

## MP7650 CONTROLLER

### **STANDARD FEATURES**

#### **1.0 INTRODUCTION**

The LSEC MP7650 is a sophisticated state of the art, microprocessor based controller. It consists of five major parts: a Power Supply board, a Relay Interface Board, a Main Control Board, Ribbon Cable and a Human Machine Interface Panel. It is designed to operate in the "industrial" temperature range of -40 to +85 deg C.

#### **1.1 Power Supply**

The Power Supply (PS) unit accepts a 12-volt dc or 24-volt dc input from any external power source. It is designed to function on starting batteries. Voltage regulation for the power supply is within 2% volts from no load to full load. External voltage sources can vary from 7 volts dc to 36 volts dc without harm to the MP7650 or interruption of its operation. Momentary losses of power will not compromise the efficient operation of the controller.

#### **1.2 Relay Interface Board**

The Relay Interface Board (RIB) is the electro mechanical interfacing device between the MP7650 microprocessor controls and the power panel and the user interfaces. When the transfer switch is ordered, 12-volt dc or 24-volt dc operation must be selected. Although the power supply will accept any voltage within its range, the relays that populate the Relay Interface Board must be either 12-volt dc or 24-volt dc.

#### **1.3 Main Control Board**

The Main Control Board (MCB) contains the microprocessor and performs all of the logic necessary to control the transfer switch. It contains a perpetual date and time clock, which is programmed to automatically adjust for leap years and daylight savings time changes. It contains the timers listed in the section marked "Setting Timers". All timer, date and time settings are stored in battery backed-up non-volatile memory which can be maintained de-energized for 10 out of 100 years.

#### **1.4 Human Machine Interface Panel**

The Human Machine Interface Panel consists of a graphic overlay which displays a one-line representation of a transfer switch, ten LED's (Not in Auto, Ground Fault\*, Normal Available, Normal Closed, Normal Tripped\*, Normal Reverse Power\*, Normal Withdrawn\*, Emergency Available, Emergency Closed, Emergency Tripped\*, Emergency Reverse Power\*, Emergency Withdrawn\*) to annunciate status of the switch, a two line, 48 character LCD to display transfer switch mode of operation, date, time, timers status, fault condition, exerciser status other pertinent data. Additionally, the HMI Panel contains a keypad, which allows the transfer switch to be programmed.

### **2.0 OPERATIONAL CONFIGURATION**

The MP7650 controls the operation of the automatic transfer switch and contains as standard features five modes of operation, six timers, a plant exerciser, and three sets of dry contacts for customer use.

#### **2.1 Modes of Operation**

There are five modes of operation. Four of which are selectable by using the HMI Panel

1. Automatic
2. Hand Crank

## MP7650 CONTROLLER

3. Load Test
4. Off/Reset
5. The fifth mode is Fault. In the fault mode, the transfer switch has failed to perform some function and the trouble is displayed on the HMI Panel LCD

### 2.2 Timers - The six standard timers are:

**TDES** Time Delay Engine Start. This timer is adjustable from 0 to 300 seconds and is factory set at 3 seconds. It is initiated upon sensing the loss of normal power and once timed out will initiate an engine start signal.

**TDE** Time Delay Emergency. This timer is adjustable from 0 to 300 seconds and is factory set at 5 seconds. It is initiated upon the starting of the engine and once timed out will initiate the transfer to the emergency source.

**TDN** Time Delay Neutral. This timer is adjustable from 0 to 300 seconds and is factory set at 3 seconds. It is initiated upon the opening of one source and will inhibit the closing of the oncoming source until it has timed out. Provided on Dual Motor & Insulated Case Transfer Switches only.

**TDR** Time Delay Return. This timer is adjustable from 0.0 to 60.0 minutes and is factory set at 10 minutes. It is initiated upon the restoration of normal power and will inhibit the switch from retransferring to the normal source until it has timed out. If at any time during the timing cycle normal power is not maintained, this timer will be terminated and will be reinitiated when normal power returns.

**TDEC** Time Delay Engine Cool down. This timer is adjustable from 0.0 to 60.0 minutes and is factory set at 10 minutes. This timer is initiated upon the retransfer of the switch to the normal source and will keep the engine running until it has timed out.

**MRT** Minimum Run Timer. This timer is adjustable from 0.0 to 60.0 minutes and factory set at 10 minutes. It is initiated upon the first successful starting of the engine generator set and will keep the engine running until it has timed out.

### 2.3 Plant Exerciser - The Plant Exerciser operates on a weekly basis and operates as follows:

1. It can be disabled
  2. It can be enabled with or without load
  3. Any time of day can be selectable as start time
  4. Any duration of exercise period is selectable (hh:mm) from 00:01 through 24:00
- Any day or days of the week (SMTWTFS) are selectable for exercising.  
Any week of the month (12345) is selectable for exercising.

### 2.4 Pilot Lights - The following LED's are provided in the MP7650:

NOR	Normal Source Available	NAW	*Normal Switch Withdrawn
EMR	Emergency Source Available	EAW	*Emergency Switch Withdrawn
SIN	Switch in Normal	EAT	*Emergency Switch in Test
SIE	Switch in Emergency	NAT	*Normal Switch in Test
NIA	Not in Automatic		
NT	*Normal Tripped		
ET	*Emergency Tripped		
GF	*Ground Fault		



## MP7650 CONTROLLER

RPN \*Reverse Power Normal  
RPE \*Reverse Power Emergency

\* Optional Equipment

### 2.5 Dry Contacts "form C":

ES Engine Start One set of contacts to initiate Engine Start.  
SIE Switch In Emergency Two sets of contacts for remote annunciation.  
SIN Switch in Normal Two sets of contacts for remote annunciation.  
NOR \*Normal Available Two sets of contacts for remote Normal Available indication.  
TRBL Trouble One set of contacts for remote annunciation.  
TDBT \*Transfer Pre-signal Two sets of contacts for remote Transfer Pre-signal initiation.  
EMR \*Emergency Available One/Two sets of contacts fro remote Emergency Available indication (number of customer contacts available depend on Options Accessories Selected).

