Entelli-Switch 250
Microprocessor Controller
Transfer Switch Control Panel
Introduction

GE Zenith Transfer Switches are used to provide a continuous source of power for lighting and other critical loads by automatically transferring from source 1 power to source 2 power in the event that source 1 voltage falls below preset limits.

Voltage sensing and system control is performed via a state-of-the-art microcontroller located on the cabinet door. It is designed to give highly accurate control of the transfer switch system.

All GE Zenith transfer switches are designed for use on emergency or standby systems, and are rated for total system or motor loads. Transfer switches are UL Listed under Standard 1008 and CSA Certified under Standard C22.2 No. 178 and IEC Listed under Standard 947.

NOTES: A protective device such as a molded case circuit breaker or fused disconnect switch MUST be installed on both sources of incoming power for circuit protection and as a disconnection device.

All references made within this manual about the term “S1” or “Source 1” relate to a Normal Power Source. All references made about the term “S2” or “Source 2” relate to an Emergency or Alternative Power Source.
The safe operation of your switch is GE Zenith’s focus. The proper storage, installation, operation and maintenance will help increase the life of the switch.

Due to hazardous voltage and current, GE Zenith recommends that a GE Zenith Certified technician or a qualified electrician must perform the installation and maintenance of the switch.

Equipment Inspection and Storage

Once you have received the transfer switch, inspect it for any damage. This includes damage to the enclosure, power panel, control panel and wiring harness. If any damage is found or suspected, file a claim as soon as possible with the carrier and notify the nearest GE Zenith representative.

Before installation, if it is necessary, store the transfer switch in a clean dry place, protected from dirt and water. Provide ample air circulation and heat, if necessary, to prevent condensation.

<table>
<thead>
<tr>
<th>Storage Temperature</th>
<th>Operating Temperature (Ambient):</th>
<th>Humidity</th>
</tr>
</thead>
<tbody>
<tr>
<td>-30°C to +75°C (non-condensing)</td>
<td>40-400 AMP (molded shell)</td>
<td>5% to 95%</td>
</tr>
<tr>
<td>(-22°F to +167°F)</td>
<td>-20°C to +65°C</td>
<td>(non-condensing)</td>
</tr>
<tr>
<td>40-4000 AMP (all other frame and panel types)</td>
<td>-20°C to +60°C</td>
<td>(4°F to +140°F)</td>
</tr>
</tbody>
</table>

Final Equipment Inspection

Prior to energizing the transfer switch:
1. Remove any debris incurred, with a vacuum, due to shipment or installation.
2. Verify that all cabled connections are correct and that phase rotation of both sources match.
3. Check engine start connections.
4. Verify the correct connection of all control wires.
5. Check settings of all timers and adjust as necessary.
6. Adjust any optional accessories as required.
7. Check the lug torque values of the power connections.
   **NOTE:** Lug torque values are specified in the power panel manual.
8. Make sure that all covers and barriers are installed and properly fastened.
   **NOTE:** Power panels ship from GE Zenith in Source 1 Position.

Do not use a blower since debris may become lodged in the electrical and mechanical components and cause damage.

| DANGER |
| HAZARDOUS VOLTAGE |
| (Can Cause Severe Injury or Death) |

Turn OFF all power before installation, adjustment, or removal of transfer switch or any of its components.

| CAUTION |

| WARNING |

Each GE Zenith transfer switch is factory wired and tested. A complete information package is furnished with each switch which includes:

a. Sequence of operation.
b. Description and operation of all accessories supplied.
c. Power panel connection diagram and schematic.
d. Description and identification of all customer field connections.

Installation of GE Zenith transfer switches includes:

a. Mounting the transfer switch cabinet.
b. Connection of Source 1, Source 2, and Load cables or bus bars.
c. Connection of external control circuits as required.
Engine Start Control Connections

The engine-start terminals are clearly identified by a label on the microcontroller backplate. In the case of manual transfer switches, or in other applications not requiring the microprocessor, clearly marked terminal blocks are provided in the upper left corner of the control panel for the engine start control wires.

Figure 2 shows location of engine start connections for Bypass Isolation Transfer Switch. Figure 5 (pg.6) shows location of engine start connections for Automatic Transfer Switch.

Terminals for field connections to the A3 Source 2 auxiliary contacts and the A4 Source 1 auxiliary contacts are also provided. These terminals are clearly marked and appear on the side of the power panel. On 400 amp metal frame units these terminals appear on the bracket above the operator handle.

Initial Energization

Before proceeding, refer to the information package supplied with the ATS and read and understand the information on all accessories provided.

1. Unlock the enclosure.
2. Open the enclosure.
3. Verify the correct system voltage.

NOTE: The equipment rating nameplate on the transfer switch lists the voltage. See Figure 3.


NOTE: The controller will illuminate Source 1 Available LED if proper voltage is sensed.

5. Verify the phase to phase voltages at Source 1 line terminals.
7. Start the generator’s engine.

NOTE: The controller will illuminate Source 2 Available LED when preset voltage and frequency levels are reached.

8. Verify the phase to phase voltages at Source 1 line terminals.
9. Verify that the phase rotation of Source 1 is the same as the phase rotation of Source 2.
10. Shut down the generator’s engine.
11. Place the starting control in the Automatic position.
12. Complete the visual inspection of the transfer switch.
13. Close the enclosure.
14. Lock the enclosure.

DANGER

HAZARDOUS VOLTAGE
(Can Cause Severe Injury or Death)

Turn OFF all power before installation, adjustment, or removal of transfer switch or any of its components.
Initial Energization (cont’d)

After all options and accessories are checked and verified, follow these steps to set up the ATS. Refer to Entelli-Switch 250 display Figure 4. The annunciation LEDs illuminate to indicate (1) source availability, (2) ATS position, and (3) Entelli-Switch 250 control function (timing).

1. Unlock the enclosure.
2. Open the enclosure.
3. Place the Disconnect Switch in the Inhibit.
   **NOTE:** This step is only performed if the “DS” Option was purchased.
4. Close the external (up-stream) Source 1 circuit breaker.
   **NOTES:** Source 1 Available and Source 1 Position LED’s will illuminate.
   - If Source 1 Available LED does not illuminate, verify that Source 1 Voltage is above the preset restore value.
   - The Gen-Set will start and run while Source 2 stop Delay Timer is timing.
5. Close the External (up-stream) Source 2 line circuit breaker.
6. Start the engine generator in MANUAL mode.
   **NOTE:** When the voltage and frequency reach preset values, the Source 2 Available LED will illuminate.
7. Verify the phase to phase voltages at Source 2 line terminals.
8. Verify that the phase rotation of Source 2 is the same as the phase rotation of Source 1.
9. Shut down the generator’s engine. (Place in Automatic Mode.)
   **NOTE:** Source 2 Available LED will turn off.
   **NOTE:** The engine generator will continue to run for the duration of Source 2 Stop Delay Timer.
10. Place the disconnect switch to ENABLE.
11. Complete the visual inspection of the transfer switch.
12. Close the enclosure.
13. Lock the enclosure.

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**WARNING**

When performing a hi-pot or dielectric test on the power section, **DISCONNECT** the control panel plugs from the microprocessor to avoid potential damage.
A complete information package is furnished with each transfer switch including a complete connection diagram and schematic which details all necessary control circuit field connections.

The engine start control wires connect to the engine start relay terminals located to the left of the microprocessor. Figure 5 shows the location of these terminals.

