

Manufacturer of True Sine Wave Power Inverters and Related Products

## MX SERIES POWER INVERTERS



MX SERIES FAMILY

- **N+1 REDUNDANT**
- **EXPANDABLE**
- **REMOTE SWITCHING**
- **TRUE SINE WAVE**
- **“HOT” INSERTABLE**
- **1000 WATT MODULES**
- **OPTIONAL SNMP**

**EXELTECH** manufactures the world's first truly **redundant, modular** inverter system; the **most reliable** inverter system available. No single malfunction will cause the inverter system to fail. **Modules are "hot" insertable.** Power levels are **expandable**, and modules can be added or replaced **without interruption in power** to your critical loads.

The MX system can be configured for **power levels from 1 to 20KW with 120 Vac** output. Up to 40KW at 240 Vac bi-phase or 60KW at 208 Vac 3 phase with many input and output voltages also available.

A control card and any number of additional 1000 Watt power modules combine to make a standard inverter. This type of system can be expanded as power requirements increase, and upgraded to be N+1 redundant as desired.

The MX system is **extremely compact and lightweight.** Power modules weigh only 7 lbs. Each.

Output voltage is precisely regulated, so that no measurable voltage change occurs on the output as input voltage fluctuates. Similarly, less than 0.5 volt change in output voltage will occur when the output load varies from 0 to 100% of rated power. With distortion of 2% maximum, this inverter offers **the cleanest sine wave power available.**

Models are available which cover all standard battery systems. Custom models can be designed to meet your specific input voltage requirements.

# MX SERIES MODULE DESCRIPTION

The *Exeltech MX* Series of inverters is a modular system which can be assembled in many combinations to afford the user infinite flexibility. Options such as AC distribution, AC disconnect, metering, DC disconnect, DC distribution, transfer switch and maintenance bypass switch are also available; (see accessories).

The building blocks of the system are as follows:

- 1.) Power Module - A 1000 Watt slave power inverter. It requires drive signals from a Master Module or Control Card as described below. This module is the backbone of the inverter system.
- 2.) Master Module - A 1000 Watt power inverter which contains all the electronics necessary to operate. Requires an enclosure to provide connections to the battery and AC output. It can also operate up to 19 slave Power Modules. If this module is used, the system cannot be fully redundant.  
***All MX systems require either a master module or at least one control card.***
- 3.) Control Card - Generates all the signals necessary to operate up to 20 Power Modules. The card itself will not generate any AC output power nor does any power flow through it. This card can be paralleled with another Control Card to generate a redundant set of control signals to form the basis of a completely redundant inverter system.  
***All MX systems require either a master module or at least one control card.***
- 4.) Alarm Card - Can be used in conjunction with a redundant or non redundant inverter to provide various alarm output signals via LED's and alarm contact closures. Must be included in redundant systems to detect failure of control card.
- 5.) Transfer Switch - Provides the same functions as the alarm card, plus provides a relay to transfer AC power to the load, from either the inverter or the utility input. Use only with systems 7KW of or less.

The above modules can be placed in the following enclosures; Installations can either be free standing or in standard relay racks.

