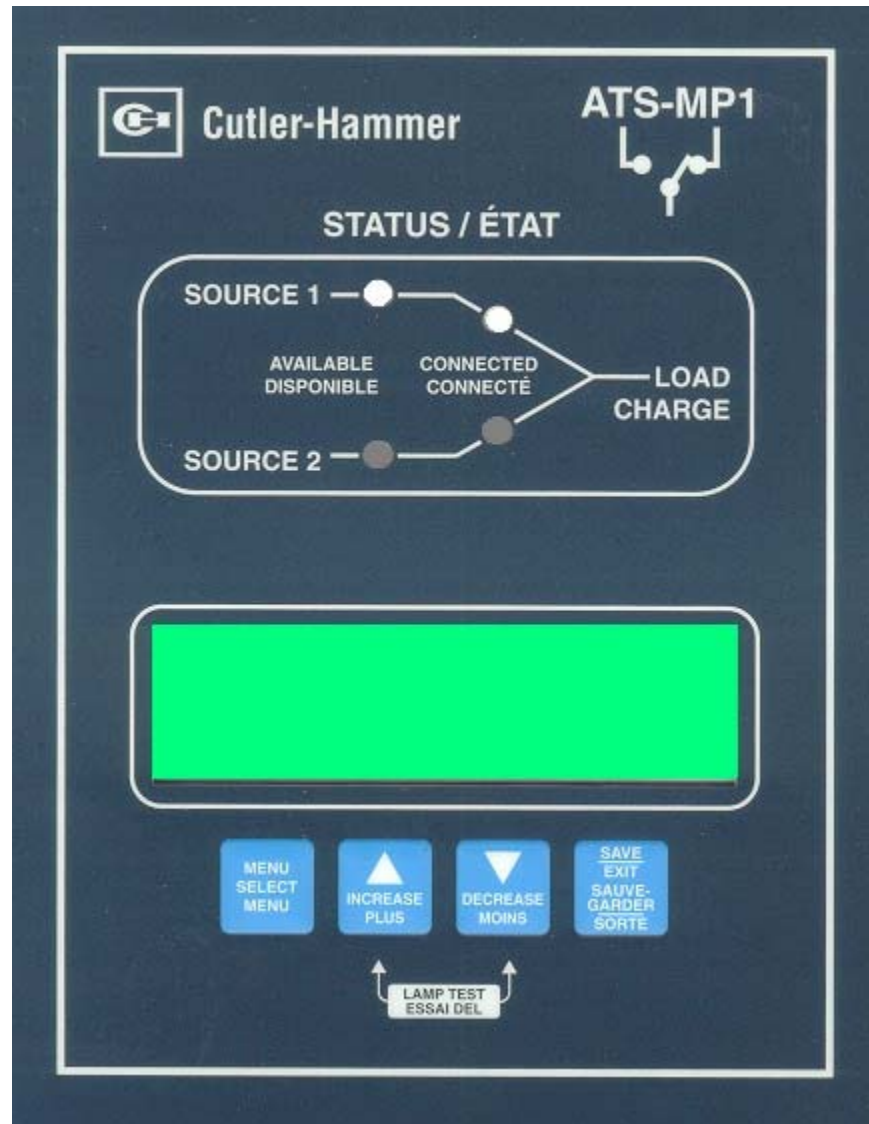


## Instructions for Cutler-Hammer MP1 Series Automatic Transfer Switches 30-1200A





## Table of Contents

<b>1. WARRANTY .....</b>	<b>1</b>
<b>2. RECEIVING, HANDLING AND STORAGE .....</b>	<b>1</b>
2.1 RECEIVING .....	1
2.2 HANDLING.....	2
2.3 STORAGE.....	2
<b>3. INTRODUCTION .....</b>	<b>3</b>
3.1 SAFETY PRECAUTIONS .....	3
3.2 GENERAL DESCRIPTION.....	3
3.2.1 <i>Type A</i> .....	3
3.2.2 <i>Type B</i> .....	3
3.3 DESCRIPTION OF OPERATION.....	4
3.4 DEFINITIONS.....	4
<b>4. EQUIPMENT DESCRIPTION.....</b>	<b>5</b>
4.1 “F-FRAME” AUTOMATIC TRANSFER SWITCH .....	5
4.2 “K, L, M, N-FRAME” HORIZONTAL AUTOMATIC TRANSFER SWITCH.....	5
4.3 TABLE 1 - SYSTEMS COORDINATION INFORMATION – .....	6
<b>5. PERFORMANCE SPECIFICATIONS.....</b>	<b>7</b>
<b>6. DESCRIPTION OF OPERATION.....</b>	<b>8</b>
6.1 INPUT PUSHBUTTONS .....	8
6.2 PROGRAM MODE.....	8
6.2.1 <i>Password</i> .....	8
6.2.2 <i>Setpoints Menu</i> .....	8
6.3 LAMP TEST.....	9
6.4 SERIAL CONNECTION .....	9
6.5 LED OUTPUTS .....	9
6.6 INPUT CONTACT DESCRIPTIONS .....	9
6.7 OUTPUT CONTACT DESCRIPTIONS.....	10
<b>7. OPERATION VOLTAGE AND MEASUREMENT.....</b>	<b>10</b>
7.1 MP1 .....	10
7.2 MP1-E .....	10
<b>8. OPTIONS AND SETPOINTS .....</b>	<b>11</b>
8.1 MP1 SERIES CONTROLLER OPTIONS .....	11
8.2 EXTERNAL OPTIONS .....	13
<b>9. PROGRAM SETPOINTS MENU.....</b>	<b>15</b>
<b>10. SUMMARY OF OPTIONS .....</b>	<b>16</b>
<b>11. TROUBLESHOOTING.....</b>	<b>17</b>
<b>12. MAINTENANCE .....</b>	<b>18</b>



## 1. Warranty

The Seller warrants that the Product manufactured by it will conform to Seller's applicable specifications and be free from failure due to defects in workmanship and material for a period of one (1) year from the date of shipment. In the event that a Product fails to comply with the foregoing warranty Seller will, at its option, either (a) repair or replace the defective Product, or defective part or component thereof, F.O.B. Seller's facility freight prepaid, or (b) credit Buyer for the purchase price of the Product. All warranty claims shall be made promptly in writing. Seller requires all non-conforming Product be returned at Seller's expense for evaluation unless specifically stated otherwise in writing by Seller. This warranty does not cover failure or damage due to storage, installation, operation or maintenance not in conformance with Seller's recommendations and industry standard practice or due to accident, misuse, abuse or negligence. This warranty does not cover reimbursement for labour, gaining access, removal, installation, temporary power or any other expenses which may be incurred in connection with repair or replacement. This warranty does not apply to Product not manufactured by Seller. Seller limits itself to extending the same warranty it receives from the supplier.

