

INSTALLING, OPERATING AND MAINTAINING

**INSULATED CASE
FIXED AND DRAW OUT**

MANUAL TRANSFER SWITCHES

WARNING!

WHEN WORKING ON EQUIPMENT OF THIS TYPE, EXTREME DANGER OF ELECTROCUTION EXISTS THAT MAY RESULT IN INJURY OR DEATH. DO NOT ATTEMPT ANY REPAIRS OR ADJUSTMENTS TO THIS EQUIPMENT WITHOUT FIRST TAKING THE APPROPRIATE PRECAUTIONS TO PREVENT PERSONAL INJURY AND EQUIPMENT DAMAGE.

DURING INSTALLATION AND USE OF THIS PRODUCT, COMPLY WITH THE NATIONAL ELECTRICAL CODE (NEC), FEDERAL, STATE AND LOCAL CODES, AND ALL OTHER APPLICABLE SAFETY CODES.

MAIN UTILITY POWER MUST BE OFF DURING INSTALLATION, WHEN PERFORMING EQUIPMENT MAINTENANCE OUTSIDE THE EQUIPMENTS NORMAL MAINTENANCE SCOPE AND WHEN PERFORMING REQUIRED MAINTENANCE ON ANY POWER CABLE(S) CONNECTED TO THE EQUIPMENT.

WARRANTY

Lake Shore Electric Transfer Switches are guaranteed against defective materials and workmanship for a period of one year from date of shipment. If, within one year after shipment, it is proved to Lake Shore's satisfaction that the equipment requires valid warranty and Lake Shore is promptly notified of same, Lake Shore will make necessary corrections, free of charge. F.O.B. works where manufactured.

Such necessary corrections constitute the full extent of Lake Shore's warranty. There are no warranties, which extend beyond those described herein. This warranty is exclusive and is in lieu of all other warranties, whether written, oral, implied or statutory. No warranty of merchantability or of fitness for purpose shall apply.

Lake Shore is not responsible for damage to its equipment through improper installation or use, unauthorized repair or modifications, or attempts to operate it above its rated capacities or in abnormal environments. In no event, whether as a failure to meet conditions of the warranty or otherwise, shall Lake Shore be liable for any special, incidental, or consequential damages, including, but not limited to, loss of profit or revenues, loss of good will, damages to associated equipment, cost of capital, cost of substitute products, facilities, service or replacement power, costs of downtime or claims of third parties for such damages.

Notice: The owner of this transfer switch must perform certain required maintenance functions as described in **Section #6 REQUIRED MAINTENANCE** of this manual in order to maintain Lake Shore Electric Corporation's one year exclusive warranty. Failure to perform this maintenance shall void this warranty.

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NOTE

Engineering changes may have been made after publication date. Any departure from this manual should be checked with Lake Shore Electric Corporation.

Lake Shore Electric Corporation reserves the right to change specifications without prior notice.

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1. CONSTRUCTION

Insulated Case Transfer Switches manufactured by Lake Shore Electric Corporation use two stored energy insulated case switches and/or circuit breakers to accomplish the transfer between two separate power sources to a single load.

These insulated case circuit breaker(s) and/or switch/switches, (insulated case units), are interlocked via a mechanical control system.

The mechanical rod interlock installed between the insulated case units encompasses the mechanical interlock system. The mechanical interlock is located on the right side of the two switches. This mechanism is a factory-installed device, which positively prevents both of the insulated case switches or circuit breakers from being in the **ON** position simultaneously.

Manually operable push buttons are accessible from the front of the switch to enable personnel to manually operate the transfer switch. These pushbuttons are permanently mounted and readily accessible in an emergency. This transfer switch can be manually operated under load.

All interface relays are of the enclosed industrial type to ensure long life and minimum maintenance. All relays are rated for continuous duty to eliminate overheating of coils.

2. DESCRIPTION OF OPERATION

The following are general descriptions of operation applying to Insulated Case Transfer Switches. Certain accessory additions may modify the sequence of operations as required to suit specific applications.

The Insulated Case Manual Transfer Switch is effectively used for Service Entrance Rated Transfer Switches because the independent motor design allows the necessary condition of having both switches in the off position so that the load is isolated and disconnected from the two sources. As with all other Lake Shore Electric products, the speed at which the current carrying contacts open and close is independent from the speed of the manual operator. Therefore, manual transfer of the switch under load can be accomplished without danger to the operator or the connected loads.