The terminals are clearly identified by a label on the microcontroller backplate. In the case of manual transfer switches, or in other applications not requiring the microprocessor, clearly marked terminal blocks are provided in the upper left corner of the control panel for the engine start control wires.
Entelli-Switch 250 Controller

Consists of two major assemblies:

I. The Microprocessor contains the following:

A. Entelli-Switch 250 Board - Customer Input and Output (I/O) for system interface. Located on the left hand side of the back of the unit (see figure 6)
   1. I/O accessories that can be found here are:
      a. Engine start relay P output
      b. Pre-Signal to transfer T3, W3 and UMD output (optional)
      c. Transfer Inhibit Q3 and Q7 input (optional)
      d. Remote test Q2 input (optional)
      e. Network interface ZNET input/output (optional)

B. LCD and Keypad located on the exterior of the door (see figure 7)
   1. User accessibility to the following:
      a. LED indication of source availability
      b. LED indication of transfer switch position
      c. LCD screen indicates:
         (1) timer count down (numeric)
         (2) event reporting (text)
      d. Keypad provides user interface to:
         [in conjunction with LCD screen]
         (1) Setting sensors and timers
         (2) Configuring logic accessories

II. The Controls Power Supply (CPS)

Contains transformers which drop line voltage to control level for controller input and SCR inputs (see figure 6).
**LCD & Keypad**

These options are accessible through the LCD and keypad (see figure below). To become familiar with the options loaded into a particular unit, scrolling through the SET and CFG menu will show the descriptions of the options (see pages 17-18). These menus are the very same menus that are used to access the setting and/or configuration of these options. The SET (setting) menu is primarily used to show or change, time and voltage settings. The CFG menu is primarily used to turn an option on or off. When scrolling through these menus, no changes can be made without entry of the access code.

The factory set six-digit access code is located on a white label on the back of the unit (see figure 10 pgs. 17-19).

The Entelli-Switch 250 has many logic options. Each controller is downloaded with options at the time of manufacture. The collection of options that any one controller has is specified at the time of order placement. The following pages include all the options that can reside in the controller. Not all units include all options.
User Setting for Voltage & Frequency

Standard 3-Phase Sensing on 3 and 4 Pole Units

**Source 1**

**Under Voltage "Restore"**  
Factory Default: 90%  
This adjustment determines the minimum acceptable voltage required to transfer to Source 1.  
Adjust via the SET menu. Range is 85% to 100% in 1% increments (see page 18).  
Once satisfied, the T timer will begin timing to transfer to Source 1.

**Under Voltage "Fail"**  
Factory Default: 80%  
This adjustment determines the low voltage threshold.  
Adjust via the SET menu. Range is 75% to 98% in 1% increments (see page 18).  
"Fail" must be a minimum of 2% below "Restore" setting. Once voltage falls below threshold, P timer begins timing to signal Source 2 Generator to start.

**Under Frequency "Restore"**  
Factory Default: 95%  
This adjustment determines the minimum acceptable frequency required to transfer to Source 1.  
Adjust via the SET menu. Range is 90% to 100% in 1% increments (see page 18).  
Once satisfied, the T timer will begin timing to transfer to Source 1.

**Over Frequency "Restore"**  
Factory Default: 102%  
This adjustment determines the minimum acceptable Over Frequency threshold at which the transfer switch is allowed to re-transfer to Source 1.  
Adjust via the SET menu. Range is 102% to 104% in 1% increments (see page 18).  
"Restore" must be a minimum of 1% below "Fail" setting.

**Under Frequency "Fail"**  
Factory Default: 90%, (5 seconds minimum)  
This adjustment determines the low frequency threshold.  
Adjust via the SET menu. Range is 88% to 98% in 1% increments (see page 18).  
"Fail" must be a minimum of 2% below "Restore" setting. Once satisfied, the T timer will be bypassed to expedite the transfer to Source 1.

**Over Frequency "Fail"**  
Factory Default: 105%  
This adjustment determines the maximum acceptable Over Frequency at which the transfer switch is allowed to re-transfer to Source 2.  
Adjust via the SET menu. Range is 103% to 105% in 1% increments (see page 18).  
"Fail" must be a minimum of 2% below "Restore" setting. Once satisfied, the W timer will begin timing to transfer to Source 2.

**Source 2**

**Under Voltage "Restore"**  
Factory Default: 90%  
This adjustment determines the minimum acceptable voltage required to transfer to Source 2.  
Adjust via the SET menu. Range is 85% to 100% in 1% increments (see page 18).  
Once satisfied, the W timer will begin timing to transfer to Source 2.

**Under Voltage "Fail"**  
Factory Default: 80%  
This adjustment determines the low voltage threshold.  
Adjust via the SET menu. Range is 75% to 98% in 1% increments (see page 18).  
"Fail" must be a minimum of 2% below "Restore" setting. Once voltage falls below threshold, T timer will be bypassed to expedite the transfer to Source 1.

**Over Voltage "Fail"**  
Factory Default: 110%  
This adjustment determines the maximum acceptable Over Voltage.  
Adjust via the SET menu. Range is 105% to 110% in 1% increments (see page 18).  
Once exceeded, the T timer will be bypassed to expedite the transfer to Source 1.

**Over Voltage "Restore"**  
Factory Default: 105%  
This adjustment determines the minimum acceptable Over Voltage threshold at which the transfer switch is allowed to transfer to Source 2.  
Adjust via the SET menu. Range is 103% to 105% in 1% increments (see page 18).  
"Restore" must be a minimum of 2% below "Fail" setting.

**Under Frequency "Fail"**  
Factory Default: 90%, (5 seconds minimum)  
This adjustment determines the low frequency threshold.  
Adjust via the SET menu. Range is 88% to 98% in 1% increments (see page 18).  
"Fail" must be a minimum of 2% below "Restore" setting. Once satisfied, the W timer will begin timing to transfer to Source 2.

**Over Frequency "Fail"**  
Factory Default: 105%  
This adjustment determines the maximum acceptable Over Frequency.  
Adjust via the SET menu. Range is 103% to 105% in 1% increments (see page 18).  
Once exceeded, the W timer will be bypassed to expedite the transfer to Source 2.

**Over Frequency "Restore"**  
Factory Default: 102%  
This adjustment determines the minimum acceptable Over Frequency threshold at which the transfer switch is allowed to re-transfer to Source 2.  
Adjust via the SET menu. Range is 102% to 104% in 1% increments (see page 18).  
"Restore" must be a minimum of 1% below "Fail" setting.
# Accessory Group Packages

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Group Packages</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STDS</td>
</tr>
<tr>
<td>6P</td>
<td>●</td>
</tr>
<tr>
<td>A1</td>
<td>○</td>
</tr>
<tr>
<td>A1E</td>
<td>●</td>
</tr>
<tr>
<td>A3</td>
<td>●</td>
</tr>
<tr>
<td>A4</td>
<td>●</td>
</tr>
<tr>
<td>Calibrate</td>
<td>●</td>
</tr>
<tr>
<td>CDT</td>
<td>●</td>
</tr>
<tr>
<td>CDP</td>
<td>●</td>
</tr>
<tr>
<td><strong>DS</strong></td>
<td>●</td>
</tr>
<tr>
<td><em>DT</em>*</td>
<td>●</td>
</tr>
<tr>
<td><em>DW</em>*</td>
<td>●</td>
</tr>
<tr>
<td>E</td>
<td>●</td>
</tr>
<tr>
<td>EL/P</td>
<td>●</td>
</tr>
<tr>
<td>K/P</td>
<td>●</td>
</tr>
<tr>
<td>L1</td>
<td>●</td>
</tr>
<tr>
<td>L2</td>
<td>●</td>
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<tr>
<td>L3</td>
<td>●</td>
</tr>
<tr>
<td>L4</td>
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<td><em>LN</em>*</td>
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<td>Q2</td>
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<td>Q3</td>
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<td>Q7</td>
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<tr>
<td>R1-1</td>
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<tr>
<td>R1-3</td>
<td>○</td>
</tr>
<tr>
<td>R15</td>
<td>○</td>
</tr>
<tr>
<td>*R15D</td>
<td>○</td>
</tr>
<tr>
<td>R16</td>
<td>●</td>
</tr>
<tr>
<td>R50</td>
<td>●</td>
</tr>
<tr>
<td>S5P</td>
<td>◢</td>
</tr>
<tr>
<td>S12P</td>
<td>◢</td>
</tr>
<tr>
<td>S13P</td>
<td>◢</td>
</tr>
<tr>
<td>T</td>
<td>●</td>
</tr>
<tr>
<td>T3/W3</td>
<td>2</td>
</tr>
<tr>
<td>U</td>
<td>●</td>
</tr>
<tr>
<td>UMD</td>
<td>2</td>
</tr>
<tr>
<td>VI</td>
<td>●</td>
</tr>
<tr>
<td>W</td>
<td>●</td>
</tr>
<tr>
<td>YEN</td>
<td>●</td>
</tr>
</tbody>
</table>

- ● Standard Accessory included in the group package.
- ○ Optional Accessory not included but can be added to group package.
- ◢ Optional Accessory. Can not be used with accessory having the same symbol.
- N/A
- 2 Denotes an Accessory with 2 circuits as a standard.
- 3 Denotes an Accessory with 3 circuits as a standard.

