or nickel-cadmium batteries.
- Oversized transformer and SCR heatsink allow constant current charging at 10 amps up to the equalize voltage setting for fastest battery charging.

Note: The battery charger will discharge the engine starting battery(ies) when the battery charger is connected to the battery(ies) and is not connected to an AC power supply. To prevent engine starting battery(ies) discharge, install battery charger relay kit GM39659.



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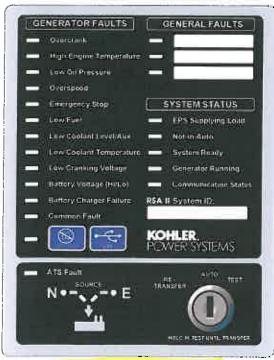
#### **Industrial Generator Set Accessories**

# KOHLER POWER SYSTEMS Remote Serial Annunciator II (RSA II)





RSA II



**RSA II with ATS Controls** 

# Remote Serial Annunciator II (RSA II) for Kohler® Controllers

 Monitors the generator set equipped with one of the following controllers:

**KPC 1000** 

Decision-Maker® 3+

Decision-Maker® 3000

Decision-Maker® 550

Decision-Maker® 6000

 Allows monitoring of the common alarm, remote testing of the automatic transfer switch, and monitoring of the normal/ emergency source with one of the following controllers:

MPAC™ 1000

MPAC™ 1500

- Configuration via a personal computer (PC) software.
- RSA II panel includes writable surfaces (four white boxes in illustration) for user-defined selections.
- Uses Modbus® protocol, an industry standard.
- Controller connections:

RS-485 for serial bus network

USB device port for PC

12-/24-volt DC power supply

120/208 VAC power supply (available accessory)

 Meets the National Fire Protection Association Standard NFPA 110, Level 1.

#### **Dimensions**

 Dimensions—W x H x D, mm (in.). Also fits in a standard 203 mm x 203 mm (8 in. x 8 in.) Hoffman box.

**Surface Mounted:** 

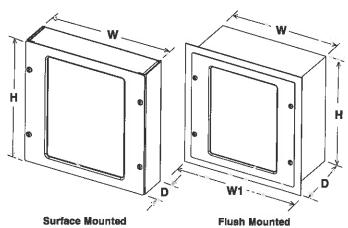
203 x 203 x 56 (8.0 x 8.0 x 2.2)

Flush Mounted:

203 x 203 x 58 (8.0 x 8.0 x 2.3)

Flush mounting plate W1: 229 (9.0)

Modbus<sup>€</sup> is a registered trademark of Schneider Electric.



Fault and Status Conditions	Fault LEDs	Fault Horn	System Ready LED	Generator Running LED	Communication Status LED
Overcrank Shutdown	Red	On	Red	Off	Green
High Engine Temperature Warning *	Yellow	On	Red	Green	Green
High Engine Temperature Shutdown	Red	On	Red	Off	Green
Low Oil Pressure Warning *	Yellow	On	Red	Green	Green
Low Oil Pressure Shutdown	Red	On	Red	Off	Green
Overspeed Shutdown	Red	On	Red	Off	Green
Emergency Stop *	Red	On	Red	Off	Green
Low Coolant Level/Aux. Shutdown	Red	On	Red	Off	Green
Low Coolant Temperature *	Yellow	On	Red	Off	Green
Low Cranking Voltage	Yellow	On	Red	Off	Green
Low Fuel-Level or Pressure *	Yellow	On	Red	Green or Off	Green
Not-In-Auto	Red	On	Red	Green or Off	Green
Common Fault	Red	On	Green	Green or Off	Green
Battery Charger Fault (1) *	Yellow	On	Red	Green or Off	Green
Battery Charger Fault (2) *	Yellow	On	Green	Green or Off	Green
High Battery Voltage *	Yellow	Off	Green	Green or Off	Green
Low Battery Voltage *	Yellow	Off	Green	Green or Off	Green
User Input #1 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #1 (Shutdown)	Red	On	Green	Off	Green
User Input #2 (Warning)	Yellow	Off	Green	Green or Off	Green
User Input #2 (Shutdown)	Red	On	Green	Off	Green
User Input #3 (Warning) (1) †	Yellow	Off	Green	Green or Off	Green
User Input #3 (Shutdown) (1) †	Red	On	Green	Off	Green
EPS Supplying Load	Yellow	Off	Green	Green	Green
Communications Status (Fault mode)	_	Off	Green or Red	Green or Off	Red
ATS Fault (RSA II with ATS Controls only)	Red	On	Red or Yellow	Green or Off	Green

Green LEDs appear as steady on when activated.

Yellow LEDs slow flash when activated except steady on with EPS supplying load and high battery voltage.

Red LEDs slow flash when activated except fast flash with loss of communication and not-in-auto.

#### **Specifications**

- LED indicating lights for status, warning, and/or shutdown.
   See the above chart for details.
- Power source with circuit protection: 12- or 24-volt DC
- Power source with120/208 VAC, 50/60 Hz adapter (option)
- · Power draw: 200 mA
- · Humidity range: 0% to 95% noncondensing
- Operating temperature range: -20°C to +70°C (-4°F to +158°F)
- Storage temperature range: -40°C to +85°C (-40°F to +185°F)
- Standards:
  - NFPA 110, level 1
  - UL 508 recognized
  - CE directive
  - O NFPA 99
  - EN6II-4-4 fast transient immunity
- RS-485 Modbus<sup>®</sup> isolated port @ 9.6/19.2/38.4/57.6 kbps (default is 19.2 kbps)
- USB device port
- NEMA 2 enclosure
- (1) All generator set controllers except Decision-Maker® 3+ controller.
  (2) Decision-Maker® 3+ controller only.
- May require optional kit or user-provided device to enable function and LED indication.
- Digital input #3 Is factory-set for high battery voltage on the Decision-Maker® 3+ controller.

Modbus® is a registered trademark of Schneider Electric.

#### ATS Controls (RSA II with ATS controls only)

- ATS position LED (normal or emergency)
- Power source indicator LED (normal or emergency)
- ATS fault LED
- Key-operated spring-loaded test switch (Re-Transfer/Auto/Test)

#### NFPA Requirements

- NFPA 110 compliant
- · Engine functions:
  - High battery voltage warning \*
  - High engine temperature shutdown
  - High engine temperature warning \*
  - Low battery voltage warning \*
  - Low coolant level/aux. shutdown
  - Low coolant temperature warning \*
  - Low cranking voltage
  - Low fuel warning (level or pressure) \*
  - Low oil pressure shutdown
  - Low oil pressure warning \*
  - Overcrank shutdown
  - Overspeed shutdown
- General functions:
  - O Audible alarm silence
  - Battery charger fault \*
  - Lamp test
  - Master switch not-in-auto

#### Fault and Status LEDs and Lamp Test Switch

Alarm Horn. Horn sounds giving a minimum 90 dB at 0.1 m (0.3 ft.) audible alarm when a warning or shutdown fault condition exists except on high/low battery voltage or EPS supplying load.

Alarm Silenced. Red LED lights when alarm horn is deactivated by alarm silence switch (lamp test switch).

Alarm Slience Switch. Switch quiets the alarm during servicing. The horn will reactivate upon additional faults.

ATS Fault. Red LED lights when ATS fails to transfer.

Aux. See Low Coolant Level/Aux.

Battery Charger Fallure. LED lights if battery charger malfunctions. Requires battery charger with alarm contact.

(High/Low) Battery Voltage. LED flashes if battery or charging voltage drops below preset level. LED lights steady if battery voltage exceeds preset level.

Common Fault. LED lights when a single or multiple common faults occur.

Communication Status. Green LED lights indicating annunciator communications functional. Red LED indicates communication fault.

Emergency Power System (EPS) Supplying Load. LED lights when the generator set is supplying output current (Decision-Maker<sup>®</sup> 550, 3000, and 6000 controllers) or when transfer switch is in the emergency position (Decision-Maker<sup>®</sup> 3+ controller).

**Emergency Stop.** LED lights and engine stops when emergency stop is made. May require a local emergency stop switch on some Decision-Maker 3+ controllers.

**Generator Running.** LED lights when generator set is in operation.

(Generator Switch) Not In Auto. LED lights when generator set master switch is in RUN or OFF/RESET position.

**High Engine Temperature.** Red LED lights if engine has shut down because of high engine coolant temperature. Yellow LED lights if engine coolant temperature approaches shutdown range. Requires warning sender on some models.

Lamp Test Switch. Switch tests all the annunciator indicator LEDs and horn.

**Low Coolant Level.** LED lights when engine coolant level is below acceptable range on radiator-mounted generator sets only. When used with a Decision-Maker® 3+ controller, the LED indicates low coolant level or an auxiliary fault shutdown. Requires user- supplied low coolant level switch on remote radiator models.

**Low Coolant Temperature.** LED lights if optional engine block heater malfunctions and/or engine coolant temperature is too low. Requires prealarm sender on some models.

Low Cranking Voltage. LED lights if battery voltage drops below preset level during engine cranking.

**Low Fuel (Level or Pressure).** LED lights if fuel level in tank approaches empty with diesel models or fuel pressure is low on gas models. Requires customer-supplied switch.

**Low Oil Pressure.** Red LED lights if generator set shuts down because of insufficient oil pressure. Yellow LED lights if engine oil pressure approaches shutdown range. Requires warning sender on some models.

**Overcrank.** LED lights and cranking stops if engine does not start in either continuous cranking or cyclic cranking modes.

**Overspeed.** LED lights if generator set shuts down because of overspeed condition.

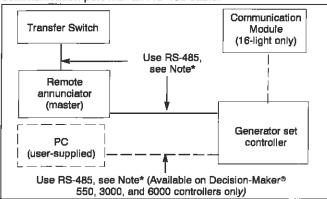
**System Ready.** Green LED lights when generator set master switch is in AUTO position and the system senses no faults. Red LED indicates system fault.

User-Defined Digital Inputs #1, #2, and #3. Monitors two digital auxiliary inputs (warnings or shutdowns). Individual red LEDs flash when a fault occurs or the status changes. User-defined digital input #1 and #2 are selected via the RSA II master for local or remote (generator set or ATS). The user-defined digital input can be assigned at the controller or via PC using SiteTech™ setup software.

#### Communications (Shown with RSA II with ATS Controls)

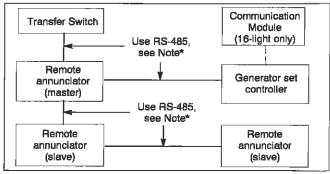
#### Local Single (Master) Connection

A single RSA II connects directly to the controller's communication port with an RS-485 cable.



#### Local Multiple (Master/Slave) Connections

A single RSA II master connects directly to the controller's communication port with an RS-485 cable. Additional RSA IIs (slaves) can connect to the single master RSA II. Status of the RSA II (master) is annunciated on the RSA II (slave) panel.



Note\*: Use RS-485 for a total of up to 1220 m (4000 ft.) maximum from the first device to the last device.

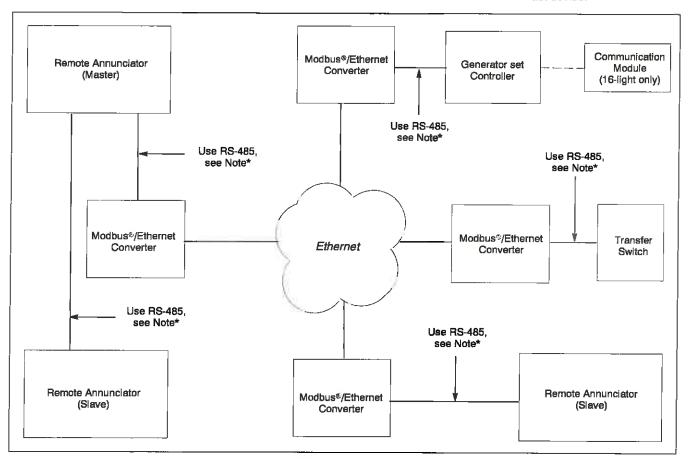
Kohler Power Systems Asia Pacific Headquarters 7 Jurong Pier Road Singapore 619159 Phone (65) 6264-6422, Fax (65) 6264-6455

# Modbus®/Ethernet, Single Master or Multiple Master/Slave Connections (Shown with RSA II with ATS Controls)

An RSA II master communicates with a controller and RSA II slaves through an Ethernet network. A Modbus®/Ethernet converter is required for each RSA II and controller. RS-485 cable connects the RSA II to the converter. Category 5e (Cat 5e) network cable connects the Modbus®/Ethernet converter to the Ethernet.

Note: Combining RSA II remote annunciators with the RSA 1000 is permissible provided that the master remote annunciator is an RSA II remote annunciator.

Note\*: Use RS-485 for a total of up to 1220 m (4000 ft.) maximum from the first device to the last device.

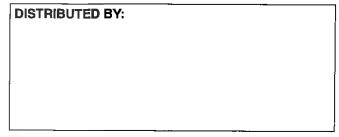


#### Accessories

- ☐ Power source adapter kit 120/208 VAC, 50/60 Hz.
- Modbus®/Ethernet converter GM41143-KP2 for serial to Ethernet communication.
- Communication module GM32644-KA1 or GM32644-KP1 is required with Decision-Maker<sup>®</sup> 3+ controllers.

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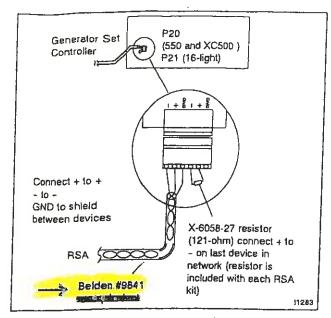


Figure 19 RS-485 Connector Details

**16-Light Controller.** Figure 20 shows the 16-light controller with P21 location and Figure 21 shows the RS-485 connections.

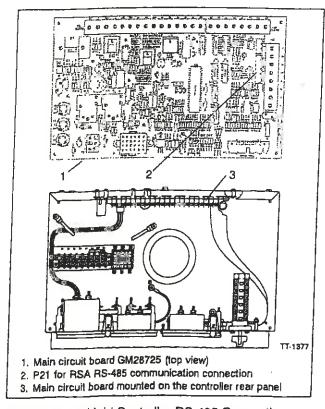


Figure 20 16-Light Controller RS-485 Connections

Circuit Board Designation	Connector Designation	Wire Designation
<del>-</del>	1	Black
+	2	White
GND	3	Shield

Figure 21 16-Light Controller P21 RS-485 Connections

550 and XC500 Controllers. Figure 22 shows the 550 and XC500 controllers with P20 location and Figure 23 shows the RS-485 connections.

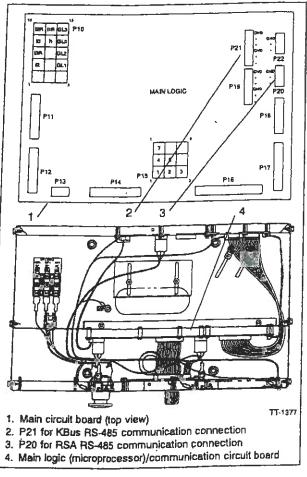


Figure 22 550/XC500 Controller RS-485 Connections

Circuit Board Designation	Connector Designation	Wire Designation	
GND	1	Shield	
+	2	White	
-	3	Black	

Figuré 23 550/XC500 Controller P20 RS-485 Connections

# **KOHLER.** Power Systems

**Specific-Breaker Rated ATS** 





#### **Ratings**

Voltage:

208-480 VAC 50/60 Hz

**Current:** 

40-1000 Amps (standard transition) 100-600 Amps (programmed transition)

#### **Transfer Switch Standard Features**

- UL 1008 listed at 208-480 VAC file #E58962 (automatic), #E86894 (nonautomatic)
- CSA certification available
- · Available with either automatic or non-automatic control
- Available in 2, 3, or 4 pole configurations
- High withstand/closing ratings, for use with specific breakers only
- Electrically operated, mechanically held mechanism
- Double-throw, mechanically interlocked design (break-before-make power contacts)
- · Enclosed arc chambers with arc chutes
- Standard-transition model KSS and programmed-transition KSP model available
- Silver tungsten alloy contacts on 400–600 amp models (Model KSS)
- Silver alloy main contacts (Model KSP)
- · Front-accessible contacts for easy inspection
- Programmed-transition operation provides a center OFF position that allows residual voltages in the load circuits to decay (Model KSP)
- Main shaft auxiliary position-indicating contacts, one set Normal and one set Emergency

#### MPAC® 1500 Controller

#### Standard Features

- Microprocessor-based controller
- · Environmentally sealed user interface
- LCD display, 4 lines x 20 characters, backlit
- Dynamic function keypad with tactile feedback pushbuttons allows complete programming and viewing capability at the door
- LED indicators: Source available, transfer switch position, service required (fault), and "not in auto"
- Broadrange voltage sensing (208-600 VAC) on all phases
- Phase-to-phase sensing and monitoring with 0.5% accuracy on both sources
- Frequency sensing with 0.5% accuracy on both sources
- Anti-single phasing protection
- Phase rotation sensing for three-phase systems
- Real-time clock with automatic adjust for daylight saving time and leap year
- Time-stamped event log
- Fail-safe transfer for loaded test and exercise functions
- DIP switches: password disable and maintenance
- Modbus® RTU and Modbus® TCP/IP protocols (Modbus® register map available)
- RJ45 connector for 10/100 ethernet connection
- USB port with read/write compatibility
- Isolated RS-485 ports
- One-year limited warranty

#### **Programmable Features**

- Programming and monitoring methods:
  - Monitoring and password-protected programming at the door using the keypad and display
  - Program and monitor using a PC with Monitor III integrated generator set and ATS monitoring software
  - o Transfer files through the USB port
- System voltage and frequency
- Voltage unbalance
- Over/undervoltage and over/underfrequency for all phases of the normal and emergency sources
- Adjustable time delays
- Load/no load/auto-load test and load/no-load exercise functions
- Programmable inputs and outputs
- Time-based and current-based\* load control
- · Load bank control for exercise or test
- Pre/post-transfer, nine individual time delays for selected loads
- ABC/BAC/none phase rotation selection with error detection
- · Resettable historical data
- In-phase monitor
- · Password protection, three security levels
- \* Requires current sensing kit.

#### MPAC® 1500 Controller Features

#### **User Interface LED Indicators**

- · Contactor position: source N and source E
- Source available: source N and source E
- Service required (fault indication)
- Not in automatic mode

#### **LCD Display**

- System status
- Line-to-line voltage
- Line-to-neutral voltage
- Active time delays
- Source frequency
- Preferred source selection
- System settings
- Common alarms
- Load current, each phase;
- Inputs and outputs
- Faults
- Time/date
- Address
- Event history
- Maintenance records
- Exerciser schedule
- Exerciser mode
- · Time remaining on active exercise

#### **Dynamic Function Tactile Keypad Operations**

- Scroll up/down/forward/back
- Increase/decrease/save settings
- End time delay
- Start/end test or exercise
- Reset fault
- Lamp test

#### **DIP Switches**

- Maintenance mode
- Password disable

#### **Event History**

- View up to 99 time and date-stamped events on the display or on a personal computer equipped with optional Monitor III software.
- Download up to 2000 events with Monitor III software or download complete event history file to a PC or a memory device connected to the USB port.

#### Main Logic Board Inputs and Outputs

- Two (2) programmable inputs
- Two (2) programmable outputs, isolated form C (SPDT) contacts rated 1 amp @ 30 VDC, 500 mA @120 VAC

Main Board I/O Specifications					
Output contact type   Isolated form C (SPDT)					
Output contact rating	1 amp @ 30 VDC, 500 mA @120 VAC				
I/O terminals wire size range	#12-24 AWG				

#### Communications

- USB port with read/write capability
- Isolated RS-485 ports
- RJ-45 connector for 10/100 ethernet connection
- Modbus® RTU and Modbus® TCP/IP protocols (Modbus® register map available)
- USB Port. Upload or download files from a PC or a memory device through the USB port.
  - Application software
  - Event history files
  - Language files
  - Parameter settings
  - Usage reports
  - Feature configuration

#### **USB** Data Logger

- · Time-stamped voltage and frequency readings
- Minimum and maximum current and voltage readings for a selected time period

#### **Programmable Features**

- System voltage, 208-600 VAC \*
- System frequency, 50/60 Hz \*
- Single/three-phase operation \*
- Standard/programmed-transition operation \*
- Preferred source selection
- Phase rotation: ABC/BAC/none selection with error detection
- Voltage and frequency pickup and dropout settings
- Voltage unbalance, enable/disable
- In-phase monitor: enable/disable and phase angle
- Transfer commit/no commit
- Source/source mode: utility/gen, gen/gen, utility/utility, or utility/gen/gen for 3-source systems
- Passwords, system and test
- Time, date, automatic daylight saving time enable/disable
- Time delays (see table)
- Exerciser: calendar mode, loaded/unloaded up to 21 events
- Test: loaded/unloaded/auto load (1-60 minutes)
- Remote test: loaded/unloaded
- Automatic override on generator failure (loaded test and exercise)
- Peak shave delay enable/disable
- Current monitoring†
- Pre/post-transfer, 9 individual time delays for selected loads
- Current-based load control settings: high/low current levels and load add/remove priority for 9 separate loads ÷
- Prime power sequence alternates between two generator sets
- · Resettable historical data
- \* System parameters factory-set per order
- \* Requires optional current sensing kit.

  Modbus® is a registered trademark of Schneider Electric.

#### MPAC® 1500 Controller Features, continued

#### Programmable Inputs

- External time delay input
- External battery fault
- External common fault
- Inhibit transfer
- Load shed to force transfer to OFF (programmed- transition models only; requires optional load shed kit)
- · Peak shave/area protection input
- External test
- Three-source system disable

#### **Programmable Outputs**

- Chicago alarm control
- Common alarm events
- Contactor position
- Exercise active
- · Failure to acquire standby source
- · Failure to transfer
- · Generator engine start, source N and E
- I/O module faults
- Load bank control
- Load control active (pre/post transfer delay, up to 9 outputs)
- Loss of phase fault, source N and E
- External battery fault
- Non-emergency transfer
- · Not in automatic mode
- Over/underfrequency faults, source N and E (generator)
- Over/undervoltage faults, source N and E
- Peak shave/area protection active
- Phase rotation error, source N and E
- Preferred source supplying load
- Software-controlled relay outputs (four maximum)
- Source available, preferred and standby
- · Standby source supplying load
- Synchronizing output
- Test active
- · Transfer switch auxiliary contact fault
- Transfer switch auxiliary contact open
- Voltage unbalance

Voltage and Frequency Sensing							
Parameter	Default	Adjustment Range					
Undervoltage dropout	90% of pickup	75%-98%					
Undervoltage pickup	90% of nominal	85%-100%					
Overvoltage dropout *	115% of nominal*	106%-135%					
Overvoltage pickup	95% of dropout	95%-100%					
Unbalance enable	Disable	Enable/Disable					
Unbalance dropout	20%	5%-20%					
Unbalance pickup	10%	3%-18%					
Voltage dropout time	0.5 sec.	0.1-9.9 sec.					
Underfrequency dropout	99% of pickup	95%-99%					
Underfrequency pickup	90% of nominal	80%-95%					
Overfrequency dropout	101% of pickup	101%-115%					
Overfrequency pickup	110% of nominal	105%-120%					
Frequency dropout time	3 sec.	0.1-15 sec.					
* 690 volts, maximum. Default = 110% for 600 volt applications.							

Adjustable Time Delays						
Default	Adjustment Range					
3 sec.						
3 sec.	0-6 sec. †					
5 sec.						
2 sec.						
1 min.						
1 min.	0–60 min.					
3 sec.						
15 min.						
1 sec.						
1 sec.	1 sec, - 60 min.					
60 sec.	10 sec - 15 min.					
30 min.	1-60 min. (1 min. increments)					
6 min.	6 min 100 days (6 min. increments)					
0 sec.						
0 sec.						
0 sec.						
0 sec.	0-60 min.					
0 sec.						
0 sec.						
	Default 3 sec. 3 sec. 5 sec. 2 sec. 1 min. 1 min. 3 sec. 15 min. 1 sec. 60 sec. 30 min. 6 min. 0 sec. 0 sec. 0 sec. 0 sec. 0 sec.					

Note: Time delays are adjustable in 1 second increments, except as noted.

<sup>†</sup> Engine start time delay can be extended to 60 minutes with an External Battery Supply Module Kit.

## **Application Data**

	Switch	Range Range	e of Wire Sizes, Copper or Aluminum*		
Model	Rating, amps	Normal, Emergency, and Load	Neutral	Ground	
40-150	40-150	(1) #8 to 3/0 AWG †	(3) #6 - 3/0 AWG		
	200-225	(1) #6 AWG to 250 KCMIL †	<del>-</del>		
	260	(1) #6 AWG to 350 KCMIL †	(3) #4 - 600 KCMIL or	(3) #6 - 3/0 AWG	
KSS	400	(1) #4 AWG to 600 KCMIL † or (2) #1/0 AWG to 250 KCMIL †	(6) 1/0 - 250 KCMIL		
	600	(2) #2 AWG to 600 KCMIL #	(3) #4 - 600 KCMIL or (6) 1/0 - 250 KCMIL	(0) #4	
	800	(2) #1/0 AWG to 750 KCMIL		(3) #4 - 600 KCMIL or (6) 1/0 - 250 KCMIL	
	1000	(4) #2 AWG to 600 KCMIL	(12) #2 - 600 KCMIL		
	100	(1) #14 to 1/0 AWG			
	200	(1) #6 AWG to 250 KCMIL	(3) #4 ~ 600 KCMIL or	(3) #6 - 3/0 AWG	
KSP	400	(1) #4 AWG to 600 KCMIL or (2) 1/0 AWG to 250 KCMIL	(6) 1/0 - 250 KCMIL	(5) #0 - 3/0 AWG	
	600	(2) #2 AWG to 600 KCMIL	(6) #4 - 600 KCMIL or (12) 1/0 - 250 KCMIL	(3) #4 - 600 KCMIL or (6) 1/0 - 250 KCMIL	

<sup>\*</sup> Use 60°C minimum wire for #14 to #1 AWG. Use 75°C minimum wire for 1/0 AWG and larger.

<sup>†</sup> Use copper wire only.

Environmental Specifications					
Operating Temperature   -20°C to 70°C (-4°F to 158°F)					
Storage Temperature	-40°C to 85°C (-40°F to 185°F)				
Humidity	5% to 95% noncondensing				

Input and Output Connection Specifications					
Component Wire Size Range					
Main board I/O terminals	#12-24 AWG				
I/O module terminals	#14-24 AWG				

Contact Ratings						
			Moto	r Load		
	Resistive Load	Inductive Load	NC	NO		
Engine Start Contacts	2 A @ 30 VDC	N/A	N/A	N/A		
Auxiliary Contacts, KSS (40-600A)	15 A @ 250 VAC	N/A	N/A	N/A		
Auxiliary Contacts, KSS (800-1000A)	15 A @ 480 VAC	15 A @ 250 VAC; 6 A @ 500 VAC	5 A @ 125 VAC; 3 A @ 250 VAC; 1.5 A @ 500 VAC	2.5 A @ 125 VAC; 1.5 A @ 250 VAC; 0.75 A @ 500 VAC		
Auxiliary Contacts, KSP	15 A @ 480 VAC	15 A @ 250 VAC; 6 A @ 500 VAC	5 A @ 125 VAC; 3 A @ 250 VAC; 1.5 A @ 500 VAC	2.5 A @ 125 VAC; 1.5 A @ 250 VAC; 0.75 A @ 500 VAC		

#### Codes and Standards

The ATS meets or exceeds the requirements of the following specifications:

- Underwriters Laboratories UL 508, Standard for Industrial Control Equipment
- Underwriters Laboratories UL 1008, Standard for Automatic Transfer Switches for Use in Emergency Standby Systems file #E58962 (automatic), #E86894 (nonautomatic)
- CSA C22.2 No. 178 certification available, file #LR58301
- NFPA 70, National Electrical Code
- NFPA 99, Essential Electrical Systems for Health Care Facilities
- NFPA 110, Emergency and Standby Power Systems
- IEEE Standard 446, IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
- NEMA Standard ICS 10-2005, Electromechanical AC Transfer Switch Equipment

- EN61000-4-4 Fast Transient Immunity Severity Level 4
- IEC 60947-6-1, Low Voltage Switchgear and Control Gear;
   Multifunction Equipment; Automatic Transfer Switching
   Equipment
- EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
- IEC Specifications for EMI/EMC Immunity:
  - CISPR 11, Radiated Emissions
  - o IEC 1000-4-2, Electrostatic Discharge
  - o IEC 1000-4-3, Radiated Electromagnetic Fields
  - o IEC 1000-4-4, Electrical Fast Transients (Bursts)
  - □ IEC 1000-4-5, Surge Voltage
  - o IEC 1000-4-6, Conducted RF Disturbances
  - IEC 1000-4-8, Magnetic Fields
  - o IEC 1000-4-11, Voltage Dips and Interruptions
- IEEE 472 (ANSI C37.90A) Ring Wave Test

#### **Weights and Dimensions**

Weights and dimensions are shown for transfer switches in NEMA type 1 and type 3R enclosures, and open units. Consult the factory for open units and other enclosures.

Note: Weights and dimensions are provided for reference only and should not be used for planning installation. See your local distributor for submittal drawings.

#### Standard-Transition Models

		Dimensions mm (in.)			Weight kg (lb.)		
Amps	NEMA Type	Height	Width	Depth *	2-Pole	3-Pole	4-Pole
40-225	1, 3R	791 (31.1)	450 (17.7)	316 (12.5)	28 (62)	30 (65)	31 (68)
260-400	1, 3R	1223 (48.1)	560 (22.0)	362 (14.3)	52 (115)	56 (123)	59 (131)
600	1, 3R	1702 (67.0)	610 ( <del>24.0)</del>	514 (20.2)	179 (395)	183 (403)	186 (410)
800	1, 3R	1932 (76.1)	864 (34.0)	515 (20.3)	N/A	226 (498)	236 (520)
1000	1, 3R	1932 (76.1)	864 (34.0)	515 (20.3)	N/A	231 (509)	241 (531)

<sup>\*</sup> Allow enough room to fully open the door for inspection and service per NEC and local codes. The NEMA type 3R enclosures have a security cover on the controller that extends 54 mm (2.1 in.) beyond the door.

#### **Programmed-Transition Models**

		Dimensions mm (In.)			1	Weight kg (lb.)	)
Amps	NEMA Type	Height	Width	Depth *	2-Pole	3-Pole	4-Pole
100-200	1, 3R	1223 (48.1)	560 (22.0)	362 (14.3)	52 (115)	56 (123)	59 (1 <b>31</b> )
400	1, 3R	1223 (48.1)	560 (22.0)	362 (14.3)	52 (115)	56 (123)	59 (1 <b>31</b> )
600	1, 3R	1702 (67.0)	610 (24.0)	514 (20.2)	179 (395)	183 (403)	186 (410)

Allow enough room to fully open the door for inspection and service per NEC and local codes. The NEMA type 3R enclosures have a security cover
on the controller that extends 54 mm (2.1 in.) beyond the door.

# Withstand and Close-On Ratings (WCR), Standard-Transition Models Ratings Summary

The transfer switch is rated for use on a circuit capable of delivering not more than the RMS symmetrical amperes listed at the specified maximum voltage below, but no greater than the interrupting capacity of the selected circuit breaker or fuse. Circuit breakers and fuses are supplied by the customer.

	With Current-Limiting Fuses			Coordinated er Rating, illowing tables)	Any Breaker Ratings †					
Switch Rating, Amps	Fuse Class	Maximum Circuit Amps at 480 VAC Maximum Circuit Amps at 480 VAC Voltage 480 VAC		Maximum Voltage	Maximum Circuit Amps at 480VAC	Time Duration (sec. maximum				
40-225	J	200,000	480 V	30,000	480 V	10,000	0.025			
260	N/A	N/A	480 V	35,000	N/A	N/A	N/A			
400	J	200,000	480 V	50,000	480 V	35.000	0.050			
400	RK5, RK1	100,000	460 V	30,000	460 V	35,000	0.050			
600	N/A	N/A	480 V	50,000	N/A	N/A	N/A			
800 1000	L	200,000	480 V	65,000	N/A	N/A	N/A			

<sup>\*</sup> All values are available symmetrical RMS amperes and tested in accordance with the withstand/closing requirements of UL 1008.

<sup>†</sup> Applicable to breakers with instantaneous trip elements.

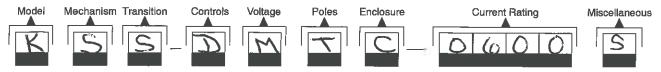
## Ratings with Specific Manufacturers' Circuit Breakers, Standard-Transition, continued

	Molded-Case Circuit Breakers							
Switch Rating, amps	WCR, amps RMS	Voltage, Max.	Manufacturer	Туре	Max. Size			
				FDC, HFD	225			
				HJD, JDC, JGC, JGU, JGX	250			
			Eaton/	CHKD, CHLD4, CHMDL4, CLDC4, CMDL4, HKD, HLD4, HMDL4, KDC, LDC4, MDL4, NB TRIPAC	400			
			Cutler-Hammer	CHLD6, CHMDL6, CMDL6, HLD6, HMDL6, LCDC6, LDC6, MDL6, NB TRI-PAC	600			
	İ			CHMDL8, CMDL8, HMDL8, MDL8, NB TRI-PAC	800			
				JJ, JL, JR	250			
			Schneider/	LJ, LL, LR	400			
400	50,000	480	Square D	LJ, LL, LR	600			
400	30,000	400		MJ, PJ, PK, PL, RJ, RK, RL	800			
				CFD6, HFD6, HFXD6, HHFD6, HHFXD6	250			
				CJD6, HHJD6, HHJXD6, HJD6, HJXD6, SCJD6, SHJD6	400			
			ITE/Siemens	CLD6, HHLD6, HHLXD6, HLD6, HLXD6, SCLD6, SHLD6	600			
				CMD6, HMD6, HMXD6, MD6, MXD6, SCMD6, SHMD6, SMD6	800			
				FEH, FEL, FEN, SFL, SFP	250			
				FGH4, FGL4, FGP4, SGL4, SGP4, TB4, THLC4, TJL4, TLB4	400			
			General Electric	FGH6, FGL6, FGN6, FGP6, SGL6, SGP6, TB6, TJL6				
			SKH8, SKL8, SKP8, TB8	800				
				HJD, JDC, JGC, JGH, JGU, JGX	250			
			Eaton/	CHKD, CHLD4, CHMDL4, CLDC4, CMDL4, HKD, HLD4, HMDL4, KDC, LDC4, MDL4, NB TRI-PAC	400			
			Cutler-Hammer	CHLD6, CHMDL6, CMDL6, HLD6, HMDL6, LCDC6, LDC6, MDL6, NB TRI-PAC	600			
				CHMDL8, CMDL8, HMDL8, MDL8, NB TRI-PAC	800			
				JJ, JL, JR	250			
			Schneider/	LJ, LL, LR	400			
			Square D	LJ, LL, LR	600			
600	50,000	480		MJ, PJ, PK, PL, RJ, RK, RL	800			
				CFD6, HFD6, HFXD6, HHFD6, HHFXD6	250			
			_	CJD6, HHJD6, HHJXD6, HJD6, HJXD6, SCJD6, SHJD6	400			
	i		ITE/Siemens	CLD6, HHLD6, HHLXD6, HLD6, HLXD6, SCLD6, SHLD6				
				CMD6, HMD6, HMXD6, MD6, MXD6, SCMD6, SHMD6, SMD6	800			
				FEH, FEL, FEN, SFL, SFP	250			
				FGH4, FGL4, FGP4, SGL4, SGP4, TB4, THLC4, TJL4, TLB4	400			
			General Electric	FGH6, FGL6, FGN6, FGP6, SGL6, SGP6, TB6, TJL6	600			
				SKH8, SKL8, SKP8, TB8	800			
			Eaton/	TRI-PAC NB, CHMDL, HMDL, CHND, HND, NDC, CNDC	800			
			Cutter-Hammer	TRI-PAC NB, CNDC, NDC, CRDC, TRI-PAC PB, RDC, CHND, HND	1200			
			Sch <b>ne</b> ider/	MH, MH SERIES 2				
200			Square D	MH SERIES 2	1000			
800	65,000	480		CMD6, HMD6, SCMD6, SHMD6, CND6, HND6, SCND6, SHND6, CPD6	800			
1000			ITE/Siemens	CND6, HND6, SCND6, CPD6, SHND6	1200			
			General Electric	TB8, TC, THC, THP, TKL85, SKL8, SKP8, MICROVERSA TKL 12S, SKL12, SKP12	800			
			GOIDIAI LICUIIC	THC, THP, SKP12, TRP, MICROVERSA TKL, SKL12	1200			

KOHLER CO., Kohler, Wisconsin 53044 USA Phone 920-457-4441, Fax 920-459-1646 For the nearest sales and service outlet in the US and Canada, phone 1-800-544-2444 KOHLERPower.com

Kohler Power Systems Asia Pacific Headquarters 7 Jurong Pier Road Singapore 619159 Phone (65) 6264-6422, Fax (65) 6264-6455

#### **Model Designation**



Record the transfer switch model designation in the boxes. The transfer switch model designation defines characteristics and ratings as explained below.

