Zenith ZT30 and ZB30
Short-time rated ATS and Bypass Isolation ATS
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Section 1: General Information

Hazard Categories

The following important highlighted information appears throughout this document to warn of potential hazards or to call attention to information that clarifies a procedure.

Carefully read all instructions and become familiar with the devices before trying to install, operate, service or maintain this equipment.

DANGER
Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION
Failure to comply with these instructions may result in product damage.

NOTICE
Indicates important information that must be remembered and aids in job performance.

Warranty

This document is based on information available at the time of its publication. While efforts have been made to ensure accuracy, the information contained herein does not cover all details or variations in hardware and software, nor does it provide for every possible contingency in connection with installation, operation, and maintenance. Features may be described herein that are not present in all hardware and software systems.

ABB Zenith Controls assumes no obligation of notice to holders of this document with respect to changes subsequently made. ABB Zenith Controls makes no representation or warranty, expressed, implied, or statutory, with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purpose shall apply.

Contact your local sales office if further information is required concerning any aspect of the Automatic Transfer Switch operation or maintenance.

Warranty Period:

The Warranty Period for ZTE, ZTS, ZTG, and ZT30 Series transfer switch Products is twenty-four (24) months from the date of shipment.

Notes: This warranty is valid only in the United States and for products sold and installed within seller-specified countries.

Replacement parts are warranted for a period of ninety (90) days when installed by an authorized seller factory or authorized seller service station.
Section 2: Product Specification

Quality Assurance
All ABB Zenith Automatic Transfer Switches (Standalone and Bypass Isolation) have been designed and manufactured to the highest technical standards. Strict procedures ensure first class product quality.

Product Serial Number
Please have the serial number available when communicating about the Automatic Transfer Switch. Each Automatic Transfer Switch has a unique serial number located on the fascia (Refer to Figure S4-2).

Measurement Units
All components are specified in Metric [inch] units unless specified otherwise.

Product Rating
For UL 1008 withstand and close on short circuit rating refer to ABB Publication Number TB1102.

Product Ratings will be available on the Rating Label applied on the Product.

Production Description
ABB Zenith Automatic Transfer Switch is suitable for application on power systems up to 600 VAC 50/60 Hz systems.

Storage
Do not store Automatic Transfer Switch in corrosive environments above LC1 (sea salt mist) and G1 as per ANSI/ISA-S71.04-1985. Failure to comply with these instructions may result in product damage. Store Automatic Transfer Switch and related accessories in a clean, dry location in their original packaging.

Notice:
Final inspection of the equipment should be performed prior to energizing the automatic transfer switch as below.

1. Remove any dirt or debris that may have collected during shipment or installation. NEVER use high pressure blowing air. This could drive dirt or other foreign objects into electrical or mechanical components which could cause damage. Use an industrial quality vacuum cleaner to remove any dirt or foreign objects.
2. Be certain all cable connections are correct and that the phase rotation of both sources match.
3. Inspect the engine start connections and verify the correct connection of all control wires.
4. Check all programmable setpoints and adjust as necessary. In addition, adjust any optional accessories as required.
5. Be certain that the actual lug torque values are in keeping with the requirements outlined in the instruction book to insure the integrity of power connections.
6. Check to be sure that all covers and barriers are properly installed and fastened.
7. If any damage is found or suspected, file a claim as soon as possible with the carrier & notify the nearest ABB Zenith representative or call 1-800-637-1738 option 3.
Unpacking the ATS

The safe operation of your switch at all times is ABB Zenith focus. It must be recognized that hazardous voltages and currents can exist during normal operation and any maintenance on the transfer switch must be performed utilizing appropriate safety measures. Installation, adjustment, maintenance or removal of the switch must only be carried out by qualified personnel with all power to the switch turned off. It is recommended that only Qualified electricians are allowed to install or provide maintenance on the switch.

Prior to installation store the transfer switch in a clean dry location, protected from dirt & water. Provide ample air circulation & heat if necessary to prevent condensation. See table T2-1 for recommended storage & ambient operating temperatures.

ABB Zenith Automatic transfer switches are packaged as per the standard packaging regulatory standards requirement suitable for domestic and international shipment through all modes of transportation (Air, Sea & Road). Once you unpack the units please make sure that all the components are received as per the BOM. For any missing items contact your local ABB Zenith service representative.

Turn OFF all power before installation, adjustment or removal of transfer switch or any of its components.
Due to hazardous voltages and currents, ABB recommends that an ABB Certified technician or a qualified electrician perform the installation & maintenance of the switch.

**WARNING**

Before drilling conduit entry holes or any accessory mounting holes, cover and protect the switch and control panel to prevent dirt and metal fragments from entering the mechanical and electrical components of the switch. Failure to do so may result in damage and malfunction of the switch and void the warranty.

**CAUTION**

Lifting Guidelines for Enclosed ATS/Bypass Isolation ATS

1. ABB Zenith ATS are mounted onto a wooden pallet using the bolts & nuts. Please remove the bolts & nuts prior to lifting.
2. ABB Zenith ATS enclosures have the provisions for lifting through the standard overhead lifting devices.
3. Position the lifting device across the top of the enclosure. Engage the lifting hooks and adjust lifting positions such that the hooks are out.
4. Refer to the dimensional drawing for the center of gravity (denoted as CG), weight information & lifting provision to select the properly rated lifting devices.
5. While lifting the units through the lifting chains it is recommended to maintain 30 degree angle as shown in figure S3-2.
6. Refer figure S3-1 for lifting provisions on the enclosure top.
7. ABB Zenith ATS & Isolation Bypass units should be lifted using properly rated lifting devices.

Lifting Guidelines for Open Style ATS/ Bypass Isolation ATS

1. ABB Zenith Open style ATS/Isolation Bypass units are mounted onto a wooden pallet using required brackets.
2. Electrical Panel & Auxiliary Panels are mounted using separate brackets on to the wooden pallet.
3. Controller & other electronic components are mounted inside a separate cardboard box on the wooden pallet.
4. ABB Zenith ATS enclosures have the provisions for lifting through the standard overhead lifting devices.
5. Position the lifting device across the top of the units as shown in figure S3-1. Engage the lifting hooks and adjust lifting positions such that the hooks are out.
6. Refer the dimensional drawing for the CG, weight information & lifting provision to select the properly rated lifting devices.
7. While lifting the units through the lifting chains it is recommended to maintain min 30 degree angle as shown in figure S3-2.
8. ABB Zenith ATS & Isolation Bypass units should be lifted using properly rated lifting devices.

---

Figure S3-1: ATS enclosed assembly

Figure S3-2: Lifting angle

Figure S3-3: Isolation ATS assembly
ATS & Bypass Isolation

ATS Mounting:

1. Anchoring provisions are provided on all the ABB Zenith ATS & Bypass Isolation enclosures.

2. For open style ATS & Bypass Isolation ATS mounting please refer to the dimensional drawings shipped available on ABB Critical Power Website http://www.geindustrial.com/products/critical-power.