### Limitation of Liability

The remedies of the Buyer set forth herein are exclusive and are the sole remedies for any failure of Seller to comply with its obligations hereunder. In no event shall Seller be liable in contract, in tort (including negligence or strict liability), extra-contractually, or otherwise for damage to property or equipment other than the Product sold hereunder, loss of profits or revenue, loss of use of Product, cost of capital, claims of customers of the Buyer, or any special, indirect, incidental or consequential damage whatsoever. The total cumulative liability of Seller arising or related to this contract whether the claims are based in contract, in tort (including negligence or strict liability), extra-contractually, or otherwise, shall not exceed the price of the Product or Service on which such liability is based.

## 2. Receiving, Handling and Storage

### 2.1 Receiving

Every effort is made to insure that transfer switch equipment arrives at its destination undamaged and ready for installation. Crating and packing is designed to protect internal components as well as the enclosure. Transfer switch enclosures are skid mounted and suited for forklift movement. Care should be exercised, however, to protect the equipment from impact at all times. Do not remove protective packaging until the equipment is ready for installation. When transfer switch equipment reaches its destination, the customer should inspect the shipping container for any obvious signs of rough handling and/or external damage incurred during the transportation phase. Record any external and internal damage observed for reporting to the transportation carrier. Call the carriers concerned at once for inspection, and request an inspection report. Do not write to us first – notify the carrier instead. If this precaution is not taken we cannot assist you in recovering the amount of the claim against the carrier. All claims should be as specific as possible and include shop order (S.O.#) and general order numbers (G.O.#).

A shipping label is affixed to the top of the shipping container which includes a variety of equipment and customer information, such as General Order Number (G.O.#) and Catalog Number (Cat.#). Make certain that this information matches other shipping paper information.

Each transfer switch enclosure is bolted through its top and bottom mounting holes to a rigid wooden pallet. The pallet is open at two ends for movement by a fork lift. Heavy-duty cardboard surrounds the enclosure. A corrugated cardboard protector covers the entire top of the enclosure with additional cardboard protectors over the indicating lights. The shipment is secured and further protected with shrink wrap. Do not discard the packing material until the equipment is ready for installation.

Once the top packaging is removed from the shipment, the enclosure door can be opened. A paper envelope of documents will

be found within the enclosure, usually attached to the inside of the door. Important documents, such as test reports, wiring diagrams, and appropriate instruction leaflets, are enclosed within the envelope and should be filed in a safe place.

## **2.2 Handling**

As previously mentioned, transfer switch equipment is packaged for forklift movement. Protect the equipment from impact at all times and do not double stack. Once the equipment is in the installation location and ready to be installed, packaging material can be removed. Once the enclosure is unbolted from the wooden pallet, it can be hand moved to its installation position. Two lifting lugs on the top of the enclosure are provided as standard on switches from 200-1200 Amps to facilitate installation.

## **2.3 Storage**

Although well packaged, this equipment is not suitable for storage outdoors. The equipment warranty will not be applicable if there is evidence of outdoor storage. If the equipment is to be stored indoors for any period of time, it should be stored with its protective packaging material in place. Protect the equipment at all times from excessive moisture, construction dirt, corrosive conditions and other contaminants. It is strongly suggested that the package protected equipment be stored in a climate controlled environment of -20° to 30°C with a relative humidity of 80% or less. Do not, under any circumstances, stack other equipment on top of a transfer switch equipment enclosure, whether packaged or not.

### 3. Introduction

This technical document is intended to cover most aspects associated with the installation, application, operation and maintenance of the ATS-MP1 and ATS-MP1-E series controller. It is provided as a guide for authorized and qualified personnel only in the selection and application of an Automatic Transfer Switch with the Cutler-Hammer ATS-MP1 series controller. Please refer to the specific WARNING and CAUTION in Section 3.1 before proceeding. If the purchaser requires further information regarding a particular installation, application or maintenance activity, a Cutler-Hammer representative should be contacted.

#### 3.1 Safety Precautions

All safety codes, safety standards and/or regulations must be strictly observed in the installation, operation and maintenance of this device.

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#### **WARNING**

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**THE WARNINGS AND CAUTIONS INCLUDED AS PART OF THE PROCEDURAL STEPS IN THIS DOCUMENT ARE FOR PERSONNEL SAFETY AND PROTECTION OF EQUIPMENT FROM DAMAGE. AN EXAMPLE OF A TYPICAL WARNING LABEL HEADING IS SHOWN IN REVERSE TYPE TO FAMILIARIZE PERSONNEL WITH THE STYLE OF PRESENTATION. THIS WILL HELP TO INSURE THAT PERSONNEL ARE ALERT TO WARNINGS, WHICH MAY APPEAR THROUGHOUT THE DOCUMENT.**

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#### **CAUTION**

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**COMPLETELY READ AND UNDERSTAND THE MATERIAL PRESENTED IN THIS DOCUMENT BEFORE ATTEMPTING INSTALLATION, OPERATION OR APPLICATION OF THE EQUIPMENT. IN ADDITION, ONLY QUALIFIED PERSONS SHOULD BE PERMITTED TO PERFORM ANY WORK ASSOCIATED WITH THE EQUIPMENT. ANY WIRING INSTRUCTIONS PRESENTED IN THIS DOCUMENT MUST BE FOLLOWED PRECISELY. FAILURE TO DO SO COULD CAUSE PERMANENT EQUIPMENT DAMAGE.**

#### 3.2 General Description

CSA Standard C22.2 No. 178-1978 defines an automatic transfer switch as, "self acting equipment for transferring one or more load conductor connections from one power source to another." The same Standard also gives definitions for type A and type B automatic transfer switches. "Transfer switch type A means an automatic transfer switch that does not employ integral overcurrent devices." "Transfer switch, type B means an automatic transfer switch that (does) employ integral overcurrent protection." Cutler-Hammer automatic transfer switches are available in both types.

##### 3.2.1 Type A

Type A are equipped with special instantaneous magnetic only interrupters. The trip settings of these special interrupters are set (and fixed) at higher than standard values. They are intended to trip only if the upstream protective device fails to clear a fault. Incorporating these special magnetic only interrupters, a type A automatic transfer switch operates in exactly the same way as a transfer switch not having this feature. In the event that both devices trip, the control circuitry will automatically initiate transfer to the alternate source. The transfer operation will reset the "tripped" magnetic only interrupter.

##### 3.2.2 Type B

Type B switches are equipped with standard moulded case circuit breakers with standard thermal-magnetic trip units that will provide the required over-load and short circuit protection. Type B switches can also be built using electronic trip units, which gives the ability to include ground fault tripping, as well as overload (long and short time) and short circuit protection (instantaneous). For application information or assistance with type B switches, refer to Cutler-Hammer.

For the remainder of this manual, the switching devices employed in the switch shall be referred to as breakers. This can imply either magnetic-trip only *moulded case switches (MCS)*, or *moulded case circuit breakers (MCCB)* with overcurrent trip units.