For those Transfer Switches built as Draw Out switches, additional safety and reliability is provided. The transfer switch itself inherently functions to bypass either source by connecting the alternate source to the load. By offering the draw out feature, either or both of the insulated case switches can be withdrawn, thereby isolating them from live parts. This allows maintenance, service or replacement of the switch without loss of service to the load or danger to the maintenance personnel. Please refer to the Masterpact® NW manual, provided with each Insulated Case Manual Transfer Switch, for detailed instruction on the operation of these insulated case products.

The Style IC switch is tested and listed as a manual transfer switch under U.L. 1008 and is CSA approved. Maintenance requirements are minimal. All components, from the switches to the pushbuttons and pilot lights are standard, industrial grade components and are readily available and replaceable. In addition, a drawout configuration is available which provides for bypass and isolation of each source switching mechanism.

(Refer to Individual Unit Wiring Diagrams Included with the Transfer Switch.)

3. INSTALLATION

3.1. MOUNTING AND CONNECTING

The standard Lake Shore transfer switch is designed for operation in a clean, dry, dust-free location where a minimum of vibration is present.

When used in conjunction with an engine generator set, it is recommended that the transfer switch be located as close as possible to the generator set, thus preventing voltage drops and improper operation. The maximum recommended distance the manual transfer switch should be installed from the engine generator set is 1400 feet.

Insulated Case Transfer Switches are manufactured in free standing enclosures with NEMA enclosure ratings of 1, 3, 3R, 12, 4 and 4X. Open transfer switches are generally mounted in a customer-supplied enclosure; consequently, there are certain steps, which should be followed:

1. Mount to a rigid framework to prevent vibration.
2. Review all electrical clearances with the enclosure door or panels closed.
3. Insure there is no strain on the bus bars due to improper alignment.
4. Insure that the lugs will be of the correct size for cables used before cabling into the enclosure.

The Normal source power cables are to be connected to the Normal Bus extensions marked NL1, NL2, and NL3. Please refer to the specific wiring diagram supplied with the switch.

The Emergency source power cables are to be connected in a like manner to the Emergency bus extensions marked EL1, EL2 and EL3. (**Note:** Be careful to pass the cable through any current transformers or other devices, which may be part of a generator control.)

The load cables are to be connected to the load bus extensions marked L1, L2 and L3. On three-phase, four-wire transfer switches, or single-phase, three-wire transfer switches, a neutral bus is provided.

Note: Verify that the phase sequence of normal and emergency sources, are identical. Failure to do this could result in damage to the transfer switch and/or other equipment and will void the warranty extended by Lake Shore Electric Corporation. When installing the power cables, be careful not to disturb or damage the control wires that go to the various terminals. Ground lugs are provided on all transfer switches. One of these lugs **must** be connected to earth ground.

CAUTION: Be sure to check that all power cable lugs are torqued to the applicable requirement for the switch see Section 6, REQUIRED MAINTENANCE.

3.2. PLACING THE TRANSFER SWITCH IN OPERATION

Before energizing the switch electrically, be certain all external connections have been properly made according to the wiring diagram provided with the switch. Inspect all wires, cables, and bus bar for abraded insulation, foreign matter, and electrical clearance.

Before applying power to the load connections from either source of the transfer switch, install a three phase voltage meter to the load connections set to phase to phase readings. (NOTE: if a three phase voltage meter is not available, use two single phase voltage meters and install one across phases A and B and the second across phases B and C.)

Now, manually set the transfer switch to the Normal source (Normal breaker CLOSED & Emergency breaker OPEN) and energize the normal source. Using the appropriate equipment and safety precautions, verify that there is power on the load side of the Normal Source Breaker by checking the voltage readout on the temporary meter(s) installed on the load connections. Depending on the accessories order with the switch, which operate on Normal power, may be verified. (i.e.: Pilot Lights, Electrical Assist, etc)

Do not attempt to energize the Emergency source until the switch is operating satisfactorily on normal. With the Normal source operating, the Emergency source may now be manually energized for testing. The Emergency source, including all safety interlocks, should be checked over before an attempt is made at a complete systems test. Once the check is complete, set the transfer switch to the Emergency source (Emergency breaker CLOSED & Normal breaker OPEN). Using the appropriate equipment and safety precautions, verify that there is power on the load side of the Emergency Source Breaker by checking the voltage readout on the temporary meter(s) installed on the load connections. Depending on the accessories order with the switch, which operate on Emergency power, may be verified. (i.e.: Pilot Lights, Electrical Assist, etc)

Now return the manual transfer switch back to the Normal source and allow the Emergency source to cool down properly. The above tests are sufficient to place the transfer switch in operation. The following pages contain specific information on the various components.