3. For open style units we recommend the door cut out pattern & other electrical controls mounting as shown in the dimensional drawings. For any questions please contact your local ABB Zenith Service Representative.
Basic Tools Needed for Installation and Maintenance

Table T3-1 provides a list of hand tools required to perform common installation, operation and maintenance of the ZT30 Automatic Transfer Switch.

<table>
<thead>
<tr>
<th>TOOL NAME</th>
<th>TASK(S)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17mm wrench or socket</td>
<td>Mechanical or compression lug installation</td>
</tr>
<tr>
<td>1/2” socket</td>
<td>Power cable connection</td>
</tr>
<tr>
<td>4mm and 5mm hex</td>
<td>Inspection of contacts - Removal of top/bottom cover</td>
</tr>
<tr>
<td>Phillips screwdriver</td>
<td>Removal and installation of Fascia</td>
</tr>
<tr>
<td></td>
<td>Inspection of ATS limit switches</td>
</tr>
<tr>
<td></td>
<td>Current transformers adjustments</td>
</tr>
<tr>
<td></td>
<td>Customer I/O adjustment</td>
</tr>
<tr>
<td>19mm wrench or socket</td>
<td>Mounting of Standalone ATS into enclosure</td>
</tr>
</tbody>
</table>

Table T3-1: Required hand tools for common installation and maintenance tasks

Torque values:
1) Power cable connectors: Refer to ATS Fascia (Front Cover)
2) All other components: Consult factory

Power Cable Connection

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>PART NUMBER</th>
<th>WIRE RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000A-2000A</td>
<td>2600A-3000A</td>
</tr>
<tr>
<td>Mechanical lug</td>
<td>S-3060</td>
<td>#2 – 750 kcmil</td>
</tr>
<tr>
<td>Compression lug</td>
<td>PS-8419</td>
<td>500 kcmil</td>
</tr>
<tr>
<td>Compression lug</td>
<td>PS-8467</td>
<td>600 kcmil</td>
</tr>
<tr>
<td>Compression lug</td>
<td>PS-8420</td>
<td>750 kcmil</td>
</tr>
</tbody>
</table>

Table T3-2: Listing of mechanical and compression lug

<table>
<thead>
<tr>
<th>AMPERAGE</th>
<th>DRAWING NUMBER</th>
<th>2600A-3000A</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1000A-2000A</td>
<td></td>
</tr>
<tr>
<td>Mechanical lug</td>
<td>O-4106</td>
<td></td>
</tr>
<tr>
<td>Compression lug</td>
<td>O-4107</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2600A-3000A</td>
<td></td>
</tr>
<tr>
<td>Mechanical lug</td>
<td>O-4106</td>
<td></td>
</tr>
<tr>
<td>Compression lug</td>
<td>O-4107</td>
<td></td>
</tr>
</tbody>
</table>

Table T3-3: Listing of lug configuration drawing for both mechanical and compression lug offering
Power Cable Access Location

Power cables can be accessed from the rear or side by removing panel screws carefully. While installing the units keep adequate space in the sides & rear of the unit for ease of accessing the power cables. It is recommended not to stand on any of the components while accessing the power cables.

Section 4: Standalone ATS Product Operation

Standalone ATS Product consists of Power Panel with factory fitted harness, electrical panel as a control circuit for the controller, controller & enclosures. Refer the electrical schematic diagram provided for the electrical connections. Follow all the warning & caution instructions before energizing the unit. Operate the switch manually before making the electrical connections.
Mechanical and electrical interlocking, as defined by the transition type, is provided to ensure a safety condition against paralleling of sources.
Standalone ATS Operation

DANGER

Hazardous Voltage Can Cause Severe Injury Or Death

Manual close contact operations ONLY when opposite source contacts are open. Failure to comply with these instructions will result in death or serious injury.

WARNING

Improper Installation Operation and Maintenance

Ensure only qualified personnel install, operate, service and maintain all electrical equipment. DISCONNECT all power sources prior to installation, operation, service and maintenance of all electrical equipment. These activities shall be performed only by certified GE Zenith technicians or qualified electricians. Only use the Charging Handle to perform manual operations of the Transfer Switch. No motorized device shall be used as a substitute. Failure to comply with these instructions could result in death or serious injury.

Stored Energy Mechanism Key Features

Each charging action provides sufficient energy for one Contact Close operation. Charging is not required for Contact Open operations.

Sequence of Operations - Manual Mode

In the event the ATS had to be operated manually, please follow these steps:

1. Prior to manually operate the ATS, turn Control Switch to Inhibit. Refer to figure S4-1 for location of Control Switch.
2. Open the ATS Access Panel on the front door.
3. Via the Access Panel, determine contact position status of the ATS. “Open” denotes contacts are in an open state. “Closed” denotes contacts are in the closed state. Refer to table T4-1 for all possible combination of status indication.
4. A “Ready” status will indicate that the mechanism spring is charged and that the mechanism could perform transfer to a particular power source. For instance, S1 “Ready” indicates that the S1 mechanism spring is fully charged. Refer to table T4-1 for all possible combination of status indication.
5. A status will indicate that the ATS is not ready to perform transfer to a particular power source, due to mechanism spring not fully charged.
6. To open a closed contact, press the Open Button at the middle of the ATS. Note that upon pressing the Open Button, both S1 and S2 contacts will open.
7. To manually charge the mechanism spring, insert the Charging Handle into the manual charge access point of the power source to which the ATS needs to close onto. Refer to figure S4-3 for location of the respective charge access points.
8. With the Charging Handle inserted into the appropriate access point, perform a clockwise rotation to initiate charging sequence.
9. Keep rotating the Charging Handle until the closing spring is fully charged. At this point, the handle will not be able to rotate further. Refer to table T4-3 for approximate number of rotations needed to completely charge the spring.
10. Once the ATS indicates a “Ready” status, press the Close Button to transfer the ATS to the intended power source.

CAUTION: Completion of the mechanism spring charge operation will produce an audible click. Further clockwise rotation of the Charging Handle could damage the equipment.
Sequence of Operations –
Automatic Mode

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 Relay Driver Module (item E on figure S4-9) to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SN limit switch waits for 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 Relay Driver Module 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 Relay Driver Module 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 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 Relay Driver Module 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 Relay Driver Module 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 Relay Driver Module 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 Relay Driver Module 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.

Figure S4-9: Electrical Panel
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 S4-10).

- **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 Relay Driver Module to operate the main transfer operator. The load is now transferred to Source 2 line. The transfer switch is mechanically locked. SE 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 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 Relay Driver Module 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.
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 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 Relay Driver Module 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 Relay Driver Module 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 Relay Driver Module 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 Relay Driver Module 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.