### 3.3 Description of Operation

The Cutler-Hammer Automatic Transfer Switch provides automatic transfer of an electrical load to a standby power supply in the event of drop or loss of voltage of any or all phases of the normal power supply. Upon the restoration of the normal supply, the electrical load is automatically retransferred to the normal power supply. The mechanism provides a positive mechanical interlock to prevent both breakers being closed at the same time. The mechanism is also designed to leave both breakers trip free in the closed position, permitting incorporation of thermal and short-circuit protection in either or both breakers. In Type B switches, an alarm switch contact is supplied. This contact is connected to the controller to lock the motor circuit out of operation when the breaker(s) trip on an overload or short-circuit condition. Then the breaker has to be manually reset. Instructions for the reset procedure are located on the front of the operating mechanism.

### 3.4 Definitions

With respect to their use in this document and as they relate to automatic transfer switch operation, the following terminology is defined:

**Available** – A source is defined as “available” when it is within all undervoltage / overvoltage / underfrequency / overfrequency setpoint ranges for the nominal voltage and frequency setting.

**Fails** – A source is defined as “failed” when it is outside of any undervoltage / overvoltage / underfrequency / overfrequency setpoint ranges for the nominal voltage and frequency setting for a time exceeding 0.5 seconds.

**Failsafe** – Refers to the condition whereby the transfer switch is connected to the emergency source. In the event that the emergency source fails with normal source available an immediate retransfer to normal source shall occur.

**Transfer** – A “transfer” is defined as the automatic operation under a normal source

failure of switching the Load from Normal Source to the Emergency Source.

**Retransfer** – A “retransfer” is defined as the automatic operation under Normal Source reappearance of switching the Load from Emergency Source to Normal Source.



## 4. Equipment Description

### 4.1 “F-Frame” Automatic Transfer Switch

Rated 30 amperes through 150 amperes at 600 Volts AC and 200A at 240V maximum, 50 or 60 Hertz. The mechanism is a lever operated device controlled by a 120 volt unidirectional motor. The transfer motor drives a cam that in turn operates a steel lever by sliding a pin along a slot in the back of the lever. The lever, in turn, operates the two breaker handles. There are two micro switches (NS/x, ES/x) inside the breakers that are operated by the breaker's main contacts to provide switch status indication to the automatic controller. The switch has three operating positions. They are: the normal breaker closed and the emergency breaker open, the emergency breaker closed and the normal breaker open or both the normal and emergency breakers open. The normal and emergency breakers can never both be closed at the same time.



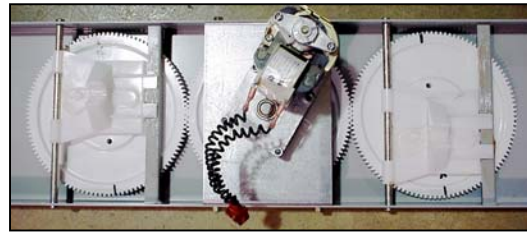
**Figure 1 -Typical Power Panel for 30-200A models**

The F-Frame switch can also be easily manually operated. Remove the thumb screw on the operating handle and place it in a safe location. Then the lever can be manually operated for whatever position desired without interference by the automatic control. For automatic control again, simply align the hole in the motor arm with the slot in the operating arm and replace the thumb screw. The various automatic control components are described beginning in Section 6 titled “Description of Operation”.

### 4.2 “K, L, M, N-Frame” Horizontal Automatic Transfer Switch

A complete line rated from 200 through 1200\* Amperes at 600 Volts AC 50 or 60 Hertz.

The transfer mechanism consists of the transfer motor, a gear train and two breaker operating cams.



**Figure 2 - Spur Gear Meshing Relationship (Bottom View of Top Cover)**

The transfer motor drives the centre gear which in turn operates the two secondary gears. There is a projection in the secondary gears which slides in a groove in the operating cams, moving the cams from side to side. The breaker handles are set inside two outer guides of the cam and are also moved from side to side. There are two micro switches (NS/x, ES/x) inside the breakers that are operated by the breaker's main contacts to provide switch status indication to the automatic controller.

The Horizontal type transfer switch has three operating positions, the normal breaker closed and the emergency breaker open, the emergency breaker closed and the normal breaker open or both the normal and the emergency breakers open but never both the normal and emergency breakers closed at the same time. The switch is also easy to operate manually. Simply remove the motor disconnect plug and turn the operating handle on the front of the transfer mechanism in a counter clockwise direction until you hear the breakers operated and the indicator is in the desired position. There will be no interference from the microprocessor control. For automatic control, reconnect the transfer motor plug and the transfer switch will seek the source with power available.

\* A 1200A Switch in the Horizontal design is provided as a type “B” switch with overcurrent protection (Option 16N) and rated for 80% continuous current.



Figure 3 - Typical Power Panel for 200-1200A models

#### 4.3 Table 1 - SYSTEMS COORDINATION INFORMATION – WITHSTAND, CLOSING & INTERRUPTING RATINGS

ATS Ampere Rating	Ratings when used with upstream breaker (kA)			Ratings when used with upstream fuse (kA)		
	240V	480V	600V	Max Fuse Rating	Fuse Type	600V
30	100	65	25	200	J,T	200
70	100	65	25	200	J,T	200
100	100	65	25	200	J,T	200
150	100	65	25	400	J,T	200
225	100	65	35	400	J,T	200
300	100	65	35	400	J,T	200
400	100	65	35	600	J,T	200
600	65	50	25	800/1200	J,T	100/200
800	65	50	25	1200/1600	L	100/200
1000	65	50	25	1600	L	200
1200	65	50	25	1600	L	200

## 5. Performance Specifications

The performance specifications for the ATS-MP1 Controller Board are given in Table 2:

**Table 2 – Performance Specifications**

Input Control Voltage	(50-150)% of $V_{(IN,RMS)}$	50/60 Hz
Voltage Measurements of:	Normal Source $V_{AB}$ Normal Source $V_{BC}$ Normal Source $V_{CA}$	Emergency Source $V_{AB}$ Emergency Source $V_{BC}$ Emergency Source $V_{CA}$
Voltage Measurement Range:	0 to 360 VAC RMS (50/60Hz) – <b>MP1</b> 0 to 750 VAC RMS (50/60Hz) – <b>MP1-E</b>	
Voltage Measurement Accuracy:	± 2% of reading over the monitoring range	
Frequency Measurements of:	Normal Source (S1), Emergency Source (S2)	
Frequency Measurement Range:	40 Hz to 70 Hz	
Frequency Measurement Accuracy	± 0.3 Hz over the measurement range	
Undervoltage Dropout Range:	50% to 97% of the nominal system voltage	
Undervoltage Pickup Range:	(Dropout +2%) to 99% of the nominal system voltage	
Overvoltage Dropout Range:	105% to 120% of the nominal system voltage	
Overvoltage Pickup Range:	103% to (Dropout –2%) of the nominal system voltage	
Underfrequency Dropout Range:	90% to 97% of the nominal system frequency	
Underfrequency Pickup Range:	(Dropout + 1Hz) to 99% of the nominal system frequency	
Overfrequency Dropout Range:	103% to 110% of the nominal system frequency	
Overfrequency Pickup Range:	101% to (Dropout – 1Hz) of the nominal system frequency	
Operating Temperature Range	-20°C to + 70°C	
Storage Temperature Range	-35°C to + 85°C	
Operating Humidity	0 to 95% relative humidity (non-condensing)	
Generator Start Relay	5A, 1/6 HP @ 250VAC 5A @ 30VDC with a 30W maximum load	
Alarm Relay	10A, 1-3 HP @ 250VAC 10A @ 30VDC	