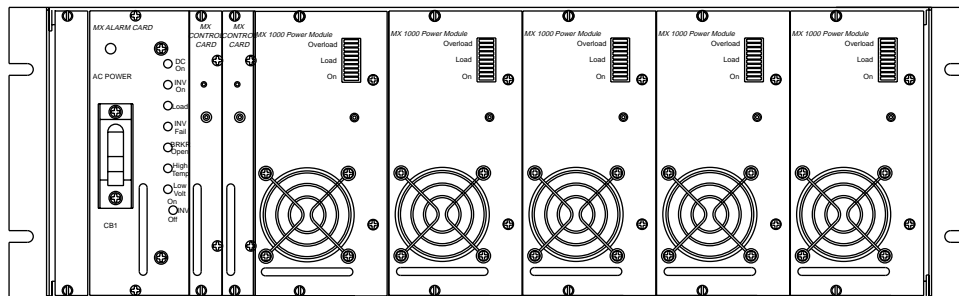
- 1.) 19" cage assembly - Compatible with a 19" relay rack. The smallest cage which can contain a redundant system. Available in the following configurations:
  - 19A - Basic configuration for a redundant system. Holds up to 4 Power Modules, 2 Control Cards and either a Transfer Switch, System Monitor Card or an Alarm Card.
  - 19B - Used as an expansion rack or may be used as an expandable, non redundant inverter, up to 5 KW.  
***This configuration will not accept X-fer Switch, alarm card or control cards.***
- 2.) 23" cage assembly - Compatible with a 23" relay rack.
  - 23A - Basic configuration for a redundant system. Holds up to 5 Power Modules, 2 Control Cards and either a Static Transfer Switch, Transfer Switch, System Monitor II or an Alarm Card.
  - 23B - Used as an expansion rack or may be used as an expandable, non redundant inverter, up to 6 KW.  
***This configuration will not accept X-fer Switch, alarm card or control cards.***
- 3.) 7" cage assembly - for 1 or 2KW systems when redundancy is not required.
  - 7C - Consists of 1 Transfer Switch and 1 Master Module.  
***This configuration will not accept an alarm card or control cards.***
  - 7B - Expandable up to 2KW. 1 Master Module and 1 Power Module.  
***This configuration will not accept X-fer switch, alarm card or control cards.***
- 4.) 9" cage assembly- for 1-3KW systems when redundancy is not required.
  - 9C - Consists of Transfer Switch, 1 Master Module and 1 Power Module.  
***This configuration will not accept an alarm card or control cards.***
  - 9B - Expandable up to 3KW. 1 Master Module and 2 Power Modules.  
***This configuration will not accept X-fer Switch, alarm card or control cards.***

# MX SERIES SYSTEM DESCRIPTION

The *Exeltech MX* Series of inverters is available in three basic architectures; redundant, upgradable and expandable. Different options and sizes are available to fit varying applications. As a benefit of the *MX* series modular design, power levels are expandable in any system, as power requirements increase.

1.) **N+1 Redundant-Expandable Inverter System**: For applications where reliability and maintainability are paramount, the N+1 redundant system offers the most cost effective method of achieving redundancy and the ability to maintain the system while loads remain on line. All cards (except 12 Vdc) are "hot" insertable to allow maintenance without interrupting power to critical loads. Designing the power level with N+1 number of power modules, allows for redundancy without necessitating the purchase of a duplicate system. (An A/B Buss option is available, which adds to system reliability).

A redundant system consists of:



1 ea. Alarm Card or System Monitor Card part # H (100 Vac)  
A (120 Vac)  
B (120 Vac)  
C (120 Vac)  
F (230 Vac)

Options: 1 ea. X-fer switch part # G (100 Vac)  
S (120Vac)  
X (120 Vac)  
Z (230 Vac)  
X-fer switch includes alarms and replaces the alarm card.

2 ea. Control Cards part # LL (100 Vac)  
CC (120 Vac)  
EE (230 Vac)

At least 3 Power Modules part # P (100 Vac)  
P (120 Vac)  
R (230 Vac)

expansion rack part # 1B (19" cage)  
2B (23" cage)

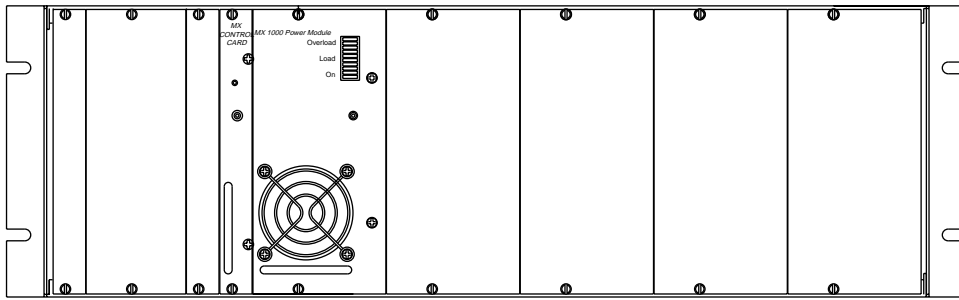
...integrates with rack A for accommodating additional power modules, up to total rating of 20KW. Additional control cards and a larger X-fer switch may be required. Please call the factory for assistance.

1 ea. Cage assembly part # 1A (19" cage)  
2A (23" cage)

2.) **Upgradable Inverter System**: The *Upgradable system* offers the flexibility to add a X-fer switch or alarm card and Full Redundancy for future requirements. A minimum system with as little as one control card and one power module can be upgraded in the future to include additional power modules, X-fer switch or alarm card and an additional control card for full redundancy (see figure II).