Sample Model Designation: KSP-DCTA-0100S

#### Model

K: Kohler Transfer Switch

#### Mechanism

S: Specific-Breaker Rated

#### Transition

S: Standard

P: Programmed

#### Controls

D: MPAC 1500

Microprocessor Controls, Automatic

MPAC™ 1500

Microprocessor Controls, Non-Automatic

#### Voltage/Frequency

C: 208 Volts/60 Hz

D: 220 Volts/50 Hz

F: 240 Volts/60 Hz

G: 380 Volts/50 Hz

H: 400 Volts/50 Hz

J: 416 Volts/50 Hz

K: 440 Volts/60 Hz

M: 480 Volts/60 Hz

P: 380 Volts/60 Hz

R: 220 Volts/60 Hz

#### Number of Poles/Wires

N: 2-pole, 3-wire, solid neutral T: 3-pole, 4-wire, solid neutral

V: 4-pole, 4-wire, switched neutral

#### **Enclosure**

A: NEMA 1† D: NEMA 4 **B: NEMA 12** F: NEMA 4X C: NEMÁ 3R G: Open unit

\* NEMA1 enclosure is standard. Other types are available to order.

Current Rating: Numbers indicate the current rating of the switch in amperes:

0040 ± 0200 0600 0080 0 0225 3 0800₽ 0260 ‡ 0100 1000± 0150 \$ 0400

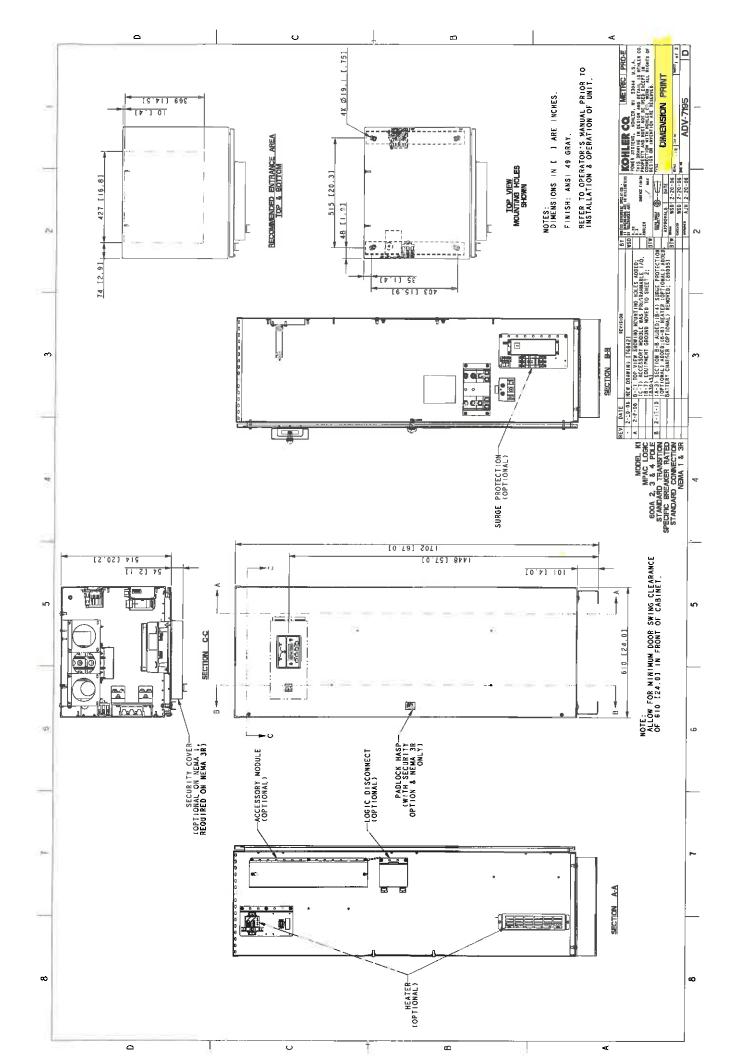
\* Standard-transition models only.

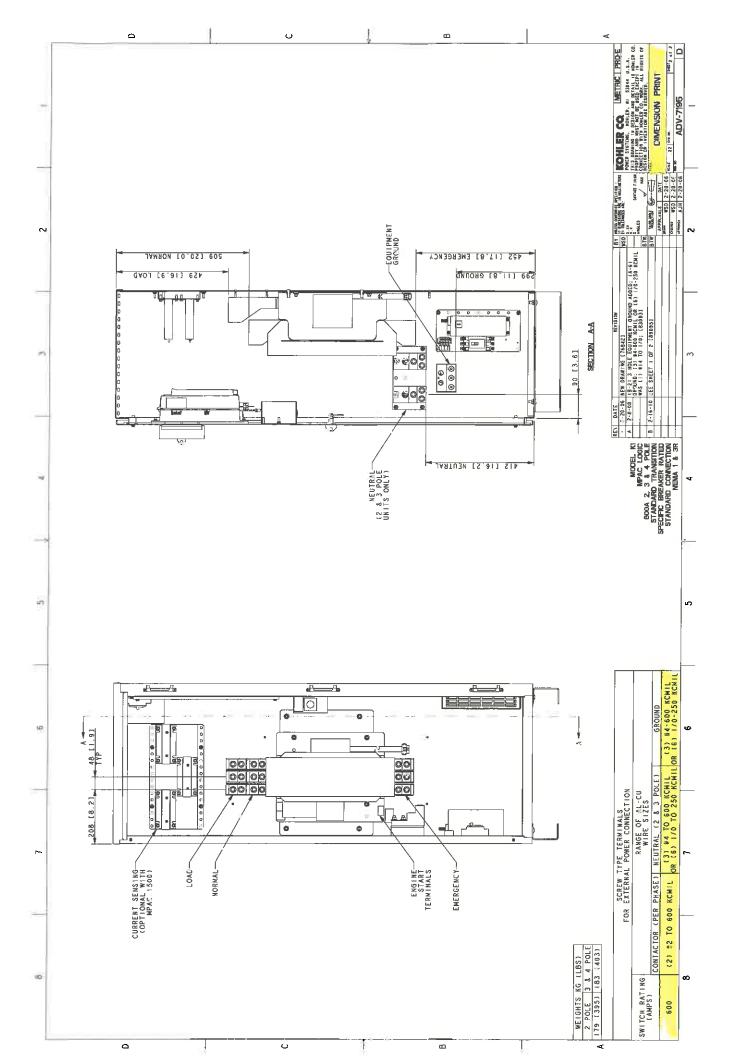
#### Miscellaneous

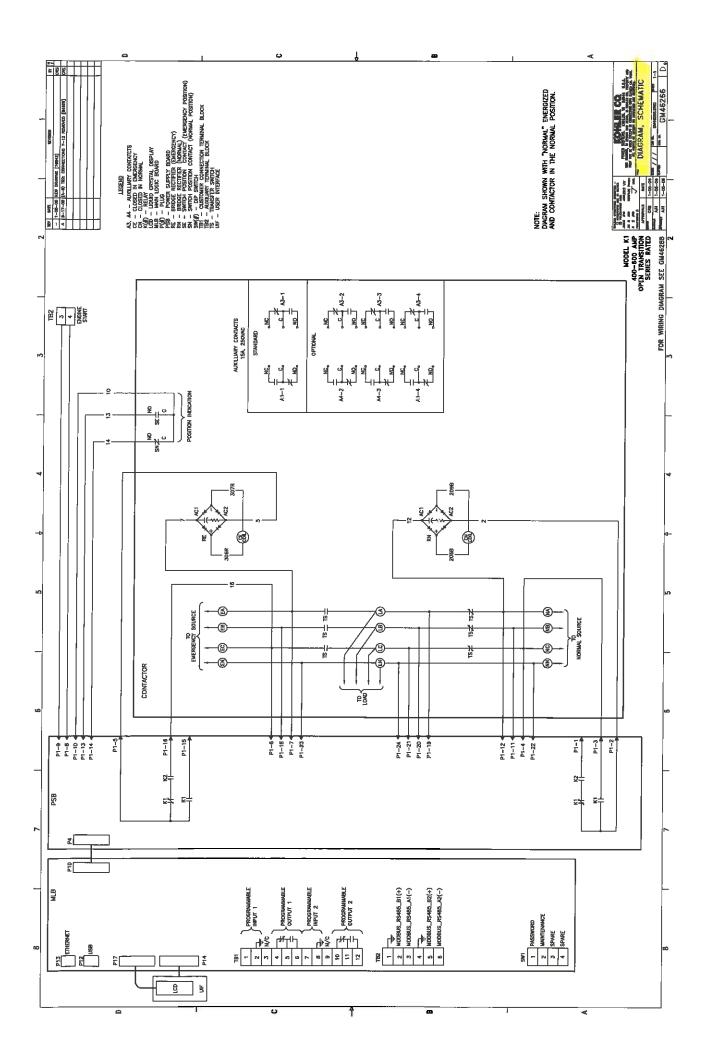
S: Standard Connections

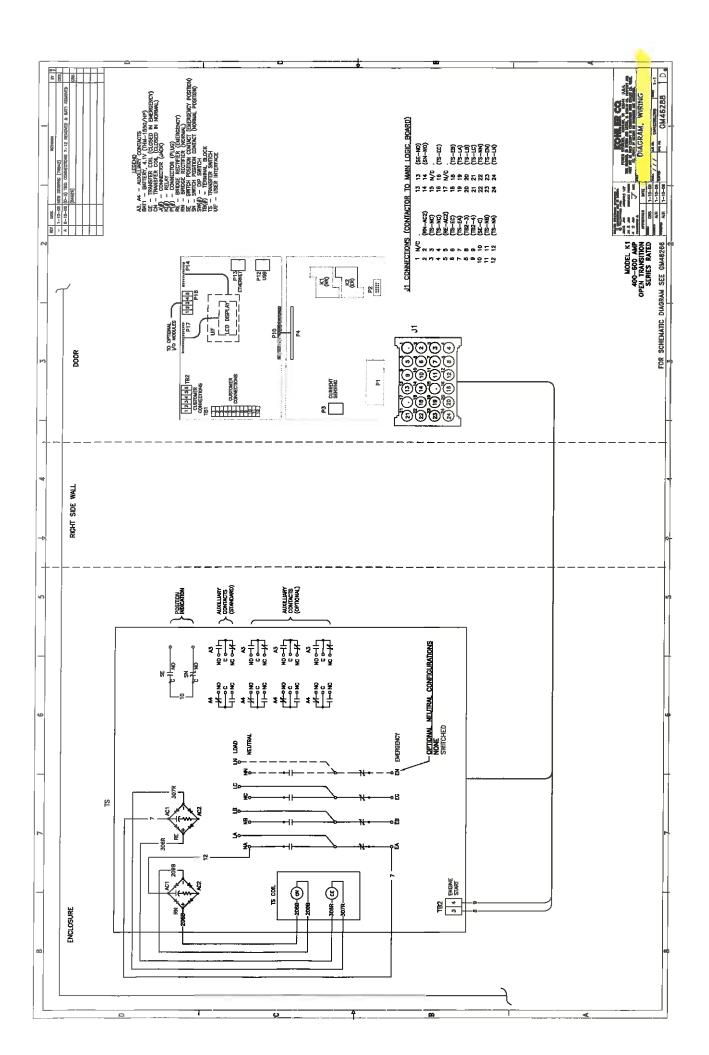
Availability is subject to change without notice. Kohler Co. reserves the right to change the design or specifications without notice and without any obligation or liability whatsoever. Contact your local Kohler® Power Systems distributor for availability.

DISTRIBUTED BY:		









# **Extended Five-Year or Three Thousand (3000)-Hour Comprehensive Stationary Standby Limited Warranty**

This Kohler Standby Generator System has been manufactured and inspected with care by experienced craftsmen. If you are the original purchaser, Kohler Co. warrants for five years or three thousand (3000) hours, whichever occurs first, that the system will be free from defects in material and workmanship if properly installed, maintained, and operated in accordance with Kohler Co.'s instruction manuals. A Kohler distributor, dealer, or authorized representative must perform startup.

This warranty is not effective unless a proper extended warranty registration form and warranty fee have been sent to Kohler Co. within one year of supervised startup.

During the warranty period, repair or replacement at Kohler Co.'s option will be furnished free of charge for parts, provided an inspection to Kohler Co.'s satisfaction discloses a defect in material and workmanship, and provided that the part or parts are returned to Kohler Co. or an authorized service station, if requested. This extended warranty expires five full years after date of startup or after 3000 hours of operation, whichever occurs first.

This warranty does not apply to malfunctions caused by damage, unreasonable use, misuse, or normal wear and tear while in your possession.

The following will not be covered by this warranty:

- Normal engine wear, routine tuneups, tuneup parts, adjustments, and periodic service.
- Damage caused by accidents, improper installation or handling, faulty repairs not performed by an authorized service representative, or improper storage.
- Damage caused by operation with improper fuel or at speeds, loads, conditions, modifications, or installation contrary to published specifications or recommendations.
- 4. Damage caused by negligent maintenance such as:
  - Failure to provide the specified type and sufficient lubricating oil
  - Failure to keep the air intake and cooling fin areas clean.
  - c. Failure to service the air cleaner.
  - d. Failure to provide sufficient coolant and/or cooling air.
  - Failure to perform scheduled maintenance as prescribed in supplied manuals.
  - f. Failure to exercise with load regularly.
- 5. Original Installation charges and startup costs.
- Starting batteries and the following related expenses:
  - a. Labor charges related to battery service.
  - b. Travel expense related to battery service.

- Engine coolant heaters, heater controls, and circulating pumps after the first year.
- Rental of equipment during performance of warranty repairs.
- Non-Kohler-authorized repair shop labor without prior approval from the Kohler Co. Warranty Department.
- Parts purchased from sources other than Kohler. Replacement of a failed Kohler part with a non-Kohler part voids warranty on that part.
- 11. Radiators replaced rather than repaired.
- Fuel injection pumps not repaired locally by an authorized servicing dealer.
- 13. Engine fluids such as fuel, oil, or coolant/antifreeze.
- Shop supplies such as adhesives, cleaning solvents, and rags.
- Expenses incurred investigating performance complaints unless the problem is caused by defective Kohler materials or workmanship.
- Maintenance items such as fuses, filters, spark plugs, loose/leaking clamps, and adjustments.

A Startup Notification form must be on file at Kohler Co. A Startup Notification form must be completed by Seller and received at Kohler Co. within 60 days after the date of initial startup. Standby systems not registered within 60 days of startup will automatically be registered by Kohler Co. using the Kohler Co. ship date as the startup date.

To obtain warranty service, call 1-800-544-2444 for your nearest authorized Kohler service representative, or write Kohler Co., Generator Service Department, Kohler, WI 53044 USA.

KOHLER CO. SHALL NOT BE LIABLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND including, but not limited to, incidental consequential labor costs, installation charges, telephone charges, or transportation charges in connection with the replacement or repair of defective parts.

This is our exclusive written warranty. We make no other express warranty, nor is anyone authorized to make any in our behalf.

ANY IMPLIED OR STATUTORY WARRANTY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS OF PURCHASE, is expressly limited to the duration of this warranty.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.



KOHLER CO. Kohler, Wisconsin 53044 Phone 920-565-3381, Fax 920-459-1646 For the nearest sales/service outlet in the US and Canada, phone 1-800-544-2444 KohlerPowerSystems.com



Customer lac Ops Readiness Location	Date Date
1.41111/11/1	1 P A B R
Address 2051 National Gaurd Dr. Mornis	sville, NC, 27560
Type of Equipment KON It	2 /
Eqpt S/N SGM 32B 56 Z Eqpt M/N 350 REO	ZJ SOUR CANTIEL EN
Eng S/N RG 013 32 0285 // Fng M/N 6/35 // F	485
X-Fer Switch S/N SGM 329 RH7 M/N KSS-D	MTC- 0600-Spec
Type Repair Emergency Quoted Other	
Complaint Start vo.	<del></del>
Cause	
Correction Checked Fluid Levels Pur	
	attery charger heads.
	sted Saffey Shut downs.
Out Generator Through 2 Hour	Load Bank.
	M.PAC 1500 Controller
Bridge keetities and Coil all	Damaged. Trouble shoot
1975. Checked Contactor Found 1	othing William . Checker
Additional Repairs Needed ATS Harness wring.	round Nothing Wan
Need To replace MPAC 1500 2	Bridge Rectifiers and
Co.l.	J. S. Y. S. J. Unia
	111687
Materials Removed from Site Customer Sic	PANKI H
Outside Oil	
Used oil qty. Used Antifreeze qty.	Name
	Title
	P.O. #
Service Tech	nician
Method of Payment Account Credit Card	
Credit Card Information	
Is repair Complete Yes No	
Emergency S/B Generator System left operational: YesNo	
System left in Automatic Mode Yes No Break	er Closed Yes No
	•
Signed Title_	Date
Purchase Order No.	



14240 South Lakes Drive Charlotte, NC 28273 866-766-4966 704-588-1043 Fax 704-588-8373

#### LOAD BANK TEST REPORT

NAME:	SS:	Ta. 205 Me	c Ops	tional C le, NC,	iness Fourd Dr 27560	DATE:		9-14 9E0ZS
TIME TI STARTE			115			S/N #:		32856Z
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1115 1136 11-15 1200 1215 1330 12-14 1300 1315	100% 100% 100% 100% 100% 100% 100%	350 350 350 350 350 350 350 350	415 415 415 415 415 415 415 415 415	480 480 480 480 480 480	60 60 60 60 60 60 60	47 41 41 41 41 41 41	174 180 180 180 180 180 180	
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		1		/				·
CUSTOM	ER:			/ <del>                                     </del>	TECHI		Marion Sosh 7	



Customer NC National Gran	Location	Date 8-14-14
Contact	Phone	DON 14-16951
Address 2051 National Gua	d No. Marcis Ville	Vc 27560
	•	
Eqpt S/N SGM 328562 Eq	DI M/N 350 REOZ 5	
Eng S/N R66/35/028571 En	RMN 6/35 HF485	og Spec
X-Fer Switch S/N J-M 329 RH7	MIN NSS-DMTC-06005	Space
	oted Other	Spec
Complaint Faish Start up.		
Cause		
Correction 1. Hed Power To	ATS. Gemoved an	1 Replaced
MCAC 'SDJ. Had To 1	cogram New MPAC	1500 Parayal
and Replaced 2 Boid	ye Rectifiers Also	Replaced Col
	ntor wires Landed	
	se Rotation Clock	D+ 1/1
	st and Power O.	1 I
	70000	nage.
Additional Repairs Needed	· · · · · · · · · · · · · · · · · · ·	
		1001
Materials Removed from Site	Customer Signature	
Used oil qty.	Name	NN HTOT
Used Antifreezeqty.	Title	UNIA- KAD CONST
Used Bateriesqty.	P.O. #	
•	Service Technician	
Method of Payment Account Cre		
Credit Card Information		
Is repair Complete Yes No		
Emergency S/B Generator System left operational:	Yes No	
System left in Automatic Mode Yes		es No
Signed	Title	Data
Purchase Order No.		Date
	·	

# **KOHLER.**POWER SYSTEMS

### **Startup Notification**

Follow the startup checklist on the back of this form. Then complete the form. This form is required for coverage under the Kohler limited warranty and must be completely filled out at the time of initial startup. Representatives of the distributor/dealer and owner must sign the notification form. **Signing this form represents acceptance of the unit and that all information on the startup form is correct.** Please submit registration to Kohler Co. using the online warranty processing system. Users that do not have access to the online warranty site should mail a copy to Kohler.

Startup Date
mo. 8 day 14 yr. 14

warranty site should	d mail a copy to Kohler.			A STATE OF THE PARTY OF THE PAR						
Authorized K	older Teprocentative	Partonia	<b>Start</b> yp		Owner Name/Un	it Location				
Telephone				Telephone	the state of the s	Annual Control of the				
Company Name	Saci's			Company Name	Owner	8				
NIXON IOW	iel service	5		NC /	lational Gu	ard				
3101 You	ver Service Kmont Rd			2051	National Gui	ad Do				
charlot				City	risville	W SI				
State	·			State		<del> </del>				
NC				^	10					
ZIP/Postal Code 28	208			ZiP/Postal Code	27560					
Country	5			Country	US					
					from nearest authorized Kohler tor/dealer to the power system equipme	rit:				
		Meraly S	and Eng	ine Nameplate	Information					
	Generator 5	et. No 1	Eng	jine No. 1	Generator Set No. 2	Engine No. 2				
Serial No.	SGM 32	356Z	RG 61	35L02857	64.0285W					
Model No.	350 RE0	23	6/35 H	F486						
Spec. No	GM 7615									
			in hone iter	n to each colu	no must be checked)					
Industrial Residential/Comm			e/Towable/Tra		☐ Prime					
					☐ Rental ☐ Standby	-				
		fer Switch	and Switc	hgear Namepia	ne information.					
	ATS No. 1	AT	S No. 2	ATS No. :	ATS No. 4	Switchgear				
Serial No.	56M329RH7									
Spec. No	KSS- DMTC- 0	6005								
Contractor Serial No.	1682562-			1						
Model No.		الالاث		A Harrison						
Kohler Representative's N				Owner Representati	ive's Name (print)					
Soshua	Tenkate			DAN	1/800- KAD	LONST.				
Cohler Representative's	Signature and Date			- NATE:	itive's Signature and Date					
// A	mo.	8 day /	4 4 /4	24	PIL	mo. <u>8 day 14 yr. 14</u>				
4 1/					1					

Form Distribution: Warranty Department, MS 072, Kohler Co., Kohler, WI 53044

PINK copy: Distributor

YELLOW copy: Owner's Representative

# **Fuel System**

# **NC National Guard TAC OPS**

KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/5/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

Supplier: Vital Fuel Systems

Manufacturer: OPW, Morrison, Pryco, FPI

**Specification:** Fuel System

Submittal #: 1

\boldsymbol{X}' APPROVED """

""""APPROVED AS NOTED

"""REVISE AND RESUBMIT



REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY ERRORS THEREIN OR FOR FURNISHING THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC.

DATE 2-24-14 BY Nixon

KAD Construction, Inc.						
X	Approved					
	Approved as noted					
	Revised & Resubmit					
Signature:	Dan Hyatt					
Title:	Owner					
Date:	Feb 05, 2014					



#### vitalfuelsystems.com

(Formerly Petroleum Equipment Solutions, Inc.) Why did we change our name?

Project: National Guard TAC OPS Center Power Upgrades

Morrisville, NC

Date: January 16, 2014

Section: Drawings NGM-E4, NGM –E6

#### **Submittal**

#### Equipment:

- (1) OPW TSD-4536 HDPE Tank Sump
- (1) OPW SMF-4E Tank Sump Mounting Fitting
- (1) Morrison 318L-3800AM Lightweight Manhole
- (1) Pryco Weatherproof Pump Control Panel with UL-508 Listing, 120VAC, with Pump Hand-Off-Auto Switch, Power Available Indicator Light, Low Fuel Level Indicator and Alarm, Critical High Level Alarm with Contacts for Engine shutdown, Base Tank Float Switches, Alarm Silence Pushbutton, Leak Alarm
- (1) 120VAC 2GPM Supply Pump in weatherproof NEMA 3R Enclosure (mounted outside the generator enclosure)
- (1) FPI LD-BB15 Leak Switch (located in new tank top sump)
- (1) Morrison 334-0200 1" Foot Valve
- (4) Morrison 691-0500 1" Full Port Ball Valve
- (1) Morrison 691-0700 1-1/2" Full Port Ball Valve

#### Aboveground Piping:

Schedule 40 Black Steel Pipe A53, Type E, Grade B with Class 150 Threaded Fittings <u>Underground Piping:</u>

OPW Flexworks UL-971 Listing Double-wall HDPE Underground Flexible Fuel Piping 1" Supply line

1-1/2" Return Line (Gravity Overflow)

Tim Horton (919) 629-8174 (Direct) (919) 303-7374 (Main) thorton@vitalfuelsystems.com







# Medium Bury (TSM) Shallow Bury (TSS) A A A C C C C C C D E D E

#### Polyethylene Tank Sumps with Mechanically Fastened Covers

#### **Features & Benefits:**

- Long-Term Watertight Performance/ Strength & Rigidity – one-piece design provides reliable watertight integrity and long product life. Designed to resist deformation under burial and high water table forces.
- Installation Flexibility multiple flats provide maximum area for locating pipe entries.
- Easy Field Height Adjustability –
   the special ribbed height adjustment
   design makes adjustments to finished
   grade, if necessary, quick and easy.

#### **Replacement Parts & Accessories**

Part Number	Description
H13257M	Knob
H13213M	Bracket
H13214M	Seal 33" (838 mm)
H13215M	Seal 39" (991 mm)
C04420M	Ring 33" (838 mm)
C04432M	Ring 39" (991 mm)
D02025M	Cover 33" (838 mm)
C02034M	Cover 39" (991 mm)
CLC-33	Latched Fiberglass Tank Sump Lid

#### **Ordering Specifications - Polyethylene Tank Sumps (with Mechanically Fastened Covers)**

	Dimensions									Sump Base Burial Depth				Weight				
Part #	Application	Manway Diameter		A Cover		B Height		Сх	C x D Panel		E Base		max.		min.			
		in.	mm	in.	mm	in.	mm	in.	mm		in.	mm	in.	mm	in.	mm	lbs.	kg
TSS-4536	Tank Sump Shallow Bury, 36" x 45"	36	914	33	838	34	864	12 x 12	305 x 305	12	45	1,143	39	991	28	711	84	38
TSM-4536	Tank Sump Medium Bury, 36" x 45"	36	914	33	838	39	991	17 x 12	432 x 305	12	45	1,143	44	1,118	33	838	86	40
TSM-4842	Tank Sump Medium Bury, 42" x 48"	42	1,066	39	991	39	991	17 x 11	423 x 279	14	48	1,219	44	1,118	33	838	88	40
TSD-4536	Tank Sump Deep Bury, 36" x 45"	36	914	33	838	51	1,295	17 x 11	423 x 279	14	48	1,219	56	1,422	33	838	90	41
TSD-4842	Tank Sump Deep Bury, 42" x 48"	42	1,067	39	991	51	1,295	17 x 11	432 x 279	14	48	1,219	56	1,422	33	838	92	42

# **Tank Sump Mounting Flanges**

FlexWorks tank sump mounting flanges are used to mount FlexWorks tank sumps to 4" and 6" underground storage tank bung fittings. Flange top models (SMF-6) provide added flexibility in positioning of pump or extractor outlets. First, the riser or extractor is threaded into the top flange. The top flange is then oriented and bolted to the mounting flange.

Our No-Bolt style mounting flange, model TFA-4090, is also used to mount FlexWorks tank sumps to 4" underground storage tank bung fittings and attaches to the bottom of the sump base to provide a secure and liquid tight connection. This model has compression studs for added stability and fast and easy installation with a socket wrench.

#### **Tank Manway Adaptors**

FlexWorks Tank Manway Adaptors are used to mount tank sumps to a tank's outward flanged manway. This adaptor attaches to the tank's manway and compresses the fabricated sump base and gasket between two steel compression rings.

#### **Sump Inspection Ports**

FlexWorks optional sight glass kits include urethane sealant (SL-1100).



#### **Ordering Specifications - Tank Fitting Adaptor**

Part #	Application
TFA-4090	4" Tank Fitting Adaptor, No Bolt Style
SMF-4E	4" Tank Fitting Adaptor, Bolt Style
SMF-4EFT	4" Tank Fitting Adaptor, Bolt Style, Extended Flange
SMF-6	6" Tank Fitting Adaptor, Bolt Style
SMF-4E	4" Tank Fitting Adaptor, Bolt Style

#### **Ordering Specifications - Tank Manway Adaptor**

Part #	Application
TMA-2224	Tank Manway Adaptor (22 inch)
TMA-2424	Tank Manway Adaptor (24 inch)

#### **Ordering Specifications - Sump Inspection Port**

Part #	Application	
SIP-4	4" Sump Inspection Port	



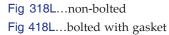
The complete Environmental System for underground fuel transfer and containment for the 21st century.

# **Manholes**

#### 318L /418L

#### **Lightweight Manhole**

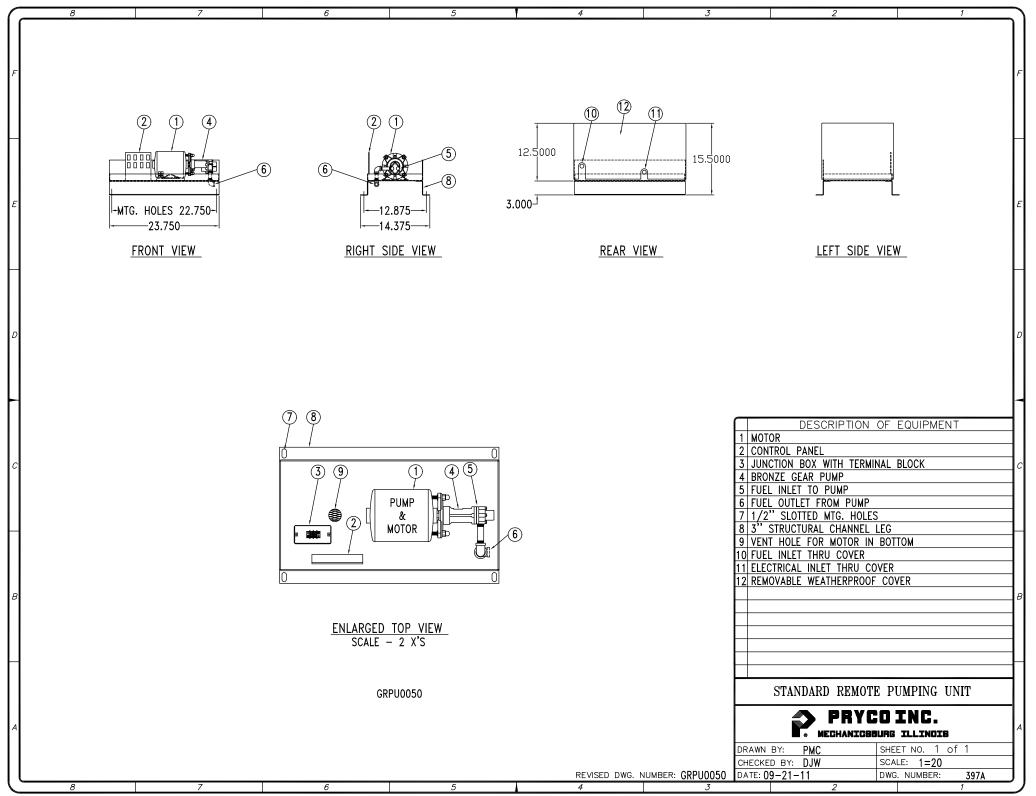
A lightweight, large diameter cover that is as strong as steel and reasonably priced. For use on service station drives. Meets H-20 load requirements. Epoxy coated recessed stainless steel handle that can be key or hand lifted. The manhole also has a slip resistant surface and is fire resistant. Lab tested in all weather and seasonal conditions for maximum strength and corrosion resistance. A stainless steel pryplate is standard as a cover removal option in the 318L.