* Delayed Transition Units Only.
** Optional for 40-400 Amp
Accessory Definitions

6P
Test Switch, Momentary

6A
Test Switch, Maintained Auto/Momentary Test

6AP
Test Switch, Maintained/Momentary utilizing keypad

6B
Test Switch, Maintained - Auto / Momentary - Test, Key Operated

6C
Test Switch, Maintained - Auto / Maintained - Test, Key Operated

A1
Auxiliary Contact, operates on Source 1 line failure.

A1E
Auxiliary Contact, operates on Source 2 line failure.

A3
Auxiliary Contact: Closed in emergency (Source 2) Additional Available (10 max.) and need to be specified.

A4
Auxiliary Contact: Closed in normal (Source 1) Additional Available (10 max.) and need to be specified.

A62
Sequential Universal Motor Load Disconnect Circuit. Normally closed auxiliary contacts for motor loads. Open 0-60 seconds prior to transfer, after transfer, or both in either direction then re-close in timed sequence after transfer.

AB3
Auxiliary Contact: Closed in bypass emergency (Source 2) (S.P.D.T.) (Standard up to 400 Amp) Additional Available (10 max.) and need to be specified.

AB4
Auxiliary Contact: Closed in bypass normal (Source 1) (S.P.D.T.) (Standard up to 400 Amp) Additional Available (10 max.) and need to be specified.

B9
Battery charger connections.

Calibrate
While monitoring the actual Phase to Phase voltage levels and Frequency with a calibrated test equipment, the Phase to Phase voltage sensing and Frequency can be adjusted accordingly. Calibration capabilities are available for Frequency and AB, BC, CA Phase to Phase voltage for both Sources. Adjust via SET menu (see page 18)

CDP
Clock Exerciser Load/ No Load: Allows the Generator to start and run unloaded or to simulate a power failure, start Generator and run under load. Can be configured by end user for 1, 7, 14, 28, 365 day cycle. (See page 16)

CDT
Load or NO-Load. One event exerciser with adjustable Engine exercise timer. Exercise duration can be set between 5 and 60 minutes in 1 minute increments. Can be configured to run every 1, 7, 14, or 28 days. Factory Default is 20 minutes. When exerciser is impending (*E*) appears in the upper right hand corner of LCD screen. See page 15 for instructions. Configured via CFG (see page 17). Set via SET menu (see page 18).

CTAP
Alarm Panel on transfer to Source 2 with Silence button.

DS
Disconnect Switch, Auto/Inhibit. Inhibits transfer in either direction when in inhibit. Allows automatic operation when in Auto. (40-400 Amps optional, 600-4000 Amps standard)

DT (Delayed Transition Only)
Time Delay from Neutral Switch position to Source 1 position. Adjustable 0-10 minutes in 1 second increments. Standard setting is 5 seconds Adjust via SET menu (see page 18)

DW (Delayed Transition Only)
Time Delay from Neutral Switch position to Source 2 position. Adjustable 0-10 minutes in 1 second increments. Standard setting is 5 seconds. Adjust via SET menu (see page 18)

E
Engine Start Contact

EL/P
Event Log: Sequentially Numbered Log of 16 events that track date, time, reason and action taken
System Data: Total Life Transfers (N2P)
Days Powered Up
Total Transfers to S2
Total S1 Failures
Time S1 available in Hrs
Time S2 available in Hrs. (N1P)

F
Fan contact, operates when generator is running.

HT
Heater and Thermostat

K
Frequency Meter, Door mount.

K/P
Frequency Indication for S1 and S2

L
LNP Center-off position LCD-Indicator Indicating LED lights:
L1 Indicates Switch in Source 2 position.
L2 Indicates Switch in Source 1 position.
L3 Indicates Source 1 available.
L4 Indicates Source 2 available.
## Accessory Definitions (cont’d)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>M1</strong></td>
<td>Single Phase Amp Meter</td>
</tr>
<tr>
<td><strong>M2</strong></td>
<td>Three Phase Amp Meter</td>
</tr>
<tr>
<td><strong>M80</strong></td>
<td>3000 Digital Power Monitor</td>
</tr>
<tr>
<td><strong>M82</strong></td>
<td>5200 Digital Power Meter</td>
</tr>
<tr>
<td><strong>M83A</strong></td>
<td>EPM 5300 Digital Power Meter with Modbus Port</td>
</tr>
<tr>
<td><strong>M83B</strong></td>
<td>EPM 5350 Digital Power Meter with Ethernet Port</td>
</tr>
<tr>
<td><strong>M84</strong></td>
<td>7430 Digital Power Meter, Wye or Delta</td>
</tr>
<tr>
<td><strong>M85A</strong></td>
<td>EPM 9450 Digital Power Meter, Ethernet</td>
</tr>
<tr>
<td><strong>M85B</strong></td>
<td>EPM 9450 Digital Power Meter with Internal 56K Mod.</td>
</tr>
<tr>
<td><strong>M86A</strong></td>
<td>EPM 9650 Digital Power Meter, Wye or Delta, RS232 or RS485</td>
</tr>
<tr>
<td><strong>M86B</strong></td>
<td>EPM 9650 Digital Power Meter, Wye or Delta, RS232 or RS485</td>
</tr>
<tr>
<td><strong>N1</strong></td>
<td>Running Time Meter, Door mount</td>
</tr>
<tr>
<td><strong>N2</strong></td>
<td>Operation Counter, Door Mount</td>
</tr>
<tr>
<td><strong>P1</strong></td>
<td>Time Delay Source 2 Start. Adjustable 0-10 seconds. Standard setting is 3 seconds. Adjust via SET menu (see page 18)</td>
</tr>
<tr>
<td><strong>P2</strong></td>
<td>Time Delay S2 Start. Adjustable 1/6 to 300 seconds.</td>
</tr>
<tr>
<td><strong>Q1</strong></td>
<td>Remote Peak Shave or Area Protection Circuit. Energize Q2 to simulate Source 1 Line failure causing the Generator to start and transfer the load to Source 2. Should Emergency fail during this operation, Transfer Switch will retransfer back to Source 1.</td>
</tr>
<tr>
<td><strong>Q2</strong></td>
<td>Remote inhibit transfer to Source 2 circuit. Energize Q3 input to allow transfer to Source 2. To enable Q3 option, engage Q3 jumper.</td>
</tr>
<tr>
<td><strong>Q7</strong></td>
<td>Inhibit transfer to Source 1 circuit. Energize Q7 input to prevent transfer to Source 1.</td>
</tr>
<tr>
<td><strong>R1-1/R1-3</strong></td>
<td>Source 1 Over Voltage sensing for single and three phase systems. Source 1 Over Voltage &quot;Fail&quot; Factory Default: 110% This adjustment determines the maximum acceptable over voltage. Adjust via the SET menu. Range is 105% to 110% in 1% increments (see page 18). Once exceeded, the P timer begins timing to signal the Generator to start. Source 1 Over Voltage &quot;Restore&quot; Factory Default: 105% This adjustment determines the minimum acceptable over Voltage threshold at which the Transfer Switch is allowed to automatically transfer to Source 1. Adjust via SET menu. Range is 103% to 108% in 1% increments. &quot;Restore&quot; must be a minimum of 2% below &quot;Fail&quot; setting (see page 18).</td>
</tr>
<tr>
<td><strong>R15/R15D</strong></td>
<td>Load Shed Should Source 2 become overloaded, a signal can be given to switch to the dead or Mid position.</td>
</tr>
<tr>
<td><strong>R16</strong></td>
<td>Phase Rotation Sensing Can be turned on or off via CFG menu (see page 17). Factory Default is on. This feature prevents Line Source to Line Source transfers from occurring between dissimilar phase sequences. This condition is primarily caused by an installation error. Connections from Source 1 and Source 2 need to be verified, compared, and corrected to remedy the inconsistent phase rotation between the sources. WARNING: Turning off this feature can cause severe damage to loads.</td>
</tr>
<tr>
<td><strong>R26</strong></td>
<td>Interruptable Power Rate Provisions. Allow transfer out of Source 1 position to Source 2 or dead Source 2. Alarm and Pre-Signal circuit included.</td>
</tr>
<tr>
<td><strong>R50</strong></td>
<td>In Phase Monitor this feature restricts Live to Live Source Transfers to occur unless both Sources are within 7 electrical degrees or less of each other. Live to live Source transfers usually occur during transfer back to Source 1 or during Testing. R50 does not change the operation of the Automatic Transfer Switch in a power failure mode. After all timer functions have elapsed, the CHECKING FOR SOURCE SYNCHRONISM will be displayed as well as the direction of transfer (S1-S2 for example denotes transfer from Source 1 to Source2). When synchronism is accomplished, transfer will take place.</td>
</tr>
</tbody>
</table>
Accessory Definitions (cont’d)