Timer Designations as they appear in the SET menu

<table>
<thead>
<tr>
<th>ATS TYPE</th>
<th>P</th>
<th>W</th>
<th>DW</th>
<th>T</th>
<th>DT</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Transition</td>
<td>Time Delay S2 Start</td>
<td>Time Delay S2 Stable</td>
<td>Time Delay S1 Stable</td>
<td>Time Delay to S1</td>
<td>Engine Cooldown</td>
<td></td>
</tr>
<tr>
<td>Delayed Transition</td>
<td>Time Delay S2 Start</td>
<td>Time Delay S2 Stable</td>
<td>Time Delay to S2</td>
<td>Time Delay S1 Stable</td>
<td>S2 Stop Delay</td>
<td></td>
</tr>
<tr>
<td>Source 1 Fails</td>
<td>Transfer to Source 2</td>
<td>Source 1 Returns</td>
<td>Transfer to Source 1</td>
<td>Engine Cooldown</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Closed Transition

**DANGER**

**Hazardous Volatile Can Cause Severe Injury Or Death**

Manual close contact operations ONLY when opposite source contacts are open.

Failure to comply with these instructions will result in death or serious injury.

**WARNING**

**Improper Installation Operation and Maintenance**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

DISCONNECT all power sources prior to installation, operation, service and maintenance of all electrical equipment. These activities shall be performed only by certified GE Zenith technicians or qualified electricians.

DO NOT ATTEMPT TO PERFORM MANUAL OPERATIONS OF AUTOMATIC TRANSFER SWITCH IN CLOSED TRANSITION MODE.

Only use the Charging Handle to perform manual operations of the Transfer Switch. No motorized device shall be used as a substitute.

Failure to comply with these instructions could result in death or serious injury.

ABB Zenith Closed Transition Transfer Switches are designed to Transfer the Load between two available sources without 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.

Retransfer 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 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 10 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.

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 Relay Driver Module 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.
Position Indication for Automatic Transfer Switch - Standalone ATS and Isolation ATS

<table>
<thead>
<tr>
<th>READY STATUS INDICATOR</th>
<th>CONTACT POSITION INDICATOR</th>
<th>DESCRIPTION</th>
<th>PERMISSIBLE OPERATION*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&quot;CLOSED&quot;</td>
<td>Contact set is closed, connecting load to source</td>
<td>User may manually open the contact set by pushing the Open Button</td>
</tr>
<tr>
<td></td>
<td>&quot;OPEN&quot;</td>
<td>Opposite source contacts are closed or mechanism spring is not charged Contact set is open</td>
<td>If opposite source contacts are open the user may manually charge the mechanism spring by inserting Charging Handle into Manual Charge access point and rotating clockwise</td>
</tr>
<tr>
<td>&quot;READY&quot;</td>
<td>&quot;OPEN&quot;</td>
<td>Mechanism is charged Contact set is open</td>
<td>User may manually close the contact set by pushing the Source Close Button</td>
</tr>
</tbody>
</table>

Table T4-1: Position Indication Description for Standalone ATS & Isolation ATS

*Permissible operations are given for illustrative purposes only. Never attempt to manually close contacts with opposite source contacts closed

Position Indication for Automatic Transfer Switch - Bypass ATS

<table>
<thead>
<tr>
<th>CHARGE STATUS LED</th>
<th>CONTACT POSITION INDICATOR</th>
<th>DESCRIPTION</th>
<th>PERMISSIBLE OPERATION*</th>
</tr>
</thead>
<tbody>
<tr>
<td>On</td>
<td>&quot;CLOSED&quot;</td>
<td>Mechanism closing spring is charged Contact set is closed, connecting load to source</td>
<td>User may manually open the contact set by pushing the Bypass Open Button</td>
</tr>
<tr>
<td>On</td>
<td>&quot;OPEN&quot;</td>
<td>Mechanism closing spring is discharged Contact set is open</td>
<td>User may manually close the contact set by pushing the Bypass Source Close Button</td>
</tr>
<tr>
<td>Off</td>
<td>&quot;CLOSED&quot;</td>
<td>Mechanism closing spring is not charged Contact set is closed, connecting load to source</td>
<td>User may manually charge the mechanism closing spring by inserting Charging Handle into Bypass Manual Charge access point and rotating clockwise User may manually open the contact set</td>
</tr>
<tr>
<td>Off</td>
<td>&quot;OPEN&quot;</td>
<td>Mechanism closing spring is not charged Contact set is open</td>
<td>User may manually charge the mechanism closing spring by inserting Charging Handle into Bypass Manual Charge access point and rotating clockwise</td>
</tr>
</tbody>
</table>

Table T4-2: Position Indication Description for Standalone ATS & Isolation ATS

*Permissible operations are given for illustrative purposes only. Never attempt to manually close contacts with opposite source contacts closed

<table>
<thead>
<tr>
<th>OPERATIONS</th>
<th>NUMBER OF CRANKS REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main spring charge</td>
<td>Approx. 13</td>
</tr>
</tbody>
</table>

Table T4-3: Stored Energy Mechanism Sequences of Operation
Section 5: Bypass Isolation ATS Product Operation

Bypass Isolation ATS Product consists of Isolation Panel & Bypass Panel mounted inside the frame assembly with factory fitted harness. It also consists of an electrical panel, controller & enclosure. Refer the electrical schematic diagram provided for the electrical connections. Follow all the warning & caution instructions before energizing the unit. Operate the switch manually before making the electrical connections.

Figure S5-1: Front view of Bypass Isolation ATS in an enclosure (MX350 controller shown).
Access Panel for the Bypass Isolation ATS is located in the left side the frame assembly as shown in S5-1. Make sure to follow all warning and caution notes before accessing the buttons on access Panel. Access Panel consist of status indication for the contacts, mechanism for both Source 1 & Source 2 & racking position indication for Isolation Panel.

Figure S5-2: View of Bypass Access Panel with various indicators and push buttons.
Bypass Isolation ATS Product: Switch Bank & Test Plugs

ATS and Bypass Isolation ATS Product: Charging Handle

Charging handle will be used to charge the mechanisms manually. Do not use any other device to charge the mechanism manually. Charging handles are mounted in the left side of the enclosures as shown in figure S5-5. Take out the handle carefully and insert in the manual. Charge access points shown in figure S4-3 for ATS & S5-2 for Bypass. Use the same handle as the pushing device to operate the opening and closing buttons. In Bypass Isolation ATS same charging handle needs to use for racking the Isolation ATS.
Bypass Isolation Operation

**WARNING**

**Improper Installation**
Operation and Maintenance

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.

DISCONNECT all power sources prior to installation, operation, service and maintenance of all electrical equipment. These activities shall be performed only by certified GE Zenith technicians or qualified electricians.

Only use the Charging Handle to perform manual operations of the Transfer Switch. No motorized device shall be used as a substitute.

**Failure to comply with these instructions could result in death or serious injury.**

Sequence of Operations - Manual Mode - Isolation ATS

Manual operation of the Isolation ATS is only possible with the front door opened. In the event the Isolation ATS has to be operated manually in the AUTO position, please follow these steps:

1. Verify that both S1 and S2 contact of the Bypass ATS is in the Open position. This can be done by opening the Bypass access panel (refer to figure S5-1). “Open” denotes contacts are in an open state. “Closed” denotes contacts are in the closed state.

