

# Electromechanical Controls - Overview

## Standard Automatic Transfer Switch Features

<b>P8</b>	<b>TDR</b>	Time Delay Return
<b>5</b>	<b>TDT</b>	Time Delay to Transfer **
<b>8x</b>	<b>PFRN</b>	Phase Failure Relay Normal, 1 $\phi$ or 3 $\phi$
<b>17</b>	<b>SC</b>	Engine Start Contacts
<b>34A</b>	<b>LTS</b>	Load Test Switch, Maintained

\*\* Dual Motor & Insulated Case Automatic Transfer Switch

## Positive Control System Configurations

The following configurations are available for ease of ordering the most common timer groups utilized on transfer switches.

<b>P1</b>	TDR, ODR, TDE, EMT
<b>P2</b>	TDR, ODR, EMT
<b>P3</b>	TDR, ODR, TDE
<b>P4</b>	TDR, TDE, EMT
<b>P5</b>	TDR, ODR
<b>P6</b>	TDR, TDE
<b>P7</b>	TDR, EMT
<b>P8</b>	TDR

## Control Accessory Descriptions

### 1. TDR - Time Delay to Return

Provides a delay after the return of Normal power before retransferring the load from the Emergency source. This feature allows Normal voltage to stabilize and ensures against the premature return when the Normal power grid is potentially unbalanced. Provided in a five-range model 0.02-0.3 sec., 0.07-3 sec., 0.6-30 sec., 3.5 sec.-3 min., and 35 sec.-30 min., the timing ranges are field adjustable. This time delay is standard on all electro-mechanical automatic transfer switches.

### 2. TDE - Time Delay to Emergency

Provides a delay after the engine has started before transferring the load to the Emergency source. This feature allows voltage to stabilize at the Emergency source to protect against initial wide fluctuations and can provide a brief warm-up period before loading the engine. Provided in a five-range model 0.02-0.3 sec., 0.07-3 sec., 0.6-30 sec., 3.5 sec.-3 min., 35 sec.-30 min., the timing ranges are field adjustable.

### 3. ODR - Outage Delay Relay

Provides an adjustable delay after failure of the Normal source before initiating an Engine-Start signal to allow for temporary short-duration fluctuations in voltage. This feature prevents unnecessary starting of the engine and is usually supplied with an adjustable range of 1 to 300 seconds although other delay times are available.

### 4. EMT - Engine Maintained Timer

Provides a time delay after retransferring the load to the Normal source before shutting down the engine. This feature allows the engine to run under no-load conditions for cooling before shut-down to prevent against thermal and mechanical shocks. Provided in a five-range model 0.02-0.3 sec., 0.07-3 sec., 0.6-30 sec., 3.5 sec.-3 min., 35 sec.-30 min., the timing ranges are field adjustable.

### 5. TDT - Time Delay to Transfer (For Dual Motor & Insulated Case Transfer Switches)

Provides a time delay between opening the contacts on one source and closing the contacts on the other source. This feature is recommended where there are high inductive loads, since with both sources open the residual field currents are allowed to decay to acceptable limits preventing electrical and mechanical overloads. This time delay functions in both directions (Normal to Emergency and Emergency to Normal) provided in a five-range model 0.02-0.3 sec., 0.07-3 sec., 0.6-30 sec., 3.5 sec.-3 min., 35 sec.-30 min., the timing ranges are field adjustable.

### 6. PE - Plant Exerciser / Switchable Load

Provides for regular automatic exercising of the Emergency Power System on a pre-selected schedule. The basic timer provides for a flexible period (in 15-minute increments) of exercise, and the periods can be scheduled for any specific day (or days) within a 7-day cycle. In the event of engine-generator failure, when operating in the plant exerciser mode, the Automatic Transfer Switch will immediately return to the Normal source, if available. A selector switch is included allowing exercising under either "load" or "no-load" conditions.

- 6A** Always transfers the load to emergency power during the "Plant Exerciser Test". "No Load Test Switch" is not included.
- 6C** "No Load Test Switch" included which will allow the "Plant Exerciser Test" to run the emergency power source w/o transferring the load to emergency power or allow for load testing on emergency power.

### 7. FPC - Fire Pump Control

Provides necessary features required by NFPA 20 for the automatic transfer switch to be used with centrifugal fire pump controllers. For Dual Motor and Insulated Case Transfer Switches only. Two configurations are available:

- 7A** Utility to Generator
- 7B** Not Available

### 8. PFRN - Phase Failure Relay Normal

Provides for close differential monitoring of the Normal Source voltage to ensure that it is within acceptable limits. The factory setting for the PFRN is 90% Pickup and 80% Dropout of the nominal voltage. The 3 phase units can be adjusted to guard against long term reduced voltage conditions ("brownouts") to as close a differential as 2% (i.e. 89% Pickup and 87% Dropout). This relay is standard on all automatic transfer switches.