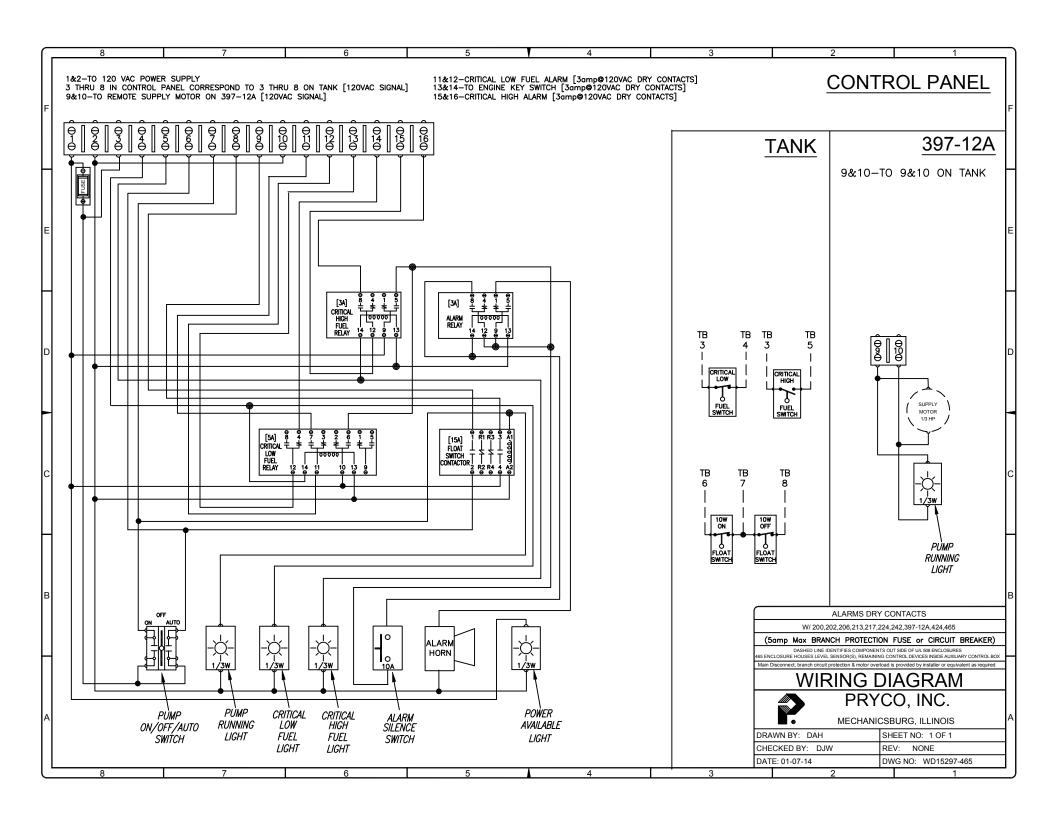




Style	Size* & Description	Weight	Weight	Minimum ID	Skirt ID	Cover Diameter	Overall
		(Complete)	(Cover Only)				Height
318L	38" x 10" Non-bolted	125 lbs	55 lbs	36 <sup>5</sup> / <sub>16</sub> "	36 <sup>11</sup> / <sub>16</sub> "	38 <sup>7</sup> / <sub>8</sub> "	12"
318L	38" x 18" Non-bolted	157 lbs	55 lbs	36 5/16"	36 11/16"	38 7/8"	20"
318L	44" x 10" Non-bolted	172 lbs	89 lbs	42 <sup>5</sup> / <sub>16</sub> "	42 11/16"	44 <sup>7</sup> / <sub>8</sub> "	12 ½"
318L	44" x 18" Non-bolted	188 lbs	89 lbs	42 5/16"	43"	44 7/8"	20"
418L	38" x 10" Bolted w/gasket	111 lbs	55 lbs	34 13/16"	36 11/16"	38 <sup>7</sup> / <sub>8</sub> "	12"
418L	44" x 10" Bolted w/gasket	168 lbs	89 lbs	40 13/16"	42 11/16"	44 7/8"	12 ½"
418L	44" x 18" Bolted w/gasket	188 lbs	89 lbs	40 13/16"	42 11/16"	44 <sup>7</sup> / <sub>8</sub> "	20"

<sup>\*</sup>Size: Approximate cover diameter x skirt length

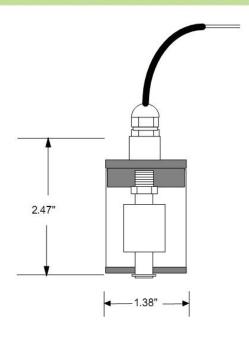






## **Specification Sheet**

#### **LD-FPI-BB15 Leak Detection**



#### SPECIFICATIONS:

STEM MATERIAL: Brass FLOAT: 1" x 1" Buna SHROUD: Brass

SWITCH: 50 watt, SPST

SWITCH OPERATION: N.O. reversible to N.C.

WIRING: 2 Wire PVC Cable

Black and Red, 22 Gauge Wire, 15 Feet

MAXIMUM OPERATING TEMP: 180° F

MAXIMUM OPERATING PRESSURE: 150 PSI





#### **Common Options:**

- Lead Length
- SPDT Switch
- Thermocouple

Do you need something to be different? No problem, call or email and let us know how we can modify this product to meet your exact requirements. Modified products typically ship in 3 days.

1-09



# Tank Equipment

#### 334 Series

# Single Poppet Foot Valve

Installed at the inlet of a suction line normally at the bottom of the storage tank. Contains a poppet and functions like a check valve to hold prime on a pump. Metal-to-metal seat and screened inlet.



Fig. 334

Fig. 334BP...vertical check valve with 1/8" port hole. Only available in  $1\frac{1}{2}$ ".

#### **Construction Details**

Body, seat and poppet...brass Screen...20 mesh stainless steel

Size	Weight		
3/4"	1.00 lbs		
1"	1.25 lbs		
11/2"	2.50 lbs		
2"	4.75 lbs		

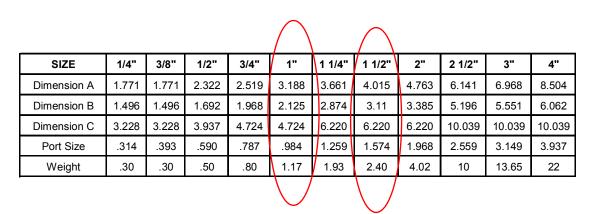
В

 $\mathbf{C}$ 

Α

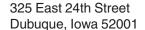
# Specifications —

- Hot forged brass body
- Hard chrome-plated ball
- Blowout proof stem
- · Teflon seals
- Dacrotized carbon steel handle with PVC grip Fig. 691B handle is lockable
- UL listed for use with flammable liquids (Subject YRBX, YRBX7)
   Sizes 1/4"—2" 600 psig, Sizes 2 1/2"—4" 450 psig
- UL listed for LP-gas shut-off (Subject YSDT, YSDT7)
   Sizes 1/4"—2" 600 psig, Sizes 2 1/2"—4" 450 psig
- AGA approval on 1/4"—4" sizes
- Meets WW-V-35
- Threads NPT ANSI B.1.20.1
- Temperature range -40° to 350°F
- FM approval 1/4"—2"
- CSA approval
- STI UL2244 listing



Note: All dimensions are in inches except weight which is in pounds.





Ph: 800.553.4840 Fax: 563.583.5028





# Introducing Next Generation OPW FlexWorks Pipe

# Why a new pipe?

OPW Fueling Containment Systems has developed a Next Generation FlexWorks Pipe in response to the voice of the customer. You asked and we delivered! The new pipe is more flexible, lighter and has reduced memory.

#### **UL APPROVALS**

- Motor Vehicle Fuels
- **Migh Blend Fuels**
- Concentrated Fuels
- Aviation and Marine

Lighter,
More Flexible, Easier
to Install, UL Approved
for All Fuels

# What makes this pipe so different?

- Increased Pipe Flexibility the force required to bend the pipe has been reduced to facilitate piping layout. This makes installation quicker and easier, especially in cold weather.
- Pipe Weight has been reduced to facilitate shipping and handling
- Pipe Memory Inherent pipe memory has been reduced significantly to facilitate connection of pipes inside sumps
- Redesigned Profile for Enhanced Leak Detection Performance
- Next Generation Enhanced KYNAR Liner

Leading The Way Since 1892



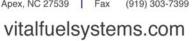
#### **Product Line-Up**

- Double wall 3/4", (1", 1-1/2",)2", and 3".
- Vapor & vent single and double wall 2" & 3".



OPW Fueling Containment Systems 3250 US 70 Business West Smithfield, N.C., 27577-0330 Customer Service: 1-800-422-2525 Customer Service Fax: 1-800-421-3297 Technical Service: 1-866-547-1816

www.opwfcs.com





#### **Operation / Maintenance Information Diesel Fuel Storage/Delivery System**

**Customer: KAD Construction** 

5132 Departure Dr. Raleigh, NC 27616

Date: July 22, 2014

**Project: National Guard TAC OPS Center Power Upgrades** 

2051 National Guard Dr. Morrisville, NC 27560

#### **Contents**

System Overview

Control Pump and Alarm Panel

Supply Pump

Fuel Maintenance Sheet

Warranty

Tim Horton

919-629-8174



#### vitalfuelsystems.com



#### **System Overview**

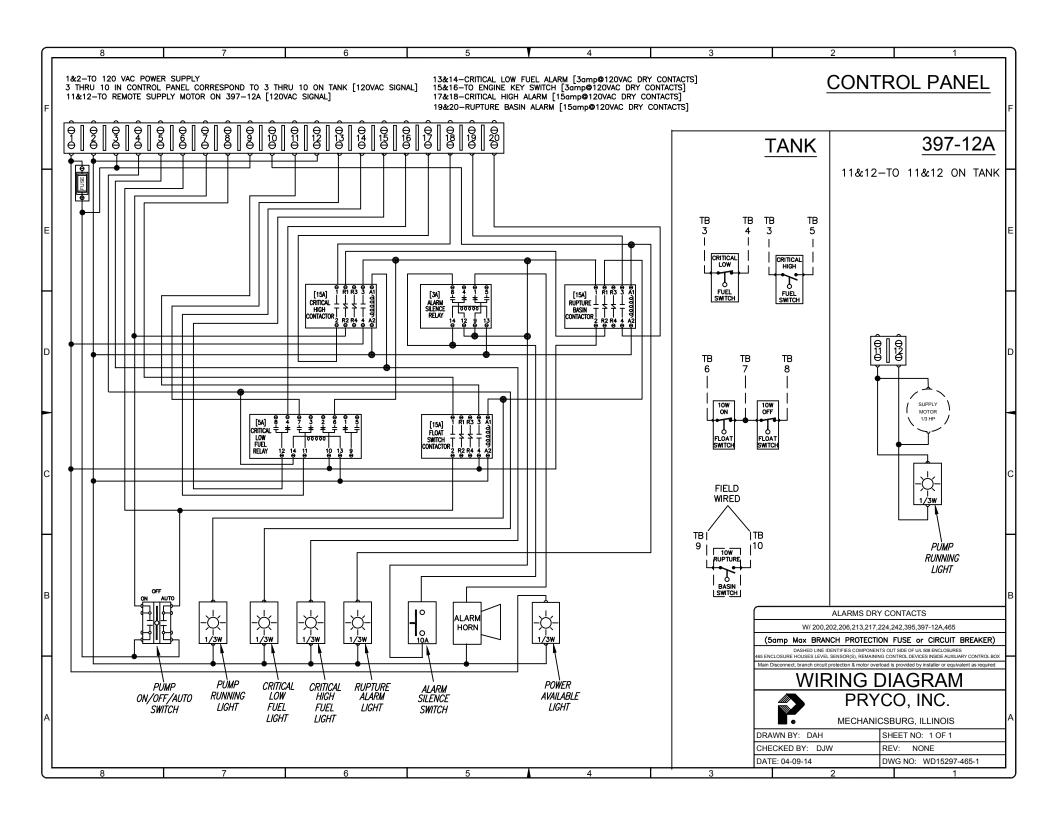
#### **Pump Control and Alarm Panel:**

The generator base tank system has a Pryco pump control and alarm panel with alarm indications for Critical High', 'Low', and 'Tank Leak'. This panel requires access to a 110-volt power source. Pump automatically refills the generator base tank.

#### **Supply Pump:**

Fuel is pumped from the tank using a 2 gpm positive displacement gear pump. There is a Day Tank overflow gravity return line supplied that is sized to exceed the capacity of the supply pump.







Telephone: 217 / 364-4467 Fax: 217 / 364-4494

# OPERATIONS AND MAINTENANCE MANUAL For PUMP SETS

#### WHAT TO DO FIRST

Upon receiving your new pump set system equipment, always check for physical signs of damages before signing the bill of lading. Inspect for possible damage that might have occurred during shipment. All products are inspected at point of shipment to ensure they are free of any defects. Dropping and other rough handling in transit could place stress or break welds and plumbing joints that will result in a failure. Check to ensure the system equipment arrives in good condition.

#### THEN

Always have the fuel system installed by trained, authorized personnel. Remove shipping plugs from all connection fittings. Check to ensure any overflow line is continuous to the main storage tank without valves and traps (NFPA 37). Pryco fuel systems are designed for open venting. Make sure the vents are properly installed and unobstructed. Before starting the system, perform a final check of all pipe fittings for tightness. <a href="IMPORTANT - Always clear fuel lines of debris resulting from pipe cutting and threading and other installation processes.">IMPORTANT - Always clear fuel lines of debris resulting from pipe cutting and threading and other installation processes.</a> Failure to do so may result in fuel contamination that will injure injectors and other engine components.

#### **FINALLY**

Record your model and serial numbers here and save this manual. The model and serial numbers are located on the embossed tag inside the electrical enclosure cover located at the upper right-hand corner of the pump set.

Model:	Install Date:	
Serial Numbers(s)		

#### **FACTORY TESTING PROCEDURES**

During fabrication, Pryco systems are pressure tested at 5 psi of air pressure by quality control personnel.

All systems are carefully tested for proper operation. Power is applied to the unit and all aspects of the operation are tested. Alarms are tested by manually creating abnormal conditions in the sequences of operation. Components with contacts are tested for continuity during "closed" conditions. Pump motor controls are tested for start up and shut down of the motor. Proper rotation of the pump and motor are checked while in operation. All reset and test switches are checked for proper operation.

# PUMPS AND MOTORS GENERAL INFORMATION

**PUMPS** - The standard pump is a 2 GPM Bronze Gear Pump. Other pump models include: 4, 8, 10, 23, and 40 GPM. Each come with or without a pressure relief valve. This information generally applies to all models

The pump is driven directly from the shaft of the electric motor by means of a flexible coupling. An aluminum adapter connects the pump to the motor.

The pump is of bronze construction with stainless steel shafts, positive springloaded buna lip seals, and self-lubricating carbon bearings.

Due to close tolerances of components, fuel to the pump must be clean. Fine abrasives such as sand, silt, and powders in suspension will destroy its pumping ability. A **fuel strainer** (Pryco option # 314 or 315) should be installed just ahead of the pump (and solenoid valves, check valves, and other like devices) to keep debris from entering the system.

The pump's basic metals construction allow a temperature range of -40°F. to +400°F.; however, the buna lip seals have a temperature limit of +250°F. Avoid extreme temperatures and rapid fluctuations as they are detrimental to the pump's service life.

The pump is capable of creating 18 (plus) inches of vacuum on the suction side and up to 100 psi on the discharge side. Refer to pages 4 and 5 for a chart of the performance of each pump at 1725 RPM.

Before starting the system for the first time, you should apply some fuel oil through a **priming tee** to wet the pump gears. The fuel retained in the system lines and the gear chambers serve to wet the gears on subsequent starts.

**MOTORS** - The standard motor coupled to the pump has these characteristics: 1/3 HP, 115 VAC, 1 PH, 60 Hz, Thermal Protected, 6.6 FL Amps, 1.0 Service Factor.

The standard motor is special split phase with moderately high starting torque as well as a moderately high starting current. The thermal protected motors have internal, automatic protectors that will reset after the motor cools. Other motor configurations available range from 1/4 HP VDC motors up to 5 HP, 460 VAC. Install power to the motor(s) according to National Electrical Code.

#### **MOTOR LUBRICATION**

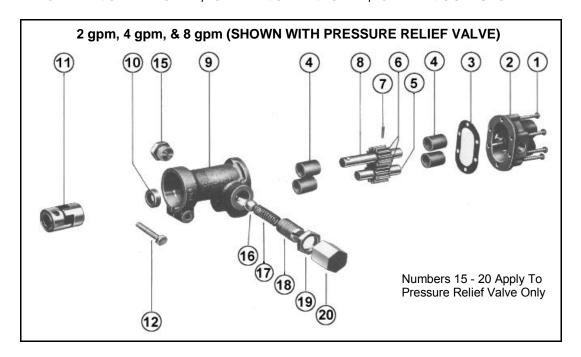
Sleeve Bearings - re-oil using #5W-20 oil every 3000 hours of motor operation.

Ball Bearings - If the motor has provision for re-greasing, use a good grade of bearing grease every 2000 hours.

If lubrication instructions appear on the motor, they will supercede these instructions.

Do not use unauthorized repair parts. These can affect proper and safe operation of the motor. Contact Pryco for replacement motors.

# PUMP EXPLODED VIEW and PARTS LIST OPT #402 - 2 GPM, OPT #401 - 4 GPM, OPT #400 - 8 GPM



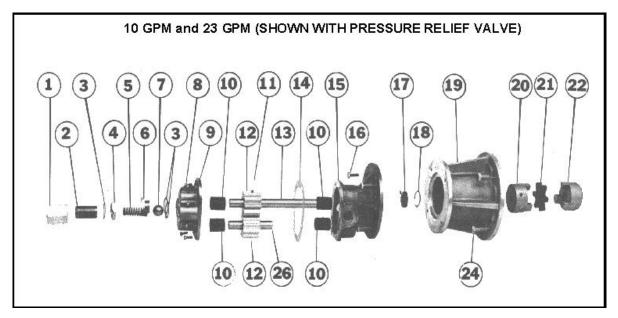
#### **PARTS LIST**

NO.	PART NAME	REQ.	NO.	PART NAME	REQ.	NO.	PART NAME	REQ.
1	Screw	6	7	Pin	1	15	Plug Nut*	1
2	Body	1	8	Drive Shaft	1	16	Ball*	1
3	Gasket	1	9	Cover	1	17	Spring*	1
4	Bearing	4	10	Seal	1	18	Adjusting Screw*	1
5	Idle Shaft	1	11	Coupling	1	19	Lock Nut*	1
* Par	ts For Pressure Rel	ief Valve		rew	1	20	Valve Nut*	1

#### PUMP PERFORMANCE CHART - 1725 RPM MOTOR At 60° F.

PUMP	PSI	2	20	40	60	80	100	125	150
#402	GPM	2.10	1.98	1.86	1.74	1.62	1.50	1.35	1.20
2GPM	HP REQ.	.05	.09	.14	.18	.23	.28	.33	.39
	MOTOR HP	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
#401	GPM	4.07	3.75	3.41	3.08	3.23	3.03	2.75	2.50
4GPM	HP REQ.	.10	.16	.22	.29	.36	.43	.55	.68
	MOTOR HP	1/3	1/3	1/3	1/3	1/2	1/2	3/4	3/4
#400	GPM	8.25	7.75	7.00	6.50	5.50	-	-	-
8GPM	HP REQ.	.38	.50	.73	.80	.95	-	-	-
	MOTOR HP	1/2	1/2	3/4	1	1	-	-	-

# PUMP EXPLODED VIEW and PARTS LIST OPT #403 - 10 GPM and OPT #404 - 23 GPM



#### **PARTS LIST**

NO.	PART NAME	REQ.	NO.	PART NAME	REQ.	NO.	PART NAME	REQ.
1	Valve Nut*	1	9	Cover	1	17	Seal	1
2	Adjust Screw*	1	10	Bearing	4	18	Retaining Ring	1
3	Fiber Washer*	3	11	Pin	1	19	Adapter	1
4	Locknut*	1	12	Gear	2	20	Coupling Half-L	1
5	Spring*	1	13	Drive Shaft	1	21	Rubber Insert	1
6	Plug Nut*	1	14	Gasket	1	22	Coupling Half-R	1
7	Ball*	1	15	Body	1	24	Adapter Screw	4
8	Cover Screw	8	16	Body Screw	4	26	Idle Shaft	1

<sup>\*</sup> Parts For Pressure Relief Valve

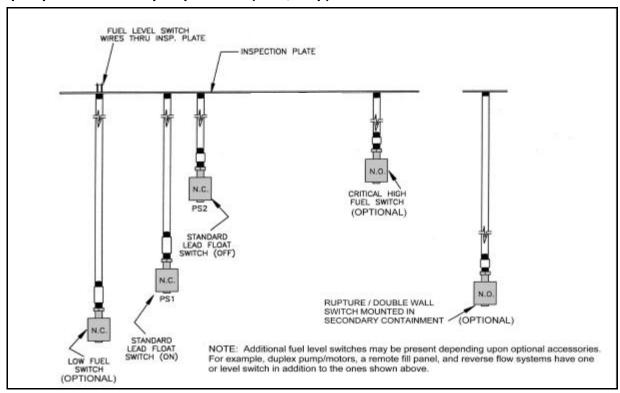
#### PUMP PERFORMANCE CHART - 1725 RPM MOTOR At 60° F.

PUMP	PSI	2	20	40	60	80	100	125	150
#403	GPM	10.5	10.3	10.1	9.90	9.60	9.40	9.20	9.00
10GPM	HP REQ.	.05	.75	.90	1.20	1.50	1.75	2.00	2.32
	MOTOR HP	1/2	3/4	1	1-1/2	1-1/2	2	2	3
#404	GPM	23.3	22.9	22.5	22.1	21.7	21.3	20.7	20.1
23GPM	HP REQ.	.90	1.19	1.53	1.92	2.25	2.70	3.15	3.70
	MOTOR HP	1	1-1/2	1-1/2	2	3	3	3	5

#### PUMP PERFORMANCE CHART - 1140 RPM MOTOR At 70° F.

PUMP	PSI	10	20	40	60	80	100	125	150
#405	GPM	40-39	38	36	34	32	30	28	25
40GPM	HP REQ.	.90	1.1	1.7	2.3	2.8	3.5	4.3	5
	MOTOR HP	1	1-1/2	2	3	3	5	5	5

The information contained on the next two pages do not specifically pertain to a pump set. They are included to describe most likely actions that initiate various signals to a pump set to control pump motors (start, stop) and other devices.

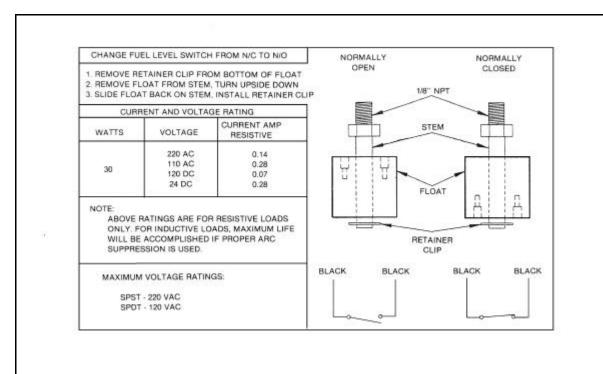


#### GENERAL SEQUENCE OF OPERATION

When power is applied to the day tank, the pump/motor will begin to fill the day tank.

- ? As the fuel rises to the 86% level, the PS1 (Pump/Motor-ON) float switch opens and the tank continues to fill.
- ? When the fuel level reaches the 100% level, the PS2 (Pump/Motor OFF) float switch opens and stops the pump/motor.
- ? As the generator engine consumes fuel and the level drops to the 86% level, the pump/ motor will fill the tank until the 100% fuel level is reached. PS1 turns on the pump/ motor — PS2 turns it off.
- ? If the fuel level drops to 75%, the LOW FUEL SWITCH (option 203) closes allowing a light on the control panel to illuminate.
- ? If the fuel in the tank should reach 102% full, the HIGH FUEL SWITCH (Option 209) will close sending a high fuel level signal to the day tank terminal block.

- ? If the fuel level rises to 103%, the CRITICAL HIGH FUEL SWITCH (option 213) closes allowing the following:
  - a Critical High Fuel light on the control panel to illuminate,
  - a N.O. solenoid valve will close causing the pump/motor to stop, and
  - a set of dry contacts, to be used for remote annunciation, will become active.
- ? If the fuel rises to 5% in the secondary containment (if installed), the RUPTURE ALARM SWITCH (option 395) closes allowing the following:
  - a Rupture Alarm light on the control panel to illuminate,
  - the pump/motor to stop, and
  - a set of dry contacts, to be used for remote annunciation, will become active.



#### **FUEL LEVEL SWITCH**

Pryco fuel level switches are accurate and dependable. They are made of Buna-N and polybutylene terephtalate (PBT) — a combination for use in diesel oil. The fuel level switches are mounted on 1/8" NPT black pipe nipples extending through a 5" x 5" inspection port on the top of the day tank.

If for some reason a switch becomes inoperable, follow these steps for replacement:

- 1 Disconnect power to the day tank control circuits.
- 2 Locate, using the supplied wiring diagram, the contactor, relay, terminal block, or similar component to which the inoperable level switch is attached, and disconnect the two black wires.
- 3 Remove the eight  $\frac{1}{4}$ " bolts securing the 6  $\frac{1}{2}$ " x 6  $\frac{1}{2}$ " inspection plate that is located on top of the tank.
- 4 Remove the inspection plate being careful not to damage existing wiring.
- 5 Locate the fuel level switch that is inoperable and remove it from the pipe coupling.
- 6 Using a continuity tester, ensure the proper positioning of the level switch float. If there is continuity where there should not be, remove the retainer clip, turn the float over (end for end) and replace the retainer clip (see instruction at the top of this page).
- 7 Install fuel level switch to the pipe coupling.
- 8 Re-attach the wires removed in step 2.
- 9 Re-install inspection plate and bolt to tank.
- 10 Re-test all day tank functions and ensure proper operation.

#### WARRANTY

#### PRYCO, INC.

All sales by **PRYCO**, **INC**., are subject to the following terms and conditions as its Warranties:

**PRYCO, INC.**, warrants that its products shall be as represented in its catalog and warrants its products against defects in workmanship and materials under normal use and conformance with manufacturer's instructions for installation and use for a period of one year from date of sale determined by invoice date and which **PRYCO**'s examination shall disclose to its satisfaction to be thus defective.

This remedy is agreed by Buyer and **PRYCO** to constitute a sole and exclusive remedy and all sales are made subject to the condition that **PRYCO** is not liable for consequential damages or for personal injuries of its customers or others.

**PRYCO** will not warrant installation of fuel tank. Alteration of design or repairs without written authorization will void warranty.

During such period, **PRYCO** will repair or replace, at its option, such defective parts without charge to buyers, provided buyer pays shipping charges for return of such products to **PRYCO**.

Electrical parts are warranted only to the extent of the warranty provided by their respective manufacturers of such parts.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY, FITNESS OR PRODUCTIVENESS. THIS WARRANTY SHALL NOT APPLY TO ANY PRYCO PRODUCT OR ANY PART THEREOF WHICH HAS BEEN THE SUBJECT OF ACCIDENT, NEGLIGENCE, ABUSE OR MISUSE. PRYCO WARRANTY IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY PRYCO. THERE ARE NO OTHER WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

# PRYCO, INC.

P. O. BOX 108 Mechanicsburg, IL 62545

Telephone: 217 / 364-4467 Fax: 217 / 364-4494



#### vitalfuelsystems.com

(Formerly Petroleum Equipment Solutions, Inc.) Why did we change our name?

#### **Fuel Maintenance Program**

#### **Diesel Fuel for Stand-by Generators:**

Stand-by generators represent large investments of money. Since the only function of a stand-by power system is to restore power immediately whenever incoming power fails, every component of the system must be in good operating condition at all times. Most problems stem from the system's relative inactivity. The diesel fuel can be in storage for several years waiting to be used. This can cause the fuel to deteriorate and unless detected and remedied, the system may be damaged or fail to start. Let's look at the problems of diesel fuel closer.

#### **Repolymerization:**

Today's diesel fuel is different from the diesel of the early 1980's. To meet the increasing demand for diesel fuel the refiners no longer simply distill crude oil to make distillates, they resort to catalytic cracking. This process breaks up heavier fuels so they will meet the specifications for diesel fuel. This catalytically cracked fuel does not want to stay in its new form. It wants to rapidly change back into something heavier. Repolymerization forms submicronic particles which score fuel metering injectors causing them to "drool" and "slobber", diluting crankcase oil with fuel.

As aging continues, the repolymerized molecules become longer and longer forming sludge which plugs filters and eventually makes the fuel unpumpable. Often we blame bacteria when in fact it is just the fuel re-organizing itself into a heavier product. The rate of repolymerization is a direct function of age and energy input into the fuel.

This means that periodic pumping and filtering of the fuel will actually hasten repolymerization while providing only temporary relief. Pumping and filtering should be used for the removal of inorganics (sand, dirt, rust, etc.), but only in conjunction with a fuel maintenance program that incorporates the ongoing use of a proper fuel additive.

**Bacteria:** Bacteria are also a problem. These bacteria feed on nitrogen, sulfur and iron oxides. Since these materials are present in a fuel system, a biocide is a necessity to maintain fuel quality.

Wax: Wax is a natural component of petroleum fuels. In cold weather wax crystals will form and agglomerate mixing with water, polymer of fuel, and bacteria to further shut down the fuel pumping process.

**Oxidation:** Oxidation is a slow natural process of fuel degradation that also produces solids.





#### vitalfuelsystems.com

(Formerly Petroleum Equipment Solutions, Inc.) Why did we change our name?

Water: Water is a natural enemy of fuel. Water causes corrosion of tanks, lines and injectors and reduces combustibility. Condensation will accumulate at the bottom of the tank and should be periodically checked and removed before it reaches the pick up of the product piping.

#### Special Ultra Low Sulfur Diesel (ULSD) Alert:

We are also finding that Biodiesel and Low / Ultra Low Sulfur Diesel are more unstable than traditional No. 2 fuel oil and need stabilizing even more in order to preserve and extend its useful life. Effective October 1, 2010 all on and off road diesel fuel sold in the in the U.S. is Ultra Low Sulfur Diesel (ULSD). ULSD has a higher degree of solvency which causes more gums, resins, and particulate matter to be released into stored fuel over time as well as causing corrosion of petroleum equipment.

#### **Solutions:**

#### **Solution for Organics (Fuel Additive):**

VITAL Fuel Systems, Inc. offers ILFC's (International Lubrication and Fuel Consultants Inc.) 1032 fuel inhibitor. It is a detergent, a dispersant, a biocide, a demulsifier, a corrosion inhibitor, a metal deactivator, and a polymerization retardant. It is an improved version of an inhibitor originally developed at AT&T's Bell Telephone Laboratories by ILFC's founder for use in stand-by power systems. Research has proven that, with regular monitoring and treatment with inhibitors, diesel fuel can be stored indefinitely and provide dependable energy when needed.

We recommend 1:10,000 ratio dosage rate for a normal maintenance treatment. For problem fuel a greater dosage may be needed.

Also available is the ILFC 1052. This has all the benefits of the 1032 plus it reduces the fuel's pour point for reliable cold weather performance. The recommended dosage is 1:5,000 for this product.

These additives are self-dispersing and can be poured directly into a full or partially full fuel

**BE CAREFUL:** All fuel additives are not intended to address the same problems. There are many commercially-available additives that make various claims. It is important to make sure that the product you use will actually provide solutions for the specific organic conditions mentioned above. The ILFC family of fuel additives was scientifically-developed and rigorously lab and field-tested over more than 25 years and are the only approved additives that meet the stringent standards of the US Navy.







National Guard Tac Ops Center Power Upgrades Project:

> 2051 National Guard Dr. Morrisville, NC 27560

Date: July 22, 2014

#### Warranty

The following warranty applies to the diesel fuel dispensing system supplied by VITAL Fuel Systems, Inc. We extend a one year warranty, parts and labor on the following:

Aboveground Tanks:

Aboveground Tank Alarm Panels & Switches:

**Underground Tanks:** 

Other Tank Accessories including Vents, Fills, Gauges, Valves:

Installation of Fuel Lines:

Note: Fuel Systems require inspection and maintenance. This is essential to prevent undetected problems.

Our warranty is limited to the repair of defective products for one year and does not cover incidental or consequential damages or injuries, including, but not limited to damages to person, to property or other commercial loss.

# **HVAC: AC-1 & CU-1**

# **NC National Guard TAC OPS**

#### KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

# HOCKADAY MECHANICAL CORPORATION

#### **SUBMITTAL FOR APPROVAL**

#### **PROJECT**

National Guard Tactical Operations Morrisville, NC

#### ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

#### CONTRACTOR

KAD Construction Raleigh, NC

#### ITEM SUBMITTED

Computer room air conditing unit

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/26/2013

JKH







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BASS, NIXON & KENNEDY, INC.

DATE 1-6-14

**BY Taine Mergenthaler** 

#### Submittal

Prepared For: Date: December 18, 2013

Bass Nixon and Kennedy, Inc.

Sold To: Job Name:

Hockaday Mechanical National Guard Morrisville Readiness Center

Brady Trane is pleased to provide the enclosed submittal for your review and approval.

#### **Product Summary**

Qty Product

1 Computer Room Air Conditioner

#### NOTE:

• 6 kW Heater Provided, 7.3 kW Not Available.

Adam Sippel / Pam Bradford Brady Trane 401 Kitty Hawk Drive Morrisville, NC 27560-8271 Phone: (919) 781-0458

Fax: (919) 781-9198

Tag Data - Computer Room Air Conditioner (Qty: 1)

Item	Tag	Qty	Description	Model Number
A1	AC/CU-1	1	Computer Room Air Conditioner	DAPA-0334-A0DRCU-0334-3LD

#### **Product Data – Computer Room Air Conditioner**

Item: A1 Qty: 1 Tag: AC/CU-1

Mini Plus Air Cooled 3 Ton 460/3 phase Air Handler

6 kW 460 volt Electric Reheat Thru the Door Disconnect 5 lb/hr Steam Humidifier

Merv 8 Filters

Condensate Pump, External Mount and Field Power 460v <

Water Detection Module

Smoke Detector

Outdoor Remote Condensing Unit 3 Ton 460/3 phase

Fusible Disconnect, 460v

Hot Gas Bypass

Condensate Pump does not appear to be plenum rated. Provide condensate pump specified on permit drawings.

Note: Coordinate all new electrical information with electrical contractor.



Product Data – Computer Room Air Conditioner

Item: A1 Qty: 1 Tag: AC/CU-1

# MINI PLUS CEILING SYSTEM GUIDE SPECIFICATIONS 3 Ton

#### **Computer Room Air Conditioning Units**

Basis-of-Design Product: Subject to compliance with requirements, provided product indicated on drawings or comparable product by one of the following:

Data Aire, Inc.

Description: The environmental control, Computer Room Air Conditioning, units shall be provided with a high sensible cooling system, self-contained, and shall be capable of humidifying, dehumidifying, and filtering air. Units shall be factory assembled, piped, wired and factory run tested prior to shipment. Provide quantities and configurations as shown on the project drawings.

Safety Certification: Units shall be ETL or UL listed.

**Cabinet and Frame** - The frame shall be constructed of 14 gauge welded tubular steel and be coated with a heavy corrosion inhibiting finish. The outer steel casing shall have removable panels for servicing. The panels shall be insulated with half inch (1/2") thick, neoprene. An integral return air filter box with duct connection shall be factory installed and contain 2-inch thick MERV 8 filters (based on ASHRAE Std. 52.2).

**Electrical** - All electrical components including contactors, relays, control transformers, and capacitors shall be pre-wired. The control circuit voltage shall be 24 volts. A micro-switch shall disable the unit operation prior to condensation pan overflow should the drain line become plugged with debris.

#### Air Cooled Split Systems (with outdoor condensing units)

The refrigeration system shall be split type consisting of an evaporator section and a remote outdoor condensing unit. The evaporator and condensing unit shall be factory assembled and tested. Refrigeration piping and control wiring between the evaporator section and the condensing unit shall be field provided.

The evaporator section shall be mounted in the ceiling space with ducted supply and return air as required on the project drawings.