2. If either S1 or S2 contacts are closed, depress the Open Button at the middle of the Bypass Access Panel (refer to figure S5-2 for location of the Bypass Access Panel).

3. Prior to manually operating the ATS, turn Control Switch to Inhibit. Refer to figure S5-1 for location of Control Switch.

4. Open enclosure front door. This will allow access to the Isolation ATS.

5. Determine contact position status of the ATS. “Open” denotes contacts are in an open state. “Closed” denotes contacts are in the closed state. Refer to table T4-1 for all possible combination of status indication.

6. A “Ready” status will indicate that the mechanism spring is charged and that the mechanism could perform transfer to a particular power source. For instance, S1 “Ready” indicates that the S1 mechanism spring is charged. Refer to table T4-1 for all possible combination of status indication.

7. A status will indicate that the Isolation ATS is not ready to perform transfer to a particular power source, due to mechanism spring not charged.

8. To open a closed contact, depressed the Open Button at the middle of the Isolation ATS.

9. To manually charge the closing spring, the Charging Handle needs to be inserted into the manual charge access point of the power source to which the Isolation ATS needs to close onto.

10. With the handle inserted into the appropriate access point, perform a clockwise rotation to initiate charging sequence.

11. Keep rotating the Charging Handle until the closing spring is fully charged. At this point, the handle will not be able to be rotated further. Refer to table T4-3 for approximate number of rotations needed to completely charge the spring.

12. Once the Isolation ATS indicates a “Ready” status, depress the Close Button to transfer the ATS to the intended power source.

Sequence of Operations - Manual Mode - Bypass ATS

An automatic transfer switch equipped with a bypass-isolation switch provides the ability to withdraw the Isolation ATS for testing and/or maintenance purposes without interrupting the served load. Operations of the unit are quick and convenient requiring only one operator to complete. Instructions are mounted on the front of each isolation switch door along with a mimic panel providing indication of power source availability and Isolation ATS/Bypass switch positions.

The Bypass ATS is normally open on both sources with the Isolation ATS feeding the system load. During operation, the Bypass switch is closed paralleling the Isolation ATS contacts which then allows withdrawal of the Isolation ATS to the "TEST" or "ISOLATE" positions. Mechanical and electrical interlocks are included to prevent cross-servicing or bypassing to a dead source. In the "TEST" position, the Isolation ATS is disconnected from the load (now fed through the bypass) but control power is present to allow complete operational testing through the control panel of the Isolation ATS. In the "ISOLATE" position, the Isolation ATS is completely withdrawn and may be removed from the enclosure for maintenance if desired. Control power is NOT available in this position. The Isolation ATS will NOT be operational electrically.
Sequence of Operations - Manual Mode - Bypass ATS (Cont.)

After the isolation operation, if the Bypass ATS is closed on Source 1 and if this source fails, an auxiliary contact on the bypass control will automatically start the engine-generator set.

When the second source is available, the Bypass ATS may be operated to transfer the load to the available source. Interlocks prevent this transfer, if the Isolation ATS is in the AUTO position and still connected to Source 1.

In the event the Bypass ATS has to be operated manually with the Isolation ATS in the ISOLATE or TEST position, please follow these steps:

1. Verify that the Isolation ATS is in either the Isolate or Test position. This can be performed by observing the Status Annunciation Lights (refer to figure S5-1 for location).
2. When ready to operate the Bypass ATS, open the Bypass Access Panel (refer to figure S5-1 for location of the Bypass Access Panel).
3. An illuminated Status LED (green) will indicate that the mechanism spring is charged and that the mechanism could perform transfer to a particular power source. Refer to table T4-2 for all possible combination of status indication.
4. A Status LED (green) that is not illuminated will indicate that the Bypass ATS is not ready to perform transfer to a particular power source, due to mechanism spring not charged.
5. To open a closed contact, depressed the Open Button at the middle of the Bypass ATS.
6. To manually charge the closing spring, the Charging Handle needs to be inserted into the manual charge access point of the power source to which the Bypass ATS needs to close onto.
7. With the handle inserted into the appropriate access point, perform a clockwise rotation to initiate charging sequence.
8. Keep rotating the Charging Handle until the closing spring is fully charged. At this point, the handle will not be able to be rotated further. Refer to table T4-3 for approximate number of rotations needed to completely charge the spring.
9. Once the Bypass ATS Status LED (green) is illuminated, depress the Close Button to transfer the Bypass ATS to the intended power source.
10. Closure of contacts into the intended power source is indicated by the Position Indicator which will read “ON”.

Sequence of Operations - Racking Operation

1. Verify that the Bypass ATS contacts are open and the Isolation ATS is supplying load.
2. Turn Control Switch to the Inhibit position.
3. Open Bypass Access Control Panel.
4. Position status for both S1 and S2 Bypass ATS contacts should read Open.
5. Determine which contact set of the Bypass ATS needs to be closed. The Bypass ATS needs to close into the same source as that of the Isolation ATS’s.
6. An illuminated Status LED (green) will indicate that the mechanism spring is charged and that the mechanism could perform transfer to a particular power source. Refer to table T4-2 for all possible combination of status indication.
7. A Status LED (green) that is not illuminated will indicate that the Bypass ATS is not ready to perform transfer to a particular power source, due to mechanism spring not charged.
8. To manually charge the closing spring, the Charging Handle needs to be inserted into the manual charge access point of the power source to which the Bypass ATS needs to close onto.
9. With the handle inserted into the appropriate access point, perform a clockwise rotation to initiate charging sequence.
10. Keep rotating the Charging Handle until the closing spring is fully charged. At this point, the handle will not be able to be rotated further. Refer to table T4-3 for approximate number of rotations needed to completely charge the spring.
11. Once the Bypass ATS Status LED (green) is illuminated, depress the Close Button to transfer the Bypass ATS to the intended power source.
12. To rack out Isolation ATS to the TEST position, insert the Charging Handle into the Rack Insertion Hole (refer to figure S5-2 for location).
13. Rotate the Charging Handle counter-clockwise until the “TEST” Status Annunciation Light is illuminated.
14. To rack out to the ISOLATE position, continue to rotate the Charging Handle counter-clockwise until the “ISOLATE” Status Annunciation Light is illuminated.
15. To Remove ATS: Refer to the “Removal of the Isolation ATS” section.
16. After the isolation operation, if the Bypass ATS is closed on Source 1 and if this source fails, an auxiliary contact on the bypass control will automatically start the engine-generator set.

Interlocks prevent this transfer, if the Isolation ATS is in the AUTO position and still connected to Source 1.
Sequence of Operations - Racking Operation (Cont.)

To Reconnect ATS

1. With the Isolation ATS on a lifting device, approach the Bypass Frame so as to align with the Cradle Rail Slider. Make sure the Rail Sliders are fully extended.