**Table 3 - Applicable Test Standards**

UL 991
Canadian Standards Association Conformance (CSA)
UL 1008 / CSA 22.2 No 178.22
Dielectric test
FCC Part 15
Conducted/Radiated Emissions (Class A)
CISPR 11
Conducted/Radiated Emissions (Class A)
IEC 1000-2
Electrostatic Discharge test
IEC 1000-3
Radiated Susceptibility tests
IEC 1000-4
Fast Transient tests
IEC 1000-5
Surge Withstand tests

## 6. Description of Operation

The primary functions of the ATS-MP1 controller is to accurately monitor two power sources and provide the necessary intelligence to operate a transfer switch in an appropriate and timely manner. The ATS-MP1 uses proven microprocessor-based technology that provides a high reliability and accuracy for all voltage sensing and timing functions. The input function consists of keypad type pushbutton inputs (4 in total). In addition, effectively a fifth user input exists via a rear located PC type serial port connection to be used in factory and field programming of options and setpoints. Outputs functions consist of LED outputs (4 total) and a two line 16-character alphanumeric LCD display output.

### 6.1 Input Pushbuttons

There are four front panel membrane type pushbuttons. Pushbuttons accomplish their function when pressed and released.

#### Menu Select

The user can scroll through the available display information. Pushing the Menu Select key will scroll through the voltage and frequency of each source. When in the setpoints menu, pushing the Menu Select key will scroll the user through each of the setpoint options in sequence.

**Increase** (Increments specific variable range)

When the user initiates program mode, each press of the Increase key will increase the displayed value by one. The Increase pushbutton will continue to scroll if it is pressed and not released.

**Decrease** (Decrements specific variable range)

When the user initiates program mode, each press of the Decrease key will decrease the displayed value by one. The Decrease pushbutton will continue to scroll if it is pressed and not released.

#### Save/Exit

When in program mode and the user has selected the desired setpoints for nominal

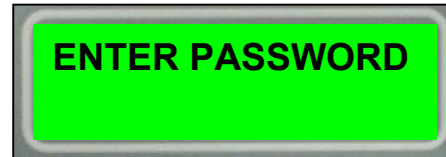
operation, pressing the save button will store all of the settings.

The following are three modes of operation that are easily accessed via the front panel keys:

### 6.2 Program Mode

This mode of operation is used only to change setpoint values of existing operating parameters (standard and programmed options).

Program mode is achieved by depressing the Menu Select key and Save (Exit) key simultaneously for five-second duration.



The LCD will then display the phrase "Enter Password."

#### 6.2.1 Password

To enter the program mode, the ATS-MP1 requires a password to prevent unauthorized persons from modifying setpoint values. The password is factory set to a combination of 4 depressions of the Menu Select, up, and down arrow keys in sequence. The password set at the factory is contained on a sticker mounted on the rear of the controller.

**Factory Password:**  
**Decrease, Increase, Menu, Decrease**

Once the correct password is entered, the password may be changed by the user at the prompt "Change Password?" It is advisable that if changed, the password be set to either a combination that is easily remembered, and also written in the appropriate space on the sticker. The enclosure door can be padlocked to prevent unauthorized persons from gaining knowledge of the password.

#### 6.2.2 Setpoints Menu

When in the setpoints menu, by depressing the Menu Select key, the user can scroll through the operating parameters at any time adjusting any setpoint values using the

Increase or Decrease keys. Once all of the setpoint operating parameters have been entered, the user may save the new setpoint options by depressing the Save (Exit) key. Once this is completed, the controller acknowledges the setpoint values have been programmed by displaying the message "Setpoints Programmed."

### 6.3 Lamp Test

(Increase and Decrease Simultaneously)  
Pressing the Increase and Decrease buttons simultaneously will cause the all LEDs to illuminate for a minimum of ten seconds. During this lamp test the LCD displays the message "Lamp Test."

### 6.4 Serial Connection

A serial input connection is accessible from the rear of the ATS-MP1 controller. This input is used for factory and field programmability of options and setpoints. It communicates to a standard PC or laptop via serial communication. A field update software package for Windows® based PCs is available. This software allows the user to adjust and view controller setpoints, and add additional options to the controller with a factory authorized code. Contact Cutler-Hammer for further details.

### 6.5 LED Outputs

#### Normal Source Available

This red LED is lit when the normal source meets the user programmed setpoint criteria.

#### Normal Source Connected

This red LED displays the status of the transfer switch position. It illuminates when the normal source is available and the transfer switch is in normal position. Indication of the transfer switch in normal position is accomplished by sensing the closed A-contact of the normal breaker auxiliary.

#### Emergency Source Available

This red LED is lit when the emergency source meets the user programmed setpoint criteria.

#### Emergency Source Connected

This red LED displays the status of the transfer switch position. It illuminates when

the emergency source is available and the transfer switch is in emergency position. Indication of the transfer switch in emergency position is accomplished by sensing the closed A-contact of the emergency breaker auxiliary.

## 6.6 Input Contact Descriptions

The control outputs of the ATS-MP1 controller are wetted DC contacts.

### Source 1 Auxiliary Closed

This contact is hard-wired to the normal breaker auxiliary contact that is closed when the normal breaker is closed (A-contact).

### Source 2 Auxiliary Closed

This contact is hard-wired to the emergency breaker auxiliary contact that is closed when the emergency breaker is closed (A-contact).

### Source 1 and Source 2 Lockout (Requires Option 16)

This contact is hard-wired to the normal and/or emergency breaker lockout (bell alarms) contacts that close when one of the breaker has tripped due to an overcurrent condition or fault current condition. Closure of this contact inhibits any transfer from occurring and the message "\*\*\* LOCKOUT \*\*\*" will appear on the LCD.

### Bypass Time Delay(s) (Requires Option 8)

Closure of this contact will bypass the programmed values for either or both of the TDNE and TDEN timer setpoints, depending upon which option has been selected

### Go To Neutral (Services Disconnect)

Closure of this contact forces the controller to switch to the neutral position thereby disconnecting the load from both sources. Enabling of this function forces a minimum neutral position time as determined by the programmed TDN setpoint.

### Test/Area Protection

Closure of this contact will cause the controller to initiate a transfer to Source 2 if the transfer switch is in Source 1 position. Opening of this contact will cause the controller to initiate a transfer to Source 1 if the transfer switch is in Source 2 position.