# MX SERIES SYSTEM DESCRIPTION

Figure II.



1 ea. Cage assembly  
part # 1A (19" cage)  
2A (23" cage)

**Options:**

1 ea. X-fer Switch  
part # G (100 Vac)  
S (120 Vac)  
X (120 Vac)  
Z (230 Vac)

1 ea. Alarm Card  
part # H (100 Vac)  
A (120 Vac)  
B (120 Vac)  
C (120 Vac)  
F (230 Vac)

1 ea. Control Card  
part # L\*(100 Vac)  
C\*(120 Vac)  
E\*(230 Vac)

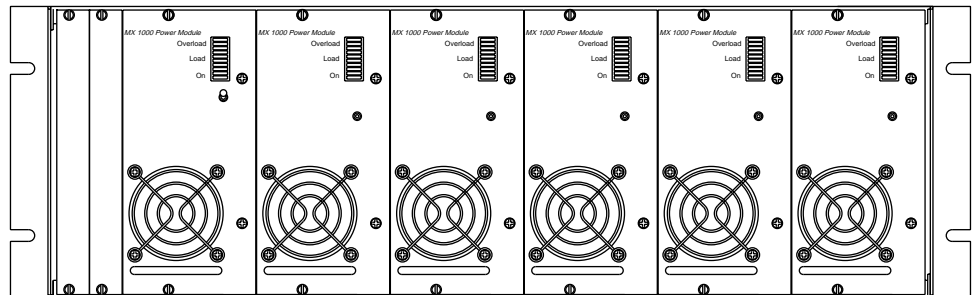
1 ea. Power Module  
part # P (100 Vac)  
P (120 Vac)  
R (230 Vac)

3.) **Expandable inverter system:** This configuration can be used as an independent inverter system (figure III), or to expand power levels of existing **MX** systems (see stacked systems). By using one master module, a system may be expanded to include a X-fer switch and additional power modules (see figure IV). 1KW inverters with a X-fer switch use the 7" or 9" (part # 7C, 9C) cage. 1KW, 2KW and 3KW inverters without a X-fer switch use the 7" or 9" (part number 7B, 9B) cage assembly.

Figure III.

1 ea. Cage assembly\_  
part # 1B (19" cage)  
2B (23" cage)  
7B (7" cage)  
9B (9" cage)  
expansion rack  
(see stacked  
systems)

1 ea. Cage assembly  
part # 1A (19" cage)  
2A (23" cage)  
7C (7" cage)  
9C (9" cage)



**Options:**

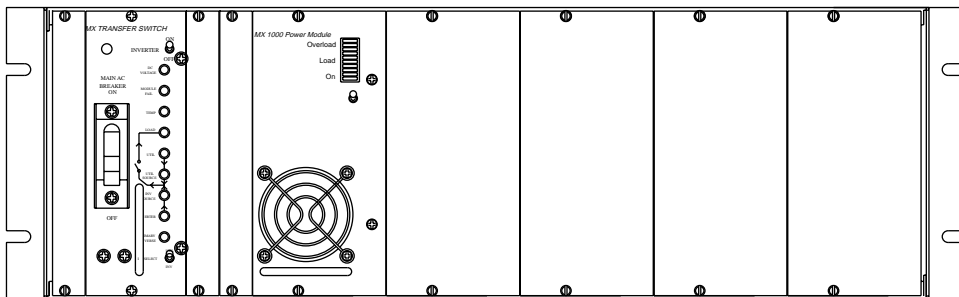
1 ea. X-fer Switch  
part # G (100 Vac)  
S (120 Vac)  
X (120 Vac)  
Z (230 Vac)

1 ea. Master Module<sup>1</sup>  
part # Q\* (100 Vac)  
M\* (120 Vac)  
N\* (230 Vac)

Up to 5  
Power Modules  
part # P (100 Vac)  
P (120 Vac)  
R (230 Vac)

1 ea. Master Module<sup>1</sup>  
part # Q\* (100 Vac)  
M\* (120 Vac)  
O\* (230 Vac)

Figure IV.



<sup>1</sup> Alarm card is not an option on this configuration

# MX SERIES SYSTEM PART NUMBER

Use the Design Chart to formulate the 15 digit model number.