2. Make sure the rollers on each side of the Isolation ATS sits on the Rail Sliders.

3. Once engagements with the Rail Sliders are confirmed, lifting provisions from the lift device can be removed.

4. Using the Isolation ATS pull out handle, push the Isolation ATS into the ISOLATE position.

5. The Isolation ATS can now be racked into any position using the Charging Handle via the Bypass Access Control Panel. Rotate the Charging Handle clockwise until the intended Status Annunciation Light is illuminated.

6. Upon racking into the AUTO position, the Isolation ATS contacts will open.

7. Rack fully into AUTO position. User should feel a mechanical stop at AUTO position. Check that text “AUTO” is visible in the Racking Position Indicator of the Bypass Access Panel (refer Figure S5-2) and the AUTO Annunciation Light is illuminated (refer Figure S5-1).

8. When the ATS is in the AUTO position, press the ATS Contact Reset button. This will make sure the Isolation ATS closes its contacts to the same Source as the Bypass ATS.

9. At this point, proceed to open the Bypass ATS contacts by pressing the Open button via the Bypass Access Panel.

10. Rotate the Control Switch to the Auto position.

11. ATS is now fully automatic.

Notes:

1. Control Switch in Inhibit will prevent ATS electrical operation.

2. DO NOT use excessive force on the Charging Handle.

3. When ATS is in Test or Isolate, Bypass Switch is a manual transfer switch to either available source (indicated on light panel).

Removal of the Isolation ATS

Upon reaching the Isolate position via the Racking operation, user can proceed with removing the Isolation ATS completely from the Bypass Isolation product. This allows for maintenance or installation activities to be done externally that require access to areas of the Bypass product that will otherwise be inaccessible had the Isolation ATS is still in place as part of the Bypass Isolation product. Examples of such activities include servicing work on the Bypass ATS field installation of the Protective Shutter Assembly. Using the Isolation ATS pull out handle, pull the ATS to the outer most position (refer to figure S5-8).

Figure S5-10 illustrates application of lifting hooks on lifting provisions present on the Isolation ATS. Recommended lifting devices include Beech lift truck with sufficient load capacity. Approximate weight of Bypass-Isolation ATS: 800 – 1000 lbs.
Figure S5-7: Operation of the Bypass ATS via the Bypass Access Panel.

Figure S5-8: Operator pulling Isolation ATS out to be serviced.

Figure S5-9: Position of the Isolation ATS prior to removal.

Figure S5-10: Application of lifting provisions onto the Isolation ATS prior to removal.

Figure S5-11: Removal of the Isolation ATS out from the Bypass system.
Sequence of Operation -
Automatic Mode - Isolation ATS

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 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. 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 (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 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-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.
Closed Transition

**WARNING**

**Improper Installation**  
**Operation and Maintenance**

Ensure only qualified personnel install, operate, service and maintain all electrical equipment.  

DISCONNECT all power sources prior to installation, operation, service and maintenance of all electrical equipment. These activities shall be performed only by certified GE Zenith technicians or qualified electricians.  

DO NOT ATTEMPT TO PERFORM MANUAL OPERATIONS OF AUTOMATIC TRANSFER SWITCH IN CLOSED TRANSITION MODE.  

Only use the Charging Handle to perform manual operations of the Transfer Switch. No motorized device shall be used as a substitute.  

**Failure to comply with these instructions could result in death or serious injury.**

ABB Zenith Closed Transition Transfer Switches are designed to Transfer the Load between two available sources without 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 Closed Transition 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 by opening all line breakers (Source 1 and Source 2).
2. With the main door still closed, open the ATS access panel to expose the various indicators and buttons.
3. Refer to Section 1 – Standalone ATS operations for opening Source 2 contacts.
4. Once Source 2 contacts are opened, energize Source 1 to allow the ATS to automatically close back into source 1.
ZT30 Electrical Panel

A: Control Power Transformers
B: Controller SPD
C: Electrical Panel Input: Factory Configured
D: Maintenance Switch
E: Relay Driver Module
F: I/O Modules
G: MX350 Controller
H: Customer I/O
I: Engine Start Terminals
J: Voltage Output
Fuse Block for Customer Use

Figure S5-12: Front view of MX350 Electrical Panel

A: Control Power Transformers
B: Controller SPD
C: Electrical Panel Input: Factory Configured
D: Maintenance Switch
E: Relay Driver Module
F: Engine Start Relay

Figure S5-13: Front view of MX250 Electrical Panel
Section 6.0: Entelli-Switch 250 Controller

Inspection Prior to Initial Energization

DANGER
Hazardous Volatge Can Cause Severe Injury Or Death

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

CAUTION
Certain accessories, per specific schematics, can inhibit automatic transfer. Engine Gen-Set could start when engine control wires are attached.

Prior to energizing the transfer switch, perform the following:
1. With a vacuum, remove any debris collected on the switch during shipment or installation.
2. Check engine start connections. The engine-start relay is located on the Electrical Panel (Figures S5-13, item F). The E contact provides the engine start signal from the automatic transfer switch controller to the genset.
3. Verify the correct connection of all control wires.
4. Check settings of all timers and adjust as necessary.
5. Adjust any optional accessories as required.
6. Verify that all Source 1, Source 2 and Load cables are correctly connected to the clearly marked terminals on the unit.
7. Verify the number and sizes of required cable lugs.
8. Verify equipment ground cable(s) are installed per NEC and/or local codes.
9. Verify that all cable lug connections are tightened in accordance to the Fascia label.
10. Remove surface oxides from cables by cleaning with a wire brush.
11. Make sure that all covers and barriers are installed and properly fastened.
12. Ensure all sources that are to be connected to the ATS have been fully commissioned and any voltage regulation systems have been fully commissioned.

Engine Start Control Connections
The engine-start relay is located on the Electrical Panel as indicated in Figure S5-13. Terminals on the relay base can be accessed for manual transfer switches, or in other applications not requiring the microprocessor.

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 left side of the Electrical Panel (item H in Figure S5-13).

Initial Testing and Energization of the Switch Manual Testing of Mechanism - MX250

A manual Charging Handle is provided with the transfer switch for maintenance and manual purposes (refer to figures S5-5 and S5-6 for location of Charging Handle). Manual operation of the switch may be checked before it is operated electrically.

Insert the handle and operate the transfer switch between the Source 1 and Source 2 positions. After insuring the switch mechanically transfers adequately, return the switch to Source 1 position, remove the handle and return it to the holder provided. Before proceeding, refer to the information package supplied with the ATS. Read and understand the information on all accessories installed. Please refer to Sections 4 and 5 for Sequence of Operations for Standalone ATS and Bypass Isolation ATS respectively.

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: Voltage is listed on the Fascia label. Figure S4-2 shows the location of the Fascia for both ATS and Bypass Isolation ATS.