### **Preferred Source – MP1-E Only Requires Option 10**

This feature permits the selection of either source (1 or 2) as the preferred or normal source. The normal source is the source that the switch always looks to for availability so that it can transfer to it.

### **Manual Return To Normal – MP1-E Only Requires Option 29**

A manual operated momentary contact (normally open) operates in conjunction with the Manual Return to Normal option to replace the TDEN timing function. With the manual mode set, closure of this contact will prompt an immediate transfer bypassing the TDEN time delay. This ensures that a re-transfer occurs only at the discretion of the operator.

## **6.7 Output Contact Descriptions**

The control outputs of the ATS-MP1 controller are dry relay contacts. These relays are comprised of a latching Form A relay to provide the Generator Start Relay contact, a Form A contact for the Transfer Motor Relay contact, and a Form C relay for an alarm output. The dielectric rating for each output is a minimum of 1500 VAC

### **Generator Start Relay**

This latching relay is the generator start relay for system configurations that employ a generator on the emergency source. This relay employs a Form A contact for closure of the generator start circuit. The Generator start relay is rated for 5A @ 30VDC with a 30W maximum load.

### **Transfer Motor Relay**

This is a Form A contact is used to close the electrical path of the transfer motor control circuit. Closure of this contact will initiate a transfer from the normal source to emergency source and from emergency source to normal source as required per normal transfer switch operation.

### **Alarm Relay**

The full Form C contact of this relay may be wired to an alarm enunciator panel to indicate problem with the ATS. This relay is normally energized to indicate an absence of an alarm state. De-energization of this

relay indicates the presence of an alarm condition. An alarm condition will occur if a transfer has been initiated but is never completed (This may indicate that something is wrong with the motor or transfer mechanism). The alarm contact will also change state if the controller detects a phase reversal condition between the normal and emergency sources. The controller will also inhibit transfer on this condition

### **Pre-Transfer Relay (MP1-E Only) Requires Option 35**

This feature provides for the control of an external 120V instant relay with 2 Form C contacts to remotely signal that a re-transfer is about to take place.

## **7. Operation Voltage and Measurement**

Both the MP1 and MP1-E operate on single and three phase systems with selectable frequency settings of 50Hz or 60Hz.

### **7.1 MP1**

This MP1 operates directly from the line sensing inputs of the two different sources (normal and emergency). The nominal operating system inputs are from 110VAC-240VAC. The standard system assumes that neutral is available and that the transfer motor can therefore be powered from an available 120 VAC source. If a neutral conductor is not available, a 120VAC supply is created by an external transformer.

### **7.2 MP1-E**

The MP1-E provides the user with an enhanced feature set, and a wider range of voltage measurement, from 110VAC-600VAC. A high impedance resistive circuit is used in series with the voltage sensing inputs to reduce the voltage applied to the controller to comply with safety codes for door-mounted devices. The power supply for the MP1-E requires a 120VAC source, provided by an external transformer.

## 8. Options and Setpoints

The options and setpoints are stored in non-volatile memory. A standard option is enabled on every controller. Those designated as programmable can be added at the factory at the customer's request (usually at an additional cost), or can be added in the field via PC software and/or an option key. Setpoint values are modified by using the pushbutton keys on the front panel or using the Cutler-Hammer ATS-Connect Field Update software.

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### NOTICE

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**REFER TO BOTH THE FACTORY TEST SHEET, AND THE DRAWINGS THAT SHIPPED WITH THE TRANSFER SWITCH TO DETERMINE THE OPTIONS THAT ARE INSTALLED. AN OPTION WILL NOT BE FUNCTIONAL, NOR WILL THE PARAMETERS BE ADJUSTABLE THROUGH THE SETPOINTS MENU IF AN OPTION IS NOT ENABLED.**

### 8.1 MP1 Series Controller Options

#### Standard option - TDNE Time Delay Normal to Emergency

Provides a time delay when transferring the normal source to the emergency source. To ensure stability of the emergency source. Timing begins when the emergency source becomes available.

#### Standard option - TDES Time Delay Engine Start

Delays the initiation of the engine start circuit in order to override momentary power outages or voltage fluctuations of the normal source. The TDES timer shall start when the normal source becomes unavailable. If the normal source becomes available while timing, the TDES timer shall reset. The controller can perform the time delay engine start function without control power for 120 seconds.

#### Standard option - TDEN Time Delay Emergency to Normal

Delays the transfer from the emergency source to the normal source to permit stabilization of the normal source before re-transfer is made. Timing begins when the normal source becomes available.

If the emergency source fails during timing for a period greater than 0.5 seconds, transfer to normal source is immediate. If the normal source fails during timing, the TDEN timer shall reset once the normal source becomes available again.

#### Standard option - TDEC Time Delay Engine Cooldown

Permits the generator to continue to run unloaded after retransfer to the normal source has occurred. Timing begins when the transfer to normal has been completed.

#### Emergency Source Frequency/Voltage Sensing

Continuously monitors the emergency source for one of the conditions listed below. When the emergency frequency and/or voltage is outside the dropout setpoints, the source will become unavailable. The source's frequency and/or voltage will then have to be within the pickup setpoints to become available again.

- a) Emergency Source Undervoltage (**Standard option**)
- b) Emergency Source Underfrequency (**Standard option**)
- c) Emergency Source Overvoltage (**Optional Feature**)
- d) Emergency Source Overfrequency (**Optional Feature**)

#### Normal Source Frequency/Voltage Sensing

Continuously monitors the normal source for out of range setpoint values. When the normal frequency and/or voltage is outside the dropout setpoints, the source will become unavailable. This will then prompt a transfer to the emergency source once it becomes available. The normal source's frequency and/or voltage will then have to be within the pickup setpoints to become available again for a retransfer.

- a) Normal Source Undervoltage (**Standard option**)

- b) Normal Source Underfrequency  
**(Optional Feature)**
- c) Normal Source Overvoltage **(Optional Feature)**
- d) Normal Source Overfrequency  
**(Optional Feature)**

#### **Standard Option – Phase Reversal MP1-E Only**

The alarm contact will change state if the controller detects a phase reversal condition between the normal and emergency sources. The controller will also inhibit transfer on this condition.

#### **Standard Option - Plant Exerciser**

This option provides for automatic test operation of the generator. The interval is fixed at once per week with duration equal to the programmed engine test time (ERT). Two optional modes of plant exercising are available:

- a) No Load Exercise
- b) Load Exercising with failsafe

If desired, this option can be disabled by choosing “No” at the “Plant Exerciser” prompt in the menu. Also if “---” is chosen as the test day, the engine will not be exercised.