Any questions relating to the use of this Manual Transfer Switch, or for Technical assistance, should be referred to the Technical Support of Lake Shore Electric Corporation, 205 Willis Street, Bedford, Ohio 44146, Phone (440) 232-0200, Fax (440) 232-5644.

4. OPERATING MECHANISM (INSULATED CASE SWITCH / BREAKER)

The operating or switching mechanisms used in the Insulated Case Transfer switches are MASTERPACT® NW automatic and non-automatic circuit breakers. The MASTERPACT® devices may be non-automatic, automatic, fixed or draw-out as required by the transfer switch configuration. See the MASTERPACT® O & M manual provided with the Insulated Case Transfer Switch for necessary technical information on these products. If additional information is necessary, please contact the factory; call 800-225-0141.



Figure 1 - Masterpact® NW Low-voltage Power/Insulated Case Circuit Breaker

5. OPTIONAL ACCESSORIES

Lake Shore Electric offers many additional accessories for the insulated case transfer switches. Please check the documents and drawings for your particular switch to see what additional options are included.

5.1. SERVICE ENTRANCE – SE

This option provides for the Manual Transfer Switch to be labeled as suitable for use as service equipment. The Actual determination of designating it as service equipment rests with the engineer in charge of the project or the authority having jurisdiction. When the Service Entrance accessory is selected, the Transfer Switch is suitable for use as Service Entrance Equipment and is provided with the following additional equipment:

1. Padlockable Enclosure
2. Over Current Trip
3. Bell Alarm for the For Remote Trouble Circuit Installed by Customer
4. Neutral Bus with Main and Ground Lugs
5. Main Bonding Jumper per NEC 2002 250.8
6. Appropriate Nameplates and Instructions to be Applied in the Field

Instructions and labeling that accompanies the service entrance transfer switch will be in the following format.

1. When required by the National Electric Code or the engineer in charge of the project, connect one side of the grounding strap that is presently mounted on the neutral bar to ground. The other side of the grounding strap will remain connected to the neutral bar.
2. Apply the “SERVICE DISCONNECT” label on or near the operating handle of the Normal circuit breakers as required per the National Electrical Code or the engineer in charge of the project.
3. Apply the “SERVICE ENTRANCE” label on the outside of the enclosure door above the door handle.
4. If the building is supplied by more than one service, a permanent plaque or directory should be installed at this service disconnect denoting the location of all other services, feeders and branch circuits supplying this building in accordance with 2002 NEC 230-2.E.

5.2. GROUND FAULT PROTECTION OR INDICATION – GFP / GFPE

This option provides ground fault detection in one of three places; 1) normal power, 2) emergency power, or 3) the load bus of the transfer switch. Once the ground fault is detected, the switch can be factory configured to provide either **protection** or **indication**.

(GFP) Ground fault protection means that when an overload condition is detected by the trip unit installed on the Normal Breaker, it will trip open the normal breaker and the Bell Alarm will send out a signal.

(GFPE) Ground fault protection on emergency means that when an overload condition is detected by the trip unit installed on the Emergency Breaker, it will trip open the emergency breaker and the Bell Alarm will send out a signal.

5.3. SURGE SUPPRESSION TVSS – SPD

This option provides hard-wired secondary surge arrestors on both the normal and emergency sources. This provides a degree of protection for voltage surges and lightning strikes. They are suitable for use in service entrance locations and meet the requirements of NEC 280, UL 1449 and ANSI C62.11. They protect surges up to 40 kA per Phase. No field installation is necessary.

5.4. REMOTE DISCONNECT – RD

This option provides a shunt trip input to the transfer switch so that from a remote location either or both of the switches can be tripped and the transfer switch sent to the Fault mode. Customer interconnection can be made at a terminal block.