## EXELTECH MX SERIES

### MODEL NUMBER

**Step 1:** Enter the two character code for cage assembly size and configuration.

**Step 2:** When a transfer switch or alarm card is used, enter the single character code for that card. 2nd and 3rd characters designate option level of transfer switch or alarm card. Enter 00 for standard module, if no alarm card or transfer switch use "B" configuration backplane, enter (\*\*).

**Step 3:** Alpha character assigned by EXELTECH to represent changes or revision levels in racks, alarm cards, or transfer switch. Enter (-). EXELTECH will assign revision level. See revision level chart on [www.exeltech.com](http://www.exeltech.com) for the most current revision list.

**Step 4:** Enter the two character code for Control Card(s) or Master Module. There is not an application where both are used. Enter (M\*) or (C\*) if only one is used.

**Step 5:** To designate power level, enter the number of power modules required. Redundant systems require continuous load rating plus one additional power module(\* if none used).

**Step 6:** To designate output voltage of the power module required, enter the single character code(\* if none used).

**Step 7:** Single alpha character assigned by EXELTECH represents changes or revision levels in Control Cards, Master Modules, or Power Modules. Enter (-). EXELTECH will assign revision level. See revision level chart on [www.exeltech.com](http://www.exeltech.com) for the most current revision list.

**Step 8:** To designate input voltage, enter the single character from the VDC voltage chart below.

Vdc INPUT VOLTAGE CHART						
DC Volts	12	24	32	48	66	108
Designation	1	2	B	4	E	I

**Step 9:** Output frequency is designated by using the first number of the frequency (5 for 50Hz, 6 for 60Hz, 4 for 400Hz).

**Step 10:** For options, enter two digit code. If no option, enter (00).

**EXAMPLE:** A redundant system with an alarm card, to fit a 23" wide cage, for powering a 4000 watt continuous load, at 120Vac, 60Hz with 48Vdc input would require the following model number...

**2AA00ACC5P-4600**

# MX SERIES MODULE PART NUMBER

## EXELTECH MX SERIES MODULE NUMBER

MX    -    -    -    -    -    -

**Step 1:** Model number always starts with MX.

**Step 2:** To designate a cage assembly, enter the two character code from the design chart. When ordering a power module or master module, enter a "K". If ordering any other module, enter an asterisk(\*).

**Step 3:** To designate the type of module, enter the single character code from the design chart. To designate cage assembly, enter an asterisk(\*).

**Step 4:** To designate input voltage, enter the single character code from the **Vdc INPUT VOLTAGE CHART** below. If ordering an alarm card, transfer switch or cage assembly, enter an asterisk(\*).

Vdc INPUT VOLTAGE CHART						
DC Volts	12	24	32	48	66	108
Designation	1	2	B	4	E	I

**Step 5:** Output frequency is designated by using the first number of the frequency(5 for 50Hz, 6 for 60Hz, 4 for 400Hz). If ordering a transfer switch, alarm card, power module or cage assembly, enter an asterisk(\*).

**Step 6:** This space designates current revision level, and is for EXELTECH use only. If no revision is in use for this module, no number or character will be used.

**Step 7:** To designate option, enter the code from the option chart below. If no option is required please leave blank.

OPTION CHART	
Option	Code
Conformal coating	07
Low idle current	08

**MODULE EXAMPLES:** A 12Vdc, 120Vac, 60Hz master module would require the following module number...  
**MXK-M-1-6-1**

A 48vdc, 120Vac, 60Hz power module with conformal coating option would require the following module number...  
**MXK-P-4-\*-1-07**