\* Optional Equipment

### 2.6 Diagnostics

The MP7650 has a full array of diagnostic features that allow the trained technician to understand the status of the transfer switch at all times. In addition to a series of encoded diagnostic routines internal to the firmware, the following additional diagnostic tools are available.

1. The Main Control Board is equipped with diagnostic LED's, which annunciate all 16 inputs and 14 outputs of the controller.
2. A dedicated trouble relay is provided to provide remote annunciation of improper operation of the transfer switch.
3. The display on the LCD of the various faults and conditions pinpoints the improper operation with crystal clear accuracy. The nine types of fault that will be displayed are: Ground Fault\*, Reverse Power\*, Bell Alarm (normal or emergency)\*, Open Normal Failed, Open Emergency Failed, Both Opens Failed, Close Normal Failed, Close Emergency Failed.
4. Since the power supply to the MP7650 is separately derived from the normal and emergency sources, all diagnostic information is retained during a power outage.

### 2.7 Switches

MD Maintenance Disconnect. This two position switch is mounted inside the enclosure and is provided so that the control circuitry can be de-energized for maintenance purposes.

ORPB Override Pushbutton. This momentary switch is mounted inside the enclosure and is provided so that the TDR timer can be bypassed during testing.

LTS Load Test Switch. This momentary switch is mounted inside the enclosure and is provided so that a complete load test can be initiated without use of the HIM Interface Panel. This switch when momentarily depressed will simulate a complete load test cycle (i.e. start the engine and transfer to emergency; and return to normal and stop the engine).

## MP7650 CONTROLLER

**MSE** Menu Switch Enable. This switch is mounted inside the enclosure and is provided so that the MHI Panel touch pads can be deactivated so that no unauthorized change in operating mode can be accomplished by non-authorized personnel.

### **OPTIONAL ACCESSORIES**

#### **3.0 ACCESSORIES AVAILABLE**

**ACBT** Auxiliary Contacts Before Transfer - This option provides 2 sets of dry contacts which change state prior to transfer in either direction. Time delay between initiation of the contacts and switch transfer is field adjustable 0 - 300 seconds.

**ACSA** Auxiliary Contacts Source Available - This option provides 2 sets of dry contacts for each source, which are energized whenever the sources become available.

**CBT** Circuit Breaker Trips - This option provides over-current protection within the transfer switch on either or both sources. This feature may eliminate the requirement to install separate over-current protective devices on either the Normal or Emergency source or both. Trips are available as either thermal magnetic or Electronic depending on the switch. Includes source tripped pilot light.

**CTT** Closed Transition Transfer - This options provides transfer of power from one source to another without interruption of power to the load. Includes a Synchronize Fail Timer to protect against extended paralleling with the Normal Source. This option is for use on Dual Motor and Insulated Case switches only. Consult factory for details.

**FPC** Fire Pump Control - This option provides all necessary features required under NFPA 20 for Automatic Transfer Switches to be used with centrifugal fire pump controls.

**GFI** Ground Fault Indication - When a ground fault is detected on the load bus of the transfer switch, the transfer switch will annunciate the condition but will not place the switch in the fault mode. Includes Ground Fault Pilot Light.

**GFP** Ground Fault Protection - When a ground fault is detected on the load bus of the transfer switch, the transfer switch will disconnect both sources from the ground fault and operation will be placed in the Fault mode. Includes Ground Fault Pilot Light and Not In Auto Pilot Light.

**LDI** Load Demand Inhibit - This option provides an input to the controller, which either will remove, the load from the emergency source, if connected, or will inhibit the transfer switch from being transferred to emergency. This option is used in conjunction with load demand control in associated Lake Shore Electric Paralleling Switchgear.

**MLT** Maintained Load Test - This option provides a maintained load test switch in place of the standard momentary load test switch inside the transfer switch. It also includes a terminal block, which will accept a remote signal to force the switch to emergency.

**RN** Return to Normal - This option provides immediate return to the Normal source when available. The TDR is not present therefore return to Normal when Emergency is available will not occur. This switch will, of course, return to Normal upon the loss of the Emergency source.

**PS** Peak Shave - This option provides in input to the controller, which will cause the transfer of the load to the emergency source. This is typically used in conjunction with other energy saving systems. Returns to



## MP7650 CONTROLLER

normal should emergency source fail.

**RD** Remote Disconnect - This option provides the ability to remotely disconnect both sources of the transfer switch from the load and operation will be placed in the fault mode. Includes Source Tripped Pilot Light.

**SE** Service Entrance - Provides for transfer switch (Dual Motor & Insulated Case only) to be approved for use as service entrance equipment. Includes over-current protection, source tripped pilot light, selector switch, neutral bus bar, lugs, bonding jumper and other special items as required by NEC.

**SH** Space Heater

**SPP** Single Phase Protection - This option will open the Normal Source even when the Emergency source is not available to prevent damage to the load due to under voltage or single phasing.

**SPD** Surge Suppression Device - This option provides a degree of protection for the transfer switch from voltage surges, which may damage control circuitry. Protection includes secondary surge suppressors on both power sources up to 40kA per phase.