#### **Optional Feature 8 - Pushbutton Bypass of Time Delays (PBNE/PBEN)**

Enables the user to bypass TDNE or TDEN timer during a test or exercise. Pressing the external pushbutton shall cause the transfer switch to transfer to the normal and/or emergency source without a time delay. Three optional modes of bypassing are available:

- a) PBNE – Pushbutton Bypass Time Delay Normal to Emergency
- b) PBEN – Pushbutton Bypass Time Delay Emergency to Normal
- c) PBG – Pushbutton Bypass Time Delay Global (Both TDNE & TDEN)

#### **Optional Feature 10 - Preferred Source (PFR SRC) MP1-E Only**

Permits the selection of either source (1 or 2) as the preferred source. The preferred source is the source that the MP1-E

controller looks to for availability so that the transfer switch may remain in this position and supply the load with this source. The preferred source will be considered the same as the “normal” source and the alternate source will be considered the same as the “emergency” source. All time delays (e.g. TDNE, TDEN) will be a function of this feature and follow the preferred source. Three optional modes of Preferred Source Selection are programmable:  
PS1 – Source 1 is selected as preferred. Source 2 is the alternate source.  
PS2 – Source 2 is selected as preferred. Source 1 is the alternate source.  
PS0 – No Source is selected as preferred

**Note:** If the preferred source feature is not programmed, Source 1 will default as the preferred source and Source 2 will default as the alternate source.

If no sources are selected as preferred, the transfer switch will remain on any source that is available and meets the programmed set-point criteria. Moreover, in this mode of operation, the transfer switch will only transfer from Source 1 to Source 2 or from Source 2 to Source 1 if a failure occurs on the source that the transfer switch resides on. It should be noted that the preferred source contact is disabled when there is no preferred source selected. However, if the Area protection option is enabled and prompted, the controller will react by transferring to the appropriate source as described in the Area Protection feature.

#### **Optional Feature 26D - Test/Area Protection**

This feature provides for a remote customer contact. This option is always enabled in the controller, but as an option, terminal block connections may be provided for a remote signal.

Closure of this contact will cause the controller to initiate a transfer to Source 2 if the transfer switch is in Source 1 position. Opening of this contact will cause the controller to initiate a transfer to Source 1 if the transfer switch on Source 2 position. This feature is typically used if it is known that there may be problems with the Normal Source such as an impending lightning storm, or the local utility performing maintenance in the area. The switch will



remain on the emergency source until the external contact is opened, when user is certain that the threat of problems has passed. If the emergency source fails at any time when in the Area Protection mode, the switch will immediately transfer back to the Normal source if it is Available.

The MP1-E controller allows the Test/Area protection input to be disabled if the user would like to prevent unauthorized users from using the test switch or input contact.

#### **Optional Feature 29 - Manual Return To Normal – MP1-E Only**

A manual operated momentary contact (normally open) operates in conjunction with the Manual Return to Normal option to replace the TDEN timing function. With the manual mode set, closure of this contact will prompt an immediate transfer bypassing the TDEN time delay. This ensures that a re-transfer occurs only at the discretion of the operator.

**Optional Feature 32 - Time Delay Neutral** Provides a time delay in the transfer switch neutral position when the load is transferred in one or both directions. This is to prevent excessive inrush currents due to out-of-phase switching of large inductive loads. If the TDN timer is programmed to 0 seconds, the transfer switch shall operate as if the TDN option is disabled. Three optional modes of Neutral Time Delay are available as programmable:

- (a) TDN(NE) – Time Delay Neutral (from Normal to Emergency)
- (b) TDN(EN) – Time Delay Neutral (from Emergency to Normal)
- (c) TDN(G) – Time Delay Neutral (Both directions)

## **8.2 External Options**

There are also external options that may be installed in a Cutler-Hammer Automatic Transfer Switch. A brief description is provided.

#### **Standard Feature 6D – 2 Position Test Selector Switch (TSS)**

Position 1 – “Auto”: The ATS will function normally, transferring to the emergency source when normal power is lost.

Position 2 – “Test”: The ATS will simulate the loss of the normal source. The switch will transfer to source 2 after the Time Delay Engine Start, and the TDNE has expired. The ATS will return to the normal position when the switch is return to “Auto”.

**Option 6G** is identical to the Test Selector Switch except key operated. Key removable in “Auto” position.

#### **Standard Feature 6H – 4 Position Test Selector Switch (FPSS)**

Position 1 – “Auto”: The ATS will function normally, transferring to source 2 when normal power is lost.

Position 2 – “Test”: The ATS will simulate the loss of the normal source. The switch will transfer to source 2 after the Time Delay Engine Start, and the TDNE has expired. The ATS will return to the normal position when the switch is returned to “Auto”.

Position 3 – “Engine Start”: The engine start contacts will close, giving the genset a start signal. This position can be used to test the correct connection of the engine start terminals, or as a remote start. The controller with function normally and transfer to the emergency if normal power is lost.

Position 4 – “Manual”: This will disconnect the transfer motor, and prevent transfers in either direction. The ATS can be transferred only by operating the manual transfer handle.

**Option 6J** is identical to the Four Position Selector Switch except key operated. Key removable in “Auto” position.

#### **Optional Feature 12C – Normal Connected Pilot light.**

A green 30mm indication light indicates that the load is connected to the normal source.

#### **Optional Feature 12D – Emergency Connected Pilot light.**

A red 30mm indication light indicates that the load is connected to the emergency source.

**Optional Feature 12G – Normal Available Pilot light.**

A white 30mm indication light indicates that the normal source is available.

**Optional Feature 12H – Emergency Available Pilot light.**

A white 30mm indication light indicates that the emergency source is available.

**Optional Feature 14 – Auxiliary Relays**

120VAC instant relays labeled NRA (Normal Source) and ERA (Emergency Source) provide the user with up to six (6) form C contacts for switch status indication. The relays are energized when power is available and the switch is currently connected to the source. The contacts are wired to terminal blocks beginning with number 501. See the schematic shipped with the unit for more detail.

**Optional Feature 15 – Auxiliary Contacts**

Auxiliary switches mounted inside the breakers follow the breaker position, regardless of power availability. The form C contacts are wired to terminal blocks beginning with number 401. See the schematic shipped with the unit for more detail.

**Optional Feature 16 - Integral Overcurrent Protection**

Provides overcurrent protection integral to the power switching device. The use of this option can, in many cases, eliminate the need for separate upstream, overcurrent/short-circuit protection. For safety purposes, this option includes a lock-out function that prevents further automatic transfer operation until the appropriate source is manually reset. The MP1 controller will also read \*\*\*LOCKOUT\*\*\* on the display. See the front of the switch mechanism for instructions. (Note: Four pole transfer switches include overcurrent protection only on the three power poles)

**Optional Feature 18 – Metering and Communications**

Analog meters or Cutler-Hammer IQ metering devices can be installed to provide various metering functions. Refer to the appropriate instruction manuals that ship

with the transfer switch for additional information.

**Optional Feature 24 – Battery Charger**

A 5A trickle charger with DC output of 12V or 24V is mounted either inside the switch enclosure or supplied loose and externally mounted. Refer to the specific instruction manuals that ship with the transfer switch for additional information.

**Optional Feature 30 – Cranking Limiter**

An externally mounted timing relay, adjustable from 0-120 sec. The relay will interrupt the engine start circuit if voltage does not appear on the emergency source within the pre-selected time. When setting the time delay, make certain the TDES and the warm-up time of the genset is taken into account.