5.5. CIRCUIT BREAKER TRIPS – CBTN / CBTE

This option provides circuit breaker trips on either or both sides of the transfer switch. Trips will come complete with bell alarms.

5.6. AUXILIARY CONTACTS SOURCE AVAILABLE – ACSA

This option provides a form “C” contact wired out to terminal blocks. They are identified as “EMR” (Emergency Available) and “NOR” (Normal Available).

5.7. AUXILIARY CONTACTS SWITCH POSITION – ACSP

This option provides a single auxiliary contact with the Normal and Emergency side breakers that are wired out to terminal blocks. They are identified as “SIE” (Switch in Emergency) and “SIN” (Switch in Normal).

5.8. PILOT LIGHTS – PL

This option provides pilot lights on the door of the transfer switch which indicate the current position of the normal and emergency breakers and when a source is available. This option is typically used in conjunction with a manual transfer switch which has the electrical assist option and/or requires source available/switch position annunciation.

5.9. ELECTRICAL ASSIST – EA

This option is included when operation of the breakers is required without opening the front door of a manual transfer switch. This will provide four push buttons for external breaker operation. The buttons are as follows:

1. Open Normal
2. Open Emergency
3. Close Normal
4. Close Emergency

NOTE: The Normal and Emergency breakers may not be closed at the same time, but they may both be open at the same time.

5.10. CONTROL ENABLE SWITCH – CES

This option provides a keyed switch on the door of the transfer switch that allows the operator to lock out the push button controls provided with the Electrical Assist option.

5.11. MULTIFUNCTION METER – MFM

This option provides a multifunction meter on the load output that may be setup to monitor single or three phase systems. For three phase transfer switches, the unit can be setup to monitor delta or wye, 3-wire or 4-wire, systems. The unit measures the following:

- | | | |
|---------------------------------|---------------------------|-------------------------------|
| 1. Phase Voltage (V) | 6. Active Energy (kWh) | 11. Instantaneous Amp Demand |
| 2. Phase to Neutral Voltage (V) | 7. Reactive Power (VAR) | 12. Instantaneous Watt Demand |
| 3. Phase Current (I) | 8. Apparent Power (VA) | 13. Instantaneous VA Demand |
| 4. Frequency (Hz) | 9. Reactive Energy (VARh) | 14. Maximum Amp Demand |
| 5. Active Power (W) | 10. Power Factor (PF) | 15. Maximum Watt Demand |
| | | 16. Maximum VA Demand |

If communications are required for the meter, an RS-485 module is provided. If other communications protocols are needed, a conversion module may be used to convert the RS-485 to the appropriate protocol. Please consult the factory for the appropriate converter.

5.12. PHASE SEQUENCE MONITOR – PSM

This option provides a visual indicator on the door of the transfer switch that shows the phase sequence of the bus that it is monitoring. Consult the factory for the various locations this equipment may be located.

5.13. STRIP HEATER – SH

This option provides heaters with an adjustable thermostat inside the enclosure of the transfer switch. The purpose is to help control condensation on the control equipment. When installing the transfer switch, it is important to make sure that all cables coming into the enclosure have the proper sealant installed around them.

6. REQUIRED MAINTENANCE

**LUG TORQUE REQUIREMENTS - USE COPPER WIRE ONLY
LINE-LOAD-NEUTRAL**

The following cable lug torque values are required to be checked at installation and every six months in order to maintain the Lake Shore Electric Corporation exclusive one year warranty.

**TIGHTENING TORQUE VALUES
FOR SCREW CONNECTIONS**

AWG. Or Circular Mill Size	Tighten Torque in Inch Pounds	
	Screw Driver	External Drive Wrench
14	35	75
12	35	75
10	35	75
8	40	75
6	45	110
4	45	110
2	50	150
1	50	150
1/0	50	180
2/0	50	180
3/0		250
4/0		250
250		325
350		325
500		375
600		375
700		375
750		375
800		500
1000		500

**TIGHTENING TORQUE VALUES
FOR
SOCKET-HEAD SCREW CONNECTORS**

Internal Socket Size Across Flats Inches	Tightening Torque in Inch Pounds
1/8	45
5/32	100
3/16	120
7/32	150
1/4	200
5/16	275
3/8	375
1/2	500
9/16	600

Warning: Whenever bus and cable connections are being maintained, all power sources to the transfer switch must be disconnected and locked out.