The evaporator section shall be a draw through type consisting of a double width, double inlet blower with belt drive and variable pitch sheave and self-aligning ball bearings rated for an average life of 100,000 hours. The evaporator coil shall be constructed with copper tubes and

aluminum fins. A single refrigeration circuit shall contain an expansion valve with external equalization. The evaporator section shall have stainless steel drain pan.

The condensing unit shall be constructed of aluminum and contain a scroll compressor with crankcase heater, filter drier, sight-glass and condenser coil. The coil shall be constructed with copper tubes and aluminum fins. The condenser fan motor shall be variable speed for head pressure control down to -20° F/6.7° C. The condenser motor shall be direct drive with propeller type fan.

#### MINI dap™4

The Mini-dap™4 offers the definite answer for precision environmental control with the fast and most advance controller with 50MHz, 32 bit microprocessor. The controller system shall be comprised of three components – a wall mount display module, a combination remote wall mount temperature and humidity sensor and a unit mounted control module. The wall mount display module shall include a backlit liquid crystal display (LCD) with six keys (buttons) for easy programming. All settings and alarm conditions shall be displayed on the display module in easy read verbiage. The control module shall be mounted on the unit and connected to the display module via a special "telephone like" cable which is included with the system. A remote mounted temperature and humidity sensor is separate wall mounted device which is to be mounted at the client's selected location in the controlled space. The combination temperature and humidity sensor is connected to the control module via separate wiring which is also included with the system.

The wall-mount display module will allow recall and display of the high and low temperature and high and low humidity for the last 24 hours; current percent of capacity and average percent of capacity for the last hour of operation for cool 1, cool 2, reheat, humidification, dehumidification, component runtimes for fan motor, cooling stages, reheat, humidification, dehumidification and chilled water valve. Programming will have multi-level password and accomplished entirely from the front of the wall mount display module. Programmable functions shall be entered on flash memory to ensure program retention should power fail. The historical database shall be maintained by rechargeable battery backup. Multiple messages shall be displayed by automatically scrolling from each message to the next. Alarm conditions shall be displayed by automatically scrolling from each message to the next. Alarm conditions, in addition to being displayed, shall enunciate an audible alarm. Programmable summary contacts shall be available for remote alarm monitoring. Additional test or service terminal shall not be required for any functions. The control shall include temperature anticipation, moisture level humidity control.

An alarm condition shall continue to be displayed until the malfunction is corrected. Multiple alarms shall be displayed sequentially in order of occurrence and only those alarms, which have not been acknowledged, shall continue to sound an audible alarm. A user accessible diagnostic program shall aid in system component trouble shooting by displaying on the unit LCD screen the name of the controlled item, output number, terminal plug or pin number for each controlled item.

Compressor Short Cycle

#### **Automatic Control Functions**

Humidity Anticipation Dehumidification Lockout
Start Time Delay Sequential Load Activation

Energy Saver (Glycol Operation)\* Automatic or Manual Restart mode

#### Condition and Data Routinely Displayed

**Unit Status Current Temperature** Energy Saver On\*

Unit type Current Relative Humidity Current Chilled Water Valve Position\*

Current Date and Time Cooling stage 1, 2\* Chilled Water Temperature\* Unit ID /Zone ID\* Dehumidification Discharge Temperature\*

**Humidity Setpoint** Reheat 1 Temperature Setpoint Humidification

#### Switching and Control Functions

Fan, Cool 1, Cool 2\*, Heat, Humidification, Dehumidification, CW Valve\*

#### Menu Selection Buttons and Switches

Alarm/Silence Button Select Up/Down Buttons **Enter Button** 

System On/Off/ESC Button Menu Button

#### Standard Alarms and Conditions

Power Failure Restart High Humidity Warning High Temperature Warning Low Humidity Warning Low Temperature Warning Maintenance Required

High Pressure Compressor Firestat Tripped High Condensate Water Level Person to Contact on Alarm

Compressor Short Cycle Temperature Sensor Error

Local Alarms **Humidity Sensor Error** 

#### Optional Alarms\*\*

Smoke Detector\* Fan Motor Overload\* Humidifier inhibited\* Low Pressure Compressor Custom Message\*\* Reheat Inhibited\*

Standby Pump On\* Reheat and Humidifier inhibited\* Discharge Sensor Error\*

No Water Flow\* Chilled Water Sensor Error\*

Dirty filter\* Unit in standby\*\*

#### **Historical Data**

High/Low Temperature Last 24 Hrs Low Temperature Last 24 Hrs High Humidity Last 24 Hours High/Low Humidity Last 24 Hrs Hourly Average of Duty Alarm History (Last 100 Alarms)

Humidifier, and Chilled Water \* Percent of Cap. Utilized in the last hr

Equipment Runtimes for: Blower, Compressor 1, Compressor 2\*, Reheat, Dehumidification, Energy Saver\*

#### **Programmable Functions**

Compressor Short Cycle Alarm

Temperature Setpoint Compressor Lead/Lag Sequence\* **Humidity Anticipation** 

Temperature Deadband Compressors(s) **Dehumidification Mode** 

Calibrate Temperature Sensor Power Problem or Restart Mode System Start Delay

Low Temperature Alarm Limit Temperature Scale Scheduled Normal Maintenance

High Temperature Alarm Limit Reheat mode **Humidity Deadband Humidity Setpoint** Water Valve Voltage Range\* Calibrate Humidity Firestat Temperature Alarm Limit

High Humidity Alarm Limit Humidifier

Manual Diagnosis Low Humidity Alarm Limit Compressor Assists to Energy Saver\*

Define Password No water flow alarm action\* Network Protocol

Reset Equipment Runtimes Remote Alarm contacts Low Discharge Temperature Alarm Limit\* Audio Alarm Mode Calibrate Discharge Air Sensor\* Calibrate Chilled Water Temp. Sensor\*

Person to contact on Alarm

In addition, the Mini dap4 control panel shall support the following network protocols for integration with a Building Management System (BMS) for Computer Room Air Conditioning (CRAC system monitoring and control: Modbus RTU, Modbus TCP/IP, SNMPv1/v2, BACnet IP or BACnet MS/TP and LonTalks. Unit(s) shall be furnished with an optional interface card to communicate directly with the Building Automation System (BAS) through a RS-485, Ethernet or LonTalks port. All alarms, set points, and operating parameters that are accessible from the unit mounted control panel shall also be made available through the BAS.

#### **Options**

**Steam Generator Humidifier** - An electric steam generator humidifier with disposable cylinder and self-regulating auto flush shall be provided. The humidifier capacity shall be 5 lbs/hour.

**Disconnect Switch** - Provide units with disconnect switch. The disconnect switch with 1/4 turn latch shall be factory installed and wired. The switch must be in the "OFF" position to remove panel and access electrical compartment.

**Separate Power Source** - Indoor split systems shall be provided with separate power feeds. A power connection shall be provided for both the evaporator section and/or condenser/condensing unit.

**Hot Gas Bypass** - Provide hot gas bypass. Hot gas bypass control on the refrigerant circuit shall maintain minimum suction pressure during low load conditions.

**Condensate Pump** - Provide a condensate pump for field installation. A separate power source shall be required. Pump body shall be placed within the unit coil pan. Pump shall have a maximum of 8 feet head.

**Extended Compressor Warranty** - Compressors shall an additional two (2) or four (4) year compressor warranty to supplement standard three-year warranty.

<sup>\*</sup> Some of the programmable selections, displays or alarms may require additional components or sensors

<sup>\*\*</sup> Note: Two optional alarms are available on DX system and three optional alarms on Chilled water system. In most cases, optional alarm requires optional sensor or detector.

Item: A1 Qty: 1 Tag: AC/CU-1

	Evaporator Sec	ction			
	DAPA-0334-AO	MINI PLUS AIR-COOLED 3 TON 3 PH 460 V W/DRCU			
	Evap. Tag #:	AC-1			
	Quantity:	1			
	Voltage:	460			
	Phase:	3			
	Hertz:	60			
Cabinet Data:					
	Configuration:	Ceiling Mounted			
	Depth (inches):	26.50			
	Length (inches):	51.00			
	Height (inches):	24.00			
	Weight (lbs):	460			
<b>Entering Conditions:</b>	Entering Air DB °F:	72.0			
	Entering Air WB °F:	60.00			
	Relative Humidity (%):	50.0			
	Altitude:	0			
	ESP:	0.500			
Calculated D					
	Air Out Dry Bulb:	52.9			
	Air Out Wet Bulb:	50.6			
Evaporator Coil	Gross Total Capacity Btu:	34,700			
	Gross Sensible Capacity Btu:	28,400			
	Net Total Capacity Btu:	32,200			
	Net Sensible Capacity Btu:	25,800			
	Face Area (sq ft):	3.00			
	Face Velocity	417			
	Rows:	4			
	Fins per inch.:	12.0			
	Fin Type:	Aluminum			
* Net Coil Capacity equals gross ca	pacity minus motor heat.				
Evaporator Blower:					
	CFM:	1,250			
	Motor Horsepower	1.00			
	Motor FLA:	1.8			
	Motor Quantity:	1			
	Blower Quantity:	1			
	Air Flow:	Optional Airflow #1			
Humidifier:	Туре:				
	Capacity in Lbs/hr:	Steam Generator 5.0			
	kW:				
	KW.	1.7			
Reheat:					
icheat.	Туре:	Electric			
	Capacity BTU/hr:	20,500			
	kW:	6 00			



Filter	s:			
111111	<u> </u>	Quantity:	1	
		Size (inches):	20X25X2	
		Efficiency:	MERV 8	
Conn	ection Sizes:			
		Liquid Line (inches):	1/2	
		Suction Line (inches):	3/4	
		Condensate (inches):	3/4	
		Humidifier (inches):	1/4	
Electi	rical Data:			
		Unit Total Amps:	9.3	
		Unit MCA:	11.7	
		Unit MOP:	15	
Contr	<u>'ols:</u>			
		Mini dap4		
Acces	ssories:			
1	OPT-80-460V	HUMIDIFIER-5LB 460V		
1	OPT-132-1-3	MTR-3PH 208/460V 1HP		
1	OPT-5767	SWITCH DISCONNECT 0-40 A		
1	OPT-210	PUMP MOUNTING-ON SIDE, CEILING		
1	OPT-206-460V	PUMP-COND XTMOUNT 460V		
1	OPT-7315	CABLE-WATER DETECTION, DAP4		
1	OPT-37-MINI	SMOKE DETECTOR FOR MINI & PLUS		
1	OPT-7328	WATER DETECTION MODULE		
1	OPT-5302	WAR-18 MONTH STANDARD EXT		

#### **Standard Unit Features:**

#### MINI PLUS CEILING SYSTEMS AIR

Belt drive motor with variable pitch sheave Compressor anti-short cycle timer Crankcase heater

Expansion valve with external equalizer Filter drier Hermetic scroll compressor High pressure safety switch Low pressure safety switch MERV 8 efficient filter Micro-switch for condensate pan overflow

Stainless steel drain pan Unit mounted return air filter section



#### **Product Data - Computer Room Air Conditioner**

Item: A1 Qty: 1 Tag: AC/CU-1

	Remote Conde	ensing Unit	
	Model #:	DRCU-0334-3-LD	
	LOW DECIBEL OUTDOOR	REMOTE CONDENSING UN	IT 3 TON 3 PH 460 V
	HE Tag #:	CU-1	
	Qty:	1	
	Ambient:	95	
	Altitude:	0	
	Voltage:	460	
	Phase:	3	
	CFM:	4,000	
	RPM:	0,850	
Electrical Section	FLA:	7.70	
	MCA:	9.20	
	MOP:	15.00	
Compressor:			
-	Type:	Scroll	
	Number:	1	
	Refrigerant Type:	REFRIGERANT, R-410A	
	FLA:	6.1	
Connection Sizes			
	Pipe Conn. Liquid:	.5	
	Pipe Connection Suction:	.75	
Electrical Data	Num Of Motors:	1	
	Number Of Fans:	1	
	НР	0.5	
	Motor FLA:	1.6	
Dimensions			
	Depth (inches):	36	
	Length (inches):	29	
	Height (inches):	33	
Weights			
	Weight (lbs):	285	

#### Remote Condensing Unit Accessories

 1
 OPT-6733
 HOTGAS BP-x1 1-5T W/DRCU R410

 1
 OPT-121
 DISCONNCT- FUSIBLE 460V

 1
 OPT-5298
 WAR-24 MTH EXT CMP 1-5 T



#### Data Aire Coil Performance Data

Project: National Guard Morrisville Readiness Center Worksheet Name: National Guard Morrisville Readiness Center

Tag Number: AC-1

Air Out Wet Bulb:

Coil Face Velocity (fpm): Coil Face Area:

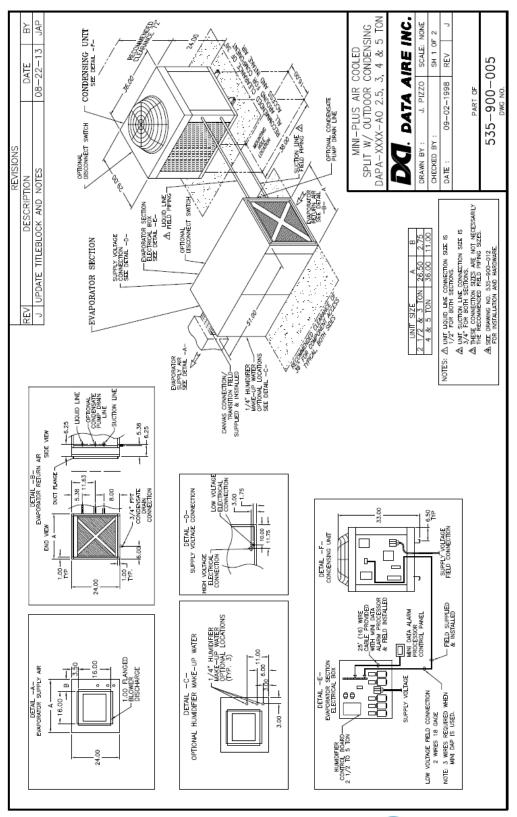
Given Data		
Model: Type:	DAPA-0334-AO Cooling	MINI PLUS AIR-COOLED 3 TON 3 PH 460 V W/DRCU
Coil Tubing OD:	0.500	
Tubes In Face:	22	
Finned Length:	28	
Rows Deep:	4	
Fins Per Inch:	12	
Fin Type:	Aluminum	
Air Flow:	Optional Airflow #1	
Air Flow (cfm):	1,250	
Entering Air DB °F:	72.0	
Entering Air WB °F:	60.0	
Entering Air RH %:	50.0	
Altitude in FT:	0	
Calculated Data		_
Total Capacity Btu:	34,700	
Sensible Capacity Btu:	28,400	
Net Total Capacity Btu:	32,200	
Net Sensible Capacity Btu:	25,800	
Air Out Dry Bulb:	52.9	

50.6 417

3.0

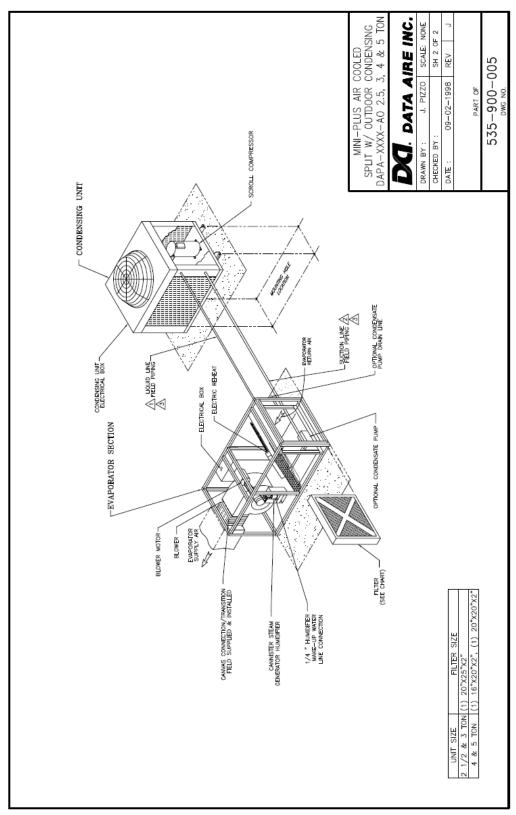


# Product Data – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1





# Product Data – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1





#### Accessory Data - Computer Room Air Conditioner

Item: A1 Qty: 1 Tag: AC/CU-1

**Control Model Number: Mini dap4** 

#### HISTORICAL DATA:

High/low temperature last 24 hours

High/low humidity last 24 hours

Blower, compressor 1, compressor 2\*, reheat, dehumidification, Energy Saver\*,

Equipment runtimes for:

Humidifier, and chilled water \* Low temperature last 24 hours

Alarm history (last 100 alarms) High humidity last 24 hours

#### Control Module

#### Temperature and Humidity Sensor





#### Display Module



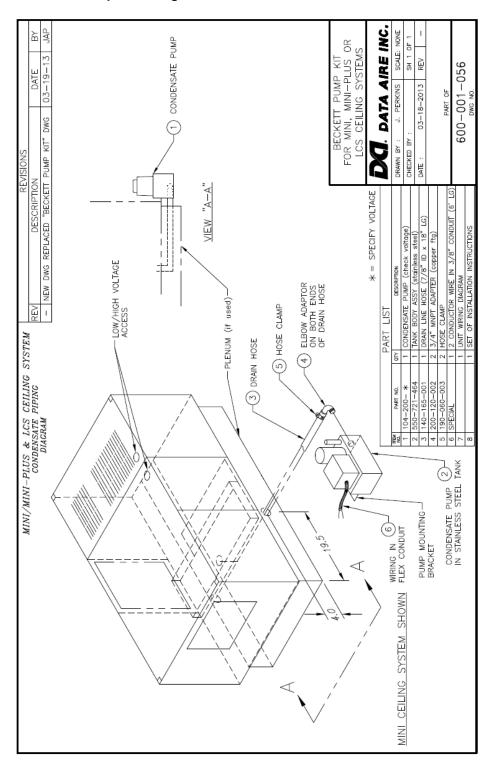
#### **Button Functions**

Alarm	Allows viewing of active alarms Silences audible alarms Resets active alarms	1	Allows scrolling to next screen Allows values changes (increase)
Menu	Allows entry to Main Menu	+	Allows entry to Menus Advances cursor
Esc ①	Return to previous screen Hold five seconds to turn ON or OFF	+	Returns to previous screen Allows value changes (decrease)



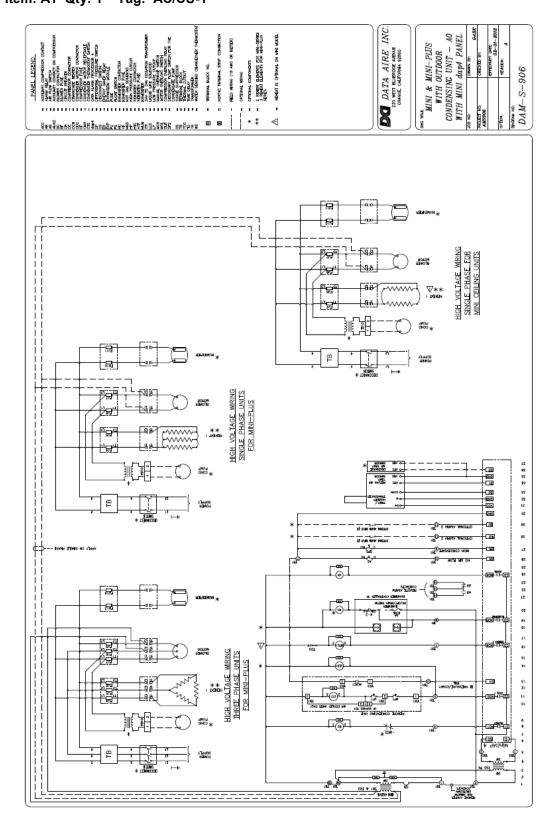
Item: A1 Qty: 1 Tag: AC/CU-1

#### **Condensate Pump Mounting**





# Wiring Diagram – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1







# **HVAC: Insulation**

# **NC National Guard TAC OPS**

#### *KAD* Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

# HOCKADAY MECHANICAL CORPORATION

## **SUBMITTAL FOR APPROVAL**

## **PROJECT**

National Guard Tactical Operations Morrisville, NC

## ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

## **CONTRACTOR**

KAD Construction Raleigh, NC

## **ITEM SUBMITTED**

Insulation

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED
REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR OR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/17/2013

JKH





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BASS, NIXON & KENNEDY, INC.

DATE 1-6-14

**BY Taine Mergenthaler** 



## SUBMITTAL DATA

# Department of Public Safety NC National Guard Morrisville Readiness Center Tactical Operations Center Power Upgrades

Mechanica	al Insulation
Hockaday Mecha	For: anical Corporation ner, NC
Tri-Therm, Inc	e. Job No. 13182

PAGE 2

Submittal Data: Mechanical Insulation

I. <u>PIPE INSULATION:</u> (ABOVE GRADE)

## A. TYPE INSULATION:

1. Flexible Elastomeric: K value = 0.25 @ 75 degrees F.

Piping: Premolded closed cell elastomeric pipe insulation

Fittings: Mitered pipe insulation

Finish: Indoors - factory finish

Outdoors - 2 coats UV & weather resistant latex-enanel

## **B. INSULATION SCHEDULE:**

SERVICE	TYPE INSULATION	PIPE SIZE	INSULATION THICKNESS
* Domestic Cold Water	Elastomeric	1/2" thru 2"	1/2"
* Condensate Drain Piping	Elastomeric	1/2" thru 2"	1/2"
* Indoor Refrigerant Suction Piping	Elastomeric	1/2" thru 2"	1/2"
* Outdoor Refrigerant Suction Piping	Elastomeric	1/2" thru 2"	1"
			1

## II. <u>DUCT INSULATION:</u> Supply and Return, Air Duct

A. 2" thick 1.0 lb. density flexible fiberglass blanket with a factory applied fsk (foil scrim kraft) vapor barrier facing.

Provide insulation thickness per N.C. Energy Code

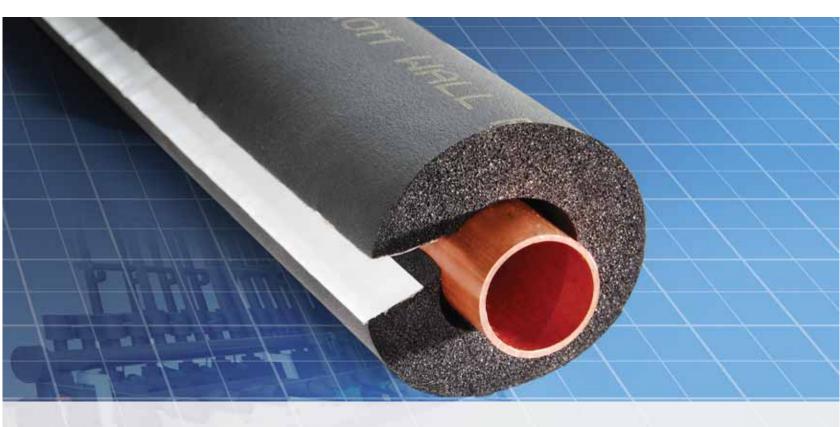
PAGE 3

Submittal Data: Mechanical Insulation

## III. MANUFACTURER'S PRODUCT DATA SHEETS: (ATTACHED)

Attachment No.	Description	Manufacturer / Product
1	Flexible Elastomeric	Armacell / AP/Armaflex SS Self Seal Tubes
2	Fiberglass Ductwrap	Knauf / Fiberglass Ductwrap
3	Contact Adhesive	Armacell / Armaflex 520 BLV Adhesive
4	Insulation Coating	Armacell / Armaflex WB Finish
5	FSK Tape	Venture Tape / 1525CW FSK Insulation Tape





# AP/Armaflex® SS

Self-Seal Tube Insulation

## **Superior Moisture Control, Mold Resistant – Faster!**



- Self-sealing, labor saving
- Closed cell, nonwicking
- Microban® antimicrobial product protection
- The IAQ Insulation™
- Fiber-free











## **AP Armaflex SS Self-Seal Pipe (Tube) Insulation**

AP Armaflex SS Self-Seal Pipe (Tube) Insulation saves labor and installed costs. It is the self-sealing version of the original closed cell, fiber-free elastomeric foam, the world's most recognized brand in flexible mechanical insulation.

- Proven: Fewer seams to seal, faster way to insulate chilled water and refrigeration lines
- Mold resistant: Made with Microban antimicrobial product protection
- Indoor Air Quality-friendly: Fiber-free, formaldehyde-free, low VOCs, nonparticulating. GREENGUARD Indoor Air Quality Certified®.
- Durable: No fragile vapor retarder

## **Description**

AP Armaflex SS Self-Seal Pipe Insulation is a 25/50-rated black flexible elastomeric thermal insulation. The expanded closed-cell structure makes it an efficient insulation. It is manufactured without the use of CFC's, HFC's or HCFC's. All AP Armaflex products are made with Microban® antimicrobial product protection for added defense against mold on the insulation.

- Nominal wall thicknesses of 3/8", 1/2", 3/4", 1" (10, 13, 19, and 25mm)
- Popular sizes up to 4" IPS

## **Factory Mutual (FM) Approvals**

AP Armaflex SS is certified through ongoing supervision by Factory Mutual Approvals to consistently provide actual values on these key performance criteria for mechanical system insulation:

- Thermal Conductivity: 0.25 BTU-in/hr. ft2 °F
- Water Vapor Transmission: 0.05 perm-inch
- Fire Rating: will not contribute significantly to fire (simulated end-use testing)

As tested by ASTM E 84 "Method of Test for Surface Burning Characteristics for Building Materials" and CAN/ULC S-102, AP Armaflex SS Pipe Insulation wall thicknesses through 1" (25mm) has a flame-spread index of less than 25 and a smokedeveloped index of less than 50.

Note: Numerical flammability ratings alone may not define the performance of products under actual fire conditions. They are provided only for use in the selection of products to meet limits specified.

ALL ARMACELL FACILITIES IN NORTH AMERICA ARE ISO 9001:2000 CERTIFIED.

www.armacell.us

## Uses

- Retards heat gain and controls condensation drip from chilled-water and refrigeration systems. Efficiently reduces heat flow for hot-water plumbing, liquid-heating and dualtemperature piping
- Acceptable in wall thicknesses through 1" (25mm) for use in air plenums and conforms to NFPA 90A and NFPA 90B requirements

The recommended temperature usage range for AP Armaflex SS Pipe Insulation is -297°F to +180°F (-183°C to +82°C). For use on cold pipes, thicknesses have been calculated to control condensation on the insulation outer surface, as shown in the table of thickness recommendations. AP Armaflex meets the energy code requirements of ASHRAE 90.1, International Energy Conservation Code (IECC) and other building codes.

## **Application**

AP Armaflex SS Pipe Insulation can be snapped over piping already connected. Fitting covers are fabricated from miter-cut tubes. Butt joints are to be sealed with one of our Armaflex adhesives: Armaflex 520, 520 Black or, where a low V.O.C. adhesive is required, 520 BLV. 520 Adhesives are contact adhesives; therefore, in all cases, both surfaces to be joined are coated with adhesive.

AP Armaflex SS is designed for installation above or below ground. For below ground applications, contact Armacell or see our Technical Bulletin No. 7 on our website, www.armacell. com. Outdoors, a weather-resistant protective finish is to be applied and Armaflex WB Finish is recommended.

AP Armaflex normally requires no supplemental vapor-retarder protection but additional vapor-retarder protection may be necessary when installed on very-low temperature piping or exposure to continually high humidity conditions. Outdoors a protective finish is to be applied and Armaflex WB Finish is recommended. Armaflex insulation products must be installed according to "Installation of Armaflex Insulations" brochure. Proper installation is required to assure Armaflex insulation performance. Before starting, the temperature of the air and of the insulation should be between 40°F (4°C) and 100°F (38°C) at the time of installation.

Note: Self-Seal Armaflex features an advanced pressure sensitive adhesive (PSA) system for tight bonds. However, any factory applied PSA is susceptible to losing tack and hence loss of adhesion properties if left unused for a prolonged period. For best results, Armacell recommends applying Armaflex self seal products within one year of lamination date.

## **Specification Compliance**

## AP Armaflex SS Pipe Insulation developed to meet:

ASTM C 534, Type I – Tubular Grade 1 ASTM E 84, NFPA 255, UL 723 CAN/ULC S102 NFPA 90A, 90B UL 181 ASTM G-21/C1338 ASTM G-22 ASTM D 1056, 2B1 MIL-P-15280J, FORM T MIL-C-3133C (MIL STD 670B),

Grade SBE 3 MEA 96-85-M City of LA – RR 7642

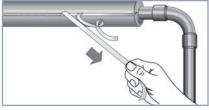
## **Physical Properties**

Specifications	Values	Test Method
Thermal Conductivity, Btu • in./h • ft² • °F (W/mK) 75°F Mean Temperature (24°C) 90°F Mean Temperature (32°C)	0.25 (0.036) 0.256 (0.037)	ASTM C 177 or C 518
Water Vapor Permeability, Perm-in. [Kg/(s•m•Pa)]	0.05 (0.725 x 10 <sup>-13</sup> )	ASTM E 96, Procedure A
Flame Spread and Smoke Developed Index through 1" (25mm)	25/50	ASTM E 84 CAN/ULC S102**
Mold Growth Fungi Resistance Bacterial Resistance	UL181 ASTM G21/C1338 ASTM G22	Meets requirements Meets requirements Meets requirements
Water Absorption, % by Volume	0.2%	ASTM C 209
Upper Use Limit <sup>⊕</sup>	180°F (82°C)	_
Lower Use Limit <sup>®</sup>	-297°F (-183°C)*	_
Ozone Resistance	GOOD	_
Sizes Wall thickness, (nominal) Inside diameter, tubular Length of sections, tubular	3/8", 1/2", 3/4", 1" (10, 13, 19, 25mm) 5/8" ID to 4" IPS (15mm to 114mm) 6' (1.8m)	_
Density, Typical Range <sup>®</sup>	3.0 - 6.0 lbs./ft. <sup>3</sup>	ASTM D 1622 or D 1667

#### Notes

- On the heating cycle, AP Armaflex SS Pipe Insulation will with stand temperatures as high as 220°F (105°C) intermittent exposure. For continuous exposure the temperature should be limited to 180°F (82°C).
- ② At temperatures below -20°F (-29°C), elastomeric insulation starts to become less flexible. However, this characteristic does not affect thermal efficiency or water vapor permeability of Armaflex insulation.
- 3 Reference only.
- \* For applications of -40°F to -297°F (-40°C to -183°C), contact Armacell.

Performance approved through continuing supervision by Factory Mutual Approvals.



Peel the protective release strips from the adhesive surface in 8" and 12" increments after insulation is snapped over pipe. The protective release strips can be removed by gently pulling at an angle. Apply firm and even pressure along the entire longitudinal seam for proper seal.

## **Armacell SS Pipe Insulation Thickness Recommendations**

## For Controlling Outer Insulation Surface Condensation

(Based upon available manufactured thicknesses and not intended to supercede any state or local building codes.)

Pipe Size	Line Temperatures							
ripe Size	50°F (10°C)	35°F (2°C)	0°F (-18°C)	-20°F (-29°C)				
BASED ON <b>NORMAL</b> DESIGN CONDITIONS* 3/8" ID through 1-1/8" ID (10mm–28mm) Over 1-1/8" ID through 2-1/8" ID (28mm–54mm) Over 2-1/8" ID through 2-5/8" ID (54mm–65mm) Over 2-5/8" ID through 6" IPS (65mm–168mm)	Nom 3/8" (10mm) Nom 3/8" (10mm) Nom 3/8" (10mm) Nom 1/2" (13mm)	Nom 1/2" (13mm) Nom 1/2" (13mm) Nom 1/2" (13mm) Nom 3/4" (19mm)	Nom 3/4" (19mm) Nom 1" (25mm) Nom 1" (25mm) Nom 1" (25mm)	Nom 1" (25mm) Nom 1" (25mm) Nom 1-1/4" (32mm) Nom 1-1/4" (32mm)				
BASED ON <b>MILD</b> DESIGN CONDITIONS** 3/8" ID through 2-5/8" ID (10mm–65mm) Over 2-5/8" ID through 6" IPS (65mm–168mm)	Nom 3/8" (10mm) Nom 1/2" (13mm)	Nom 3/8" (10mm) Nom 1/2" (13mm)	Nom 1/2" (13mm) Nom 1/2" (13mm)	Nom 3/4" (19mm) Nom 3/4" (19mm)				
BASED ON <b>SEVERE</b> DESIGN CONDITIONS* 3/8" ID through 1-5/8" ID (10mm-40mm) Over 1-5/8" ID through 3-5/8" ID (40mm-90mm) Over 3-5/8" ID through 6" IPS (90mm-168mm)	Nom 3/4" (19mm) Nom 3/4" (19mm) Nom 3/4" (19mm)	Nom 1" (25mm) Nom 1" (25mm) Nom 1" (25mm)	Nom 1-1/2" (38mm) Nom 1-1/2" (38mm) Nom 1-1/2" (38mm)	Nom 1-1/2" (38mm) Nom 1-3/4" (44mm) Nom 2" (50mm)				
For <b>VERY SEVERE</b> DESIGN CONDITIONS which Armacell would consider temperatures above <b>90°F(32°C)</b> and/or above <b>80% RH</b>	Consult Armacell for recommended insulation thickness							

NOTE: Thicknesses greater than 1" (25mm) are multiple-layer applications, see technical bulletin #30.

\*BASED ON **NORMAL** DESIGN CONDITIONS AP Armaflex SS in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **normal** design conditions, a maximum severity of **85°F (29°C) and 70% RH**. Armacell research and field experience indicate that indoor conditions anywhere in the United States seldom exceed this degree of severity.

\*\*BASED ON **MILD** DESIGN CONDITIONS AP Armaflex SS in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **mild** design conditions, a maximum severity of **80°F (27°C) and 50% RH**. Typical of these conditions are most airconditioned spaces and arid climates.

\*\*\*BASED ON **SEVERE** DESIGN CONDITIONS AP Armaflex SS in the thicknesses noted and within the specified temperature ranges will control outer insulation surface condensation indoors under **severe** design conditions, a maximum severity of **90°F (32°C) and 80% RH**. Typical of these conditions are indoor areas in which excessive moisture is introduced or in poorly ventilated confined areas where the temperature may be depressed below ambient.

## **Insulation Products for Mechanical Systems**

## Armaflex® Adhesives

Armaflex® 520 and Armaflex 520 Black Adhesives are air-drying contact adhesives that are excellent for joining seams and butt joints of AP and NH Armaflex Pipe and Sheet Insulation and Tubolit Pipe Insulation. Where a low V.O.C. adhesive is required, use Armaflex 520 BLV Adhesive.

520 Adhesives meet MIL-A-24179A and Amend-2 as Type II, Class 1. 520 Adhesives when dried to a film meet codes and specifications of less than 25 for flame spread and less than 50 for smoke (ASTM E 84).