Notes:
- If S2 Frequency is less than S1 Frequency, display will show a series of (- - - - -…..) symbols.
- If S2 Frequency is greater than S1 Frequency, display will show a series of (+++++.....) symbols.
- Each (-) or (+) symbol represents 10 electrical degrees out of phase. A maximum of 18 symbols (180 electrical degrees) can be monitored.
- The number of (-) or (+) symbols decrease as the two sources approach synchronism and increase as the two sources drift out of synchronism.
- If S1 and S2 Frequencies are identical, the display will show a series of alternating symbols (+-+-+) which also indicate the approximate out of phase degrees.

In the event that the Sources do not come within 7 electrical degrees of each other within 60 seconds, the unit will display the message: SYNCH CHECKING and will allow the user to BYPASS. If the BYPASS button is pressed, the unit will display the message: WARNING MAY CAUSE DAMAGE TO THE LOAD. Pressing XFR will actually bypass the R50. Since R50 is a passive device, the length of time it takes to reach Synchronism is dependent on the frequency difference between the two Sources. Source 1 is usually a Utility and the frequency is not within the control of the consumer. Source 2 needs to be adjusted to create an adequate difference in order for the transfer to happen a timely fashion.

Note: For optimum performance, Source 2 Generator should be adjusted a Maximum of 2 Hertz above or below the Utility frequency, minimum of 0.1 Hertz. (58 to 59.9) or (60.1 to 62) Hertz. Adjustment of Generator to 60 Hertz could cause lengthy transfer delay.

R50 Feature can be turned ON or OFF via CFG Menu (see page 17). Factory Default if OFF.

S13P
Transfer Commit. Configured via CFG menu. (see page 17) When this Feature is set to OFF: The transfer Switch is not committed to transfer unless the outage duration is longer than the timers that precede the transfer to Source 2 position. This assumes that the outage will be an isolated event. When this Feature is set to ON: The transfer Switch is committed to transfer to Source 2 position once the W timer has begun timing, even if Source 1 power returns before the transfer to Source 2. This is to ensure that the transfer takes place, because one outage may be followed by another.

S14
Test / Auto / Source 1 Selector, Door mount

SW1
Auto/Off/Start Engine control selector, Door mount (Keyed or non-keyed operation available)

SW2
Auto / Off Engine control selector, Door mount (Keyed or non-keyed operation available)

SW3
Source Priority Selector Switch, Door mount
Allows selection of Source 1 or Source 2 to be the Prime Source. Transfer Switch will transfer to selected Prime Source if that Source is available. (Keyed or non-keyed operation available)

T
Time Delay (S1) Source 1 Stable Timer. To delay transfer to Source 1 (immediate retransfer on Source 2 failure). Adjustable 0-60 minutes in 1 second increments. Standard setting is 30 minutes. Adjust via SET menu (see page 18)

T3/W3
Elevator Pre-Signal Auxiliary Contacts: Open 0-60 seconds prior to transfer to either direction, re-closes after transfer.

U
(S2) Source 2 Stop Delay Timer. Allows Engine to run unloaded after switch retransfer to Source 1. Adjustable 0-60 minutes in 1 second increments. Standard setting is 5 minutes. Adjust via SET menu (see page 18)

UMD
Universal Motor Load Disconnect Circuit: Auxiliary Contact opens 0-60 seconds prior to transfer in either direction, re-closes after transfer. Can be configured by end user for Pre-transfer, Post-transfer, or both.
How to Set the System Clock

Set System Clock, time and date
- If the clock is not set, the display will show SET SYSTEM CLOCK on the second line of the S1 OK screen.
- The S1 OK screen will show time (hours and minutes) on the second line if the system clock has been set. (Date on third line)

Setting the System Clock
(Start from S1 OK screen)
1. Remove battery protective white plastic strip near P relay. *
2. Press MORE then press SET.
3. Press MORE and scroll to SET SYSTEM CLOCK using the MORE key.
4. Press SEL.
5. ENTER ACCESS CODE located on the white label on the back of the controller.
6. Press SEL.
7. Use the up and down keys to change the hour value.
8. Press SAVE (this will enter this value and move cursor to minutes).
9. Use the up and down keys to change the minutes.
10. Press SAVE (this will enter this value and move cursor to month).
11. Use the up and down key up to change the month.
12. Press SAVE (This will enter this value and complete the clock setting).
13. Use the up and down keys to change the date.
14. Press SAVE (this will enter this value and move cursor to year).
15. Use the up and down keys to change year.
16. Press SAVE (this will enter this value and complete the clock setting).
17. To edit settings, press SEL and repeat steps 6-16.
18. If the setting is satisfactory, press MORE (unit then returns to the SET menu then press BACK, then ESC.)

* Replacement battery part #K-4100
Battery will last 5 years and provides power to retain clock function only (Controller functions without battery).
Load / No-Load
One event Exerciser with adjustable Timer. Exercise duration can be set between 5 and 60 minutes in 1 minute increments. Can be configured to run every 1, 7, 14, or 28 days. Factory default is 20 minutes.

How to CONFIGURE (CFG) and Set (SET) the Timer Exerciser

1. Beginning from the S1 OK screen, press MORE then CFG.
2. Press MORE to scroll to CONFIG TIMER EXERCISER screen.
3. The third line of the CONFIG TIMER EXERCISER will show either DAILY, WEEKLY, 14 DAY, 28 DAY, or OFF.
4. If the third line of the CONFIG TIMER EXERCISER shows DAILY, WEEKLY, 14 DAY, or 28 DAY as desired, then proceed to step 10.
5. If the third line of the CONFIG TIMER EXERCISER shows OFF or if another timer selection is desired, continue.
6. Press SEL.
7. Enter ACCESS code located on white label on the back of the controller.
8. Press UP or DOWN to select DAILY, WEEKLY, 14 DAY, or 28 DAY as desired.
9. Press SAVE.
10. Press MORE to scroll to CONFIG TIMER EXERCISER (XFR) or (NO XFR).
11. Press Up or Down to select XFR (Load Transfer) or NO XFR (No Load Transfer).
12. Press SAVE.
13. Press MORE repeatedly to BACK then S1 OK screen.

Set (SET) the Exerciser:
14. Beginning from the S1 OK screen, press MORE then SET.
15. Press MORE repeatedly until EXER S2 RUN TIME screen.
16. Press SEL.
17. Enter ACCESS code located on white label on the back of the controller.
18. Press SEL.
19. Cursor is indicated as a line under character to be changed. Change values with up and down keys.
20. Press SAVE when complete.
21. Press MORE repeatedly until SET USER SETUP then press BACK then ESC to the S1 OK screen.

How to Initiate CDT Exerciser and to start an exercise cycle every 1, 7, 14, or 28 days
From S1 screen
1) Press TEST
2) Press MORE
3) Press START TEST TIMER (to initiate Test).

- If the CDT Exerciser is Factory configured for a Load Exerciser, the Controller will immediately start a load exercise. The controller will start the generator, transfer the load to Source 2 and remain in Source 2 for the duration set for EXER S2 RUN TIME in the SET menu. The controller will retransfer the load back to Source 1 after the S1 stable timer has timed out and run the generator unloaded for the duration of the S2 stop delay timer (Engine Cool Down Timer).
- If the CDT Exerciser is Factory configured for a No-Load Exerciser, the Controller will immediately start a No-load exercise. The controller will start the generator and run it unloaded for the duration of the S2 stop delay timer (Engine Cool Down Timer).