   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

---

TRANSFER AND BYPASS ISOLATION SWITCH
Order Number: 
Equipment ID: 
Serial Number: 

RATING
Volts: Voltage Hz:Hz
Amps: Amps Phase: Phase

U.S. PATENT. WWW.GECRITICALPOWERPATENTS.COM

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Figure S6-1: Label on Fascia containing product serial number and voltage rating.

After all options and accessories are checked and verified,
follow these steps to set up the ATS. The annunciating LED
illuminates 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 Control Switch in the Inhibit.
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 Control Switch to Inhibit.
11. Complete the visual inspection of the transfer switch.
12. Close the enclosure.
13. Lock the enclosure.
Control Connections
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 relay is located on the Electrical Panel as indicated in Figure S5-13. Terminals on the relay base can be accessed for manual transfer switches, or in other applications not requiring the microprocessor.

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 left side of the Electrical Panel (item H in Figure S5-13).

MX250:

I. The Microprocessor
   A. Controller Interface Connections - Customer Input and Output (I/O) for system interface. Located on the left hand side of the back of the unit (see figure S5-13).
   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)
      f. A1 auxiliary contact, operates on S1 failure (optional)
      g. A1E auxiliary contact, operates on S2 failure (optional)
   B. LCD and Keypad located on the exterior of the door (see figure S6-2)
      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 S5-13, item G).

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 figures S6-4). 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 figures S6-6).

The MX250 Controller System 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 figure S6-7). 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 figure S6-7). “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 figure S6-7). Once satisfied, the T timer will begin timing to transfer to Source 1.
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 figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once satisfied, the T timer will begin timing to transfer to Source 1.

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 figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once exceeded, the W timer will begin timing to transfer to Source 2.

Under Frequency “Restore”  
Factory Default: 95%  
This adjustment determines the low frequency threshold. Adjust via the SET menu. Range is 88% to 98% in 1% increments (see figure S6-7). “Restore” must be a minimum of 2% below “Fail” setting.

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 figure S6-7). “Restore” must be a minimum of 1% below “Fail” setting.

Over Frequency “Fail”  
Factory Default: 102%  
This adjustment determines the maximum acceptable Over Frequency. Adjust via the SET menu. Range is 103% to 105% in 1% increments (see figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once exceeded, the W timer will begin timing to transfer to Source 2.

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 figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once satisfied, the T timer will begin timing to transfer to Source 1.

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 figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once exceeded, 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 figure S6-7). Once satisfied, the W timer will begin timing to signal the generator to start.

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 figure S6-7). “Fail” must be a minimum of 1% below “Restore” setting. Once exceeded, the T timer will be bypassed to expedite the 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 figure S6-7). “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: 102%  
This adjustment determines the minimum acceptable Over Voltage 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 figure S6-7). “Fail” must be a minimum of 1% below “Restore” setting.

Under Voltage “Fail”  
Factory Default: 80%, (5 seconds minimum).  
This adjustment determines the low voltage threshold. Adjust via the SET menu. Range is 75% to 98% in 1% increments (see figure S6-7). “Fail” must be a minimum of 2% below “Restore” setting. Once satisfied, the T timer will begin timing to transfer to Source 1.

Over Voltage “Fail”  
Factory Default: 105%  
This adjustment determines the maximum acceptable Over Voltage. Adjust via the SET menu. Range is 105% to 110% in 1% increments (see figure S6-7). “Fail” must be a minimum of 1% below “Restore” setting. Once exceeded, the W timer will be bypassed to expedite the transfer to Source 1.
Accessory Definitions

**6/P**
Test Switch, Momentary

**6A**
Test Switch, Maintained Auto/Momentary Test

**6A/P**
Test Switch, Maintained/Momentary utilizing keypad

**6B**
Test Switch, Maintained - Auto / Momentary - 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)

**A4**
Auxiliary Contact: Closed in normal (Source 1)

**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.).

**AB4**
Auxiliary Contact: Closed in bypass normal (Source 1) (S.P.D.T.).

**BC**
Battery charger

**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 figure S6-7)

**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 figure S6-7).

**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. Configured via CFG (see figure S6-6). Set via SET menu (see figure S6-7).

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

**Control Switch**
Inhibits controller from transferring for maintenance and troubleshooting

**Maintenance Switch**
Removes power from control circuit for maintenance and troubleshooting

**DT (Delayed Transition Only)**
Time Delay from Neutral Switch position to Source 1 position. Adjustable 1 sec - 10 minutes in 1 second increments. Standard setting is 5 seconds. Adjust via SET menu (see figure S6-7)

**DW (Delayed Transition Only)**
Time Delay from Neutral Switch position to Source 2 position. Adjustable 1 sec - 10 minutes in 1 second increments. Standard setting is 5 seconds. Adjust via SET menu (see figure S6-7)

**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.

**Heater**
Heater and Thermostat

**K/P**
Frequency Indication for S1 and S2

**LN/P**
Indicating LED lights:
- L1/P Indicates Switch in Source 2 position.
- L2/P Indicates Switch in Source 1 position.
- L3/P Indicates Source 1 available.
- L4/P Indicates Source 2 available.

**M2**
Three Phase Amp Meter

**M90**
EPM 2000 Digital Power Monitor with Modbus port

**M90A**
Adds pre-wiring for Enervista Viewpoint Monitoring of M90. Accessory and ATS Status using Modbus RS485 Serial Communications
M90B
Adds pre-wiring for Enervista Viewpoint 
Monitoring of M90. Accessory and ATS Status 
using Ethernet TCP/IP Communications

M91
EPM 6000 Digital Power Monitor with Modbus port

M91A
Adds pre-wiring for Enervista Viewpoint 
Monitoring of M91. Accessory and ATS Status 
using Modbus RS485 Serial Communications

M91B
Adds pre-wiring for Enervista Viewpoint Monitoring of M91. 
Accessory & ATS Status using Ethernet TCP/IP Communications

P1
Time Delay Source 2 Start. Adjustable 0-10 seconds. Standard 
setting is 3 seconds. Adjust via SET menu (see figure S3-8)
P2
Time Delay S2 Start. Adjustable 1 to 300 seconds.

Q2
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.

Q3
Remote inhibit transfer to Source 2 circuit. 
Energize Q3 input to allow transfer to Source 2. 
To enable Q3 option, engage Q3 jumper.

Q7
Inhibit transfer to Source 1 circuit. Energize Q7 
input to prevent transfer to Source 1.

R1-3
Source 1 Over Voltage sensing for three phase systems. 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 
figure S3-9). Once exceeded, the P timer begins timing to signal 
the Generator to start. 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 automatically transfer to Source 1. Adjust via SET 
menu. Range is 103% to 108% in 1% increments. “Restore” 
must be a minimum of 2% below “Fail” setting (see figure S6-7).

J2E/J2N
Under/Over Frequency sensing on S1 and S2

R8
3-phase OVer voltage sensing on S2

R15
Load Shed 
Should Source 2 become overloaded, a signal 
can be given to switch to the dead Source 1 or 
Mid position, on Delayed Transition ATS

R16
Phase Rotation Sensing 
Can be turned on or off via CFG menu (see figure S6-6). 
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 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.