**CAGE ASSEMBLY EXAMPLE:** A 19" redundant cage, 120Vac would require the following module number:  
**MX1A-\*-\*-2**

# MX SERIES SYSTEMS DESIGN CHART

MX SYSTEMS DESIGN CHART								
SYSTEMS REQUIRED	CAGE ASSY SIZE AND CONFIG.	Use X-fer or Alarm Card		Use CC or MM		POWER MODULE	AVAIL C- Current F- Future	
		X-FER SWITCH		ALARM CARD	CONTROL CARD			MASTER MODULE
		100Vac	G	H	L* or LL	Q*		P
		120Vac	X or S	A, B or C	C* or CC	M*		P
230Vac	Z	F	E* or EE	O*	R			
Redundant Upgradable 19" Cage	1A	0 or 1 <sup>1,4</sup>		0 or 1 <sup>1,4</sup>	0, 1, 2 <sup>5</sup>	0	up to 4 <sup>3</sup>	C
Redundant Upgradable 23" Cage	2A	0 or 1 <sup>1,4</sup>		0 or 1 <sup>1,4</sup>	0, 1, 2 <sup>5</sup>	0	up to 5 <sup>3</sup>	C
Expandable 19" Cage	1A	0 or 1		0	0	1	up to 3	C
Expandable 23" Cage	2A	0 or 1		0	0	1	up to 4	C
Expandable 7" Cage	7B	0		0	0	1	0 or 1	C
Expandable 9" Cage	9B	0		0	0	1	up to 2	C
Expandable 19" Cage	1B	0		0	0	1	up to 4	C
Expandable 23" Cage	2B	0		0	0	1	up to 5	C
Expandable 7" Cage	7C	0 or 1		0	0	1	0	C
Expandable 9" Cage	9C	0 or 1		0	0	1	0 or 1	F
Split Phase 19" Cage	1E	0		0	0	2	0 or 2	F
Split Phase 23" Cage	2E	0		0	0	2	0,2,4	F
Split Phase 7" Cage	7E	0		0	0	2	0	C
3 Phase 19" Cage	1F	0		0 or 1 <sup>2</sup>	0	3	0	F
3 Phase 23" Cage	2F	0		0 or 1 <sup>2</sup>	0	3	0 or 3	C
3 Phase 9" Cage	9F	0		0	0	3	0	C

<sup>1</sup> 1 per phase

<sup>2</sup> Alarm with a subset of functions (multi-phase option A13)

<sup>3</sup> System is not fully redundant with less than 3 power modules

<sup>4</sup> Minimum 1 Alarm Card or 1 X-fer Switch required for redundant system

<sup>5</sup> Minimum 2 Control Cards for redundant system.

NOTE: Any modification to any Stack System must be performed in the factory.

# MX SERIES POWER INVERTER SPECIFICATIONS

## OUTPUT POWER

CONTINUOUS POWER	SURGE POWER (3 seconds)	NO LOAD POWER	OUTPUT VOLTAGE	OUTPUT CURRENT	WEIGHT LBS.
1000W	2200W	20W	230+/-6%	4.3	7.5
1000W	2200W	20W	117+/-6%	8.6	7.5
1000W	2200W	20W	100+/-6%	10.0	7.5

## INPUT

MODEL VOLTAGE	MINIMUM (TYPICAL)	SYSTEM (TYPICAL)	MAXIMUM (TYPICAL)	TYPICAL EFFICIENCY @ FULL POWER	PEAK EFFICIENCY @ 1/3 POWER
12V	10.4/10.6*	13.8V	17V	85%	87%
24V	19/21V*	27.6V	34V	87%	89%
32V	26.5/28V*	36.8V	45V	87%	89%
48V	41.5/42.5V*	55.2V	62V	87%	89%
66V	57.5/58.5V*	75.9V	94V	88%	90%
108V	94/95V*	124V	149V	88%	90%

\*indicates typical cut-off voltage/warning buzzer voltage

## GENERAL

CONDITIONS	MINIMUM	TYPICAL	MAXIMUM
WAVEFORM	-	SINUSOIDAL	-
LINE REGULATION	-	.1%	.5%
LOAD REGULATION	-	.3%	.5%
DISTORTION	-	1.5%	2%
FREQUENCY*	-.1%	NOMINAL	+1%

\*50, 60, 400Hz nominal

See [www.exeltech.com](http://www.exeltech.com) for more data regarding MX Series inverters.

## PROTECTION CIRCUITRY

Over Voltage:	Shutoff at maximum input voltage, per input conditions.
Under Voltage:	Shutoff at minimum input voltage, per input conditions.
Thermal:	105 C internal temperature. Warning buzz 5 C before shutoff.
Output Short:	Unit shuts off: Circuit breaker protected and electronically limited.

## ENVIRONMENTAL

Temperature:	-25 to 40 C full power, derate 20% per 10 C. Above 40 C.
Humidity:	5 to 95% non-condensing
Altitude:	-200 to 10k feet full power, derated above 10k
Audible Noise:	Less than 45dbA
Cooling:	1KW-Thermostatically controlled forced air
Finish:	Polyurethane base paint
Warranty:	Full year parts and labor.