Armaflex Low VOC Spray Contact
Adhesive, green in color, is supplied in 27
pound aerosolized canisters. The product
contains no chlorinated solvents such as
methylene chloride and does not contain
ozone depleting compounds. Complies
with SCAQMD rule 1168 for volatile organic
compound content less than 80 g/l. Dried film
meets the fire building codes of
flame spread index of less
than 25 and smoke developed
index of less than 50.
Excellent for bonding Armaflex
sheet and roll insulations
to vessels, tanks, ducts

# Armaflex® WB Finish

**Armaflex WB Finish** is a white water-based latex enamel for use over all forms of Armaflex insulations. It provides a protective semi-gloss finish for both indoor and outdoor applications.

Armaflex® WB Finish

Carmacell=

Armaflex WB Finish brushes or rolls on easily. Its water base formulation makes it fast-drying without solvent fumes. Cleans up with soap and warm water. Armaflex WB Finish is supplied in gallon and quart containers.

containers.

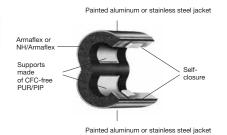
Impervious to moisture. Outdoors, is exceptionally durable and weather resistant to ultraviolet (UV) and ozone. Outdoor surfaces

# Armafix IPH, NPH Pipe Hangers

should be recoated every 2-4 years.

#### Uses

Armafix is used to support Armaflex and Armaflex NH (nonhaogen)insulated pipes with pre-insulated hangers that retard heat gain and control condensation drip from chilledwater and refrigeration systems. See Armafix Submittal Sheet for details.



# Armacell Fabricated Fittings

Armacell Fabricated Fittings are madeto-order and prefabricated using the world's highest quality, closed cell insulation. Available in wall thicknesses up to 2", these fittings are labor saving, easy to work with and apply, and provide total Armaflex system integrity.



Options include 90-degree elbows (2-piece and 3-piece), T's, 45-degree elbows, grooved fittings (AP Armaflex black) and grooved couplings

## **Insulation Tape**

AP Armaflex® Insulation Tape is made of high-quality AP Armaflex insulation. Available in tape dispenser form, the expanded closed-cell structure makes it an efficient insulation. Made with Microban® antimicrobial product protection, our tape is also formaldehyde free, low VOCs, fiber free, dust free and resists mold and mildew.

Provides a fast, easy method for insulating pipes and fittings. Reduces heat loss when applied to hot-water lines that operate up to 180°F (82°C). AP Armaflex Tape may be used with AP Armaflex Pipe and Sheet Insulation.



## ARMACELL LLC

and mechanical equipment

operating at temperatures

below 180°F (82°C).

TEL: 1 800 866-5638 FAX: 919 304-3847 info.us@armacell.com www.armacell.us

7600 Oakwood Street Extension • Mebane, NC 27302

armacell THE MAKERS OF Armaflex®

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Microban is a registered trademark of Microban Products Company.

## Friendly Feel™ Duct Wrap with Kwikstretch® Markings

## **Submittal Date**



#### Description

Knauf Friendly Feel Duct Wrap with Kwikstretch® Markings is a thermal and acoustical insulation blanket made from highly resilient, inorganic glass fibers bonded by a thermosetting resin. It is available unfaced, with a foil-scrim-kraft (FSK) jacket, a white or black metalized polypropylene-scrim-kraft (PSK) jacket, or with white or grey vinyl vapor retarders. Vapor retarders provide a 2" (51 mm) staple flange on one edge, and the factory-applied facing assures uniform quality. KwikStretch markings on the staple flange (FSK and PSK only) allow for easy and accurate job site measurements.

#### **Application**

Knauf Friendly Feel Duct Wrap is used as external insulation on commercial or residential heating or air conditioning ducts. It is suitable for the exterior of rectangular or round sheet metal ducts and spaces or surfaces where temperature and condensation must be controlled.

#### **Features**

- Low "k" factor significantly reduces heat gain or loss when applied with proper compression.
- Flexible
- · Lightweight.
- KwikStretch markings on the FSK and PSK staple flanges.
- · Excellent acoustical properties.
- · Tough and resilient.

#### Benefits

- · Energy conservation, which lowers operating costs.
- System efficiency increases; energy usage/costs decrease.
- · Conforms easily to flat or irregular surfaces.
- · Rolls allow for faster installation, lower labor costs.
- · Easier, faster measurement of stretch-out lengths.
- · Reduces sound transmission through the duct wall.
- Assured condensation control when used with FSK or PSK facings, proper installation and sealed joints, seams and penetrations.
- Resists damage in shipment, and during and after installation.

## **Specification Compliance**

#### In U.S.

- · ASTM C 553; Type I, II, III
- ASTM C 795
- ASTM C 1136; Type II (FSK and PSK facings only)
- ASTM C 1290
- GREENGUARD<sup>™</sup> Certification<sup>†</sup>
- GREENGUARD<sup>™</sup> For Children and Schools<sup>SM</sup> Certification<sup>†</sup>
- · California Title 24 (installed at 25% compression)
- HH-I-558C; Form B, Type I, Class 7
- MIL-I-24244C
- NFPA 90A and 90B
- NRC Reg. Guide 1.36

†Vinyl facings are not Greenguard certified.

## In Canada:

- CAN/ULC S102-M88
- · CAN/CGSB-51.5M; Type II (FSK facing)
- CAN/CGSB-51.11-92

#### **Technical Data**

## **Surface Burning Characteristics**

- UL/ULC Classified (except PSK and Vinyl).
- Unfaced or composite (insulation, facing and adhesive) does not exceed 25 Flame Spread, 50
   Smoke Developed when tested in accordance with ASTM E 84, CAN/ULC S102-M88, NFPA 255 and III 723

## Temperature Range (ASTM C 411)

- Faced, can be used on ducts operating up to 250°F (121°C).
- Unfaced, up to 350°F (177°C).

## Water Vapor Permeance (ASTM E 96, Procedure A)

- FSK and white PSK facings have maximum water vapor permeance of .02 perms.
- Black PSK facing has a maximum water vapor permeance of .09 perms.
- Vinyl facings have a maximum water vapor permeance of 1.3 perms.

#### Water Vapor Sorption (ASTM C 1104)

 Less than 5% by weight when tested for 96 hours at 120°F (49°C) and 95% relative humidity.

## Corrosiveness (ASTM C 665)

Will not accelerate corrosion of a steel panel compared to sterile cotton.

#### Mold Growth (ASTM C 1338)

No growth.

## Puncture Resistance (TAPPI Test T803) (Beach Units)

FSK and PSK: 25

## Application and Specification Guidelines Storage

- Protect stored insulation from water damage, construction damage and other abuse.
- If stored outside, proper protection from weather conditions should be provided.

#### Preparation

- Install Knauf Friendly Feel Duct Wrap over clean, dry sheet metal ducts.
- All sheet metal joints and seams must be sealed to prevent air leakage from the duct.

## Application

- Install Knauf Friendly Feel Duct Wrap with facing to the outside to obtain specified R-value using a maximum of 25% compression.
- Butt all insulation joints firmly together. Longitudinal seam of the vapor retarder must be overlapped a minimum of 2" (51 mm). A 2" (51 mm) tab is provided for the circumferential seam and must be overlapped.
- Where vapor retarder performance is necessary, all penetrations, joints, seams and damage to the facing should be sealed with an FSK, PSK, vinyl or foil tape or glass fabric mastic prior to system startup.
- Pressure sensitive tapes should be a minimum of 3" (76 mm) wide and be applied with moving pressure using an appropriate sealing tool. Staples should be outward clinch and placed approximately 6" (152 mm) on center.
- Closure systems should have a 25/50 F.H.C. per UL

- For rectangular ducts over 24" (610 mm) wide, secure the insulation to the bottom side of the duct with mechanical fasteners spaced on 18" (457mm) centers to reduce sag. Care should be taken to avoid overcompressing the insulation with the retaining washer.
- Unfaced Duct Wrap should be overlapped with a minimum of 2" (51 mm) and fastened with 4" (102mm) to 6" (152 mm) nails or skewers placed 4" (102mm) apart or secured with a wire or banding system. Care must be taken to avoid damaging the duct wrap. Refer to diagram for staple stitching and butt-joint method.

#### Installation Procedures

 Use the table (back) to determine stretch-outs required for the nominal thickness of insulation to limit average compression of the insulation 25% or less. Use KwikStretch markings on the FSK or PSK staple flanges to speed measurement of duct wran

## Fiber Glass and Mold

Fiber glass insulation will not sustain mold growth. However, mold can grow on almost any material when it becomes wet and contaminated with organic materials. Carefully inspect any insulation that has been exposed to water. If it shows any sign of mold, it must be discarded. If the material is wet but shows no evidence of mold, it should be dried rapidly and thoroughly. If it shows signs of facing degradation from wetting, it should be replaced. Air handling insulation used in the air stream must be discarded if exposed to water.

#### Notes

The chemical physical properties of Knauf Friendly Feel Duct Wrap with Kwikstretch® Markings represent typical average values determined in accordance with accepted test methods. The data is subject to normal manufacturing and testing variations. The data is supplied as a technical service and is subject to change without notice. References to numerical flame spread ratings are not intended to reflect hazards presented by these or any other materials under actual fire

Check with your Knauf sales representative to assure information is current.

# Friendly Feel Duct Wrap with Kwikstretch® Markings

**Submittal Date** 



Insertion Loss (Reduction of Sound Transmitted Through Duct Wall) (Sound and Vibration Design and Analysis, National Environmental Balancing Bureau, 1994) **Duct Wrap** Insertion Loss, dB/LF of Duct Duct **Sheet** Nominal Nominal Dimensions 250Hz 500Hz 1000Hz 2000Hz 4000Hz Metal **Thickness** Density 63Hz 125Hz 12" x 12" (305 mm x 305 mm) 24 GA 11/2" (38 mm) .75 PCF (12kg/m3) .6 .6 .6 .7 7.4 14.2 20.9 24" x 12" (610 mm x 305 mm) 24 GA 11/2" .75 PCF (12kg/m3) .6 .6 .6 .7 7.4 14.2 20.9 (38 mm) (1219 mm x 305 mm) .75 PCF (12kg/m<sup>3</sup>) 48" x 12" 22 GA 11/2" .5 .5 .5 .6 74 14 1 20.9 (38 mm) 24" x 24" (610 mm x 610 mm) 22 GA 11/2" .75 PCF (12kg/m3) .5 .5 .5 .6 7.4 14.1 20.9 (38 mm) 24" x 12" (610 mm x 305 mm) 26 GA 11/2" (38 mm) .75 PCF (12kg/m3) 8. 8. 8. 8. 7.5 14.2 21.0 24" x 8" (610 mm x 203 mm) 26 GA .75 PCF (12kg/m<sup>3</sup>) 1.0 1.0 1.0 3.6 10.4 17.1 23.9 (51 mm)

Stretch-Outs				
Labeled Thickness	Installed Compressed Thickness	Round	Square	Rectangular
1 <sup>1</sup> / <sub>2</sub> " (38 mm)	1 <sup>1</sup> / <sub>8</sub> " (29 mm)	P+9 <sup>1</sup> / <sub>2</sub> " (241 mm)	P+8" (203 mm)	P+7" (178 mm)
2" (51 mm)	1 <sup>1</sup> / <sub>2</sub> " (38 mm)	P+12" (305 mm)	P+10" (254 mm)	P+8" (203 mm)
2 <sup>3</sup> / <sub>16</sub> " (56 mm)	1 <sup>5</sup> /8" (42 mm)	P+13" (330 mm)	P+11" (279 mm)	P+8 <sup>1</sup> / <sub>2</sub> " (216 mm)
2 <sup>1</sup> /2" (64 mm)	1 <sup>7</sup> /8" (48 mm)	P+14 <sup>1</sup> / <sub>2</sub> " (368 mm)	P+12 <sup>1</sup> / <sub>2</sub> " (318 mm)	P+9 <sup>1</sup> / <sub>2</sub> " (241 mm)
3" (76 mm)	2 <sup>1</sup> / <sub>4</sub> " (57 mm)	P+17" (432 mm)	P+14 <sup>1</sup> / <sub>2</sub> " (368 mm)	P+11 <sup>1</sup> / <sub>2</sub> " (292 mm)

P = Perimeter of duct to be installed

Thermal Efficiency (ASTM C 177)								
Mean	0.7	5 PCF	1.0	PCF	1.5 PCF			
Temperature	k	k (SI)	k	k (SI)	k	k (SI)		
50°F (10°C)	.28	.040	.26	.037	.23	.033		
75°F (24°C)	.29	.042	.27	.039	.24	.035		
100°F (38°C)	.31	.045	.29	.042	.26	.037		
125°F (52°C)	.33	.048	.31	.045	.28	.040		
150°F (66°C)	.36	.052	.34	.049	.31	.045		
175°F (80°C)	.39	.056	.37	.053	.33	.048		
200°F (93°C)	.43	.063	.40	.058	.36	.052		

R-Value @ 75ºF Mean Temperature						
Density	Thickness	Out-Of Package R-Value	Installed R-Value (at 25% Compression)			
	1 <sup>1</sup> / <sub>2</sub> " (38 mm)	5.1	4.2			
75 DOE	2" (51 mm)	6.8	5.6			
.75 PCF (12 kg/m³)	2 <sup>3</sup> / <sub>16</sub> " (56 mm)	7.4	6.0			
(12 kg/iii )	2 <sup>1</sup> / <sub>2</sub> " (64 mm)	8.5	7.0			
	3" (76 mm)	10.2	8.4			
1.0 PCF	1 <sup>1</sup> / <sub>2</sub> " (38 mm)	5.6	4.5			
(16 kg/m <sup>3</sup> )	2" (51 mm)	7.4	6.0			
1.5 PCF	1 <sup>1</sup> / <sub>2</sub> " (38 mm)	6.1	4.8			
(24 kg/m <sup>3</sup> )	2" (51 mm)	8.2	6.4			

Forms Ava	ilable			
Density	Thickness	Width	Length	Facing
	1 <sup>1</sup> / <sub>2</sub> " (38 mm)		100' (30.48 m)	FSK, PSK,
75 DOE	2" (51 mm)		75' (22.86 m)	vinyl, unfaced
.75 PCF (12 kg/m³)	2 <sup>3</sup> / <sub>16</sub> " (56 mm)	48"	75' (22.86 m)	FSK
(12 kg/iii )	2 <sup>1</sup> / <sub>2</sub> " (64 mm)		75' (22.86 m)	FSK
	3" (76 mm)	(1219 mm)	50' (15.24 m)	FSK, PSK, vinyl
1.0 PCF	1 <sup>1</sup> / <sub>2</sub> " (38 mm)	(121311111)	100' (30.48 m)	FSK, PSK,
(16 kg/m <sup>3</sup> )	2" (51 mm)		75' (22.86 m)	unfaced
1.5 PCF	1 <sup>1</sup> / <sub>2</sub> " (38 mm)		40' (12.19 m)	FSK, PSK
(24 kg/m <sup>3</sup> )	2" (51 mm)		40' (12.19 m)	I ON, FOR

Condensation Control
Recommended minimum install R-Values for condensation contol on flat surfaces. Surface emittance: 0.2 (aged aluminum foil or galvanized sheet metal).

	Operating Temperature																
		45°F (7°C) 55°F (13°C)								6	60°F (18°C	C)					
RH		Ambient	Tempera	ture (°F)			Ambient Temperature (°F)  Ambient Temperature				ature (°F)	e (°F)					
%	70	80	90	100	110		70	80	90	100	110		70	80	90	100	110
60	2.21	3.3 <sup>1</sup>	4.3 <sup>1</sup>	4.32	5.4 <sup>3</sup>		1.1 <sup>1</sup>	2.21	3.3 <sup>1</sup>	3.3 <sup>1</sup>	4.32		1.1 <sup>1</sup>	1.1 <sup>1</sup>	2.21	3.3 <sup>1</sup>	4.32
70	3.3 <sup>1</sup>	5.4 <sup>3</sup>	6.54	7.65	_		1.1 <sup>1</sup>	3.3 <sup>1</sup>	4.32	6.54	6.5 <sup>4</sup>		1.1 <sup>1</sup>	1.1 <sup>1</sup>	3.3 <sup>1</sup>	5.4 <sup>3</sup>	6.54
80	7.04	_	_	_	_		3.3 <sup>1</sup>	6.5 <sup>4</sup>	_	_	_		2.2 <sup>1</sup>	3.3 <sup>1</sup>	6.54	_	_
90	_	_	_	_	_		_	_	_	_	_		6.54	_	_	_	_

 $<sup>^1</sup>$  All Duct Wrap products  $^2$  0.75 PCF, 2" and greater; 1.0 PCF, 1½" and greater; 1.5 PCF, 1½" and greater

 $<sup>^3</sup>$  0.75 PCF, 2" and greater; 1.0 PCF, 2"; 1.5 PCF, 2"  $^4$  0.75 PCF, 2½" and greater

THE MAKERS OF **Armaflex®** 



# **BLACK, LOW VOC ADHESIVE**

Formulated for Armaflex Insulations

Developed to meet South Coast AQMD Hexane-free Toluene-free contact adhesive Proven: no gapping, no tape needed









#### **Description**

Armaflex® 520 BLV Adhesive is a black, low VOC air-drying contact adhesive that is excellent for joining seams and butt joints of Armaflex Pipe and Sheet Insulations for line temperatures up to 250°F (120°C). No additional tape wrap needed to prevent gapping and moisture infiltration. The adhesive may also be used to apply Armaflex Sheet Insulation to flat or curved metal surfaces that will operate at temperatures up to 180°F (82°C).

- Developed to meet South Coast Air Quality Management District (SCAQMD) Rule 1168.
- Dried film also meets 25/50 flame spread index and smoke developed index requirements of codes and specifications when tested by ASTM E 84 Method

#### Uses

520 BLV Adhesive will make a resilient and heat-resistant bond with many materials where the use of a toluene-free, hexane-free low VOC, solvent-base rubber contact adhesive is suitable and desirable. Armaflex 520 BLV was developed to meet requirements for reduced emissions of Volatile Organic Compounds. Its black color helps achieve a neater, cleaner finished installation.

It will make a strong resilient bond for sealing laminated aluminum foil and kraft paper vapor retarder jackets.

#### **Properties**

## Color

Black

## **Net Weight**

6.9 lb per gallon (828 g/l)

#### Composition

Synthetic rubber base with synthetic resins and fillers added; hydrocarbon- and ketone-type solvents. Zero V.O.C. g/l calculated SCAQMD 1168

## **Solids Content**

Approximately 30% by weight

#### Coverage

200 sq ft (5m²/l) per gallon max, single coat (depending upon porosity of materials bonded and air temperature)

#### Shelf Life

2 years in original sealed container; storage temperature 60°F to 80°F (16°C to 27°C)

## **Minimum Drying Time**

3-5 minutes under normal conditions

## **Temperature Limits**

250°F (120°C)—Armaflex Pipe Insulation seams and joints 180°F (82°C)—full-bonding Armaflex Sheet Insulation

## **Container Sizes**

Pint brush-top cans and gallon containers

## **Fire Performance**



ARMACELL LLC 7600 Oakwood Street Extension P. O. Box 1038 • Mebane, NC 27302

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For any updates on this document, please refer to our website.

**DANGER**—Extremely flammable mixture; vapors may cause flash fire; vapors may ignite explosively; prevent buildup of vapors—open all windows and doors—use only with cross ventilation; keep away from heat, sparks, and open flame; do not smoke; extinguish all flames and pilot lights; and turn off stoves, heaters, electric motors, and other sources of ignition during use and until all vapors are gone; close container after use; avoid prolonged breathing of vapor and prolonged contact with skin; do not take internally; keep away from elbilders.

Not for consumer use. Sold only for professional or industrial application.

#### **Application Instructions**

Mix well contents of the container and apply only to clean, dry, oil-free surfaces. For best results, the adhesive should be brush-applied in a thin, uniform coat to both bonding surfaces. Allow the adhesive to tack prior to joining both surfaces. Avoid open time of more than 10 minutes. 520 Adhesive bonds instantly, so pieces must be positioned accurately as contact is made. Moderate pressure should then be applied to the entire bonding area to insure complete contact.

It is recommended that the adhesive be applied at temperatures above 40°F (4°C) and not on heated surfaces. Where application between 32°F and 40°F (0°C and 4°C) can not be avoided, exercise more care in applying the adhesive and closing the joint. Applications below 32°F (0°C) are not recommended.

Where lines and tanks that are insulated and will operate at hot temperatures, 520 Adhesive must cure a minimum of 36 hours at room temperature to attain heat resistance for insulated pipe to 250°F (120°C) and insulated tanks and equipment to 180°F (82°C).

Adhesive-bonded seams and joints of Armaflex Pipe Insulation must cure before finishes are applied. Where the insulation is installed by adhering seams and butt joints, the adhesive must cure 24 to 36 hours.

Adhesive-bonded seams and joints of Armaflex Sheet Insulation must cure before finishes are applied. Where the insulation is installed by adhering seams and butt joints only, the adhesive must cure 24 to 36 hours. Where the insulation is installed against surfaces with full adhesive coverage, requiring wet adhesive at joints, the adhesive must cure seven days.

Thinning is not recommended.

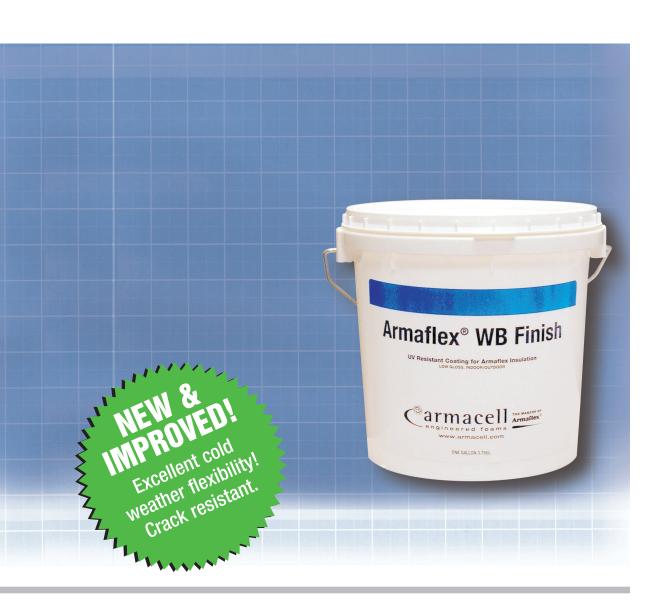
Either methyl ethyl ketone or most lacquer thinners can be used to clean fresh residue from tools and workpieces.

Armacell provides this information as a technical service. To the extent the information is derived from sources other than Armacell, Armacell is substantially, if not wholly, relying upon the other source(s) to provide accurate information. Information provided as a result of Armacell's own technical analysis and testing is accurate to the extent of our knowledge and ability, as of date of printing, using effective standardized methods and procedures. Each user of these products, or information, should perform their own tests to determine the safety, fitness and suitability of the products, or combination of products, for any foreseeable purposes, applications and uses by the user and by any third party to which the user may convey the products. Since Armacell cannot control the end use of this product, Armacell does not guarantee that the user will obtain the same results as published in this document. The data and information are provided as a technical service and are subject to change without notice.

Armaflex WB Finish



THE MAKERS OF **Armaflex®** 



## **TOUGH, LONG-LASTING PROTECTIVE COATING**

Formulated for Armaflex insulations

Exceptionally durable finish

**UV** and Weather resistant

Water-based latex enamel







## **Armaflex® WB Finish**

#### **Description**

Armaflex WB Finish is a white water-based latex enamel supplied in gallon or quart containers for use over all forms of Armaflex Insulations. It provides a protective finish suitable to both indoor and outdoor applications. It is now formulated for greater durability and cold weather flexibility to resist cracking.

Armaflex WB Finish is provided in handy plastic tubs, and brushes or rolls on easily. The water-based formulation makes it fast-drying without solvent fumes. Clean up with soap and warm water.

#### **Colors**

Armaflex WB Finish is available in white. Where a custom pastel shade is desired, Armaflex WB Finish may be tinted with selected pigment pastes recommended for shading or coloring latex paints at less than 4 ounces per gallon. When Finish is used for outdoor application, tinting is not recommended.

#### Uses

Armaflex WB Finish adheres to clean Armaflex surfaces and dries to a pliant coating. Indoors, it provides a clean white protective finish, which is impervious to moisture. Outdoors, its special properties make it exceptionally durable and weather resistant to ultraviolet (UV) and ozone. Like typical paint coatings, Armaflex WB Finish requires routine maintenance. Outdoor surfaces should be recoated every 2-4 years.

#### **Properties**

#### Color

Standard white

#### **Net Weight**

10.14 lbs. per gallon can

## Composition

Pigmented acrylic latex

V.O.C. Less than 5 g/l (calculated)

#### **Solids Content**

Approximately 50% by weight

## **Viscosity**

Heavy-bodied, easy brushing

## **Application**

Brush or roller

#### Coverage

Up to 400 sq. ft. (37 sq.m.) per gallon per single brush coat, depending on temperature and location

#### **Shelf Life**

One year in original sealed container. Storage temperature 60° to 80°F (16° to 27°C). Keep from freezing.

#### **Drving Time**

Four hours minimum for application of second coat

## **Container Size**

One-gallon or quart containers

## **Flammability**

Not flammable; water-based

## **Surface-Burning Characteristics**

Dry: ASTM E 84 Method

Applied on fiber-reinforced board

Flame-Spread Index 0

Smoke Developed Index 0

## **Application**

Stir thoroughly and apply to clean, dry, oil-free surfaces only. For best results, apply at temperatures above 50°F (10°C). Prior to applying Armaflex WB Finish, the Armaflex Insulation surface should be wiped with a damp cloth, preferably dampened with a nonoily solvent such as alcohol to remove any traces of powdered lubricant, dirt and oils.

Apply with brush or roller. A two-coat application is recommended. Allow first coat to dry before applying second coat, waiting at least four hours prior to application of second coat. Armaflex WB Finish may be applied with a shortnap paint roller. Coverage is approximately 400 sq. ft. (37 sq.m.) per gallon in single brush coat depending on temperature and location. Armaflex WB Finish may also be applied over 520 or 520 BLV Adhesive joints after the adhesive has been allowed to set for two hours.

In most cases, Armaflex WB Finish should not be used over conventional insulations or other building or structural materials. A test coat applied to a small area will usually determine the compatibility of the material in question.

Do not thin the product.

To clean fresh Armaflex WB Finish from tools, use warm soapy water.

#### **Drying**

In storage areas where foodstuffs will pick up odors, remove food during application and allow drying of Armaflex WB Finish. In cool, poorly ventilated areas, odors may persist for a period of time.

**CAUTION**—Use with ventilation; do not take internally; if swallowed, do not induce vomiting; call physician immediately; avoid contact with eyes; in case of eye contact, flush with large amounts of water for fifteen minutes and call a physician; close container after use; keep out of the reach of children.

Armacell provides this information as a technical service. To the extent the information is derived from sources other than Armacell, Armacell is substantially, if not wholly, relying upon the other source(s) to provide accurate information. Information provided as a result of Armacell's own technical analysis and testing is accurate to the extent of our knowledge and ability, as of date of printing, using effective standardized methods and procedures. Each user of these products, or information, should perform their own tests to determine the safety, fitness and suitability of the products, or combination of products, for any foreseeable purposes, applications and uses by the user and by any third party to which the user may convey the products. Since Armacell cannot control the end use of this product, Armacell does not guarantee that the user will obtain the same results as published in this document. The data and information are provided as a technical service and are subject to change without notice.



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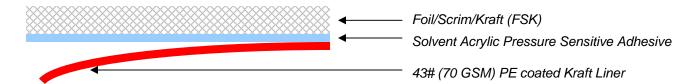
TEL. 919 304-3846 • FAX 919 304-3847 E-MAIL info.us@armacell.com INTERNET www.armacell.com

For any updates on this document, please refer to our website.



Venture Tape 1525CW COLD WEATHER FSK is a 5.0-mil (125µm) foil/scrim/kraft (FSK) lamination coated with Venture's CW<sup>®</sup> cold weather solvent acrylic pressure sensitive adhesive. Versatile FSK applies easily to both fibrous and sheet metal ducts and easily conforms to irregular surfaces. Venture Tape 1525CW excels in demanding temperature and humidity applications and provides superior performance and durability over a wide range of environmental conditions.

## **Product Construction**



## Features & Benefits

- UL723 Listed
- Specifically designed for cold weather conditions
- Tri-directionally reinforced 2 x 3 squares per inch fiberglass scrim, UL listed FSK lamination
- Also excels in high heat and humidity conditions
- High performance insulation tape is ideal for use as a vapor seal for reinforced fiberglass or mineral wool thermal insulation
- Venture CW<sup>®</sup> cold weather solvent acrylic adhesive performs well over a wide temperature range
- Hand tearable allows for easy installation
- In stock product available for immediate delivery

		Typical Value	
Test	Typical Value	(Metric)	Test Method
Product Thickness (Total)	6.5 mils	243.8 μm	PSTC-133
Thickness (Carrier)	5.0 mils	127.0 µm	PSTC-133
Thickness (Adhesive)	1.5 mils	38.1 µm	PSTC-133
Thickness (Liner)	3.1 mils	78.7 µm	PSTC-133
Peel Adhesion	96 oz/in	26.7 N/25mm	PSTC-101
Shear Strength	>168 hours	>168 hours	PSTC-107
Tensile Strength	40 lb/in width	178 N/25mm width	PSTC-131
Elongation	2 %	2 %	PSTC-131
Minimum Application Temperature	-35 °F	-37 °C	
Maximum Continuous Temperature	260 °F	127 °C	
Maximum Intermittent Temperature	300 °F	149 °C	

Typical values are not intended to be used for specification development. Technical data is believed to be true and accurate; Venture Tape recommends that the purchaser test for fitness of use in all applications.

## **Product Configurations**

- Standard sizes: 3" x 50Y, 4" x 50Y, 5" x 50Y, 6" x 50Y
- Custom widths and lengths available, contact Venture Tape for specifications and requirements

## Contact Venture Tape today for a complete list of products or a free sample

Toll Free North America 800-343-1076 From United Kingdom 0-800-962-957 From Australia 1-800-122-797 www.venturetape.com www.boma.it



Venture Tape Corp. 30 Commerce Road Rockland, MA 02370 781-331-5900 FAX 781-871-0065

## Europe – BOMA

BOMA s.r.l. Via Aquileia 22/30 34070 Villesse (GO) Italy 0481 96431 1 FAX 0481 91440





## Europe – Venture Tape

Venture Tape Europe Corp. Units 5 – 6, Faraday Close, Drayton Fields, Daventry, Northamptonshire, England NN11 8RD (0) 1327 876555 FAX (0) 1327 876444

#### Australasia

Venture Tape Australasia, Pty., Ltd. 90A Northgate Drive Thomastown 3074 Victoria Australia (03) 9464 2089 FAX (03) 9464 7268

# **HVAC: Test Balance**

# **NC National Guard TAC OPS**

## KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

# HOCKADAY MECHANICAL CORPORATION

## **SUBMITTAL FOR APPROVAL**

## **PROJECT**

National Guard Tactical Operations Morrisville, NC

## ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

## CONTRACTOR

KAD Construction Raleigh, NC

## ITEM SUBMITTED

Test & Balance Qualifications

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR OR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/17/2013

JKH







REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY ERRORS THEREIN OR FOR FURNISHING THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC.

DATE 1-6-14

By Taine Mergenthaler

# NC National Guard Tactical Operations Morrisville, NC



Charlotte, NC Office

14230 High Echelon Drive Matthews, N.C. 28105 Phone: 704-321-0494

Fax: 866-613-8755

Corporate Headquarters

5571 Peachtree Road Atlanta, Georgia 30341 Phone: 770-452-8292

Fax: 770-455-6209

Raleigh, NC Office

2000-A Ramblewood Drive Raleigh, North Carolina 27523

Phone: 919-387-5788 Fax: 919-387-6596

## Specializing In:

- Testing, Adjusting and Balancing of Air and Hydronic Systems
- Sound & Vibration Analysis



## CORPORATE HEADQUARTERS

5571 Peachtree Road Atlanta, Georgia 30341 Phone: 770-452-8292 Fax: 770-455-6209

## RALEIGH, NC OFFICE

2000-A RAMBLEWOOD DRIVE RALEIGH, N.C. 27523 PHONE: 919-387-5788 FAX: 919-387-6596

## CHARLOTTE, NC OFFICE

14230 High EcheLon Drive Matthews, N.C. 28105 Phone: 704-321-0494 Fax: 866-613-8755

## **About Our Organization:**

Research Air Flo, Inc. is an independent test and balance firm certified in air and hydronics by the National Environmental Balancing Bureau (NEBB) and the Testing, Adjusting and Balancing Bureau (TABB).

Research Air Flo, Inc was established in 1977 and has satisfactorily completed more than 22,000 projects of every scope and size. Our continued commitment to quality, integrity, and customer service has helped us to establish many longstanding relationships with owners, architects, engineers and contractors, some of which are referenced in this submittal.

We presently employ: 36 full-time test and balance technicians, 4 NEBB Certified Professionals, 6 TABB certified Test & Balance Supervisors and 2 Sound and Vibration Supervisors. Our entire staff of professionals, engineers, and sales personnel has hands on test and balance experience to insure that your needs are met from pre-design and bid stage to delivery of certified reports.

Our instrumentation is "state of the art" and, in many cases, can be interfaced with personal computers and printers for instantaneous hard copy test results. Our philosophy is to always employ the highest degree of accuracy, through the best technology available, at an affordable price.

We operate 3 full service offices in Atlanta, GA, Raleigh, NC and Charlotte, NC. Along with the full service offices, we also employ full-time personnel in Valdosta, GA and Jacksonville, NC. This level of coverage enables Research Air Flo, Inc. to service the southeastern United States with quality and efficiency. Additionally, Research Air Flo, Inc. has traveled the country on an occasional basis to meet specific needs and take advantage of opportunities as they present themselves.

We employ the best training in the industry for our employees through the use of our in-house apprenticeship training programs, industry-related training seminars, NEBB sponsored seminars and the NEBB Home Study Course. These training programs enable our staff to stay on the cutting edge of technology.

We are <u>the</u> specified test and balance firm by numerous engineers, hospitals, shopping malls and building owners. It is our desire to show you why we should become **your** test and balance company.

Sincerely, Research Air Flo, Inc.

## **Our Employees**

## **Professionals**

## Joel T. Shannon, CEO, Production Manager:

- NEBB Certified Professional
- TABB Certified T&B Supervisor
- TABB Certified Sound & Vibration Supervisor/Engineer
- TABB Certified IAQ Technician

Mr. Shannon has been with Research Air Flo, Inc. since 1988. He has held the position of CEO since 2012. Mr. Shannon's guidance and dedication continues to develop Research Air Flo into a regional leader as a test and balance contractor.