R26
Interruptable Power Rate Provisions. Allow transfer 
out of Source 1 position to Source 2 or dead Source 2. 
Alarm and Pre-Signal circuit included. 

R50 (Not available on delayed transition ATS) 
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 Source 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. 

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 60Hertz could cause lengthy transfer delay. 

R50 Feature can be turned ON or OFF via CFG 
Menu (see figure S6-6). Factory Default if OFF.
S5P
Auto / Semi Manual programmable selector
In “Auto” position, retransfer to Source 1 is automatic after the T timer has timed out. The T time delay is bypassed if Source 2 fails. In “Manual”, retransfer to Source 1 is upon depression of BYPASS DELAY button YEN or if Source 2 fails.

S12P
Auto / Manual programmable selector
In “Auto” position, the Automatic Transfer Switch functions automatically as specified with the Switch drawings. In “Manual” the Automatic Transfer Switch will transfer to either direction upon depression of Source 1 or Source 2 transfer buttons XFR. Should Source 1 fail, the Generator (Source 2), will automatically start. Once transferred in Manual, the Switch maintains position selected even if selected power fails.

S13P
Transfer Commit.
Configured via CFG menu. (see figure S6-6)
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)

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 figure S6-7)

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 figure S6-7).

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.

VI
Voltage Imbalance (Three Phase)
For a three phase source, this feature monitors phase voltage ratios based on a selected range within a selected time window. Should any phase fall below the selected lower window limit or exceed the selected higher window limit within the selected time frame, the controller initiates transfer to the other source. Range: 5% to 20% of Nominal voltage, 10 to 30 seconds window, user adjustable.
Resolution: 1% Increments
Minimum Differential: 2% between “Fail” and “Restore” settings.
Factory default: 10% “Fail”, 8% “Restore”, 30 Seconds.
See CFG Menu see figure S6-6 to configure ON or OFF.
See SET Menu see figure S6-7 to set Percentage and time Windows

W
Time Delay (S2) Source 2 Stable Timer.
To delay transfer to Source 2.
Adjustable 0-5 minutes in 1 second increments.
Standard setting is 1 second. Adjust via SET menu (see figure S6-7)

YEN (BYPASS)
Bypass Timers Key utilizing Keypad. When applicable, the system prompts the user to press a button to bypass (T) or (W) Timers should the user so desires.
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).

CDT One Event Timer Exerciser

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 CANCL 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 CFGN CLOCK EXERCISER will show either DAILY, WEEKLY, 14 DAY, 28 DAY, 365 DAY or OFF.
4. If the third line of the CFGN 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 CFGN 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.
6. Cursor is indicated as a line under character to be changed. Change values with up and down keys. Press SAVE after each entry to save value and to move to the next value to be changed.
7. Press BACK when complete.
8. Press MORE repeatedly until SET USER SETUP. Press BACK then ESC to S1 OK screen.

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 CANCL BPASS

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 CD Exerciser is configured or Set for a No-Load Exercise, or allow the controller to complete retransfer to Source 1. If the CD Exerciser is configured for a Load Exerciser

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:
• 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 Exerciser duration field to be accepted as a valid exercise period.
• The Exercise cycle will be repeated on a regular basis as programmed and initiated in the SET menu depending on what Exerciser was configured (selected) in the CFG menu.
## Zenith Controls MX250 Accessory Group Matrix

<table>
<thead>
<tr>
<th>ACCESSORIES</th>
<th>GROUP PACKAGES</th>
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<tbody>
<tr>
<td></td>
<td>MSTD</td>
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<tr>
<td>6/P</td>
<td>●</td>
</tr>
<tr>
<td>A1</td>
<td></td>
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<td>A1E</td>
<td>○</td>
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<tr>
<td>A3</td>
<td>●</td>
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<tr>
<td>A4</td>
<td>●</td>
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<tr>
<td>Calibrate</td>
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<td>●</td>
</tr>
<tr>
<td>YEN</td>
<td>●</td>
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</tbody>
</table>

- ● Standard Accessory included in the group package.
- ○ Optional Accessory not included but can be added to the group package
- ○ Optional Accessory. Can not be used with accessory having the same symbol.
- * Delayed Transition Units Only
Illustrations - MX250

Figure S6-3: Layout of MX250 with rear cover removed.

Source 1 LED (Green) indicates Source 1 is acceptable for use.

Source 1 Position LED (Green) indicates Power Panel (ATS) is closed to Source 1 position.

Source 2 Position LED (Red) indicates Power Panel (ATS) is closed to Source 2 position.

Source 2 (Red) indicates Source 2 is acceptable for use.

Source 2 (Red) indicates Source 2 is acceptable for use.

Exercise Event “Impending”

SET Menu

Keypad

#4 or the word on the LCD above the key. The word above the key changes depending on which screen is being displayed.

#3 or the word on the LCD above the key. The word above the key changes depending on which screen is being displayed.

#2 or the word on the LCD above the key. The word above the key changes depending on which screen is being displayed.

#1 or the word on the LCD above the key. The word above the key changes depending on which screen is being displayed.

Current Time, Day and Date of Display

Menus (More, CFG, TEST)

To Power Panel

To R/T Box

Engine Start Connections

Input/Output Connections to I/O Modules

Clock Program Back up Battery

Remove protective strip to enable clock functions

Network Connector

To Power Panel

To R/T Box

Figure S6-4: Graphical interface of the Entelli Switch 250.
Illustrations - MX250 (Cont.)

Figure S6-5: Exerciser programming window – MX250

- Indicates # of Exerciser Periods
- Indicates type of Exerciser: DAILY, WEEKLY, 14-DAY, 28-DAY or 365-DAY
- Indicates Exerciser start: Time for DAILY Exerciser, Time & Day for WEEKLY Exerciser, Time, Date & Month for 14-DAY, 28-DAY and 365-DAY Exerciser (24 Hour System)
- Up and Down: Use to change values
- To previous field or to exit screen
- To save value and to move cursor to next field to be changed
- Load No-Load (CDP) Exercise Indicator
- Exercise duration for this event in hours and minutes up to 10 hours per event
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)
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)

*Optional Accessories
View System Data

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

Figure S6-8: System Data View on the MX250
Section 6.1: Entelli-Switch 350 Controller

Inspection Prior to Initial Energization

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.

NOTICE

WARNING

Certain accessories, per specific schematics, can inhibit automatic transfer. Engine Gen-Set could start when engine control wires are attached.