## MECHANICAL

Four case sizes are available; all are: 7" high X 15" deep.	
19 inch Wide:	(includes hardware for rack or shelf mounting)
23 inch Wide:	(includes hardware for rack or shelf mounting)
9.97 inch Wide:	(for 1 to 3KW applications: surface mounting only)
7 inch Wide:	(for 1 or 2KW applications; surface mounting only)
Available in other sizes including metric. Call factory for sizes.	

# MX SYSTEMS MONITOR CARD

It is now possible to monitor all of your remote power stations, anywhere, from a single location. You can have up to the minute verification that all of your remote power systems are 100% operational. Your remote power system can tell you that it is currently running at 90% of its rated capacity.

An Exeltech System Monitor card is an upgrade option for any Exeltech MX Series Redundant or Upgradeable System equipped with an Alarm Card or New MX Systems with a Transfer Switch. This new product allows customers to monitor all important aspects of their power system from any IP based Ethernet network.

Customers can monitor all system alarm functions including: Power Module fail, Control Card Fail, Over Temperature, Under DC Voltage, A-B Bus failure, System Breaker Open, and System Failure. Additionally, customers can monitor battery voltage and current usage, and System output voltage and current. All alarm functions are viewable from an LCD display located on the System Monitor Card, and Ethernet connection, or a local Rs232 connection.

## Main Menu Items

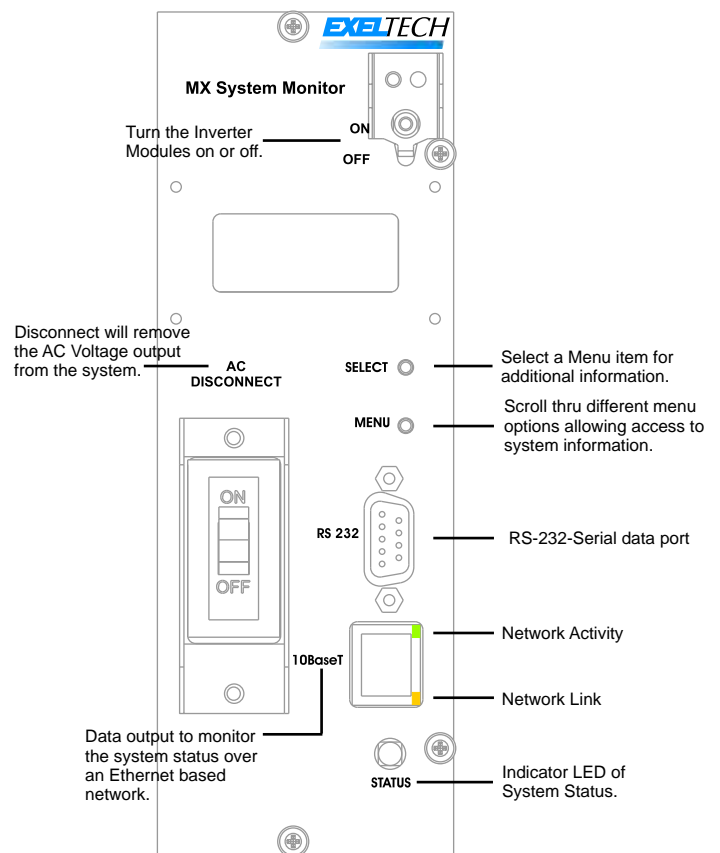
The main menu consists of 9 different screens. To switch between each menu item press the MENU button. Alarm Details and System Settings have several addition screens available for viewing or changing system parameters, press the SELECT button to choose a parameter for viewing or modification of settings. Hold the MENU button down to return to the main menu screens.

## Operation

Normal operation of the Monitor Card is exactly the same as a standard Exeltech Alarm Card with the notable exception of remote monitoring of system status. A blinking LED for the new alarm state announces new alarm states; pressing either button stops the blinking, and Alarm Details will give a listing of any alarms that have activated. For a complete description of the Exeltech Alarm Card, see the Exeltech System Installation/Operation manual.

## Remote Monitoring

Remote monitoring can be performed via DHCP enabled network, or RS 232 serial port. Monitoring software is included to allow remote sensing of alarm states, however, it is simple to implement custom software to meet any monitoring needs.