Mr. Shannon is Technical Committee Chairman of the Mid-South Environmental Balancing Bureau, a chapter of the National Environmental Balancing Bureau. His education includes courses at the American Technical Institute in Phoenix, AZ, training at the Trane Air Conditioning Clinic and study of HVAC, Electronics and Mathematics at Dekalb Technical College.

Mr. Shannon has over 25 years of test and balance experience.

## Kevin J. Derrick, CFO, Sr. Project Manager, Safety Manager:

• TABB Certified T&B Supervisor

Mr. Derrick has been with Research Air Flo, Inc. since 1993. He was named CFO in 2012. The high level of service provided by Research Air Flo is a testament to Mr. Derrick's commitment to quality service and customer satisfaction.

Mr. Derrick is responsible for the management of most large projects performed by Research Air Flo, Inc. His education includes training at the United States Navy School of Aviation Electronics, Memphis State University and Auburn University where he received a Bachelor of Science Degree in Agricultural Economics and a Master's Degree in Agriculture.

Mr. Derrick has over 22 years of test and balance experience.

## **Professionals** (Continued)

## Timothy Larson, Raleigh, NC Division Manager

- NEBB Certified Professional
- TABB Certified T&B Supervisor
- TABB Certified IAQ Supervisor

Mr. Larson has been with Research Air Flo, Inc. since 1998. He is the North Carolina Division Manager and has managed the Raleigh, NC office since September, 2000.

Mr. Larson served as President of the Georgia Chapter of NEBB from 1988 – 1993. His education includes Supervisory Training from the Sheet Metal Air Conditioning Contractors Association

Mr. Larson has over 35 years of test and balance experience.

## Michael Desimone, Charlotte, NC Division Manager

- NEBB Certified Professional
- TABB Certified T&B Supervisor & Technician
- NEBB & TABB Certified Sound & Vibration Supervisor

Mr. Desimone has been with Research Air Flo, Inc. since 1999. He is the North Carolina Sr. Project Manager and has managed the Charlotte, NC office since July, 2008.

Mr. Desimone's education includes HVAC classes at Universal Technical Institute in Houston, TX,

Mr. Desimone has over 20 years in the HVAC industry.

## Lawrence "Randy" Vann:

- NEBB Certified Professional
- TABB Certified T&B Supervisor & Technician
- Supervisor of Form Development
- Data Review & Report Certification

Mr. Vann has been with Research Air Flo, Inc. since 1996.

Mr. Vann's education includes an HVAC diploma from Coosa Valley Technical Institute in Rome, GA.

Mr. Vann also has received extensive technical training from the U.S. Navy.

Mr. Vann has over 16 years of test and balance experience.

## Office Staff – Atlanta, GA (Headquarters)

William Clunan, Engineering Manager

Rob Hansen, Draftsman, Pre-Engineering

Britt Stein, Sales / Estimating, Pre-Engineering

John "Russ" Cooper, Reporting, Office Administration

Dale Frazier, Pre-Engineering

Lynn Shannon, Accounts Payable / Receivable

## Office Staff – Raleigh, NC

Timothy Larson, Raleigh, NC Division Manager

Russell Taylor, Estimating

Ingrid Larson, Office Administration

## Office Staff - Charlotte, NC

Michael Desimone, Charlotte, NC Division Manager

Matthew Lee, Pre-Engineering, Reporting, Project Coordination



Recertification

THIS IS TO CERTIFY THAT Research Air Flo, Inc.

in Atlanta, GA

HAS MET ALL REQUIREMENTS FOR RENEWAL OF NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE

Air & Hydronics Systems

Exp. March 31, 2014

Research Air Flo, Inc./GA

No. 2736

NEBB Cert. No.

Exp. March 31, 2014

Research Air Flo, Inc./GA

No. 2736

FOR THE BOARD OF DIRECTORS:

President-Elect

NE RR

Recertification

THIS IS TO CERTIFY THAT Joel T. Shannon

with Research Air Flo, Inc. in Atlanta, GA

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Air & Hydronics Systems

Exp. March 31, 2014

Research Air Flo. Inc./GA

No. 2736

NEBB Cert. No.

FOR THE BOARD OF DIRECTORS:

Hartest Heads

President-Elect

Tational Environmental Balancing Burgan

Recertification THIS IS TO CERTIFY THAT Lawrence R. Vann

with Research Air Flo, Inc. in Atlanta, GA

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Air & Hydronics Systems

FOR THE BOARD OF DIRECTORS:

President-Elect

Satismal Environmental Balancing Puredu

Certification

THIS IS TO CERTIFY THAT Research Air Flo, Inc.

in Atlanta, GA

HAS MET ALL THE NEBB REQUIREMENTS AND AGREES TO CONFORM TO NEBB PROCEDURES AND STANDARDS FOR

Sound & Vibration Measurement

FOR THE BOARD OF DIRECTORS:

Sanley Herocke

President-Elect

NEBB Cert. No.

NEBB Cert. No.

Exp. March 31, 2014 Research Air Flo, Inc./GA

No. 2736

NE RR Certification

THIS IS TO CERTIFY THAT Joel T. Shannon

with Research Air Flo, Inc. in Atlanta, GA

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Sound Measurement

Exp. March 31, 2014 Research Air Flo, Inc./GA No. 2736

NEBB Cert. No.

FOR THE BOARD OF DIRECTORS: Sanley Herocke

President-Elect

Tational Environmental Balancing Burgan Certification

Exp. March 31, 2014

NEBB Cert. No.

Exp. March 31, 2014

Research Air Flo, Inc.-Raleigh, NC/NC

No. 2736

Research Air Flo, Inc./GA

THIS IS TO CERTIFY THAT Joel T. Shannon

with Research Air Flo, Inc. in Atlanta, GA

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Vibration Measurement

FOR THE BOARD OF DIRECTORS:

Stanley Herocke

President-Elect



International Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Kevin J Derrick

Has successfully completed the requirements for TABB Supervisor

May 16, 2012

TB916416S

Certification #

Renewed: May 16, 2012

Valid Date

December 31, 2013

Expiration Date



Valid during qualified employmen



No.3209 NEBB Cert. No.

Tational Environmental Balancing Burein

Recertification

THIS IS TO CERTIFY THAT Research Air Flo, Inc.-Raleigh, NC in Raleigh, NC

HAS MET ALL REQUIREMENTS FOR RENEWAL OF NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE

Air & Hydronics Systems

President-Elect

FOR THE BOARD OF DIRECTORS:



Recertification THIS IS TO CERTIFY THAT Timothy J. Larson

with Research Air Flo, Inc.-Raleigh, NC in Raleigh, NC

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Air & Hydronics Systems

Exp. March 31, 2014

Research Air Flo, Inc.-Raleigh, NC/NC

No. 3209

NEBB Cert. No.

FOR THE BOARD OF DIRECTORS:

Sarker Herch

President-Elect



International Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Timothy J Larson

Has successfully completed the requirements for TABB Supervisor

June 11, 2012

TB713242S

Certification #

Renewed: June 11, 2012

Valud Date

Expiration Date

December 31, 2014

International Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Timothy J Larson

Has successfully completed the requirements for Indoor Air Quality Supervisor

June 11, 2012

IA0713242S

Renewed: June 11, 2012

December 31, 2014

Expiration Date



international Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Timothy J Larson

Has successfully completed the requirements for Fume Hood Performance Testing Technician

May 17, 2012

FHP713242T Certification # May 17, 2012 December 31, 2014

Valid during qualified employment



ME RR



## Recertification

THIS IS TO CERTIFY THAT Research Air Flo, Inc. - Charlotte, NC in Charlotte, NC

HAS MET ALL REQUIREMENTS FOR RENEWAL OF NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE

Air & Hydronics Systems

FOR THE BOARD OF DIRECTORS:

Exp. March 31, 2014

Research Air Flo, Inc. - Charlotte, NC/NC

No. 3475

NEBB Cert. No.

President-Elect

NE RR

Recertification

THIS IS TO CERTIFY THAT Michael I. DeSimone

with Research Air Flo, Inc. - Charlotte, NC in Charlotte, NC

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Air & Hydronics Systems

FOR THE BOARD OF DIRECTORS:

Exp. March 31, 2014

Research Air Flo. Inc. - Charlotte, NC/NC

No. 3475

NEBB Cert. No.

Carte Heart.

President-Elect

Sational Environmental Balancing Bureau

Recertification

THIS IS TO CERTIFY THAT

Research Air Flo, Inc. - Charlotte, NC in Charlotte, NC

HAS MET ALL REQUIREMENTS FOR RENEWAL OF NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE

Sound & Vibration Measurement

FOR THE BOARD OF DIRECTORS:

Exp. March 31, 2014

Research Air Flo, Inc. - Charlotte, NC/NC

No.3475

NEBB Cert. No.

President-Elect

Satismal Emirummental Balancing Burgan

Recertification THIS IS TO CERTIFY THAT Michael I. DeSimone

with Research Air Flo, Inc. - Charlotte, NC in Charlotte, NC

HAS MET ALL THE NEBB REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN

Sound & Vibration Measurement

Exp. March 31, 2014

Research Air Flo, Inc. - Charlotte, NC/NC

No. 3475

NEBB Cert. No.

FOR THE BOARD OF DIRECTORS:

President-Elect

# International Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Michael DeSimone

Has successfully completed the requirements for TABB Sound and Vibration Supervisor

December 28, 2011

SV972734S

Renewed: December 28, 2011

December 31, 2014

Expiration Date



-







# International Certification Board

Sheet Metal and Air Conditioning Industry This certifies that

# Michael DeSimone

Has successfully completed the requirements for TABB Supervisor

December 29, 2011

TB972734S

Certification #

Renewed: December 29, 2011

December 31, 2014

Expiration Date



## FIELD TECHNICIANS

## **CHARLES AGAN**

Charles has been working at Research Air Flo, Inc. since 2011 and has 1 year of test and balance experience. Referenced projects include Facebook, and Blue Cross Blue Shield of Mississippi Data Center.

## J.P. AYERS, NEBB Certified T&B Technician, TABB Supervisor

J.P. has been working at Research Air Flo, Inc. since 2008 and has 1 year of prior test and balance experience. Referenced projects include Brinkhouse Bullit, Johnston Memorial Hospital and the UNC Physical Science Building.

## KEVIN BLANTON, NEBB Certified T&B Technician

Kevin has been working at Research Air Flo, Inc. since 1998 and has 3 years of prior experience in the heating and air conditioning industry. Referenced projects include Abraham Baldwin Agricultural College, Tifton Ga. and the Dooley County Jail.

#### DANIEL BROWN

Dan has been with Research Air Flo, Inc. since 2010. Referenced projects include Hilton Restaurant Kitchen Rebalance, Room at the Inn and BOA Aviation Hangar.

## BOBBY BUSSELL, NEBB Certified T&B Technician

Bobby has been working at Research Air Flo, Inc. since 2010 and has 2 years of test and balance experience. Referenced projects include Winn Army Hospital Modular Transition Building, and Ga. Tech #103 Boggs - Dr. Vannberg 1st Floor Labs.

## **CARLOS PERALTA CANTOS**

Carlos has been with Research Air Flo, Inc. since 2013. Referenced projects include Carolina Inn and Sharon Towers Dining Renovation

## **DENNIS DART, NEBB Certified T&B Technician**

Dennis has been with Research Air Flo, Inc. since 2001 and has 19 years of prior test and balance experience. Referenced projects include Sphinx Laboratories, Carteret Hospital, NCSU Brickyard Chilled Water Loop, and Rex Hospital.

## LANDON DERRICK

Landon has been with Research Air Flo, Inc. since 2011. Referenced projects include IDI FSA Build-Out, Brunner & America's Best.

## **BILLY HADLEY**

Billy has been with Research Air Flo, Inc. since 2008. Referenced projects include Ga. Tech Nanotechnology Research Center and 1075 Peachtree.

#### **DWIGHT HARDEN,** NEBB Certified T&B Technician

Dwight has been with Research Air Flo, Inc. since 2002 and has 2 years of prior test and balance experience. Referenced projects include The College Board and Peyton Forest Elementary School.

## KENNETH HEAD, NEBB Certified T&B Technician

Kenneth has been with Research Air Flo, Inc. since 2010 and has 11 years of prior test and balance experience. Referenced projects include Modified Record Fire Range 65046, Battalion Headquarters Facility (Ft. Benning), and VMAC Modernize Patient Wards.

## **FIELD TECHNICIANS** (Continued)

## DREW HOFFMAN, NEBB Certified T&B Technician

Drew has been with Research Air Flo, Inc. since 1999. Drew has completed major projects such as 171 Peachtree St. (Wachovia), Centergy Building @ Technology Square, Galleria 600, the UPS E-commerce building and Devon Tower.

## ERIC MARKOWSKI, NEBB Certified T&B Technician

Eric has been with Research Air Flo, Inc. since 2005 and has 11 years of prior test and balance experience. Referenced projects would include Nashville Symphony Hall and Midtown Plaza.

## STEVE MAZUROWSKI, NEBB Certified T&B Technician

Steve has been with Research Air Flo, Inc. since 2006 and has 21 years of test and balance experience. Referenced projects include 4<sup>th</sup> & 5<sup>th</sup> Floors South Vertical Expansion at St. Joseph's Hospital, Atlanta, Ga.

## DON McKITTRICK, NEBB Certified T&B Technician

Don has been with Research Air Flo, Inc. since 1999 and has 13 years of prior test and balance experience. Referenced projects include Flexible Products Company, Five Points Plaza and the Center for Disease Control Building 5.

#### RON MILLER

Ron has been with Research Air Flo, Inc. since 2009 and has 20 prior years of experience in the HVAC industry. Referenced projects include NBSC, Columbia, SC, Community School of Davidson and Premier Corporate Headquarters.

## FLORIN MOLDOVAN

Florin has been with Research Air Flo, Inc. since 2013. Referenced projects include SPX Headquarters and CTL Packaging.

## MICHAEL NEWMAN, NEBB Certified T&B Technician

Mike has been with Research Air Flo, Inc. since 2008 and has 6 years of prior test and balance experience. Referenced projects include Barrow County Justice Facility and Shands Hospital Cancer Center.

## CODY NOLL

Cody has been with Research Air Flo, Inc. since 2012. Referenced projects include Pharmavite, ADP and State Farm.

## **DANIEL ORTIZ, NEBB Certified T&B Technician**

Daniel has been with Research Air Flo, Inc. since 2012 and has 25 years of test and balance experience. Referenced projects include Time Warner Cable – Phase 3, Greiner Bio-One and Cramerton High School.

## RODGER PAGE, NEBB Certified T&B Technician, TABB Certified T&B Technician

Rodger has been with Research Air Flo, Inc. since 2008 and has 18 years of test and balance experience. Referenced projects include Benneker High School, Johnston Memorial Hospital.

## CLINT RAMLOW, NEBB Certified T&B Technician

Clint has been with Research Air Flo, Inc. since 2009. Referenced projects include Shands Hospital Cancer Center and South Patient Tower and Clinical Services. Clint has successfully passed the NEBB exam and is completing additional requirements for certification.

## **FIELD TECHNICIANS** (Continued)

## WALTER "TONY" TRUMBULL II, NEBB & TABB Certified T&B Technician

Walter has been with Research Air Flo, Inc. since 2008 and has 2 prior years of experience in the HVAC industry. Referenced projects include Speed Channel, Inc. and OrthoCarolina Expansion.

#### THOMAS ROBERTSON

Thomas has been with Research Air Flo, Inc. since 2009. Referenced projects include SOF Buildings and UNC Brinkhouse – Bullit HVAC Renovations.

## RICHIE ROBINSON, NEBB Certified T&B Technician

Richie has been with Research Air Flo, Inc. since 2005. Referenced projects include One Symphony Center and CDC Building 18. Richie has successfully completed the NEBB Home study course for technicians.

## **ALEX SARANTOS**

Alex has been with Research Air Flo, Inc. since 2008. Referenced projects include SOF Buildings and Rex Diagnostics.

## **CHRIS SHANNON**

Chris has been with Research Air Flo, Inc. since 2008. Referenced projects include Barrow County Justince Center and North Atlanta High School Renovations.

## ANTHONY SIATKOWSKI, NEBB Certified T&B Technician

Andy has been with Research Air Flo, Inc. since 2001 and has 6 prior years of experience in the HVAC industry. Referenced projects include Visible Genetics, McMaster and Carr, and The Paradies Shops headquarters. Andy also is an Unrestricted Georgia State Warm Air Licensee.

## JUSTIN STEED, NEBB Certified T&B Technician

Justin has been with Research Air Flo, Inc. since 2009. Referenced projects include Normandy Inn at Winshape Retreat and Brown Middle School. Justin has successfully passed the NEBB exam and is completing additional requirements for certification.

## **CHRIS TAYLOR**

Chris has been with Research Air Flo, Inc. since 2012. Referenced projects include Durham Justice Center, ESP Electronics and Powerhouse at American Tobacco.

## JEREMY TAYLOR, NEBB Certified T&B Technician

Jeremy has been with Research Air Flo, Inc. since 2007. Referenced projects include SOF Buildings and Duke Raleigh Hospital MOB 6.

## BILL TRUETT, NEBB Certified T&B Technician

Bill has been with Research Air Flo, Inc. since 1999. Referenced projects include The Mall of Georgia base building in Buford, Ga., Solvay Pharmaceuticals, Home Depot Corporate Building D, CDC Building 18, One Symphony Center, and the Parsons Meadow Medical Office Building.

## KEITH VANN, NEBB Certified T&B Technician

Keith has been with Research Air Flo, Inc. since 2005. Referenced projects include CDC Building 110 and Oncology Services Renovation.

## **FIELD TECHNICIANS** (Continued)

## WESLEY WEBB, NEBB Certified T&B Technician

Wesley has been with Research Air Flo, Inc. since 2005. Referenced projects include the Woodruff Arts Center, Nashville Symphony Hall and South Dekalb Hospital at Hillandale.

## **EDDIE WHITENER,** NEBB Certified T&B Technician

Eddie has been with Research Air Flo, Inc. since 2008. Referenced projects include Cascade Elementary School and America's Mart: Gift Mart Expansion.

## TIM YEAGER, NEBB Certified T&B Technician

Tim has been with Research Air Flo, Inc. since 2000 and has 8 prior years of test and balance experience. Referenced projects include The Atlanta Falcons Corporate Headquarters and Training Camp, Lanier Village Estates, IBM Global Services and Powertel Data Center.

# **REFERENCED PROJECTS**

# Military Installations

PROJECT	CONTACT
Bachelor Enlisted Quarters Camp Gieger, NC	Coy Rigney
Operations Maintenance Facility MCAS Cherry Point, NC	Sam Tanbouz
Joint Stars Maintenance Fuel Dock Hangar Warner Robins AFB, GA	Ricky Maddox
Building 645 Warner Robins AFB, GA	Ricky Maddox
Building 200 MCAS Cherry Point, NC	Robert Bittner
Hobby Shop Camp Lejeune, NC	Doug Lawrence
Child Development Center MCAS New River, NC	Doug Lawrence
Open Bay Barracks Camp Gieger, NC	Coy Rigney
Dining Hall Facilities, SATOC Ft. Jackson, SC	Eric Jones
Base-Wide Waste Treatment Facility Camp Lejeune, NC	John McIntyre
Product Support Administration Facility MCAS Cherry Point, NC	Robert Bittner

## RESEARCH AIR FLO, INC.

5571 Peachtree Road - Atlanta, Georgia 30341 Phone 770.452.8292 - Fax 770.455.6209 www.researchairflo.com



## Certified Test, Adjust and Balance Report

Date:	
Project TB#:	
Project:	
Architect:	
Engineer:	
HVAC Contractor:	



## RESEARCH AIR FLO, INC.

Table Of Contents

Project:				TB#:
Page	Description		Page	Description
	Cover			
1	Tab Index			
2	Certification			
3	Instrument			
4	Nomenclature			
5	Summary			
	V	1		

Page 1

## RESEARCH AIR FLO, INC.

	Report	Certification	
Project:			TB#:
Specified tolerances:			
Air Handling Units	- 10% / + 10%	Air Distribution	- 10% / + 10%
Pumps	- 10% / + 10%	Water Distribution	- 10% / + 10%
FINAL ADJUSTMENTS EDITION OF THE NEBI BALANCING OF ENVIR ANY VARIANCES FRO	THAT HAVE BEEN OF B PROCEDURAL STAN ROMBENTAL SYSTEM M DESIGN QUANTITIE ADJUST- BALANCE RI	STAINED IN ACCORDANIDARDS FOR TESTING,	BB TOLERANCES, ARE MARY.
Report Certification Date	B:	NEBB CERTIFIED PROFES	SIONAL
Research Air Flo, Inc. Certification Number: Expiration Date: 3/3:	2736 1/2014	(	Lawrence R. Vann

Not valid without NEBB Professional's Signature above



## RESEARCH AIR FLO, INC.

Instrument Type	Manufacturer	Model Number	Serial Number	Calibration Date
Air Data Multimeter	Shortridge	ADM-860	M01862	1/18/2013
Hydro Data Multimeter	Shortridge	HDM-250	W97050	8/9/2012
Temp./Humidity Meter	Cooper	SRH77A	C286076	2/1/2013
Tachometer	Extech	461995	Q165720	2/27/2013
Amp / Volt Meter	Fluke	322	90590541	2/1/2013
Ultrasonic Flow Meter	Controlotron	1010WDP1	U2202	N/C/R

N/C/R = No Calibration Required

Page 2



## RESEARCH AIR FLO, INC.

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## RESEARCH AIR FLO, INC.

	Nomenclature		
:t:		TB#:	

Airflow Data			
CFM	ı	Cubic Feet Per Minute	
FPM	II	Feet Per Minute	
SA	=	Supply Air	
RA	=	Return Air	
OA	ı	Outside Air	
EA	Ш	Exhaust Air	

Air Pressure Data			
TSP	ı	Total Static Pressure (in.wc.)	
ESP	=	External Static Pressure (in.wc.)	
SP	ı	Static Pressure (in.wc.)	
ΔP or DP	=	Differential Pressure	
OTA	=	Open To Atmosphere	

Temperature Data (°F)			
EAT DB	ı	Entering Air Temp. Dry Bulb	
LAT DB	П	Leaving Air Temp. Dry Bulb	
EAT WB	ı	Entering Air Temp. Wet Bulb	
LAT WB	II	Leaving Air Temp. Wet Bulb	
EWT	=	Entering Water Temperature	
LWT	=	Leaving Water Temperature	
$\Delta T$ or $DT$	II	Differential Temperature	

Distribution Data				
CD	Ш	Ceiling Diffuser		
SD	Ш	Slot Diffuser		
SG	II	Supply Grille		
LFD	П	Laminar Flow Diffuser		
FG	II	Floor Grille		
RG	II	Return Grille		
EG	П	Exhaust Grille		
ES	ı	Exhaust Slot		

Waterflow Data			
GРМ	=	Gallons Per Minute	
CHW	=	Chilled Water	
HW	=	Hot Water	
CW	=	Condenser Water	
PW	=	Process Water	

FT	Water Pressure Data			
IN HG = Inches Of Mercury	FT	=	Feet Of Water Column	
	IN	ı	Inches Of Water Column	
DOI - December Des Concess Inch	IN HG	=	Inches Of Mercury	
PSI = Pounds Per Square Inch	PSI	"	Pounds Per Square Inch	
ΔP or DP = Differential Pressure	ΔP or DP	=	Differential Pressure	

Electrical Data			
HP	"	Horsepower	
KW	ı	Kilowatts	
FLA	ı	Full Load Amps	
BHP	ı	Brake Horsepower	
VFD	=	Variable Frequency Drive	
ECM	ı	Electronically Commutated Motor	
VSM	ı	Variable Speed Motor	
VSC	=	Variable Speed Controller	
MSM	ı	Multiple Speed Motor	

Miscellaneous						
LT	=	Light Troffer				
CSD	=	Continuous Slot Diffuser				
°F	=	Degrees Fahrenheit				
DD	=	Direct Drive				
HEPA	=	High Efficiency Particulate Air				

Page 4

		Project Summary	
Projec	t:		TB#:
Item No.	Device	Description	Page Number
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-4			
			<del> </del>
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Page 5



## RESEARCH AIR FLO, INC.

	Air Handli	ng Unit Tes	t Report	$\rightarrow$				
Project:	Tested E	a.			TB#:			
Unit Number Manufacturer	Model Number	Serial Number	r Loc	cation	Area Served			
	_							
Airflow Data	Mo	otor / Fan Data		Drive Data				
Design Actu	ral	Design A	ctual F	an Sheave				
Outlet Total	Average Am	ps		Fan Bore				
Unit Total	Average Vol	ts	M	otor Sheave				
Return	Motor RPM	7		Notor Bore				
OSA	Fan RPM			Belt Size				
Relief	Motor Manu	of.		elt Quantity	_			
	Motor HP			nter Distance				
Miscellaneous Data	Phase			ırns Open**				
SP Setpoint VFD Setting (HZ.)	Motor Fram Service Fact				Inches In			
VFD Setting (HZ.)	Service Fact	or			ariable pitch sheaves			
Static P. Technician - Indicate the actual i	ressure Profile Data	n the sketch helow			(Inside Dimensions)			
- '\				rvice /idth				
	°   °			eight	+ +			
				Dia.	+ + + + + + + + + + + + + + + + + + + +			
MIXING BOX		$H = H \cap H$	a C	a (ft²)				
			Actu	al FPM				
			Desi	gn FPM				
			S.P.	(in.wc.)				
RETURN AIR			=					
A B	DEF	G H I	Data		Design Actual			
			_	Kilowatts				
A B C D	E F G	/H I .	electric Heater	Amps Volts				
External Design A	Actual Total	Design Actu	al E	Phase				
Static Design 7	Static	Design Acta	<u></u>	L Enterin	a a			
Points A and J are to be used			H E	Leavin				
Points A and J are to be used	or external, r and G for total	stauc pressures.		- Louvin	3			
Apparat	us Coil Data			ow Control D	evice Data			
Service Entering Air Leav.		Coil GPM	Manufactu					
db°F wb°F db°F	wb °F Ent. Lvg.	ΔP' Grill	Туре	Size"	Position ΔP			
Actual								
Service Entering Air Leav	ing Air Water °F	Coil GPM	Manufactu	rer				

NEBB

## RESEARCH AIR FLO, INC.

Project:										TB#:	
Test Date:	Tested By:										
Unit Number	Service	Inside Dia Width (in.)		Inch Ø Dia.		FPM Design Actual		CFM Design Actual		S.P. (in.wc.)	Notes
											-

Remark

Page 6 Page



# RESEARCH AIR FLO, INC.

Tested By:	:
Init No. Service Dwg No. Design CFM Actual C	
	FM .
	M Note
	-
	_
	-
	+
	-
	+
	+
	+

# NEBB RESEARCH AIR FLO, INC.

Project:										TB#:	
				Test	ed By:						
Init No.		S	ervice	Supply	Dwg No.		Desig	n CFM	A	tual CFM	
Area Served	Grille Number	Code/ Type	Size	Free Area	Design FPM	n CFM CFM	Initia FPM	Data CFM	Final FPM	Data CFM	Note
				1							<u> </u>
				-							-
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						_	_				
				1							
nit No.		S	ervice	Return	Dwg No.		Desig	n CFM	A	ctual CFM	
Area	Grille	Code/	Size	Free	Design	n CFM	Initia	Data	Final	Data	Note
Served	Number	Туре	3120	Area	FPM	CFM	FPM	CFM	FPM	CFM	Note
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# RESEARCH AIR FLO, INC.

		Fan P	owered	Term	ninal U	nit With	out Hea	t Test I	Report		
Project:										ГВ#:	
Test Da	te:			Tes	sted By:						
Unit Nu	mber	Unit Type	Control	Туре	Dwg. No.	Served By	Inlet Size	Unique (	Ctrl ID / Add.	Flow 0	Correction
	Δi	rside Informa	ation								
	_	ing CFM	Fan				Additional	Data			Note
	Max	Min	CFM	S	ystem Sta	tic Pressure	At Time Of	Test (in.wc.			
Design					_	Fan S	peed				
Actual											
Area Served	Grille Numbe	Code/ Type	Size	Free Area		Design	Ini FPM	itial CFM	Fina FPM		Note
Serveu	Numbe	Type		Area	FPN	CFM	FPM	CFM	FPM	CFM	
		1									
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						4					
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Remarks: \* Flow Hood Measurements



Project:

Test Date:

### RESEARCH AIR FLO, INC.

Fan Powered Terminal Unit With Electric Heat Test Report

Tested By:

Page 9

Unit Nu	mber	Unit Type	Control	Type D	wg. No.	Served By	"Ø		Oniqu	ie Ctri	ID / Ad	a. Flow	Correct
			Airsid	e Informa	ntion				Elec	trical	Informa	ation	
	Clg Max CFM	Clg Min CFM	Fan CFM	Htr. Coil CFM		g Leaving F Air DB °F	ΔΤ	ν	/olts	ø	KW	Amps	Not
Design													
Actual											]		
Fan Spee	ed		System Sta	atic Pressu	ıre At Tim	e Of Test (in.	wc.)						
Area Served	Grille Number	Code/ Type	Size	Free Area	FPM	esign CFM	FPM	Init	ial CFM		Fin FPM	nal CFM	Not
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		<u> </u>			1	1				+			
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Page 10 Page 11



# RESEARCH AIR FLO, INC.

F	an Powe	red Termin	al Unit	With Hot	Water I	Heat Test Repo	rt
Project:							ГВ#:
Test Date:		To	ested By:				
Unit Number	Unit Type	Control Type	Dwg. No.	Served By	Inlet Size "Ø	Unique Ctrl ID / Add.	Flow Correction
	Airs	ide Information		Waters	ide Informa	tion Flow Contro	ol Device Data

				rmation					Informa			ow Control	Device	Data
	Coolin	g CFM	Fan	Htr. Coil	EAT	LAT	EWT	LWT	Coil	CDM	Manuf.			
	Max Min CFI		CFM	CFM	DB°F	DB°F	°F	°F	ΔP' GFM		Size	Position	ΔΡ	Note
Design														
Actual														

Fan Spe	ed	S	System Sta	tic Pressu	re At Time	Of Test (in	.wc.)				
Area	Grille	Code/	Size	Free	Des	sign	In	itial	Fir	nal	Note
Served	Number	Type	0.20	Area	FPM	CFM	FPM	CFM	FPM	CFM	71010

Remarks: \* Flow Hood Measurements

# NEBB RESEARCH AIR FLO, INC.

Project: Test Dat				T	ested By:							TB#:	
Unit Nu	mber	Unit Type	Control Ty		Dwg. No.	Served		Inlet S		Inique	Ctrl ID / Ad	d. Flow C	Correction
		Cooling			Heating CFN	1 Volt	ø	KW	Amps	ΔΤ	Entering Air °F	Leaving Air °F	Note:
Design		Max	Min	H			K				Air*F	Alr°F	
Actual				┢		-	+		1				

Area	Grille	Code/	Size	Free	Des	sign	Ini	tial	Fil		Note
Served	Number	Type	Size	Area	FPM	CFM	FPM	CFM	FPM	CFM	Note
	7										

Remarks: \* Flow Hood Measurements

Page 13



### RESEARCH AIR FLO, INC.

Project:											TE	3#:	
Test Da	te:			To	ested E	Ву:							
Unit Nu	ımber	Unit Type	Control	Туре	Dwg.	Vo. S	erved E	lnle	et Size "Ø	Unique Ctrl	ID / Add.	Flow C	Correctio
												Ų	
						_		_	_	_		$\overline{}$	_
		Airside	Informatio	n		W	aterside	Inform	nation	Flo	w Control L	Device L	Data
	Clg Ma	_	Informatio Heating	n EAT	LAT	EWT	aterside LWT	Inform Coil		Flo Manuf.	w Control L	Device L	Data
	Clg Ma	x Clg Min		_	LAT °F		_		nation GPM		Position	Device I ΔP	
Design		x Clg Min	Heating	EAT		EWT	LWT	Coil		Manuf.			Data Note:

Area	Grille	Code/	Size	Free	Des	sign	Ini	tial	Fir	nal	Note
Served	Number	Туре	3/26	Area	FPM	CFM	FPM	CFM	FPM	CFM	Note



### RESEARCH AIR FLO, INC.

Project:										т	B#:	
Test Da	te:				T	ested By:						
Unit Nu	mber	Unit	Туре	Control	Туре	Dwg. No.	Served By	Inlet Size "Ø	Unique (	Ctrl ID / Add.	Flow	Correctio
	Clg	Max C	FM	Clg M	in CFM			,	Additional	Data		
Design Actual							System Static	Pressure A	t Time Of T	Test (in.wc.)		
Area Served	Grille		ode/ Type	Size	Fre Are		Design I CFM	lni FPM	tial CFM	Final	CFM	Note
			71									
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Page 14 Page 15



# NEBB RESEARCH AIR FLO, INC.

			Ele	ctric	Rehea	t Z	one Te	est Rep	ort			
Project:											TB#:	
Test Dat	te:			т	ested By:	_						
Zone Nu	mber		Location		Dwg. No.	Se	erved By					
	CF	М	Volts	Ø	Amps		KW	Entering Air °F	Leaving Air °F	ΔΤ	Air ΔP (in.wc.)	Note
Design												

Area	Grille	Code/	Size	Free	Des	sign	Ini	tial	Fil	nal	Note
Served	Number	Туре	3/26	Area	FPM	CFM	FPM	CFM	FPM	CFM	Note
		_						_			



# NEBB RESEARCH AIR FLO, INC.

	Hot Wate	er Rehe	at Zone 1	Test Repor	t	
Project:					TE	3#:
Test Date:	Те	ested By:				
Zone Number	Location	Dwg. No.	Served By			

	Airs	ide Inform	ation		Waters	side Inf	ormation		FI	ow Control	Device Da	ıta
	CFM	Air ΔP	EAT	LAT	EWT	LWT	Coil AP'	GPM	Manuf.			
	CFW	(in.wc.)	°F	°F	°F	°F	CON AF	GFW	Size	Position	ΔΡ	Note
Design												
Actual												

Area	Grille	Code/	Size	Free	De	sign	Ini	tial	Fil		Mada
Served	Number	Type	Size	Area	FPM	CFM	FPM	CFM	FPM	CFM	Note