## 9. Program Setpoints Menu

This table is a guide to the program setpoints menu. An explanation is given for each prompt that will appear as the Menu Select key is pressed.

Program Setpoint Display	Setpoint Possibilities	Display Explanation
Lang:	English, French	Language the controller displays messages
Current Day:	Mon-Sun	Current Day – requires to only be set once
Current Hour:	0-23	Current Hour
Current Min:	0-60	Current Min
Nom.Volt:	110 VAC – 240 VAC 110VAC – 600VAC	System operating voltage
Nom .Freq:	50Hz or 60Hz.	System operating frequency
Phases:	1 or 3	Single phase or Three Phase system
TDNE:	0 sec. to 1800 sec.	Time Delay Normal to Emergency
TDES:	0 sec. to 120 sec.	Time Delay Engine Start
TDEN:	0 sec. to 1800 sec.	Time Delay Emergency to Normal
TDEC:	0 sec. to 1800 sec.	Time Delay Engine Cooldown
TDN:	-none-, N to E, E to N, global	Time Delay in Neutral position. Can be selected when transferring in one direction only or both
TDN:	0 to 120 sec.	Time Delay Neutral
TPRE:	0 to 255 sec	Pre-Transfer Time Delay
N-UV-DO:	50% to 99% of nominal	Source 1 Undervoltage Dropout (% of nominal)
N-UV-PU:	(dropout +2%) to 99%	Source 1 Undervoltage Pickup (% of nominal)
E-UV-DO:	50% to 99%	Source 2 Undervoltage Dropout (% of nominal)
E-UV-PU:	(dropout +2%) to 99%	Source 2 Undervoltage Pickup (% of nominal)
N-OV-DO:	105% to 120%	Source 1 Overvoltage Dropout (% of nominal)
N-OV-PU:	(dropout -2%) to 120%	Source 1 Overvoltage Pickup (% of nominal)
E-OV-DO:	105% to 120%	Source 2 Overvoltage Dropout (% of nominal)
E-OV-PU:	(dropout -2%) to 120%	Source 2 Overvoltage Pickup (% of nominal)
N-UF-DO:	90% to 99% of nominal	Source 1 Underfrequency Dropout (Hz)
N-UF-PU:	(dropout +1Hz) – 99%	Source 1 Underfrequency Pickup (Hz)
E-UF-DO:	90% to 99% of nominal	Source 2 Underfrequency Dropout (Hz)
E-UF-PU:	(dropout +1Hz) – 99%	Source 2 Underfrequency Pickup (Hz)
N-OF-DO:	103% to 110%	Source 1 Overfrequency Dropout (Hz)
N-OF-PU:	(dropout –1Hz) – 110%	Source 1 Overfrequency Pickup (Hz)
E-OF-DO:	103% to 110%	Source 2 Overfrequency Dropout (Hz)
E-OF-PU:	(dropout –1Hz) – 110%	Source 2 Overfrequency Pickup (Hz)
Pref.Src:	enable or disable	Preferred source enable or disable
P.S. Select	S1, S2 or none	Preferred source select. Source 1(Normal), Source 2(Emergency) or None (source currently connected)
Man. Retransf.	Y or N	Pushbutton input for manual return to normal
Test/Area Prot	Y or N	Test/Area protection enable or disable
Plant Exerciser:	Y or N	Plant Exerciser enabled or disabled
PE Load Transf:	Y or N	Plant Exerciser Engine test with or without load
Engine Run:	0 – 600min.	Engine run time on exercise
Test Day:	--- ,or Mon-Sun	Plant Exerciser Day of the week
Test Hour:	0-23	Plant Exerciser Hour
Test Min:	0-60	Plant Exerciser Test Minute

**Note:** Highlighted options are exclusive to the MP1-E Controller

## 10. Summary of Options

Option #	Features	Standard/Optional
1	TDNE - Time delay Normal to Emergency	Standard
2	TDES - Time delay Engine Start	Standard
3	TDEN - Time delay Emergency to Normal	Standard
4	TDEC - Time delay Engine Cool-down	Standard
5B	1 $\Phi$ Undervoltage/Underfrequency	Standard
5C	1 $\Phi$ Overvoltage/Overfrequency	Optional - Programmed
5D	1 $\Phi$ Undervoltage	Optional - Programmed
5E	1 $\Phi$ Overvoltage	Optional - Programmed
5F	3 $\Phi$ Undervoltage	Optional - Programmed
5G	3 $\Phi$ Overvoltage	Optional - Programmed
5J	3 $\Phi$ Undervoltage/Underfrequency	Optional – Programmed
5K	3 $\Phi$ Overvoltage/Overfrequency	Optional – Programmed
6D	Maintained 2-Position Test Selector (Auto/Test)	Standard - External Contact
6H	Maintained 4 –Position Test Selector (Auto/Test/Man./Eng. Start)	Optional - External Contact
8C	Bypass Time Delay Normal to Emergency	Optional - External Contact
8D	Bypass Time Delay Emergency to Normal	Optional - External Contact
8M	Bypass Time Delay Global (Both Directions)	Optional - External Contact
10	Preferred Source <b>(MP1-E Only)</b>	Optional – External Contact
12C	Normal Position	Standard (On faceplate)
12D	Emergency Position	Standard (On faceplate)
12G	Normal Source Available	Standard (On faceplate)
12H	Emergency Source Available	Standard (On faceplate)
16B	Normal Side and Emergency Side	Optional - External Contact
16E	Emergency Side Only	Optional - External Contact
16N	Normal Side Only	Optional - External Contact
23C	No Load Exercise	Standard
23D	Load Exercise with Failsafe	Standard
26A	3 $\Phi$ Undervoltage	Standard
26B	1 $\Phi$ Undervoltage	Optional – Programmed
26C	3 $\Phi$ Overvoltage	Optional – Programmed
26D	1 $\Phi$ Overvoltage	Optional – Programmed
26E	1 $\Phi$ Underfrequency	Optional – Programmed
26D	Area Protection	Optional – External Contact
26F	1 $\Phi$ Overfrequency Monitor	Optional – Programmed
26H	1 $\Phi$ Undervoltage / Underfrequency	Optional – Programmed
29J	Manual Return to Normal <b>(MP1-E Only)</b>	Optional – External Contact
32A	Time Delay Neutral Global (Both Directions)	Optional – Programmed
32B	Time Delay Neutral – (Only on Transfer)	Optional – Programmed
32C	Time Delay Neutral – (Only on Retransfer)	Optional – Programmed
35A	Pretransfer (From Norm. to Emerg. Only) <b>(MP1-E Only)</b>	Optional - Programmed
35B	Pretransfer (From Emergency to Normal) <b>(MP1-E Only)</b>	Optional - Programmed
35C	Pretransfer (Global – Both Directions) <b>(MP1-E Only)</b>	Optional - Programmed