Exercise will be repeated at the same time as initiated on every 1, 7, 14, or 28 days according to the selection made in the Configure CFG menu.

How to Bypass (Cancel) an exercise during an exercise cycle
1) Press BPASS
2) Allow the controller to complete the Engine cool down cycle
If the CDT Exerciser is Factory configured for a No-Load Exerciser Or allow the controller to complete retransfer to Source 1 If the CDT Exerciser is Factory configured for a Load Exerciser

How to Bypass the next exercise event and Keep the rest of scheduled events unchanged
1) Press Test
2) Press MORE
3) Press BYPASS EXER
To re-institute the next exercise event back, press CANCEL BPASS

How to initiate a new exercise start time
1) Press TEST
2) Press MORE
3) Press EXER CANCL
4) Press START TIMER TEST

How to check the next exercise event
1) From S1 OK screen, press MORE three times.
2) The unit will display the PLANT EXERCISER NEXT event in DAYS, HOURS, and MINUTES
3) Press ESC to S1 OK Screen.

Notes:
- "E" appears in the upper right hand corner of LCD screen when exercise is impending.
- For Load Exerciser, actual exercise period (ATS in S2 position)= CDT (Exerciser) timing period +T (S1 stable Timer) timing period.
CDP Clock Exerciser

Load / No-Load Clock Exerciser

Allows the Generator to start and run unloaded or to simulate a power failure, start Generator and run under load. Can be configured by the end user for 1, 7, 14, 28, or 365 day cycles.
- A total of 7 independent No Load exercise periods (up to 10 hours each) can be programmed for each of the daily, weekly, 14-day, and 28-day exercisers.
- A total of 12 independent No Load exercise periods (up to 10 hours) can be programmed for the 365-day Exerciser.

How to Configure (CFG) the Exerciser

1. Beginning from the S1 OK screen, press MORE then CFG.
2. Press MORE to scroll to CONFIG CLOCK EXERCISER screen.
3. The third line of the CONFIG CLOCK EXERCISER will show either DAILY, WEEKLY, 14 DAY, 28 DAY, 365 DAY or OFF.
4. If the third line of the CONFIG CLOCK EXERCISER shows DAILY, WEEKLY, 14 DAY, 28 DAY, or 365 DAY as desired, press MORE repeatedly to BACK.
   Press ESC then proceed to the SET menu to set the EXERCISER.
5. If the third line of the CONFIG CLOCK EXERCISER shows OFF, continue.
6. Press SEL.
7. Enter ACCESS code located on white label on the back of the controller.
8. Press UP or DOWN to select DAILY, WEEKLY, 14 DAY, 28 DAY, or 365 DAY as desired.
9. Press SAVE.
10. Press MORE repeatedly to BACK then ESC to S1 OK screen.

How to set (SET) the DAILY Exerciser

1. Beginning from the S1 OK screen, press MORE then SET.
2. Press MORE repeatedly until SET EXERCISER screen.
3. Press SEL.
4. Enter ACCESS code located on white label on the back of the controller.
5. Press SEL.

Notes:
- In the S1 OK screen, an (*E*) appears in the upper right hand corner of LCD screen when exercise is impending.
- For Load Exerciser, actual exercise period (ATS in S2 position) = CDT (Exerciser) timing period + T (S1 Stable Timer) timing period.
- A value greater than zero must be entered in the Load No-Load (CDP) Exercise Indicator Load No-Load (CDP) Exercise Indicator Load No-Load (CDP) Exercise Indicator

How to Bypass the next exercise event and Keep the rest of scheduled events unchanged

1) Press TEST
2) Press MORE
3) Press BYPASS EXER
   To re-institute the next exercise event back, press CANCEL BYPASS

How to check the next exercise event

1) From S1 OK screen, press MORE three times.
2) The unit will display the PLANT EXERCISER NEXT event in DAYS, HOURS, and MINUTES
3) Press ESC to S1 OK Screen.

Exercise duration for this event in hours and minutes up to 10 hours per event

To save value and to move cursor to next field to be changed.

Figure 9
Entelli-Switch 250 User Setup - CFG Menu

Turn options ON or OFF via keypad through the CFG menu

Enter six digit access code
(The factory assigned six-digit access code
is located on the back of the controller)

---

S1 OK
01: 50
FRI 31 MAY 2003
MORE TEST

1 VAB = ___  2 VAB = ___
VBC = ___  VBC = ___
VCA = ___  VCA = ___
MORE CFG SET ESC

CONFIG USER SETUP
MORE BACK

---

** Timer Exerciser (CDT)**
1, 7, 14, 28 Day (pg. 11 & 15)

** Clock Exerciser**
LOAD OR NO LOAD (CDP)
1, 7, 14, 28, 365 Day (pg. 11 & 16)

** Test Key (6)**
Maintained/Momentary (pg. 11)

** Transfer Commit (S13)**
ON/OFF (pg. 13)

** Auto / Manual (S5 or S12)**
ON/OFF (pg. 13)

** In-Phase Monitor (R50)**
ON/OFF (pg. 13)

** S1 Over Voltage (R1-1 or R1-3)**
ON/OFF (pg. 12)

** S1 Under Frequency**
ON/OFF (pg. 9)

** S2 Over Voltage**
ON/OFF (pg. 9)

** S2 Over Frequency**
ON/OFF (pg. 9)

** Phase Imbalance (VI)**
ON/OFF (pg. 14)

** Phase Rotation Match (R16)**
ON/OFF (pg. 12)

** Load Disconnect TD (UMD)**
(pg. 13)

** Transfer Alarm (CTAP)**
ON/OFF (pg. 11)

** Network (ZNET)**
ON/OFF (pg. 14)

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Optional Accessories
Entelli-Switch 250 User Setup - SET Menu

**Change adjustable values through the SET menu.**

Enter six digit access code
(The factory assigned six-digit access code is located on the back of the controller)

---

**Warning:**
- Controller inputs must be relay isolated.
- Controller outputs have limited source capacity. Use only GE Zenith-specified output modules.

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**Figure 10**

- **Time Delay S2 Start (P1)** (pg.12)
- **Time Delay S2 Stable (W)** (pg.14)
- **Load Presignal TD (T3/W3)** (pg.13)
- **Load Disconnect TD (UMD)** (pg.13)
- **ATS Open Time to S2 (DW)** DELAY units only (pg.11)
- **Time Delay S1 Stable (IT)** (pg.13)
- **ATS Open Time to S1 (DT)** DELAY units only (pg.11)
- **S2 Stop Delay (U)** (pg.13)
- **CALIBRATE S1** (pg.11)
- **CALIBRATE S2** (pg.11)

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**Lithium Battery**
- Service life - 10 years
- Replace with K-4100 (BR2032)

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**User Access Code**
- Default = 121212

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**Production Information**
- www.geindustrial.com
- 24-Hour Service (773) 299-6600

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**Entelli-Switch MX250™**

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**Product Information**
- 24-Hour Service (773) 299-6600
View System Data

Enter six digit access code
(The factory assigned six-digit access code is located on the back of the controller)
Testing

Introduction
A manual operator handle is provided with the transfer switch for maintenance purposes only. Manual operation of the switch must be checked before it is operated electrically. **Both power sources must be disconnected before manual operation of the switch.**

After completing the inspection, cleaning and servicing of the transfer switch, reinstall the switch cover, and close and lock the cabinet door. Reclose the circuit breakers feeding the utility and generator sources to the switch.

Initiate the electrical transfer test by activating the test switch. P timer will time out and the microcontroller will send an engine start signal. When the W time has elapsed, the switch will complete its transfer by closing into the Source 2.

Deactivating the test switch will start retransfer to Source 1. The switch will complete its retransfer to Source 1 after the time delay of the T timer. The U engine overrun timer allows the engine generator to run unloaded for a preset cool down period.

Test Options
The ATS can be tested in either of two positions:

1) “Auto Position”
   - Full Transfer Test - This test checks the complete operation of the ATS by transferring the load’s power source from Source 1 to Source 2.