Page 17



### RESEARCH AIR FLO, INC.

			Fan Te	st l	Report			
Project:							TB#:	
Test Date:		Te	ested By:					
Unit Da	a		Notes	1 1	Unit Da	ta		Notes
Fan Number					Fan Number			
Service				] [	Service			
Manufacturer				М	Manufacturer			
Model Number				N	Model Number			
Airflow Data	Design	Actual	Notes	1 1	Airflow Data	Design	Actual	Notes
CFM (Unit Total)				П	CFM (Unit Total)			
CFM ( Connected Load)				] [	CFM ( Connected Load)			
Pressure Data	Design	Actual	Notes	N	Pressure Data	Design	Actual	Notes
Total SP (in.wc.)				11	Total SP (in.wc.)			
Suction (in.wc.)	-			1 [	Suction (in.wc.)	-		
Discharge (in.wc.)				] [	Discharge (in.wc.)	-		
Motor / Fan Data	Rated	Actual	Notes	1 1	Motor / Fan Data	Rated	Actual	Notes
Voltage				М	Voltage			
Amps				М	Amps			
Motor RPM				] [	Motor RPM			
Fan RPM					Fan RPM			
Motor Manufacturer				1/[	Motor Manufacturer			
Motor HP				ľ	Motor HP			
Phase					Phase			
Service Factor					Service Factor			
VFD Setting (HZ.)				] [	VFD Setting (HZ.)			
Drive Da	ta		Notes	11	Drive Da	nta		Notes
Fan Sheave Size				] [	Fan Sheave Size			
Fan Bore Size				IJ	Fan Bore Size			
Motor Sheave Size					Motor Sheave Size			
Motor Bore Size					Motor Bore Size			
Belt Size				] [	Belt Size			
Number Of Belts					Number Of Belts			
Center Distance				1 [	Center Distance			

Remarks:



### RESEARCH AIR FLO, INC.

														TB#:			
Test Dat	e:						ed By:										
Unit	KW		ø			lts	_		An	ıps		CFM		Temp.		Note	
Vumber				L1-L2	L1-L3	L2-L3	Avg.	L1	L2	L3	Avg.		Ent.	Lvg.	ΔΤ		
	Design												-	-			
	Actual																
	Design												-	-			
	Actual																
	Design		<u> </u>										-	-			
	Actual																
	Design		<u> </u>										-	-			
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	Actual																
	Design Actual												-	-			



### RESEARCH AIR FLO, INC.

# Pump Test Report Project: \_\_\_\_ Test Date: TB#: Tested By:

# NEBB RESEARCH AIR FLO, INC.

ject:							TE	B#:
st Date:			Tested E	Ву:				
Unit	Data		Note	1	Unit	Data		Note
Unit Number				1	Unit Number			
Service					Service			
	Air Data					Air Data		
	Design	Actual	Note			Design	Actual	Note
CFM					CFM			
Entering DB (°F)					Entering DB (°F)	-		
Entering WB (°F)					Entering WB (°F)			
Leaving DB (°F)					Leaving DB (°F)			
Leaving WB (°F)					Leaving WB (°F)			
	Water Data					Water Data		
	Design	Actual	Note			Design	Actual	Note
GPM					GPM			
Entering Wtr.(°F)				1	Entering Wtr.(°F)			
Leaving Wtr.(°F)				1	Leaving Wtr.(°F)			
Coil AP (ft.wc.)				1	Coil AP (ft.wc.)			
				1				
Flow Contro	I Device Da	ita	Note		Flow Contro	I Device Da	ta	Note
Manufacturer	$\overline{}$				Manufacturer			
Туре	_			ł	Туре			
Size (in.)					Size (in.)			
Position		_			Position			
ΔP ( )		7			$\Delta P$ ( )			

Page 21



### RESEARCH AIR FLO, INC.

ect:							TE	B#:
t Date:			Tested E	Ву:				
Uni	t Data		Note		Unit	Data		Note
Unit Number					Unit Number			
Service					Service			
	Air Data					Air Data		
	Design	Actual	Note			Design	Actual	Note
CFM					CFM			
Entering DB (°F)					Entering DB (°F)			
Entering WB (°F)		-			Entering WB (°F)	-	-	
Leaving DB (°F)					Leaving DB (°F)			
Leaving WB (°F)	-	-			Leaving WB (°F)	-	-	
	Water Data					Water Data		
	Design	Actual	Note			Design	Actual	Note
GPM					GPM			
Entering Wtr.(°F)					Entering Wtr.(°F)			
Leaving Wtr.(°F)					Leaving Wtr.(°F)			
Coil AP (ft.wc.)					Coil AP (ft.wc.)			
	_							
Flow Contro	I Device Da	ita	Note		Flow Contro	Device Da	ıta	Note
Manufacturer					Manufacturer			
Туре					Туре			
Size (in.)	•				Size ( in. )	,		
Position				] ]	Position			
ΔP ( )					ΔP ( )			1

Remarks:



### RESEARCH AIR FLO, INC.

oject:						TE	3#:
st Date:			Tested By:				
Unit	Data		Note	Unit	Data		Note
Unit Number				Unit Number			
Chi	lled Water E	Data		Chil	led Water I	Data	
	Design	Actual	Note		Design	Actual	Note
CFM				CFM			
Entering Wtr.(°F)				Entering Wtr.(°F)			
Leaving Wtr.(°F)				Leaving Wtr.(°F)			
Coil AP (ft.wc.)				Coil AP (ft.wc.)			
Cond	enser Wate	r Data		Conde	enser Wate	r Data	
	Design	Actual	Note		Design	Actual	Note
				GPM			
GPM							
GPM Entering Wtr.(°F)				Entering Wtr.(°F)			
				Entering Wtr.(°F) Leaving Wtr.(°F)			
Entering Wtr.(°F)							
Entering Wtr.(°F) Leaving Wtr.(°F)				Leaving Wtr.(°F)			
Entering Wtr.(°F) Leaving Wtr.(°F)	I Device Da	ita	Note	Leaving Wtr.(°F)	Device Da	nta .	Note
Entering Wtr.(°F) Leaving Wtr.(°F) Coil ΔP (ft.wc.)	l Device Da	ıta	Note	Leaving Wtr.(°F) Coil ΔP (ft.wc.)	l Device Da	ita	Note
Entering Wtr.(°F) Leaving Wtr.(°F) Coil ΔP (ft.wc.) Flow Contro	l Device Da	ita	Note	Leaving Wtr.(°F) Coil ΔP (ft.wc.) Flow Control	Device Da	ata	Note
Entering Wtr.(°F) Leaving Wtr.(°F) Coil ΔP (ft.wc.) Flow Contro Manufacturer	l Device Da	ta	Note	Leaving Wtr.(°F) Coil ΔP (ft.wc.)  Flow Control Manufacturer	l Device Da	nta	Note
Entering Wtr.(°F) Leaving Wtr.(°F) Coil ΔP (ft.wc.)  Flow Contro Manufacturer Type	l Device Da	ta	Note	Leaving Wtr.(°F) Coil ΔP (ft.wc.)  Flow Control Manufacturer Type	Device Da	ata .	Note

Page 23 Page 22



# RESEARCH AIR FLO, INC.

Chiller Test Report	
	TB#:

Test Date:			Те	sted By:
	Un	it Data		
Unit Number				
Manufacturer				
Model Number				
Serial Number				
	Evano	rator Data		
	Старо		Actual	Notes
Entering Water	(°F)			
Leaving Water (				
Water ΔP (ft.we	c.)			
Water Flow (GF	M)			
	0-11-4-	nser Data		
	Conde	Design	Actual	Notes
Estados Matos	(OF)	Design	Actual	Notes
Entering Water Leaving, Water				
Water ΔP (ft.we				
Water Flow (GF				
(5)	/			
	Electi	rical Data		
		Design	Actual	Notes
Voltage T1-T2	?			
Voltage T1-T3				
Voltage T2-T3				
Amperage T1-				
Amperage T1-				
Amperage T2-1	Г3			

(	Unit Data		
Unit Number			
Manufacturer			
Model Number			
Serial Number			
Evai	porator Data		
	Design	Actual	Notes
Entering Water (°F)			
Leaving Water (°F)			
Water AP (ft.wc.)			
Water Flow (GPM)			
Com	denser Data		
Con	Design	Actual	Notes
	Design	Actual	Notes
Entering Water (°F)			
Leaving. Water (°F)			
IA/- to - A D /ft )			
Water AP (ft.wc.)			
Water ΔP (ft.wc.) Water Flow (GPM)			
Water Flow (GPM)	ctrical Data		
Water Flow (GPM)	ctrical Data Design	Actual	Notes
Water Flow (GPM)	_	Actual	Notes
Water Flow (GPM)	_	Actual	Notes
Water Flow (GPM)  Ele  Voltage T1-T2	_	Actual	Notes
Water Flow (GPM)  Ele  Voltage T1-T2  Voltage T1-T3	_	Actual	Notes
Water Flow (GPM)  Ele  Voltage T1-T2  Voltage T1-T3  Voltage T2-T3	_	Actual	Notes

Remarks:

# NE BE

### RESEARCH AIR FLO, INC.

Cooling Tower Test Report											
Proje				Ŧ	10					TB#:	
lest	Date:			leste							
						Data					
Tou	er Number	Manuf	acturer	Мо	del Num	ber	Se	rial Numi	ber	Rated C	apacity
				Cell 1			Cell 2			Cell 3	
			Design	Actual	Notes	Design	Actual	Notes	Design	Actual	Notes
_	Horsepo	wer									
Motor / Electrical Data	Voltage 1										
cal	Voltage 1	1-T3									
ctri	Voltage 1	2-T3									
Ele	Amperage	T1-T2									
or/	Amperage	T1-T3									
Mot	Amperage										
	Motor RI	PM									_
	Service F	actor									_
	VFD Setting	g (Hz.)									
	Ambient Air	DB (°F)									
Data	Entering Air	WB (°F)									
Air / Water Data	Leaving Air	WB (°F)									
Wa	Entering Wa	ter (°F)					/				
Nir/	Leaving Wa	ter (°F)									
`	Water Flow	(GPM)									
	Fan RF	PM									
	Fan Sheav	e Size		•							
ta	Fan Bore	-									
Da	Motor Shea										
Fan	Motor Bor										
Drive / Fan Data	Belt Size / G	uantity									
Dri	Gear Manuf										
	Gear Mo	del									
	Gear Ra	tio									

Remarks

Page 24

Page 25



# RESEARCH AIR FLO, INC.

	Punch List	
Project:		TB#:
То:	Company:	
Fax Number:	Email Address:	
From:		

				Date	
Item	Device	Description	Discovered	Corrected	T&B Complete
4					
_					
	4				

Page 26



# RESEARCH AIR FLO, INC.

		System Diagram		
Project:			1	ГВ#:
Location			System	
Floor Plan	Mechanical	Drawing Number	Drawing By	Page 27 RCH

# **HVAC: Computer Room Unit**

# **NC National Guard TAC OPS**

### KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: 2/20/14

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

Supplier: Hockaday Mechanical Corporation

Manufacturer: Trane

**Specification:** Computer Room Air Conditioning Unit

Submittal #: 1





REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY ERRORS THEREIN OR FOR FURNISHING THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC.

DATE 2-26-14 By Taine Mergenthaler



# HOCKADAY MECHANICAL CORPORATION

### SUBMITTAL FOR APPROVAL

#### **PROJECT**

National Guard Tactical Operations Morrisville, NC

#### ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

### **CONTRACTOR**

KAD Construction Raleigh, NC

#### ITEM SUBMITTED

Computer room air conditing unit

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR OR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/26/2013

JKH

### **Submittal**

Prepared For: Date: December 18, 2013

Bass Nixon and Kennedy, Inc.

Sold To: Job Name:

Hockaday Mechanical National Guard Morrisville Readiness Center

Brady Trane is pleased to provide the enclosed submittal for your review and approval.

#### **Product Summary**

Qty Product

1 Computer Room Air Conditioner

#### NOTE:

• 6 kW Heater Provided, 7.3 kW Not Available.

#### **BNK NOTES:**

- 1. Provide with plenum rated condensate pump as specified on permit drawings.
- 2. Coordinate electrical data for air handling unit, condensing unit, and condensate pump with E.C.

Adam Sippel / Pam Bradford Brady Trane 401 Kitty Hawk Drive Morrisville, NC 27560-8271 Phone: (919) 781-0458

Fax: (919) 781-9198

Tag Data - Computer Room Air Conditioner (Qty: 1)

Item	Tag	Qty	Description	Model Number
A1	AC/CU-1	1	Computer Room Air Conditioner	DAPA-0334-A0DRCU-0334-3LD

#### **Product Data – Computer Room Air Conditioner**

Item: A1 Qty: 1 Tag: AC/CU-1

Mini Plus Air Cooled 3 Ton 460/3 phase Air Handler

6 kW 460 volt Electric Reheat

Thru the Door Disconnect

5 lb/hr Steam Humidifier

Merv 8 Filters

Condensate Pump, External Mount and Field Power 460v

Water Detection Module

Smoke Detector

Outdoor Remote Condensing Unit 3 Ton 460/3 phase

Fusible Disconnect, 460v

Hot Gas Bypass



Product Data – Computer Room Air Conditioner

Item: A1 Qty: 1 Tag: AC/CU-1

# MINI PLUS CEILING SYSTEM GUIDE SPECIFICATIONS 3 Ton

#### **Computer Room Air Conditioning Units**

Basis-of-Design Product: Subject to compliance with requirements, provided product indicated on drawings or comparable product by one of the following:

Data Aire, Inc.

Description: The environmental control, Computer Room Air Conditioning, units shall be provided with a high sensible cooling system, self-contained, and shall be capable of humidifying, dehumidifying, and filtering air. Units shall be factory assembled, piped, wired and factory run tested prior to shipment. Provide quantities and configurations as shown on the project drawings.

Safety Certification: Units shall be ETL or UL listed.

**Cabinet and Frame** - The frame shall be constructed of 14 gauge welded tubular steel and be coated with a heavy corrosion inhibiting finish. The outer steel casing shall have removable panels for servicing. The panels shall be insulated with half inch (1/2") thick, neoprene. An integral return air filter box with duct connection shall be factory installed and contain 2-inch thick MERV 8 filters (based on ASHRAE Std. 52.2).

**Electrical** - All electrical components including contactors, relays, control transformers, and capacitors shall be pre-wired. The control circuit voltage shall be 24 volts. A micro-switch shall disable the unit operation prior to condensation pan overflow should the drain line become plugged with debris.

#### Air Cooled Split Systems (with outdoor condensing units)

The refrigeration system shall be split type consisting of an evaporator section and a remote outdoor condensing unit. The evaporator and condensing unit shall be factory assembled and tested. Refrigeration piping and control wiring between the evaporator section and the condensing unit shall be field provided.

The evaporator section shall be mounted in the ceiling space with ducted supply and return air as required on the project drawings.

The evaporator section shall be a draw through type consisting of a double width, double inlet blower with belt drive and variable pitch sheave and self-aligning ball bearings rated for an average life of 100,000 hours. The evaporator coil shall be constructed with copper tubes and

aluminum fins. A single refrigeration circuit shall contain an expansion valve with external equalization. The evaporator section shall have stainless steel drain pan.

The condensing unit shall be constructed of aluminum and contain a scroll compressor with crankcase heater, filter drier, sight-glass and condenser coil. The coil shall be constructed with copper tubes and aluminum fins. The condenser fan motor shall be variable speed for head pressure control down to -20° F/6.7° C. The condenser motor shall be direct drive with propeller type fan.

#### MINI dap™4

The Mini-dap™4 offers the definite answer for precision environmental control with the fast and most advance controller with 50MHz, 32 bit microprocessor. The controller system shall be comprised of three components – a wall mount display module, a combination remote wall mount temperature and humidity sensor and a unit mounted control module. The wall mount display module shall include a backlit liquid crystal display (LCD) with six keys (buttons) for easy programming. All settings and alarm conditions shall be displayed on the display module in easy read verbiage. The control module shall be mounted on the unit and connected to the display module via a special "telephone like" cable which is included with the system. A remote mounted temperature and humidity sensor is separate wall mounted device which is to be mounted at the client's selected location in the controlled space. The combination temperature and humidity sensor is connected to the control module via separate wiring which is also included with the system.

The wall-mount display module will allow recall and display of the high and low temperature and high and low humidity for the last 24 hours; current percent of capacity and average percent of capacity for the last hour of operation for cool 1, cool 2, reheat, humidification, dehumidification, component runtimes for fan motor, cooling stages, reheat, humidification, dehumidification and chilled water valve. Programming will have multi-level password and accomplished entirely from the front of the wall mount display module. Programmable functions shall be entered on flash memory to ensure program retention should power fail. The historical database shall be maintained by rechargeable battery backup. Multiple messages shall be displayed by automatically scrolling from each message to the next. Alarm conditions shall be displayed by automatically scrolling from each message to the next. Alarm conditions, in addition to being displayed, shall enunciate an audible alarm. Programmable summary contacts shall be available for remote alarm monitoring. Additional test or service terminal shall not be required for any functions. The control shall include temperature anticipation, moisture level humidity control.

An alarm condition shall continue to be displayed until the malfunction is corrected. Multiple alarms shall be displayed sequentially in order of occurrence and only those alarms, which have not been acknowledged, shall continue to sound an audible alarm. A user accessible diagnostic program shall aid in system component trouble shooting by displaying on the unit LCD screen the name of the controlled item, output number, terminal plug or pin number for each controlled item.

Compressor Short Cycle

#### **Automatic Control Functions**

Humidity Anticipation Dehumidification Lockout
Start Time Delay Sequential Load Activation

Energy Saver (Glycol Operation)\* Automatic or Manual Restart mode

#### Condition and Data Routinely Displayed

**Unit Status Current Temperature** Energy Saver On\*

Unit type Current Relative Humidity Current Chilled Water Valve Position\*

Current Date and Time Cooling stage 1, 2\* Chilled Water Temperature\* Unit ID /Zone ID\* Dehumidification Discharge Temperature\*

**Humidity Setpoint** Reheat 1 Temperature Setpoint Humidification

#### Switching and Control Functions

Fan, Cool 1, Cool 2\*, Heat, Humidification, Dehumidification, CW Valve\*

#### Menu Selection Buttons and Switches

Alarm/Silence Button Select Up/Down Buttons **Enter Button** 

System On/Off/ESC Button Menu Button

#### Standard Alarms and Conditions

Power Failure Restart High Humidity Warning High Temperature Warning Low Humidity Warning Low Temperature Warning Maintenance Required

High Pressure Compressor Firestat Tripped High Condensate Water Level Person to Contact on Alarm

Compressor Short Cycle Temperature Sensor Error

Local Alarms **Humidity Sensor Error** 

#### Optional Alarms\*\*

Smoke Detector\* Fan Motor Overload\* Humidifier inhibited\* Low Pressure Compressor Custom Message\*\* Reheat Inhibited\*

Standby Pump On\* Reheat and Humidifier inhibited\* Discharge Sensor Error\*

No Water Flow\* Chilled Water Sensor Error\*

Dirty filter\* Unit in standby\*\*

#### Historical Data

High/Low Temperature Last 24 Hrs Low Temperature Last 24 Hrs High Humidity Last 24 Hours High/Low Humidity Last 24 Hrs Hourly Average of Duty Alarm History (Last 100 Alarms)

Humidifier, and Chilled Water \* Percent of Cap. Utilized in the last hr

Equipment Runtimes for: Blower, Compressor 1, Compressor 2\*, Reheat, Dehumidification, Energy Saver\*

#### **Programmable Functions**

Compressor Short Cycle Alarm

Temperature Setpoint Compressor Lead/Lag Sequence\* **Humidity Anticipation** 

Temperature Deadband Compressors(s) **Dehumidification Mode** 

Calibrate Temperature Sensor Power Problem or Restart Mode System Start Delay

Low Temperature Alarm Limit Temperature Scale Scheduled Normal Maintenance

High Temperature Alarm Limit Reheat mode **Humidity Deadband Humidity Setpoint** Water Valve Voltage Range\* Calibrate Humidity Firestat Temperature Alarm Limit

High Humidity Alarm Limit Humidifier

Manual Diagnosis Low Humidity Alarm Limit Compressor Assists to Energy Saver\*

Define Password No water flow alarm action\* Network Protocol

Reset Equipment Runtimes Remote Alarm contacts Low Discharge Temperature Alarm Limit\* Audio Alarm Mode Calibrate Discharge Air Sensor\* Calibrate Chilled Water Temp. Sensor\*

Person to contact on Alarm

In addition, the Mini dap4 control panel shall support the following network protocols for integration with a Building Management System (BMS) for Computer Room Air Conditioning (CRAC system monitoring and control: Modbus RTU, Modbus TCP/IP, SNMPv1/v2, BACnet IP or BACnet MS/TP and LonTalks. Unit(s) shall be furnished with an optional interface card to communicate directly with the Building Automation System (BAS) through a RS-485, Ethernet or LonTalks port. All alarms, set points, and operating parameters that are accessible from the unit mounted control panel shall also be made available through the BAS.

#### **Options**

**Steam Generator Humidifier** - An electric steam generator humidifier with disposable cylinder and self-regulating auto flush shall be provided. The humidifier capacity shall be 5 lbs/hour.

**Disconnect Switch** - Provide units with disconnect switch. The disconnect switch with 1/4 turn latch shall be factory installed and wired. The switch must be in the "OFF" position to remove panel and access electrical compartment.

**Separate Power Source** - Indoor split systems shall be provided with separate power feeds. A power connection shall be provided for both the evaporator section and/or condenser/condensing unit.

**Hot Gas Bypass** - Provide hot gas bypass. Hot gas bypass control on the refrigerant circuit shall maintain minimum suction pressure during low load conditions.

**Condensate Pump** - Provide a condensate pump for field installation. A separate power source shall be required. Pump body shall be placed within the unit coil pan. Pump shall have a maximum of 8 feet head.

**Extended Compressor Warranty** - Compressors shall an additional two (2) or four (4) year compressor warranty to supplement standard three-year warranty.

<sup>\*</sup> Some of the programmable selections, displays or alarms may require additional components or sensors

<sup>\*\*</sup> Note: Two optional alarms are available on DX system and three optional alarms on Chilled water system. In most cases, optional alarm requires optional sensor or detector.

Item: A1 Qty: 1 Tag: AC/CU-1

	Evaporator Sec	ction	
	DAPA-0334-AO	MINI PLUS AIR-COOLED 3 TON 3 PH 460 V W/DRCU	
	Evap. Tag #:	AC-1	
	Quantity:	1	
	Voltage:	460	
	Phase:	3	
	Hertz:	60	
Cabinet Data:			
	Configuration:	Ceiling Mounted	
	Depth (inches):	26.50	
	Length (inches):	51.00	
	Height (inches):	24.00	
	Weight (lbs):	460	
<b>Entering Conditions:</b>	Entering Air DB °F:	72.0	
	Entering Air WB °F:	60.00	
	Relative Humidity (%):	50.0	
	Altitude:	0	
	ESP:	0.500	
Calculated D			
	Air Out Dry Bulb:	52.9	
	Air Out Wet Bulb:	50.6	
Evaporator Coil	Gross Total Capacity Btu:	34,700	
	Gross Sensible Capacity Btu:	28,400	
	Net Total Capacity Btu:	32,200	
	Net Sensible Capacity Btu:	25,800	
	Face Area (sq ft):	3.00	
	Face Velocity	417	
	Rows:	4	
	Fins per inch.:	12.0	
	Fin Type:	Aluminum	
* Net Coil Capacity equals gross ca	pacity minus motor heat.		
Evaporator Blower:			
	CFM:	1,250	
	Motor Horsepower	1.00	
	Motor FLA:	1.8	
	Motor Quantity:	1	
	Blower Quantity:	1	
	Air Flow:	Optional Airflow #1	
Humidifier:	Туре:		
	Capacity in Lbs/hr:	Steam Generator 5.0	
	kW:		
	KW.	1.7	
Reheat:			
icheat.	Туре:	Electric	
	Capacity BTU/hr:	20,500	
	kW:	6 00	



Filter	s:				
111111	<u> </u>	Quantity:	1		
		Size (inches):	20X25X2		
		Efficiency:	MERV 8		
Conn	ection Sizes:				
		Liquid Line (inches):	1/2		
		Suction Line (inches):	3/4		
		Condensate (inches):	3/4		
		Humidifier (inches):	1/4		
Electi	rical Data:				
		Unit Total Amps:	9.3		
		Unit MCA:	11.7		
		Unit MOP:	15		
Contr	<u>'ols:</u>				
		Mini dap4			
Acces	ssories:				
1	OPT-80-460V	HUMIDIFIER-5LB 460V			
1	OPT-132-1-3	MTR-3PH 208/460V 1HP			
1	OPT-5767	SWITCH DISCONNECT 0-40 A			
1	OPT-210	PUMP MOUNTING-ON SIDE, CEILING	PUMP MOUNTING-ON SIDE, CEILING		
1	OPT-206-460V	V PUMP-COND XTMOUNT 460V			
1	OPT-7315	CABLE-WATER DETECTION.DAP4			
1	OPT-37-MINI	SMOKE DETECTOR FOR MINI & PLUS			
1	OPT-7328	WATER DETECTION MODULE			
1	OPT-5302	WAR-18 MONTH STANDARD EXT			

#### **Standard Unit Features:**

#### MINI PLUS CEILING SYSTEMS AIR

Belt drive motor with variable pitch sheave Compressor anti-short cycle timer Crankcase heater

Expansion valve with external equalizer Filter drier Hermetic scroll compressor High pressure safety switch Low pressure safety switch MERV 8 efficient filter Micro-switch for condensate pan overflow

Stainless steel drain pan Unit mounted return air filter section



#### **Product Data - Computer Room Air Conditioner**

Item: A1 Qty: 1 Tag: AC/CU-1

Remote Condensing Unit				
	Model #:	DRCU-0334-3-LD		
	LOW DECIBEL OUTDOOR	REMOTE CONDENSING UN	IT 3 TON 3 PH 460 V	
	HE Tag #:	CU-1		
	Qty:	1		
	Ambient:	95		
	Altitude:	0		
	Voltage:	460		
	Phase:	3		
	CFM:	4,000		
	RPM:	0,850		
Electrical Section	FLA:	7.70		
	MCA:	9.20		
	MOP:	15.00		
Compressor:				
-	Type:	Scroll		
	Number:	1		
	Refrigerant Type:	REFRIGERANT, R-410A		
	FLA:	6.1		
Connection Sizes				
	Pipe Conn. Liquid:	.5		
	Pipe Connection Suction:	.75		
Electrical Data	Num Of Motors:	1		
	Number Of Fans:	1		
	НР	0.5		
	Motor FLA:	1.6		
Dimensions				
	Depth (inches):	36		
	Length (inches):	29		
	Height (inches):	33		
Weights				
	Weight (lbs):	285		

#### Remote Condensing Unit Accessories

 1
 OPT-6733
 HOTGAS BP-x1 1-5T W/DRCU R410

 1
 OPT-121
 DISCONNCT- FUSIBLE 460V

 1
 OPT-5298
 WAR-24 MTH EXT CMP 1-5 T



#### Data Aire Coil Performance Data

Project: National Guard Morrisville Readiness Center Worksheet Name: National Guard Morrisville Readiness Center

Tag Number: AC-1

Air Out Wet Bulb:

Coil Face Velocity (fpm): Coil Face Area:

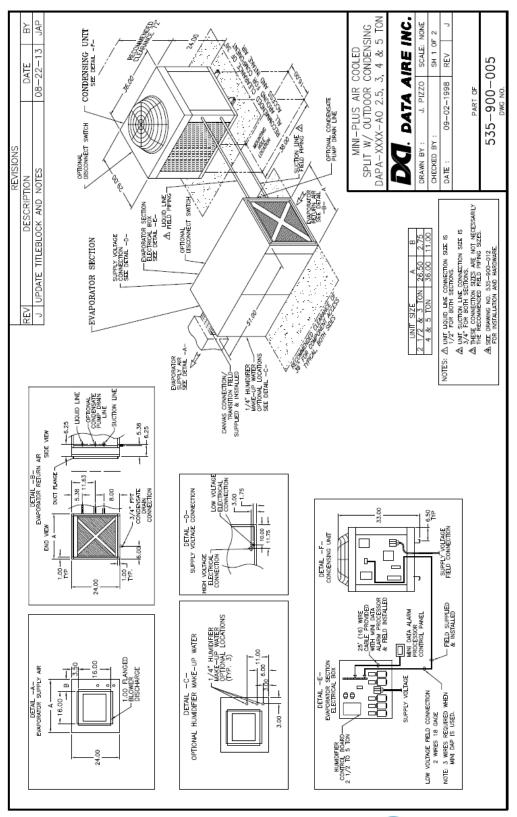
Given Data		
Model: Type:	DAPA-0334-AO Cooling	MINI PLUS AIR-COOLED 3 TON 3 PH 460 V W/DRCU
Coil Tubing OD:	0.500	
Tubes In Face:	22	
Finned Length:	28	
Rows Deep:	4	
Fins Per Inch:	12	
Fin Type:	Aluminum	
Air Flow:	Optional Airflow #1	
Air Flow (cfm):	1,250	
Entering Air DB °F:	72.0	
Entering Air WB °F:	60.0	
Entering Air RH %:	50.0	
Altitude in FT:	0	
Calculated Data		_
Total Capacity Btu:	34,700	
Sensible Capacity Btu:	28,400	
Net Total Capacity Btu:	32,200	
Net Sensible Capacity Btu:	25,800	
Air Out Dry Bulb:	52.9	

50.6 417

3.0

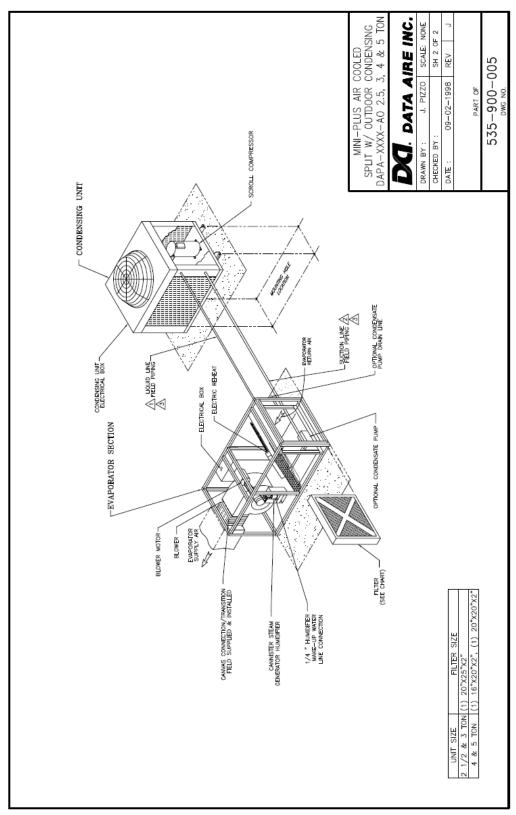


# Product Data – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1





# Product Data – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1





#### Accessory Data - Computer Room Air Conditioner

Item: A1 Qty: 1 Tag: AC/CU-1

**Control Model Number: Mini dap4** 

#### HISTORICAL DATA:

High/low temperature last 24 hours

High/low humidity last 24 hours

Blower, compressor 1, compressor 2\*, reheat, dehumidification, Energy Saver\*,

Equipment runtimes for:

Humidifier, and chilled water \* Low temperature last 24 hours

Alarm history (last 100 alarms) High humidity last 24 hours

#### Control Module

#### Temperature and Humidity Sensor





#### Display Module



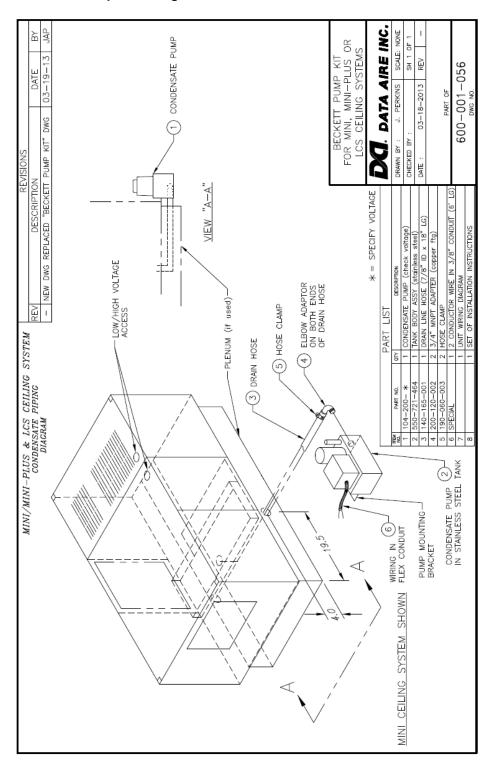
#### **Button Functions**

Alarm	Allows viewing of active alarms Silences audible alarms Resets active alarms	1	Allows scrolling to next screen Allows values changes (increase)
Menu	Allows entry to Main Menu	+	Allows entry to Menus Advances cursor
Esc ①	Return to previous screen Hold five seconds to turn ON or OFF	+	Returns to previous screen Allows value changes (decrease)



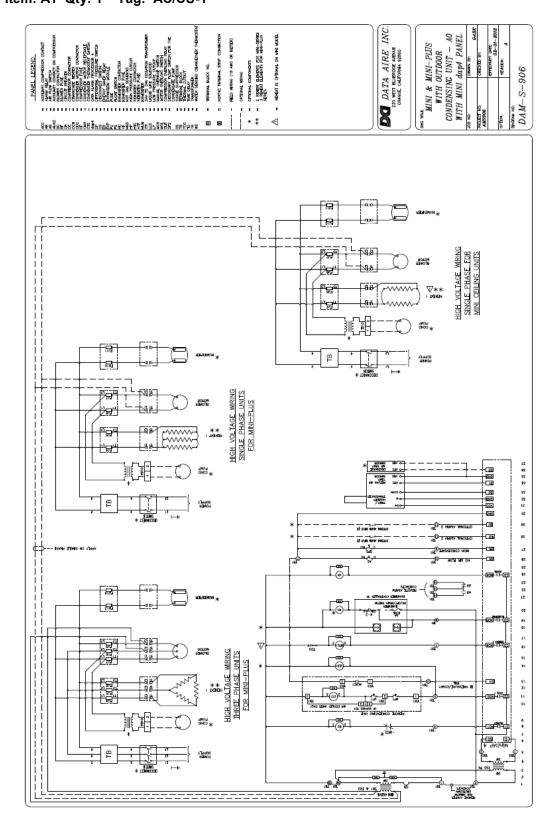
Item: A1 Qty: 1 Tag: AC/CU-1

#### **Condensate Pump Mounting**





# Wiring Diagram – Computer Room Air Conditioner Item: A1 Qty: 1 Tag: AC/CU-1







# **HVAC: Roof Top Unit**

# **NC National Guard TAC OPS**

### KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/20/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: KAD Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

Supplier: Hockaday Mechanical Corporation

Manufacturer: Trane

**Specification:** Roof Top Units

Submittal #: 1

KAD Construction, Inc.		
<b>✓</b>	Approved	
	Approved as noted	
	Revised & Resubmit	
Signature:	Dan Hyatt	
Title:	Owner	

Title: <u>Owner</u> Date: <u>2/20/14</u>





REVIEW OF THIS DOCUMENT HAS BEEN MADE ONLY FOR CONFORMANCE WITH THE DESIGN CONCEPT OF THE PROJECT AND APPROVAL OR APPROVAL AS NOTED SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ANY ERRORS THEREIN OR FOR FURNISHING THE MATERIALS AND EQUIPMENT OF PROPER DIMENSION, SIZE, QUANTITY, QUALITY, AND ALL PERFORMANCE CHARACTERISTICS TO MEET THE REQUIREMENTS AND INTENT OF THE CONTRACT DOCUMENTS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY ALL CLEARANCE AND MAKE ADJUSTMENTS IN HIS WORK WHERE CONFLICTS OR INCONSISTENCIES EXIST.