# MX SOLID STATE TRANSFER SWITCH

## Features

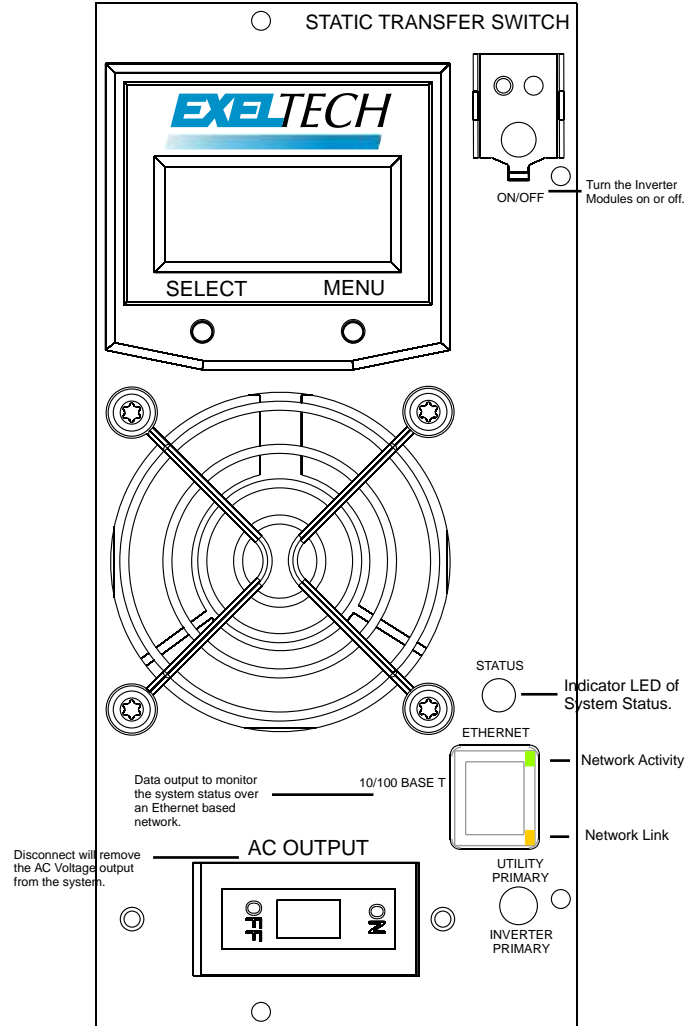
- Solid State
- Zero Switching time
- Modular Design
  - Single phase in 5, 10, 20KW
  - Split phase in 10, 20, 40KW
  - 3 Phase 15, 30, 60KW
- SNMP Monitoring
  - AC Amps
  - AC Volts
  - DC Amps
  - DC Volts
- Alarm Conditions
  - Load on alternate
  - Inverter alarms (if equipped)
- Fast AC Failure Detection (< 2 ms)
- Primary selection via front panel switch
- Optional generator start

## Operation

The Exeltech Solid State Transfer Switch sets a new standard in power density and alarm capabilities. Its modular design is available in 3 power levels, 5, 10 and 20KW, which can be linked together to provide single, split, and 3 phase systems. The Switches can communicate on a SNMP protocol via TCP/IP that provides data on AC volts and amps of both the primary and secondary sources. If linked to an MX inverter system it will perform all the normal functions of the required alarm card plus communicate DC volts and amps, all inverter alarms including inverter fail, module fail, and over temperature. If the inverter is so equipped, the switch will report both DC Bus A and Bus B Voltage. Additionally, the switch can report combined Major and Minor alarms via SNMP and form C contacts. The minor alarm is triggered with any alarm, the major alarm is only triggered with complete loss of AC Voltage to the load or when a complete loss is imminent.

All good to good transfers are synchronous and performed at zero crossing. The switch will operate on the user selectable primary source until the primary source fails or operates out of limits. It will switch to the secondary source in less than 4 ms worst case. If the primary returns to normal limits, the switch will wait 15 sec for stabilization, monitor the primary and secondary source, upon assuring they are in phase, it will switch at the next available zero crossing.

The status of all available alarms, status, and measurements are available via a 2 X 8 LCD display. It is highly recommended that an Exeltech maintenance bypass switch be used in conjunction with this or any other solid state transfer switch. This switch can be used with Exeltech inverters or between any 2 AC Sources whether they be inverters, generators or utility sources.



Voltage Transfer Set Point ( 120Vac )

Low voltage settings: 100Vac

High voltage settings: 130Vac