2) “Test Position”
   - This procedure is recommended for Preventive Maintenance (PM) of ATS without interrupting the Load thru the BYPASS/ISOLATION SWITCH.

**NOTE:** A periodic test of the transfer switch under load conditions is recommended to insure proper operation. (See National Electric Code articles 700 and 701).

**CAUTION**
Due to hazardous voltage and current, GE Zenith recommends that a GE Zenith Certified technician or a qualified electrician must perform the installation and maintenance of the switch.

**WARNING**
Both power sources must be disconnected before manual operation of the switch.

**WARNING**
When performing a hi-pot or dielectric test on the power section, **DISCONNECT** the control panel plugs from the microprocessor to avoid potential damage.
ATS Testing

Start generator and verify proper voltage, frequency and phase sequence (match to Source 1). Shut down gen set and place in Auto. Complete the visual inspection of the transfer switch, and close the cabinet door.

Initiate the test by pressing the TEST button on the LCD keypad. The controller will then prompt for your access code. After entering the code, three test options will appear—XFR LOAD, FAST TEST and NO XFR (See Figure 11).

- **XFR LOAD** test starts the generator and using the current timer settings, transfers the load to Source 2.
- **FAST TEST** test presets timer values to a maximum 30 seconds during the test. After completion of the test, all timers are reset to their original values. (T3, W3, DT and DW remain)
- **NO XFR** test starts the generator but does not transfer the load to the Source 2.

Press and hold the desired test option button until the switch transfers to Source 2 (load test) or until the generator has been run for the desired amount of time (no load test). Releasing the test button before W timer timeout will abort the test (Exception: when the transfer commit option, is configured “ON”).

To test lamps, press TEST then scroll through MORE, then press LAMP TEST. To cancel LAMP TEST press MORE.

Standard Transition

When the test is initiated, the controller initiates the Time Delay Source 2 Start Timer (Engine Start Timer "P") cycle. A manual CANCEL button is provided to cancel the test if desired. Upon completion of the (P) time delay, an Engine Start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset "Restore" values, the time delay to Source 2 Timer (W) begins its timing cycle to ensure voltage and frequency stabilization before transfer. A manual pushbutton BYPASS is provided to bypass the "W" time delay if desired. After the (W) time delay, the MX controller initiates a transfer signal through the SCR-E to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SN limit switch awaits the next operation to Source 1.

Restoration of Source 1 Power Failure:

Immeditely after re-transfer, the S2 Stop Delay Timer (Delay to Engine Stop “U”) begins its cycle to allow Source 2 Engine to run unloaded. A manual pushbutton BYPASS is provided to bypass the “U” time delay if desired. Upon completion of the (U) timing cycle, the controller sends an Engine stop signal.

Delayed Transition

Source 1 Power Failure:

When the test is initiated, the controller initiates the Time Delay Source 2 Start (Engine Start Timer "P") cycle. A manual CANCEL button is provided to cancel the test if desired. Upon completion of the (P) time delay, an Engine Start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset "Restore" values, the time delay to open Source 1 timer (W) begins its timing cycle to ensure voltage and frequency stabilization before re-transfer. A manual pushbutton BYPASS is provided to bypass the "W" time delay if desired. After the (W) time delay, the MX controller initiates a transfer signal through the SCR-E to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SN limit switch awaits the next operation to Source 1.

Restoration of Source 1 Power:

Deactivating the test switch initiates re-transfer to Source 1 sequence. The delay to open Source 2 Timer (T) begins its timing cycle to ensure voltage and frequency stabilization before retransfer. A manual pushbutton BYPASS is provided to bypass the "T" time delay if desired. After the (T) time delay, the MX controller initiates a transfer signal through the SCR-N to operate the main transfer operator. The load is now transferred to Source 1 line. The transfer switch is mechanically locked. SE limit switch awaits the next operation to Source 2.

Restoration of Source 1 Power:

Deactivating the test switch initiates re-transfer to Source 1 sequence. The delay to open Source 2 Timer (T) begins its timing cycle to ensure voltage and frequency stabilization before retransfer. A manual pushbutton BYPASS is provided to bypass the "T" time delay if desired. After the (T) time delay, the MX controller initiates a transfer signal through the SCR-N to operate the main transfer operator. The load is now transferred to Source 1 line. The transfer switch is mechanically locked. SE limit switch awaits the next operation to Source 2.
Closed Transition

GE Zenith Closed Transition Transfer Switches are designed to Transfer the Load between two available sources with out interrupting power to the Load (Make-Before-Break). Paralleling of the two sources occurs within a predefined window of synchronization and lasts less than 100 milliseconds. The initial Source is then disconnected.

Initiating a Closed Transition
When a Test is initiated, the controller initiates the Time Delay Source 2 Start (Engine Start Timer "P") cycle. Upon completion of the (P) time delay, an Engine start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset "Restore" values, the time delay to open Source 1 timer (W) begins its timing cycle. After the (W) time delay, the ATS closes into Source 2 only after the controller ensures the proper phase relationship between the two Sources. After the ATS closes into Source 2, the SE limit switch becomes activated. The controller initiates a transfer signal through the SCR-NO which opens the ATS out of Source 1. The SNO limit switch activates. The ATS has now closed back into Source 2 position without interrupting the load.

Re-Transfer with Closed Transition
Deactivating the Test Switch initiates the re-transfer. When Source 1 voltage and frequency reach the preset "Restore" values, the time delay to open Source 2 timer (T) begins its timing cycle. After the (T) time delay, the ATS closes into Source 1 only after the controller ensures the proper phase relationship between the two Sources. After the ATS closes into Source 1, the SN limit switch becomes activated. The controller initiates a transfer signal through the SCR-EO which opens the ATS out of Source 2. The SEO limit switch activates. The ATS has now closed back into Source 1 position without interrupting the load.

The ATS defaults to an open transition transfer when Source 1 fails. Closed transition transfer is not possible with only one source available. If the optional Transition Mode Selector (TMS) is available, one can select an Open Transition Transfer or a Closed Transition Transfer when both Sources are available.

If while in Closed Transition Mode, the ATS fails to open the source it is attempting to "transfer out of" within 100 milliseconds, an Alarm will sound and the source that the ATS just closed into will be opened leaving the ATS in its initial source while disabling all other transfer operations until the problem is corrected and the "Fail to Open Lockout Reset" has been pressed.

A signal will be provided (STE) to Shunt Trip the Generator Circuit Breaker if the Transfer Switch remains closed into both Sources for more than 325 milliseconds. The load will then be fed by the Source 1. The maximum time that the two Sources would be parallel, under these conditions, is less than 500 milliseconds. Before operating the Closed Transition Transfer Switch, the condition must be corrected and the Shunt Trip reset. Refer to procedure for servicing the Switch after Shunt Tripping occurs.

The unit is Factory set to accomplish transfer within 5 electrical degrees.
Requires an Isochronous Governor with an operating frequency of 60 +/- 0.2 Hz.
Requires a Shunt Trip Breaker on the Generator set with a response time not exceeding 50 milliseconds.
Emergency Service Procedure for Extended Parallel Time

ZTSCT Transfer Switch

If Source 2 breaker shunt trip was triggered after an extended parallel time (malfunction) occurred. Follow these steps to open the transfer switch.

1) Disconnect all power sources from the transfer switch by opening all line breakers (Source 1 and Source 2).
2) Open the cabinet door and turn the disconnect switch to the INHIBIT position.
3) Remove the service access cover on the left hand side of the transfer switch.
4) The manual operator and the manual handle will now be exposed. Insert the handle into the Source 2 side operator. Open the Source 2 side contacts.
5) Close the cabinet door.
6) Energize Source 1 to supply the load until further repairs can be done.

ZBTSCT Transfer/Bypass Switch

a. Auto Location:

Removal of closed transition transfer switch after Source 2 breaker shunt trip.