BASS, NIXON & KENNEDY, INC.

DATE 2-26-14 BY Taine Mergenthaler

# HOCKADAY MECHANICAL CORPORATION

### SUBMITTAL FOR APPROVAL

### **PROJECT**

National Guard Tactical Operations Morrisville, NC

#### ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

#### CONTRACTOR

KAD Construction Raleigh, NC

#### ITEM SUBMITTED

Rooftop Unit

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED
REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR OR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/30/2013

JKH



### Submittal

Prepared For: Date: December 27, 2013

Engineer: Bass, Nixon & Kennedy

Sold To: Job Name:

National Guard Morrisville Readiness Center Hockaday Mechanical

Trane U.S. Inc. is pleased to provide the enclosed submittal for your review and approval.

#### **Product Summary**

**Product** Qty

1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

#### NOTE:

Existing Roof Curb Dimensions to be Field Verified by Contractor

#### **BNK NOTES:**

1. Provide with smoke detector in return air opening as specified on permit drawings.

Adam Sippel / Pam Bradford

Trane 401 Kitty Hawk Drive Morrisville, NC 27560-8271 Phone: (919) 781-0458

Fax: (919) 781-9195

The attached information describes the equipment we propose to furnish for this project, and is submitted for your approval.

### **Table Of Contents**

Product Summary	1
1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A (Item A1)	3
Tag Data	
Product Data	3
Mechanical Specifications	4
Unit Dimensions	5
Weight, Clearance & Rigging Diagram	7
Accessory	8
Field Wiring	11
Field Installed Options - Part/Order Number Summary	12
1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A	12

Tag Data - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A (Qty: 1)

Item	Tag(s)	Qty	Description	Model Number
A1	RTU-1	1	1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A	4WCC3036-4000

#### Product Data - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item: A1 Qty: 1 Tag(s): RTU-1

Refrigerant 410A convertible heat pump 13 SEER

3 Tons, 13 SEER

460/3/60

8.0kw 480/3 (Fld)

Single power entry kit (Fld)

1-2" Filter frame (Fld)

Hinged Filter Access Door (Fld)

0 - 100% Mod. economizer w/Bar. relief (Fld)

Economizer relay kit (Fld)

Prog, 7 Day, 3Htg/2 Clg (Fld)

#### Performance Data - Packaged Heat Pump Rooftop -R410A

Tags	RTU-1
Cooling Airflow (cfm)	1200
External Static Pressure	.50
Heating Capacity (Btuh)	33,200
Emergency Heat (kW)	8.0
Clg net total capacity (Btuh)	35,000
Clg net sensible capacity (Btuh)	25,900
Cooling EDB (F)	80.00
Cooling EWB (F)	67.00
Design clg outdoor DB (F)	95.00
SEER @ AHRI (btuh/watt)	13.0
MCA with Single Point Power	21.0
MOCP with Single Point Power	25.0
Voltage	460/3/60
Net Weight (lbs)	372.0

### Mechanical Specifications - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item: A1 Qty: 1 Tag(s): RTU-1

#### **4WCC3 General**

The units shall be horizontal airflow as shipped and convertible to downflow. All units shall be factory assembled, piped, internally wired and fully charged with refrigerant. Units shall be UL listed and carry a UL label. All units shall be factory run tested to check cooling operation, fan and blower rotation and control or TXV sequence. Units shall be designed to operate at ambient temperatures between 115° F and 55° F in cooling as manufactured. Cooling performance shall be rated in accordance with AHRI standards.

#### **4WCC3 Compressor**

The compressor shall be hermetically sealed, high efficiency Climatuff compressors. Internal over current and over temperature protection, internal pressure relief shall be standard. Crankcase heaters shall be standard on all models.

#### **4WCC3 Refrigeration System**

All units shall have TXV in cooling and TXV in heating. Service pressure tap ports, and a refrigerant line filter dryer shall be standard.

#### **4WCC3 Indoor Coil**

Coils shall be internally finned or smooth bore 3/8" copper tubes mechanically bonded to configured aluminum plate fin as standard. Evaporator coil leak and pressure tested to 200 psig; condenser coil tested to 450 psig.

#### **4WCC3 Condenser Coil**

The Spine Fin condenser coil shall be continuously wrapped, corrosion resistant all aluminum with minimum brazed joints. This coil is 3/8" O.D. seamless aluminum tubing glued to a continuous aluminum fin. Coils are lab tested to withstand 2000.0 lb of pressure per square inch. The outdoor coil provides low airflow resistance and efficient heat transfer. The coil is protected on all four sides by louvered panels.

#### **4WCC3 Indoor Air Fan**

Direct-drive, forward-curved, centrifugal wheel in a Composite Vortica Blower housing. Motor shall have thermal overload protection. Permanently lubricated motor bearings. Motor/blower assembly isolated from unit with rubber mounts.

#### 4WCC3 Condenser Fan

Direct-drive, draw thru propeller type. Weather-proofed permanent split capacitor fan motor shall have built-in thermal overload and permanently lubricated motor bearings.

#### **4WCC3 System Controls**

System controls included condenser fan, evaporator fan and compressor contactors.

#### **4WCC3 Unit Casing**

All components shall be mounted in a weather-resistant steel cabinet with an enamel finish. Access panels shall be provided for unit controls and indoor coil and fans. Indoor air section compartment shall be completely insulated with fireproof, permanent, odorless glass fiber material. Knockouts shall be provided for utility and control connections. Drain connections shall be provided to accommodate indoor water runoff.

#### **Programmable Electronic Night Setback Thermostat**

Programmable electronic thermostat shall provide heating setback and cooling setup with 7-day, programming capability. 1H/1C or 2H/2C models available.

#### **Single Source Power Entry**

This accessory when used with electric heat accessory shall allow single source power connection to unit and heater combination. Single source power entry kits shall have specific matching heaters(s). Kit shall include high voltage terminal blocks, fuse blocks and fuses, cut-to-length interconnecting wiring, and junction box (if required) to provide power sources with fuse protection as required for both the unit and accessory heater. Kit components shall install within the unit cabinet in the heater access section. Single source branch power circuit shall be protected and wired in accordance with local codes.

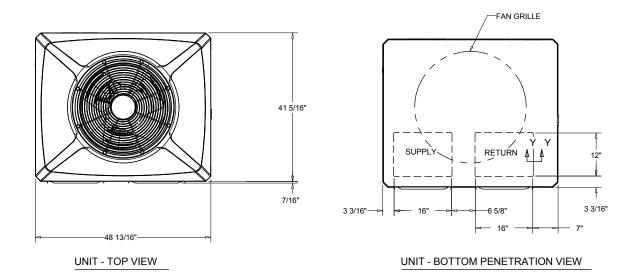
#### Fully Modulating Economizer

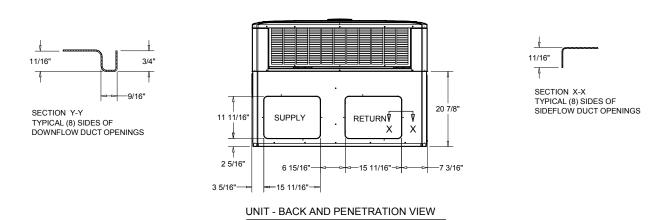
This accessory shall be field installed and be composed of the following items: 0 - 100% fresh air damper, damper drive motor and fixed dry bulb enthalpy control. Solid state enthalpy or differential enthalpy control is option. Economizer operations shall be controlled by the preset position of the enthalpy. A barometric relief damper shall be standard with the economizer and provide a pressure operated damper that shall be gravity closing and prohibit entrance of outside air on equipment off cycle. Economizer requires BAYRLAY004A relay kit to interface the economizer to the heat pump.

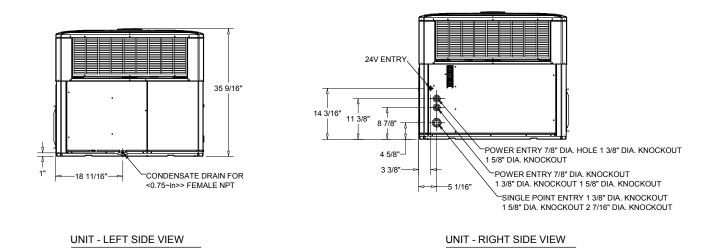
#### **Electric Heaters**

Each heater assembly shall include power supply fusing if over 48 amps, automatic resetting limit switches and heat limiter for thermal protection. Heaters shall be provided with polarized plugs for quick connection to unit low voltage wiring. Electric heat modules shall be UL listed.

# Unit Dimensions - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A Item: A1 Qty: 1 Tag(s): RTU-1







#### Unit Dimensions - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A Item: A1 Qty: 1 Tag(s): RTU-1

#### **ELECTRICAL / GENERAL DATA**

POWER CONNECTION			COMPRESSOR				
Model: Voltage Range: Min. Circuit Ampacity: Max. Circuit Breaker: Prot. Rtg. Recmd: EER/SEER Noise Rating #:	4WCC3036A4 460/3/60 8.7 15.0 15.0 11/13		Number: Phase: Rated Load Amps: Locked Rotor Amps:	1 3 5.13 35.0			
OUTDOOR MOTOR		INDOOR MOTOR		REFRIGERANT			
Number: Horsepower: Phase Full Load Amps: Locked Rotor Amps:	1 .20 1 0.6 1.3	Number: Horsepower: Motor Speed (RPM): Phase Full Load Amps: Locked Rotor Amps:	1 .50 1075 1 1.46 3.12	Type: Factory Charge Circuit #1:	'R-410A 7.25		
HEATER		,	SINGLE CIRCUIT POW	ER AMPACITY AND OVE	R CURRENT PROTECTION		
Model: Voltage: Phase: Heater Capacity (Kw): Heater (Btu): # of Stages:	'BAYHTRV408 480 3 8.0 27,300		Single Power Entry Kit BAYSPEK061 Minimum Circuit Ampacity 21.0 Maximum Over-Current Device 25.0				
Stage # 1: Stage # 2: MCA: MBS:	8.0 N/A 13.0 15.0		Single Circuit Power fuses are supplied if required for unit and / or heater.     Wiring requirements if unit and electric heaters are operated from a single circuit using a single power entry kit.				

#### NOTES:

#### UNIT ONLY

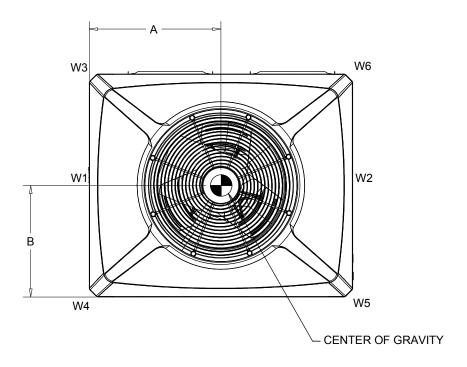
- 1. Rated in accordance with A.H.R.I. Standard 210/240.
- 2. Rated in accordance with D.O.E. test procedure.
- 3. Rated in accordance with A.H.R.I. Standard 270.

#### ELECTRIC HEATER ACCESSORY ONLY

- 4. Any power supply and circuits must be wired and protected in accordance with local electrical codes.5. The MCA values listed are for electric heater only.6. The MCA values listed are for electric heater only.

- 7. Field wire must be rated at least 75 C.
- 8. The HACR circuit breaker is for U.S.A. installations only.
- 9. For Canada installations reference only.

# Weight, Clearance & Rigging Diagram - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A Item: A1 Qty: 1 Tag(s): RTU-1



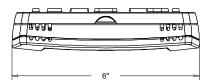
UNIT WEIGHT			CORNER WEIGHT					CENTER OF GRAVITY				
SHIPPING	NET	W1	W2		W3		W4	W5	W6	Α	В	
468.0 lb	'372.0 lb	'218.0 lb	154.0 lb		84.0 lb		134.0 lb	'94.0 lb	60.0 lb	20"	25"	
CLEARANCE TO COMBUSTIBLE MATERIAL RECOMMENDED SERVICE CLEARANCE												
воттом		0			UNIT			WITH O.A. DAMPER/ECON.		WITH 2 PC	WITH 2 POS. DAMPER	
BACK SIDE	1"	1"		BACK SIDE 12"				30"				
LEFT SIDE	6"	6"		LEFT SIDE 36"		42"						
RIGHT SIDE	6"	6"		RIGHT SIDE 24"								
FRONT SIDE	12'	12"		FRON	FRONT SIDE 42"							
TOP	36'									•		

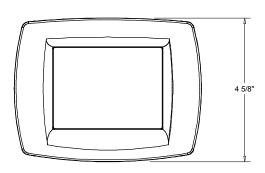
LIFTING LUG KITS

FOUR REUSABLE LUGS IN EACH KIT ALLOW UNITS TO BE EASILY LIFTED TO ROOFTOP INSTALLATIONS. THESE LUGS SNAP (NO SCREWS REQUIRED) INTO SLOTS IN THE UNIT DRIP LIP CHANNEL.

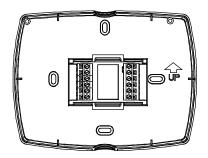
### Accessory - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item: A1 Qty: 1 Tag(s): RTU-1





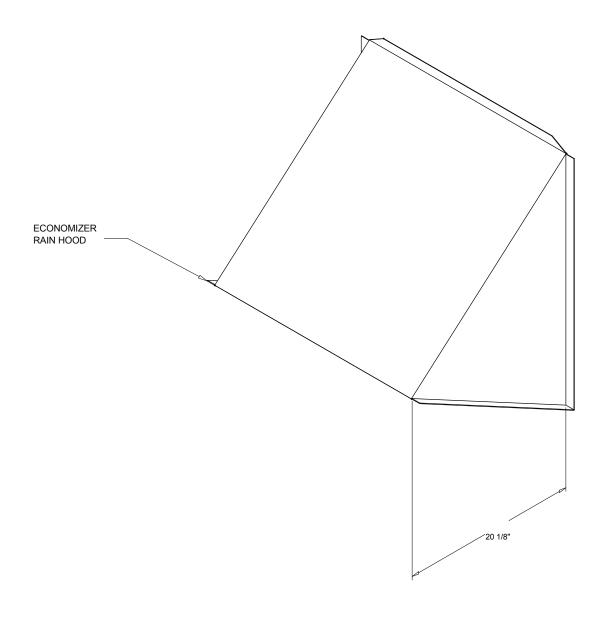




THERMOSTAT - TCONT800A/802A/803A

Accessory - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item: A1 Qty: 1 Tag(s): RTU-1



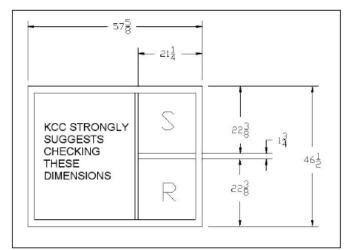
DOWN FLOW ECONOMIZER RAIN HOOD

## Accessory - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item: A1 Qty: 1 Tag(s): RTU-1

Adapter: KCC-127501 FOR OFFICE USE: TB39 | TT42 | GTG

#### Old Model: BWC042D



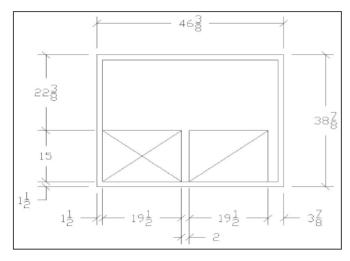
STATIC PRESSURE LOSS							
NEW UNIT CFM	TOTAL STATIC PRESSURE LOSS IN INCHES OF H2O						
1200	0.153"						

KCC curb adapters allow 1.5" (3/4" on every side) clearance around existing curb as shown. Any modification to KCC design will require extended lead times and result in additional engineering costs.

The new and old curb prints are provided for dimensional verification only and do not indicate new unit orientation.

KCC will not be responsible for field clearance issues.

#### New Model: 4WCC3036



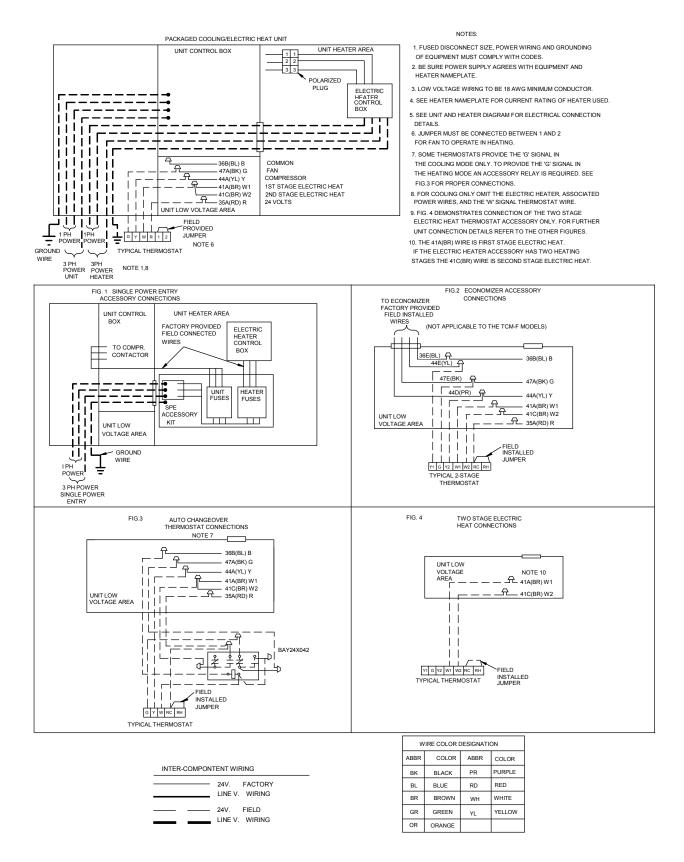
Adapter Height: 14"

Approval Name:

Γασ·

Signature:

# Field Wiring - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A Item: A1 Qty: 1 Tag(s): RTU-1



## Field Installed Options - Part/Order Number Summary

This is a report to help you locate field installed options that arrive at the jobsite. This report provides part or order numbers for each field installed option, and references it to a specific product tag. It is NOT intended as a bill of material for the job.

## Product Family - 1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A

Item	Tag(s)	Qty	Description	Model Number
A1	RTU-1	1	1.5-5 Ton Pkgd. Heat Pump Rooftop R-410A	4WCC3036-4000

Field Installed Option Description	Part/Ordering Number
Prog, 7 Day, 3Htg/2 Clg	TCONT802AS32DA
8.0kw 480/3	BAYHTRV408E
0 - 100% Mod. economizer w/Bar. relief	BAYECON101A
Economizer relay kit	BAYRLAY004A
Single power entry kit	BAYSPEK061E
1-2" Filter frame	BAYFLTR101C
Hinged Filter Access Door	BAYACCDOR1A
Adapter Curb	KCC-127501

# **HVAC: Air Distribution**

# **NC National Guard TAC OPS**

## KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com

Project: NC National Guard TAC OPS

Date: <u>2/20/14</u>

Engineer: Bass, Nixon, & Kennedy

6310 Chapel Hill Rd

Suite 250

Raleigh, NC 27607

Contractor: *KAD* Construction, Inc.

5132 Departure Dr. Raleigh, NC 27616 Contact: Dan Hussey Ph: (919) 790-2323 Fx: (919) 790-7077

DHyatt@kadconstruction.com

Supplier: Hockaday Mechanical Corporation

Manufacturer: Titus, Pottorff

**Specification:** Air Distribution

Submittal #: 1





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BASS, NIXON & KENNEDY, INC.

DATE 2-26-14 By Taine Mergenthaler



# HOCKADAY MECHANICAL CORPORATION

## **SUBMITTAL FOR APPROVAL**

## **PROJECT**

National Guard Tactical Operations Morrisville, NC

## ARCHITECT/ENGINEER

Bass, Nixon, Kennedy Raleigh, NC

## CONTRACTOR

KAD Construction Raleigh, NC

## ITEM SUBMITTED

Air Distribution

# HOCKADAY MECHANICAL CORPORATION

X REVIEWED REVIEWED AS NOTED

SUBMITTAL REVIEWED FOR GENERAL COMPLIANCE WITH THE CONTRACT DOCUMENTS ONLY. THE SUBCONTRACTOR OR SUPPLIER REMAINS RESPONSIBLE FOR FULL COMPLIANCE WITH THE CONTRACT DOCUMENTS AS REQUIRED.

12/30/2013

JKF



Faulkner/Haynes & Associates 7240 ACC Boulevard Raleigh, NC 27617

Phone: (919) 781-8840 Fax: (919) 787-8765

## **SUBMITTAL**

PROJECT: NCNG Tactical Operations

LOCATION: Morrisville, NC

CONTRACTOR: Hockaday Mechanical

ENGINEER: BNK

SUBMITTAL DATE: December 30, 2013

MATERIAL: Air Distribution by Titus

Dampers by Pottorff

SUBMITTED BY: Hunt Summerford, Sales Associate

Faulkner/Haynes & Associates, Inc.

7240 ACC Blvd. Raleigh, NC 27617 Phone: 919-781-8840 Fax: 919-787-8765

## AIR DISTRIBUTION SUBMITTAL

## (5) Pieces of Air Distribution as Manufactured by Titus

Mark	Qty.	Model	Frame	Neck Size (WxH)	Overall Size (W x H)	Service	Mount	Notes
A	2	PAR	3	14ӯ	24"x24"	Return	Lay-In	1
В	3	300RS	1	10"x10"	12"x12"	Supply	Lay-In	1

## Notes:

1. White Finish

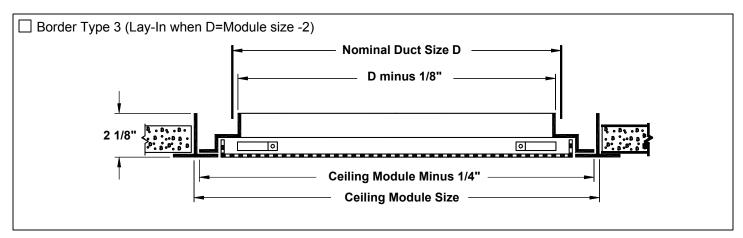
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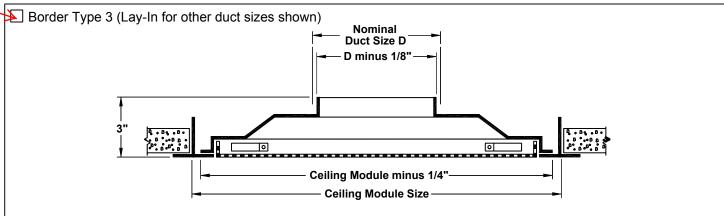


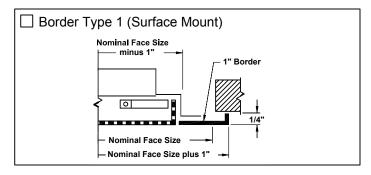
# Submittal

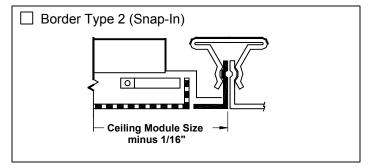
PAR • Return

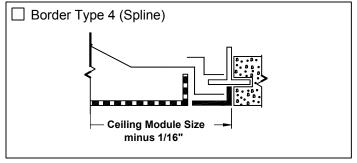
## Perforated Ceiling Diffusers Steel • Flush Face

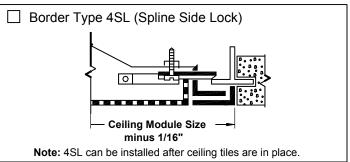












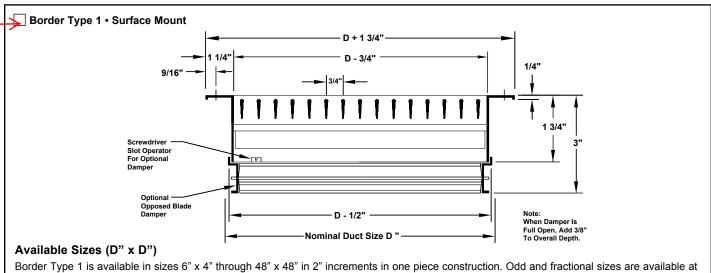
# Standard Finish: #26 White General Description ——

- Model PAR flush face perforated ceiling diffusers are designed for use as returns to match the Model PAS supply diffusers.
- Can be mounted in a plenum or connected to a return duct.
- Optional damper is easily adjusted by dropping the perforated face (see page 2).
- Perforated face has 3/16" diameter holes on ½" staggered centers.
- Material is heavy gauge steel.

## Louvered Supply Grilles and Registers • Steel

Models: ☐ 300RL • Double Deflection • Long Front Blades • 3/4" Blade Spacing

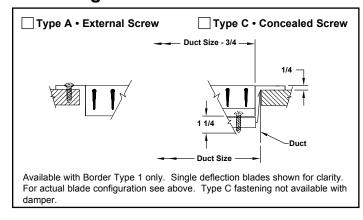
**≥ 300RS** • Double Deflection • Short Front Blades • 3/4" Blade Spacing



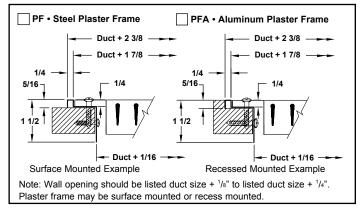
additional cost. Sizes larger than 48" x 48" are shipped in multiple sections with joining strips for field assembly.

Note: Wall or duct opening should be duct size ± 1/8". All dimensions are in inches.

## **Fastenings**



## **Mounting Frames**



## Accessories (Optional) Check if provided

Standard Finish: #26 White

Neck mounted opposed blade dampe	r
(galvanized steel)	

DS • Debris Screen (1/4" square mesh galvanized steel)

	Optional finis	sh	
_	•		

IS • Insect Screen (¹/₁6" square mesh − galvanized steel)

· Optional opposed blade damper has screw-

driver adjustment accessible through face of

EQT • Earthquake tabs Other

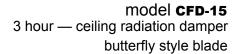
## **General Description** · Available with front louvers vertical or

- · Front and rear louvers are individually adjustable.
- · Insect and debris screens are not available when dampers are fitted.
- · Material is steel.
- #8 x 11/4" Ig. Phillip's flat head sheet metal screws (painted).
- All dimensions are ± 1/16".



horizontal.

Note: This submittal is meant to demonstrate general dimensions of this product. The drawings on this submittal are not meant to detail every aspect of the product with exactness. Drawings are not to scale. TITUS reserves the right to make changes without written notice. 605 Shiloh Road • Plano, Texas 75074 • 972-212-4800





## **Equipment Schedule**

<u>Sleeve</u> <u>Options</u>

Style: SAccessories:165F Fuse Link, Volume Control,Length:8"CRB-24, Ceramic Insulation (AsSetback:3"Req'd)

Dimensions: Net OD

Transition: Top: 6" Round with 2" deep collar

ſ	٥.		_	_			Actua	tor			
	Qty	WxH	ט	Tag	Qty	Model	Pos	Loc	Volts	Amps	VA
	3	10 x 10									

**Project:** National Guard **Location:** 

Architect: Engineer:

Addendum #: Submitted By:

Contractor:

Date: December 30, 2013

# Ceiling Radiation Dampers CFD15 (1/2) December 2009

The CFD-15 ceiling radiation damper employs butterfly style blades for point-of-origin control of radiant heat in HVAC systems. The CFD-15 is installed horizontally in the ceiling membrane of floor-ceiling or roof-ceiling assemblies with fire resistance ratings up to and including 3 hours.

**POTTORFF**°

### **Standard Construction**

Frame: 22 gauge (0.85) galvanized steel.

**Blades:** 22 gauge (0.85) galvanized steel – butterfly. Insulated with ceramic refractory material for dampers larger than 114 in.<sup>2</sup> (735 cm<sup>2</sup>).

III. (733 CIII ).

Fire Closure Device: Fusible link.

Fire Closure Temperature: 165°F (75°C).

Minimum Size:  $4" \times 6"$  (102 × 152)

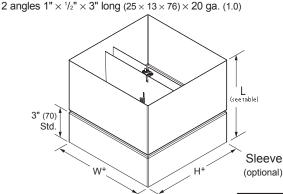
**Maximum Size:**  $24" \times 24" (610 \times 610)$ 

## **Options**

- ☐ Factory installed sleeve.
- Transitions (sleeve required):
- Round 🛮 Oval
- >□ Top □ Bottom Side: □ W □ H □ P □ Q

- $\square$  Plaster Ground  $\square$  5/8" (16) deep  $\times$  5/8" (16) wide Std.
  - $\square$  1<sup>1</sup>/<sub>4</sub>" (32) deep × 1<sup>1</sup>/<sub>4</sub>" (32) wide
  - $\square$  2" (51) deep  $\times$  5/8" (16) wide  $\square$  4" (102) deep  $\times$  5/8" (16) wide
- ☐ Flanged: ☐ <sup>3</sup>/<sub>4</sub>" (19) Std. ☐ 1" (25)
- ☐ Alternate blade protection drywall for dampers larger than 114 in.² (735 cm²).
- In. (735 cm<sup>2</sup>).
- ☐ Alternate 212°F (100°C) fire closure temperature.
- VC volume control device, factory mounted.
- Thermal blanket for steel backed diffuser: CRB-24 (Ceramic refractory blanket).
- ☐ WHI installation angle set:

2 angles  $1" \times \frac{1}{2}" \times 28"$  long  $(25 \times 13 \times 711) \times 20$  ga. (1.0)



### Ratings

**UL 555C Fire Resistance Rating:** 3 hour (horizontal, for use in 1, 2 or 3 hour rated assemblies)

## Listings

**UL 555C listing:** R14603



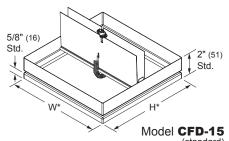
Warnock Hersey listing #: WHI-495-PSH-0177, -0178

Meets NFPA Standards: 90A and 101

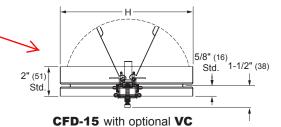
Meets Building Code Standards: IBC, NBC, NFPA, SBC and UBC

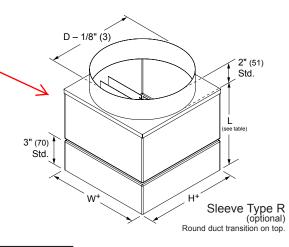






(standard)
\*Damper dimensions furnished
approximately 1/4" (6) under net O.D.

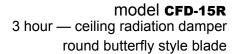




Sleeve Table						
Damper Height	Sleeve Length 'L'					
H ≤ 10" (254)	8" (203)					
10" (254) < H ≤ 14" (356)	10" (254)					
14" (356) < H ≤ 18" (457)	12" (305)					
18" (457) < H ≤ 22" (559)	14" (356)					
H > 22" (559)	15" (381)					

Damper dimensions furnished approximately net O.D.

NOTE: Dimensions in parentheses ( ) are millimeters.





#### **Equipment Schedule**

<u>Sleeve</u> <u>Options</u>

Style: S
Length: 10"
Setback: 3"

Accessories: 165F Fuse Link, Volume Control, CRB-24, Ceramic Insulation (As

Req'd)
Dimensions: Net OD
Transition Plate: Bottom:

		_	_			Actua	tor			
Qty	WxH	D	Tag	Qty	Model	Pos	Loc	Volts	Amps	VA
2		14								

**Project:** National Guard **Location:** 

Architect: Engineer:

Addendum #: Submitted By: Contractor:

Date: December 30, 2013

## **Application**

The CFD-15R ceiling radiation damper employs butterfly style blades for point-of-origin control of radiant heat in HVAC systems. The CFD-15R is installed horizontally in the ceiling membrane of floor-ceiling or roof-ceiling assemblies with fire resistance ratings up to and including 3 hours.

### **Standard Construction**

Frame: 24 gauge (0.7) galvanized steel.

**Blades:** 22 gauge (0.85) galvanized steel – round butterfly. Insulated with ceramic refractory material for dampers larger than 114 in.<sup>2</sup> (735 cm<sup>2</sup>).

Fire Closure Device: Fusible link.

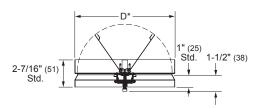
Fire Closure Temperature: 165°F (75°C).

**Minimum Size:** 4" Ø (102 Ø) **Maximum Size:** 24" Ø (610 Ø)

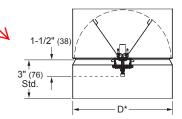
## **Options**

Ceiling Radiation Dampers CFD15R (1/1) August 2007

- ☐ Factory installed sleeve.
- □ Alternate blade protection drywall for dampers larger than 114 in.² (735 cm²).
- ☐ Alternate 212°F (100°C) fire closure temperature.
- VC volume control device, factory mounted.
- Thermal blanket for steel backed diffuser: CRB-24 (Ceramic refractory blanket).
- □ WHI installation angle set: 2 angles 1" ×  $\frac{1}{2}$ " × 28" long (25 × 13 × 711) × 20 ga. (1.0) 2 angles 1" ×  $\frac{1}{2}$ " × 3" long (25 × 13 × 76) × 20 ga. (1.0)
- ☐ Square/Rectangular Transition Plate (Maximum 24" × 24" [610 × 610] )



CFD-15R with optional VC



CFD-15R with optional sleeve and VC

### Ratings

**UL 555C Fire Resistance Rating:** 3 hour (horizontal, for use in 1, 2 or 3 hour rated assemblies)

## Listings

**UL 555C listing:** R14603



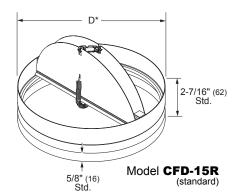


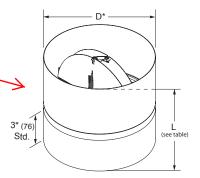
CSFM listing: 3226-0368:104

Warnock Hersey listing #: WHI-495-PSH-0177, -0178

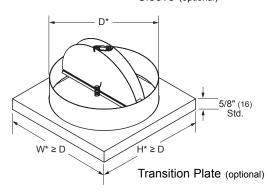
Meets NFPA Standards: 90A and 101

Meets Building Code Standards: IBC, NBC, NFPA, SBC and UBC





Sleeve (optional)



Sleeve Table							
Damper Diameter	Sleeve Length 'L'						
D ≤ 10" (254)	8" (203)						
10" (254) < D ≤ 14" (356)	10" (254)						
D > 14" (356)	12" (305)						

\*Damper dimensions furnished approximately net O.D.

# **Warranties**

## **NC National Guard TAC OPS**

KAD Construction, Inc.

5132 Departure Dr. · Raleigh, NC 27616 Contact: Dan Hyatt

Phone: (919) 790-2323 · Fax: (919) 790-7077

Email: DHyatt@kadconstruction.com