## 11. Troubleshooting

### **WARNING**

**HAZARDOUS VOLTAGES IN AND AROUND TRANSFER SWITCH EQUIPMENT DURING THE PROBLEM SOLVING PROCESS CAN CAUSE PERSONAL INJURY AND/OR DEATH. AVOID CONTACT WITH ANY VOLTAGE SOURCE WHILE PROBLEM SOLVING.**

**ONLY PROPERLY TRAINED PERSONNEL FAMILIAR WITH THE TRANSFER SWITCH EQUIPMENT AND ITS ASSOCIATED EQUIPMENT SHOULD BE PERMITTED TO PERFORM THE PROBLEM SOLVING FUNCTION. IF AN INDIVIDUAL DOES NOT FEEL QUALIFIED TO PERFORM THE PROBLEM SOLVING FUNCTION, THE INDIVIDUAL SHOULD NOT ATTEMPT TO PERFORM ANY OF THESE PROCEDURES.**

A basic problem solving effort is the first step to take prior to calling for assistance. Frequently, the effort will successfully address most problems encountered. The problem solving procedure is presented in the following paragraphs as observed Problem Symptoms and one or more possible Solution Steps. All of the steps presented may not apply to all transfer switches, depending upon the logic controller. If a problem persists after having completed the problem solving procedure, contact a Cutler-Hammer representative for further assistance. When calling for assistance, the following is the minimum information required to properly address the need:

1. **Shop Order Number (SO#)** or **General Order Number (GO#)** of transfer switch.
2. Catalog and/or Style Number of transfer switch
3. Actual location of transfer switch (type of facility, address, etc.)
4. Company name
5. Name and position of individual representing company
6. Basic description of situation as it exists
7. Any results of problem solving steps taken and/or readings taken of the system

voltage that now appears on the load terminals.

#### **A. Gen-Set Does Not Start When Test Switch is Operated and Held in "Test" Position.**

1. **Check Operation.** Make sure the Test Selector Switch is held in "test" position longer than the TDES time delay.
2. **Check Engine Controls.** Make sure control is in "Automatic" position. Make sure batteries are charged and connected. Make sure engine start circuit is wired.
3. **Check Wiring.** Make sure the start signal wires from the engine controls are connected to the correct terminals on the Control Panel. See the Schematic/Wiring Diagram.
4. **Check Signal Circuit.** Disconnect and tape start signal wires. Connect the ohmmeter between the control panel terminals 51 and 52. The reading should indicate an open circuit. Turn the Test Selector Switch to "Test" position. After TDES time delay, the ohmmeter should indicate a closed circuit.

#### **B. Transfer Switch Does Not Retransfer the Load after Normal Source Returns or after Test Switch is returned to "Auto" position.**

1. **Check Operation.** Make sure time has passed to allow for TDEN time delay.
2. **Check Normal Source Voltage Levels.** On a three phase system, voltmeter should read phase to phase voltage.
3. **Check Signal Circuit.** Confirm that the Test Switch has reopened. Make sure the controller display does not read "Area Protection". An ohmmeter should indicate an open circuit between terminals P10-6 & P10-7 on the controller.
4. **Confirm "Manual Return to Normal" is not enabled (MP1-E Only).** If the manual return to normal option is enabled, the controller will wait for a closed contact (a pushbutton) on inputs P10-6 & P10-9. Check that the pushbutton is connected properly, and when the pushbutton is pressed, the contacts are closing.

**C. With Generator Running, Switch Does Not Transfer the Load to Emergency.**

1. **Check Operation.** Make sure time has passed to allow for TDNE time delay.
2. **Check Engine Controls.** Check generator output frequency and voltage. Output should be at least 90% of nominal voltage and 95% of nominal frequency. Make sure generator output circuit breaker is closed.
3. **Check Wiring.** Voltmeter should read phase to phase voltage between Transfer Switch EA and EB.

**D. Switch Retransfers the Load, but Generator Continues to Run.**

1. Check Operation. Make sure time has passed to allow for TDEC time delay.
2. Check Engine Controls. Make sure engine starting control is in the "Automatic" position.
3. Check Signal Circuit. Disconnect and tape start signal wires which are connected to the control panel terminals 51 and 52. Connect ohmmeter between these terminals; reading should indicate an open circuit.

**12. Maintenance****WARNING**

**HIGH VOLTAGES ARE PRESENT IN AND AROUND TRANSFER SWITCH EQUIPMENT. BEFORE INSPECTING OR MAINTAINING THIS EQUIPMENT, DISCONNECT LINE POWER FROM THE EQUIPMENT BEING SERVICED BY OPENING AND LOCKING OUT, IF POSSIBLE, THE NEXT HIGHEST DISCONNECT DEVICE. FAILURE TO FOLLOW THIS PROCEDURE COULD CAUSE PERSONAL INJURY AND/OR DEATH.**

In general, transfer switch equipment is designed to be relatively maintenance free under normal usage. However, because of the variability of application conditions and the importance placed on dependable operation by this type of equipment, inspection and maintenance checks should be made on a regularly scheduled basis. Since equipment maintenance will consist

mainly of keeping the equipment clean, the frequency of maintenance will depend, to a large extent, on the cleanliness of the surroundings. If a significant amount of dust or foreign matter is present, a more frequent maintenance schedule should be followed. It is suggested that visual inspections of the equipment be made on a regular basis, not just during regularly scheduled periods. Always be alert for an accumulation of dirt in and around the structure, loose parts and/or hardware, cracks and/or discoloration to insulation, and damaged or discolored components.

**WARNING**

**DO NOT perform dielectric tests on the equipment with the control components in the circuit.**

**DO NOT use loctite.**

1. Check lubricant in high speed bearings of the motor and the low speed bearings of the gear box. For lubrication use Dow Corning Silicon DC44 or equivalent on the high speed bearings and Aero Shell No. 6 grease or equivalent in gear box after 5000 operations.
2. Check if control components and plugs are tight in sockets.
3. Periodically inspect all terminals (load, line and control) for tightness. Re-tighten all bolts, nuts and accessible hardware. Clean or replace any contact surfaces that are dirty, corroded or pitted.
4. Automatic Transfer Switches should be in clean, dry and moderately warm locations. If signs of moisture are present, dry and clean transfer switch. If there is corrosion try to clean it off. If cleaning is unsuitable, replace the corroded parts. Should dust and/or debris gather on the transfer switch, brush, vacuum or wipe clean.

**WARNING**

**DO NOT blow dirt into the breaker or terminals.**

5. Test the transfer switch operation. While the transfer switch is operating, check for freedom of movement, hidden dirt or

corrosion and any excessive wear on the mechanical operating parts. Clean, lubricate or re-place parts where necessary.

6. Check all adjustable control components (time delay and voltage sensing relays) for correct settings.
7. If the horizontal mechanism is removed be sure that the scribe lines on the gears are in line. When re-assembling the drive mechanisms, be sure that they are fastened to the correct holes in the frame and that the breaker handles are between the cam fingers. (One breaker has to be on and the other off.)

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