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**8A** Single Phase, 1 $\phi$

**8B** Three Phase, 3 $\phi$

**9. PFRN/O - Phase Failure Relay Normal / Overvoltage**

Provides for close differential monitoring of the Normal source to ensure that it is within acceptable limits with respect to overvoltage. The usual setting for the PFRN/O is 115% Pickup and 110% Dropout. This relay can also be adjusted to as close a differential as 2% (i.e. 116% Pickup and 114% Dropout), and is available as follows:

**9A** Single Phase, 1 $\phi$

**9B** Three Phase, 3 $\phi$

**10. PFRE - Phase Failure Relay Emergency**

Provides protection against transferring the load to the Emergency source until voltage has reached acceptable limits. In the event the relay drops out when Normal power is available, the TDR will be bypassed and retransfer to Normal will be initiated immediately. This relay is available as follows:

**10A** Single Phase, 1 $\phi$

**10B** Three Phase, 3 $\phi$

**11. PFRE/O - Phase Failure Relay Emergency / Overvoltage**

Provides for close differential monitoring of the Emergency source to ensure that it is within acceptable limits with respect to overvoltage. The usual setting for the PFRE/O is 115% Pickup and 110% Dropout. This relay can also be adjusted to as close a differential as 2% (i.e. 116% Pickup and 114% Dropout), and is available as follows:

**11A** Single Phase, 1 $\phi$

**11B** Three Phase, 3 $\phi$

**12. FR - Frequency Relay (Single Phase Monitoring)**

Provides Protection against transferring to the Emergency Source until the generator has reached operating frequency.

**13. FVR - Frequency / Voltage Relay (Single Phase Monitoring)**

Provides Protection against transferring to the Emergency Source until the generator has reached operating frequency and voltage.

**14. SS - Selector Switch**

Provides selection of four modes of operation of the Transfer Switch:

- **AUTOMATIC** - The transfer switch is in the fully Automatic mode.
- **MANUAL** - Provides engine start signal only. The transfer switch will not operate and the load will not be transferred.
- **TEST** - Provides engine start signal plus transfer of the load to Emergency source.
- **OFF** - Disables the control logic, ensuring that the transfer switch will remain in the same position regardless of Normal or Emergency source conditions.

**Options Available:**

**14A SS** Selector Switch Only

**14B SSWL** Selector Switch plus 12Vdc light to indicate transfer switch not in automatic

**14C SS-WL** Selector Switch plus 24Vdc light to indicate transfer switch not in automatic

**15. MRTN - Manual Return to Normal Push Button (This option may not be selected in conjunction with option 16.)**

Provides immediate return to the Normal source when Normal voltage is present, by **Manual operation only** (TDR is not present). Dual Motor application allows for time delay (TDT) between Emergency source Open and Normal source Closed. Transfer to Normal will automatically take place when there is loss of Emergency source and the Normal source is present.

**16. ORPB - Override Push Button (This option may not be selected in conjunction with option 15.)**

Provides for immediate return to Normal position by manual operation when Normal source voltage is present bypassing the TDR timer. Dual Motor application allows for time delay (TDT) between Emergency source Open and Normal source Closed.

**17. SC - Starting Contact**

Provides dry (no voltage) contact for starting an engine when initiated by the transfer switch. This is standard on all automatic transfer switches.

**18. ACRN - Auxiliary Contacts Relay for Normal (Energized when the Transfer Switch Load is fed from the Normal Source)**

Provides for two auxiliary form "C" (Common + Normally Open + Normally Closed) 10 ampere contacts to indicate the transfer switch load is being fed from the normal source.

**19. ACRE - Auxiliary Contacts Relay for Emergency (Energized when the Transfer Switch Load is fed from the Emergency Source)**

Provides for two auxiliary form "C" (Common + Normally Open + Normally Closed) 10 ampere contacts to indicate the transfer switch load is being fed from the emergency source.

**20. Option No Longer Available**

**21. Option No Longer Available**

**22. PL - Transfer Switch Indication Pilot Lights**

Provides two LED indicating lights mounted on the exterior of the transfer switch enclosure, showing the position of the switch or the available sources. Pilot Lights may also be mounted at any remote location.

**22A** Switch Position  
(GREEN = Normal, RED = Emergency)

**22B** Source Available  
(WHITE Light for Both)

**22C** System Trouble  
(AMBER Light)



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### 23. CBT - Circuit Breaker Trips for Overcurrent Protection

Provides overcurrent protection within the transfer switch. This feature may eliminate the requirement to install separate overcurrent protective devices on either the Normal or Emergency source (or both sources). Trips will be of the following configurations and will be installed on the **Normal** or **Emergency** side molded case switch:

**Thermal Magnetic** - Providing both overload and short circuit protection, the thermal magnetic type will not trip under momentary overloads, but will trip instantly on heavy short circuit currents (against a definite current/time curve).

**Magnetic Only** - Providing short circuit protection only, the magnetic only type will trip instantly (within one cycle, or approximately 0.017 seconds) when current reaches the selected setting.

**23A Normal Source** - Provides trip on Normal Source Circuit Breaker.

**23B Emergency Source** - Provides trip on Emergency Source Circuit Breaker.

### 24. SCPD - Special Circuit Protection Devices

Provides for the many special additions specified by the customer that can be added to the transfer switch.