1) Disconnect all power sources from bypass-isolation transfer switch.
2) Open the bottom cabinet door and turn the Disconnect Switch (DS) to the INHIBIT position.
3) Remove the service access cover on the left hand side of the transfer switch.
4) The manual operator and the manual handle will now be exposed. Insert the handle into the Source 2 side manual operator. Open the Source 2 side contacts.
5) Close bottom cabinet door.
6) Energize Source 1 power.
7) Close the bypass contacts (BN).*
8) Isolate the transfer switch.*
9) Remove the transfer switch from the bypass-isolation transfer switch as indicated on the bypass instruction label to inspect and repair.
10) Re-install the transfer switch after maintenance with contacts closed to the same source as the bypass switch. Reinstall the manual handle in its holder and the service access cover on the left side of the transfer switch.
11) Re-connect the transfer switch to AUTO.*

b. Auto Location:

Removal of the closed transition transfer switch if Source 1 and Source 2 contacts remain open.

1) Close the bypass switch into the available source.*
2) Turn the DS to INHIBIT. Remove the transfer switch service access cover. Close the transfer switch into the same source as the bypass switch. (Incorrect sequencing is prevented by the interlocks while the transfer switch is in AUTO only.)
3) Remove the transfer switch from the bypass-isolation transfer switch to inspect and repair.*

b. Test Location:

Removal of the closed transition transfer switch if both Source 1 and Source 2 contacts remain open.

1) Close the bypass switch contacts (BN) as indicated on the bypass instruction label on the cabinet door.
2) Disconnect all power sources from bypass-isolation closed transition transfer switch.
3) Open bottom cabinet door. Turn the Disconnect Switch (DS) to the INHIBIT position.
4) Remove the service access cover on the left side of the transfer switch.
5) The manual operator and the manual handle will not be exposed. Insert the handle into the Source 1 side and close the Source 1 contacts.
6) Close the bottom cabinet door.
7) Energize Source 1 power.
8) Remove the automatic transfer switch from the bypass-isolation transfer switch.*
9) Re-install the transfer switch after maintenance with contacts closed to the same source as the bypass switch. Reinstall the manual handle in its holder and the service access cover on the left side of the transfer switch.
10) Re-connect the transfer switch to AUTO.*

* As described in the Sequence of Operation section located in the ZTSCT/ZBTSCT Series Manual (71R-5000)
Sequence of Operation

**Standard Transition**

**Source 1 Power Failure:**
When Source 1 voltage or frequency has fallen below the preset "Fail" values, the controller initiates the Time Delay Source 2 Start Timer (Engine Start Timer "P") cycle. Upon completion of the (P) time delay, an Engine start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset "Restore" Values, the time delay to Source 2 Timer (W) begins its timing cycle to ensure voltage and frequency stabilization before transfer. A manual pushbutton BYPASS is provided to bypass the "W" time delay if desired. After the (W) time delay, the MX controller initiates a transfer signal through the SCR-E to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SN limit switch awaits the next operation to Source 1.

**Restoration of Source 1 Power:**
When Source 1 power reach the preset "Restore" values, the controller initiates re-transfer to Source 1 sequence. The delay to Source 1 Timer (T) begins its timing cycle to ensure voltage and frequency stabilization before retransfer. A manual pushbutton BYPASS is provided to bypass the "T" time delay if desired. After the (T) time delay, the MX controller initiates a transfer signal through the SCR-N to operate the main transfer operator. The load is now transferred to Source 1 line. The transfer switch is mechanically locked. SE limit switch awaits the next operation to Source 2.

Immediately after re-transfer, the S2 Stop Delay Timer (Delay to Engine Stop "U") begins its cycle to allow Source 2 Engine to run unloaded. A manual pushbutton BYPASS is provided to bypass the "U" time delay if desired. Upon completion of the (U) timing cycle, the controller sends an Engine stop signal.

**Delayed Transition**

**Source 1 Power Failure:**
When Source 1 voltage or frequency has fallen below the preset "Fail" values, the controller initiates the Time Delay Source 2 Start Timer (Engine Start Timer "P") cycle. Upon completion of the (P) time delay, an Engine start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset "Restore" values, the time delay to open Source 1 timer (W) begins its timing cycle to ensure voltage and frequency stabilization before retransfer. A manual pushbutton BYPASS is provided to bypass the "W" time delay if desired. After the (W) time delay, the MX controller initiates a transfer signal through the SCR-NO to operate the main transfer operator. The load is now transferred to the Open position. The time delay to Source 2 timer (DW) begins its timing cycle. After the (DW) time delay, the MX controller initiates a transfer signal through the SCR-E to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SN limit switch awaits the next operation to Source 1.

**Restoration of Source 1 Power:**
When Source 1 power reach the preset "Restore" values, the controller initiates re-transfer to Source 1 sequence. The delay to open Source 2 Timer (T) begins its timing cycle to ensure voltage and frequency stabilization before retransfer. A manual pushbutton BYPASS is provided to bypass the "T" time delay if desired. After the (T) time delay, the MX controller initiates a transfer signal through the SCR-EO to operate the main transfer operator. The load is now transferred to the Open position. The time delay to Source 1 timer (DT) begins its timing cycle. After the (DT) time delay, the MX controller initiates a transfer signal through the SCR-N to operate the main transfer operator. The load is now transferred to Source 1 line. The transfer switch is mechanically locked. SE limit switch awaits the next operation to Source 2.

Immediately after re-transfer, the S2 Stop Delay Timer (Delay to Engine Stop "U") begins its cycle to allow Source 2 Engine to run unloaded. A manual pushbutton BYPASS is provided to bypass the "U" time delay if desired. Upon completion of the (U) timing cycle, the controller sends an Engine stop signal.

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**Table 3**

<table>
<thead>
<tr>
<th>Timer Designations as they appear in the SET menu</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATS Type</strong></td>
</tr>
<tr>
<td><strong>Standard Transition</strong></td>
</tr>
<tr>
<td><strong>Delay/ Open Transition</strong></td>
</tr>
<tr>
<td><strong>Source 1 Fails</strong></td>
</tr>
</tbody>
</table>

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24 Entelli-Switch 250 Operation and Maintenance Manual (71R-2000A) GE Zenith Controls
Closed Transition

GE Zenith Closed Transition Transfer Switches are designed to Transfer the Load between two available sources with out interrupting power to the Load (Make-Before-Break). Paralleling of the two sources occurs within a predefined window of synchronization and lasts less than 100 milliseconds. The initial Source is then disconnected.

Initiating a Closed Transition
When a Test is initiated, the controller initiates the Time Delay Source 2 Start (Engine Start Timer "P") cycle. Upon completion of the (P) time delay, an Engine start Signal is sent to Source 2. When Source 2 voltage and frequency reach the preset “Restore” values, the time delay to open Source 1 timer (W) begins its timing cycle. After the (W) time delay, the ATS closes into Source 2 only after the controller ensures the proper phase relationship between the two Sources. After the ATS closes into Source 2, the SE limit switch becomes activated. The controller initiates a transfer signal through the SCR-NO which opens the ATS out of Source 1. The SNO limit switch activates. The ATS has now closed into Source 2 position without interrupting the load.

Re-Transfer with Closed Transition
Deactivating the Test Switch initiates the re-transfer. When Source 1 voltage and frequency reach the preset "Restore" values, the time delay to open Source 2 timer (T) begins its timing cycle. After the (T) time delay, the ATS closes into Source 1 only after the controller ensures the proper phase relationship between the two Sources. After the ATS closes into Source1, the SN limit switch becomes activated. The controller initiates a transfer signal through the SCR-EO which opens the ATS out of Source 2. The SEO limit switch activates. The ATS has now closed back into Source 1 position without interrupting the load.

The ATS defaults to an open transition transfer when Source 1 fails. Closed transition transfer is not possible with only one source available. If the optional Transition Mode Selector (TMS) is available, one can select an Open Transition Transfer or a Closed Transition Transfer when both Sources are available.

If while in Closed Transition Mode, the ATS fails to open the source it is attempting to "transfer out of" within 100 milliseconds, an Alarm will sound and the source that the ATS just closed into will be opened leaving the ATS in its initial source while disabling all other transfer operations until the problem is corrected and the "Fail to Open Lockout Reset" has been pressed.

A signal will be provided (STE) to Shunt Trip the Generator Circuit Breaker if the Transfer Switch remains closed into both Sources for more than 325 milliseconds. The load will then be fed by the Source 1. The maximum time that the two Sources would be parallel, under these conditions, is less than 500 milliseconds. Before operating the Closed Transition Transfer Switch, the condition must be corrected and the Shunt Trip reset. Refer to procedure for servicing the Switch after Shunt Tripping occurs.

The unit is Factory set to accomplish transfer within 5 electrical degrees.
Requires an Isochronous Governor with an operating frequency of 60 +/- 0.2 Hz.
Requires a Shunt Trip Breaker on the Generator set with a response time not exceeding 50 milliseconds.
Standard and Delay Transition

Each MX250 microprocessor based ATS controller requires a Controls Power Supply (CPS) to apply line voltage to the ATS operator via SCRs. Also required is power for the MX250 printed circuit board and an application of sensing voltage proportional to line voltage. This is accomplished by the Controls Power Supply (CPS). This method of switching operator voltage and applying power and sensing voltage to the printed circuit board isolates the MX250 from the line voltage, further protecting the controller from harmful line transients.

### Controls Power Supply (CPS)

<table>
<thead>
<tr>
<th>Primary Voltage at 50/60 Hz</th>
<th>CPS Assembly Part No.</th>
<th>CPS Board No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>120V</td>
<td>50P-1224</td>
<td>50P-1200</td>
</tr>
<tr>
<td>208-220V</td>
<td>50P-1225</td>
<td>50P-1201</td>
</tr>
<tr>
<td>230-240V</td>
<td>50P-1226</td>
<td>50P-1202</td>
</tr>
<tr>
<td>277V</td>
<td>50P-1227</td>
<td>50P-1203</td>
</tr>
<tr>
<td>380-400V</td>
<td>50P-1228</td>
<td>50P-1204</td>
</tr>
<tr>
<td>416-440V</td>
<td>50P-1229</td>
<td>50P-1205</td>
</tr>
<tr>
<td>460-480V</td>
<td>50P-1230</td>
<td>50P-1206</td>
</tr>
<tr>
<td>575-600V</td>
<td>50P-1231</td>
<td>50P-1207</td>
</tr>
</tbody>
</table>
Controls Power Supply (CPS)  (cont’d)

Standard Transition CPS Schematic

Delayed Transition CPS Schematic
### Troubleshooting and Diagnostics

#### General Troubleshooting

The following troubleshooting guide is used to recognize, and determine basic faults. When using this guide, it will ask several questions about the condition of the switch. This guide will then list an order of the possible faults. You will then look at the first suspected fault to determine if it is the problem. If it is not a fault, you go to the second suspected fault. If you go through all of the suspected faults, or the chart instructs you to, call a GE Zenith Representative for further assistance.

**NOTE:** When you use the troubleshooting charts, the Annunciation column refers to the LED’s on the control panel.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Annunciation</th>
<th>Possible Cause(s)</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine does not start</td>
<td>SOURCE 2 AVAILABLE LED off</td>
<td>Engine start wires not terminated properly</td>
<td>Check engine start connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generator is in OFF position</td>
<td>Investigate why Engine Control Switch was turned off</td>
</tr>
<tr>
<td>Engine does not stop</td>
<td>LCD Display - &quot;TD Engine Cool Down&quot;</td>
<td>U timing cycle not complete</td>
<td>Check U timer setting</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOURCE 1 POSITION, and SOURCE 1 and SOURCE 2 AVAILABLE LEDs on, but U timer has timed out</td>
<td>Check Engine Start Connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine start wires not terminated correctly</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Generator in MANUAL</td>
<td>Place generator in AUTO</td>
</tr>
<tr>
<td>ATS will not transfer to SOURCE 2</td>
<td>SOURCE 2 AVAILABLE LED off</td>
<td>SOURCE 2 voltage or frequency not within acceptable parameters</td>
<td>Check: Engine Start Connections, Generator Breaker, Generator Output, and Engine Control Switch</td>
</tr>
<tr>
<td>ZTS Series</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Power supply connector unplugged</td>
<td>Plug in connector</td>
</tr>
<tr>
<td></td>
<td>LCD Display - &quot;S1 _ _ _ _ TD XFR S1&gt;S2 Time Remaining _ _ _ _&quot;</td>
<td>W timing cycle not complete</td>
<td>Check W Timer setting</td>
</tr>
<tr>
<td>ATS will not transfer to SOURCE 1</td>
<td>LCD Display - &quot;ATS Open Time Remaining _ _ _ _&quot;</td>
<td>DW timing cycle not complete</td>
<td>Check DW Timer setting</td>
</tr>
<tr>
<td>ZTSD Series</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SOURCE 1 AVAILABLE LED off</td>
<td>SOURCE 1 voltage or frequency not within acceptable parameters</td>
<td>Check utility and utility breakers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Power supply connector unplugged</td>
<td>Plug in connector</td>
</tr>
<tr>
<td></td>
<td>LCD Display - &quot;Diagnostic Code 001&quot;</td>
<td>Limit switch or RT box connector unplugged</td>
<td>Call Technical Services</td>
</tr>
<tr>
<td></td>
<td>LCD Display - &quot;S1 OK Time Remaining _ _ _ _ Bypass&quot;</td>
<td>T timing cycle not complete</td>
<td>Check T Timer setting</td>
</tr>
<tr>
<td></td>
<td>LCD Display - &quot;ATS Open Time Remaining _ _ _ _&quot;</td>
<td>TD timing cycle not complete</td>
<td>Check DT Timer setting</td>
</tr>
</tbody>
</table>

Table 4
Maintenance and Testing

**CAUTION**

Due to hazardous voltage and current, GE Zenith recommends that a GE Zenith Certified technician or a qualified electrician must perform the installation and maintenance of the switch.

**WARNING**

Both power sources must be disconnected before manual operation of the switch.

A preventive maintenance program will insure high reliability and long life for the transfer switch. The preventive maintenance program for the transfer switch should include the following items:

### Inspection and Cleaning

The switch should be inspected for any accumulation of dust, dirt, or moisture, and should be cleaned by vacuuming or wiping with a dry cloth or soft brush. Do not use a blower since debris may become lodged in the electrical and mechanical components and cause damage.

Remove the transfer switch barriers and check the condition of the contacts. Any surface deposits must be removed with a clean cloth (do not use emery cloth or a file). If the contacts are pitted or worn excessively, they should be replaced. A general inspection of mechanical integrity should be made to include loose, broken or badly worn parts.

### Servicing

All worn or inoperative parts must be replaced using GE Zenith recommended replacement parts. Please refer to the Replacement Parts manual for specific part information and ordering procedures. Please contact the GE Zenith Technical Services Department for the Replacement Parts manual.

The operating mechanism of the transfer switch is lubricated with Lubriplate 105. The lubricant applied at the factory provides adequate lubrication for the lifetime of the switch. Should debris contaminate the mechanism, clean and apply additional Lubriplate.

GE Zenith can provide complete preventative maintenance services. Please contact the GE Zenith Technical Services Department for additional information.

CDT battery replacement - lithium batteries may last up to 10 years, however it is recommended that battery replacement be included in a 3-5 year service cycle. The battery maintains the exerciser memory only and does not otherwise affect the operation.

### Testing

A manual operator handle is provided with the transfer switch for maintenance purposes only. Manual operation of the switch must be checked before it is operated electrically. **Both power sources must be disconnected before manual operation of the switch.** Insert the handle and operate the transfer switch between the Source 1 and Source 2 positions. The transfer switch should operate smoothly without binding. Return the switch to Source 1 position, remove the handle, and return it to the holder provided.

After completing the inspection, cleaning and servicing of the transfer switch, reinstall the switch cover, and close and lock the cabinet door. Reclose the circuit breakers feeding the utility and generator sources to the switch.

Initiate the electrical transfer test by activating the TS test switch. P timer will time out and the microcontroller will send an engine start signal. When the W time has elapsed, the switch will complete its transfer by closing into Source 2.

Deactivating the test switch will start retransfer to Source 1. The switch will complete its retransfer to Source 1 after the time delay of the T timer. The U engine overrun timer allows the engine generator to run unloaded for a preset cool down period.

**NOTE:** A periodic test of the transfer switch under load conditions is recommended to insure proper operation. (See National Electric Code articles 700 and 701).

**WARNING**

When performing a hi-pot or dielectric test on the power section, **DISCONNECT** the control panel plugs from the microprocessor to avoid potential damage.