**24J ACSA** - Provides (2) sets of form "C" contacts (Common + Normally Open + Normally Closed) for each source to indicate when the source is available. This is done via relays NSAR and ESAR for the normal and emergency source respectively.

**24M Special Circuit Protection by Description** - See below for some standards for this option.

1. ITC - Trouble Circuit Built using the ACRN and ACRE relay contacts.
2. Georgia Transmission - This calls for a PSR on normal, emergency and load for 3 $\phi$  equipment.
3. Foster Farms - Lug Barrier.
4. Single Phase Protection on Normal Source.

### 25. MFM - Multifunction Metering

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

### 25 MFM - Multifunction Metering Continued. . .

13. Instantaneous VA Demand
14. Maximum Amp Demand
15. Maximum Watt Demand
16. Maximum VA Demand

RS-485 (Modbus) communication is the standard output from this option. Ethernet 10/100 Base-T connectivity is available upon request. If other communications protocols are needed, please consult the factory for the appropriate converter.

### 26. Option No Longer Available

### 27. Option No Longer Available

### 28. SL - Special Lugs

Provides for connection of both sources and the load (as well as the neutral when specified) to the Transfer Switch. Shall be furnished as supplied by the manufacturer of the molded case switch. Standard lugs are supplied on all Lake Shore Transfer Switches. Special lug arrangements must be specified when order is placed.

### 29. MD - Maintenance Disconnect

Disconnects control circuitry from line for maintenance purposes. Reference a units schematic diagrams for specific controls disconnected.

### 30. ST - Shunt Trips for Remote Disconnect

Electrically trips switches from a remote location (not a protective type trip).

### 31. SE - Suitable for Use as Service Entrance

Provides for transfer switch (Dual Motor & Insulated Case only) to be approved for service entrance. Includes thermal magnetic overcurrent trip on Service Source switch, selector switch, neutral bus bar, lugs, bonding jumper and strap, and special nameplate.

### 32. ED - Emergency Disconnect Switch

Provides shunt trips in both control units to electrically trip the closed unit and place the ATS in the neutral position. This is done from a selector switch located on the ATS door.

### 33. DPS - Dual Prime Source

Provides for selection between two generators or two utilities. For Dual Prime Power consult factory for details.

**33A** Manual, Generator to Generator

**33B** Automatic, Generator to Generator

**33C** Manual, Utility to Utility

**33D** Automatic, Utility to Utility



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#### 34. LTS - Load Test Switch

Provides engine starting plus transfer of the load to the Emergency source without having to fail the Normal Source.

- 34A Mounted inside the enclosure, maintained switch. This switch is standard on all electromechanical automatic transfer switches.
- 34C Mounted inside the enclosure, momentary pushbutton.
- 34D Mounted outside the enclosure on the door, momentary pushbutton.

#### 35. EC - Elevator Control

Provides 2 sets of dry (no voltage) contacts, 1 set N.O. and 1 set N.C., which change state prior to transfer in either direction. Time delay between initiation of these contacts and switch transfer is field adjustable .03 seconds to 30 minutes.

#### 36. CTT - Closed Transition Transfer

Provides transfer of power from one source to another without interruption of power to the load. Applicable to Dual Motor and Insulated Case switches only.

#### 37. Option No Longer Available

#### 38. SPD - Surge Protection Devices

Provides for protection of transfer switch from voltage surges which may damage control circuitry. Protection includes surge suppressors on both power sources and MOV's on the control circuitry.

- 38A Single Phase, 1 $\phi$
- 38B Three Phase, 3 $\phi$

#### 39. GFP - Ground Fault Protection

When a ground fault is detected, the Normal and Emergency source will be opened isolating the ground fault from external voltage sources.

- 39A Ground Fault Protection (Normal Source)
- 39B Ground Fault Indication (provides indication only with no isolating action.)
- 39C Ground Fault Protection (Emergency Source)
- 39D Ground Fault Protection on Load

#### 40. ELA - Electrical Assist

This option is for manual transfer switches and provides the operator with electrical assistance to operate the control units without entering the transfer switch enclosure.

This option includes 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; Neutral Position.

This option will also provide a Control Enable Switch (CES), keyed, to enable/disable the circuit controls.

Pilot light options for source available, PLSA, and switch position, PLSP, are included with this option. (Options 22A and 22B)

If ground fault protection is order with this transfer switch, the PLST Amber trouble light will also be included. (Option 22C)

#### 41. Option No Longer Available

#### 42. Option No Longer Available

#### 43. PS - Peak Shave

Overrides the operation of a remote or local test switch that has been used to force the ATS to the Emergency position. If the Emergency power fails the ATS will automatically retransfer to the Normal position if normal power is available.

#### 44. HTR - Strip Heater (Standard Accessory on all Outdoor Equipment)

This option provides 350 Watt, 250 Volt strip heater(s) run at 120Vac. Total power consumption per heater is 81W. These are used in conjunction with a wall mount style thermostat to help eliminate moisture build-up in the enclosure and to help prevent the controls from freezing.