Prior to energizing the transfer switch, perform the following:

1. With a vacuum, remove any debris collected on the switch during shipment or installation.
2. Check engine start connections. The engine-start terminals are located on the Electrical Panel (Figures S2-11, item I). The E contact provides the engine start signal from the automatic transfer switch controller to the genset.
3. Verify the correct connection of all control wires.
4. Check settings of all timers and adjust as necessary.
5. Adjust any optional accessories as required.
6. Verify that all Source 1, Source 2 and Load cables are correctly connected to the clearly marked terminals on the unit.
7. Verify the number and sizes of required cable lugs.
8. Verify equipment ground cable(s) are installed per NEC and/or local codes.
9. Verify that all cable lug connections are tightened in accordance to the Fascia label.
10. Remove surface oxides from cables by cleaning with a wire brush.
11. Make sure that all covers and barriers are installed and properly fastened.

Engine Start Control Connections

The engine-start terminals are located on the Electrical Panel as indicated in Figure S6-9. These terminals can be accessed for manual transfer switches, or in other applications not requiring the microprocessor.

Figure S6-9: Electrical Panel

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 left side of the Electrical Panel (item H in Figure S5-12).

Initial Testing and Energization of the Switch Manual Testing of Mechanism – MX350

A manual Charging Handle is provided with the transfer switch for maintenance and manual purposes (refer to figures S5-5 and S5-6 for location of Charging Handle). Manual operation of the switch may be checked before it is operated electrically. All power sources must be disconnected before manual operation of the switch is attempted. Insert the handle and operates the transfer switch between the Source 1 and Source 2 positions. After insuring the switch mechanically transfers adequately, return the switch to Source 1 position, remove the handle and return it to the holder provided. Before proceeding, refer to the information package supplied with the ATS. Read and understand the information on all accessories installed. Please refer to Sections 4 and 5 for Sequence of Operations for Standalone ATS and Bypass Isolation ATS respectively.
Electrical Testing of the Switch (Source 1 = Utility, Source 2 = Generator)

To verify the electrical system and proper automatic operation of the switch, perform the following steps:

Checking Source 1 (Preferred Source)

1. Check to make sure the switch is connected to Source 1 position.
2. Turn the Contact Switch to INHIBIT. This prevents the switch from transferring or sending a start signal to the Source 2 generator unintentionally.
3. Verify that the switch rating is the same as the system voltage from Source 1 supply power. The equipment rating label on the fascia lists the voltage.
4. Close the Source 1 input circuit breaker.
5. Confirm that the MX350 controller is sensing Source 1 voltage. The S1 LED should be illuminated. Electrical parameters (including phase rotation) can be viewed on the MX350 Graphical Control Panel on the \Value\Summary and Diag\Phasor screens. Verify that the system voltage is correct for the rating of the switch.

Checking Source 2 (Non-Preferred or Alternate Source)

6. Close the Source 2 input circuit breaker.
7. Manually start Source 2 via controls on the generator itself. Note that with the Control Switch in INHIBIT position, the generator cannot be started by the MX350 controller.
8. Confirm that the MX350 controller is sensing Source 2 voltage. The S2 LED should be illuminated. Electrical parameters (including phase rotation) can be viewed on the Graphical Control Panel on the \Value\Summary and \Diag\Phasor screens.
9. Verify that the phase rotation of Source 1 is the same as the phase rotation of Source 2.
10. Manually shut down the generator via controls on the generator itself.

Checking the Switch’s Ability to Transfer

11. Turn the Control Switch to AUTO position. This allows the MX350 controller to send a start signal to the generator.
12. Perform a System Test. The options available are (a) Fast Test (test with load without time delays), (b) Xfer Load and (c) No Xfer (test without load, generator start only). The test(s) can be initiated by the green TEST button on the Graphical Control Panel.
13. After completing electrical tests, close and lock the enclosure. Electrical testing of the switch is further discussed in the manual MX350 Automatic Transfer Control System (Publication Number 1601-9071-A1).
The Control Connections

The ZT30 and ZBT30 lines of transfer switches are designed for maximum flexibility and ease of installation. As illustrated in figure S5-12, the MX350 controller input/output and metering modules, and power supplies are mounted on the Electrical Panel. All terminal connections for the engine start, switch position contacts, input and output relays are located on the Electrical Panel. Configurable input and output relays are PCB board mounted on DIN rail in combinational arrays of 5 inputs and 7 outputs. A “Field Connection Diagram” (see the example in figure S6-12) is affixed on the cover of the universal transformer assembly (UTA) power supply for easy reference.

This diagram provides the factory-supplied terminal board connections as well as dry contact inputs and outputs identified by terminal number as defined in the MX350 controller. Close-up photographs of an input and output PCB with terminal connections are shown in Figures S6-13 and S6-14.

For two L cards, there will be two sets of input and output strips. The maximum combination is three pairs of I/O strips (that is, a total of six relay DIN rail mounted PCBs). The controller automatically recognizes the physical location of the input or output relays via an alpha-numeric identification system.

![Figure S6-13: Output strip and connection (ABB Zenith part number 50P-3042)](image)

The first sets of output relays are named G1 through G5 while the input relays are identified as G7 through G13. If a second L card exists in the microcontroller, the second PCB-mounted assembly output relays are named H1 through H5; the outputs are H7 through H13. Similarly, a third IO_L module is related to

![Figure S6-15: MX350 Terminal connection overview](image)
The MX350 graphical display and keypad

The MX350 controller features a ¼ VGA color graphical display with status LEDs, an USB programming port and menu-driven soft keys (see Figure S6-16) as well as dedicated control and navigational keys.

The header bar displays the hierarchical path name, the date and time and the current password access level. The soft-key labels are indicated on the bottom line. Soft-keys are used for navigation, performing functions and for acknowledgement transactions. Soft-keys labels change to show relevant selections for the displayed screen. The color of each soft-key label indicates its functionality. Soft-keys are highlighted for the displayed page, unauthorized keys are “greyed-out”, and unused keys are not displayed.

The control panel LEDs summarize the status of the transfer switch, including the following indications:

- ALARM: indicates that there is a problem with the ATS or that a user configurable alarm condition is active.
- TD DELAY: indicates that the controller is timing before taking the next control action.
- XFER INHIBIT: indicates that the controller will not automatically transfer to the other source and that operator intervention is required to allow transfer.
- S1 (Source 1) Available LED: indicates that S1 power is present and within user defined limits.
- S2 (Source 2) Available LED: indicates that S2 power is present and within user defined limits.
- S1 (Source 1) Status LED: indicates that the load is connected to S1 power.
- S2 (Source 2) Status LED: indicates that the load is connected to S2 power.

The MX350 controller page hierarchy is shown in figure S6-22.

<table>
<thead>
<tr>
<th>TERMINAL</th>
<th>TERMINAL</th>
<th>TERMINAL</th>
<th>TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>H1</td>
<td>I1</td>
<td>Output</td>
</tr>
<tr>
<td>G2</td>
<td>H2</td>
<td>I2</td>
<td>Output</td>
</tr>
<tr>
<td>G3</td>
<td>H3</td>
<td>I3</td>
<td>Output</td>
</tr>
<tr>
<td>G4</td>
<td>H4</td>
<td>I4</td>
<td>Output</td>
</tr>
<tr>
<td>G5</td>
<td>H5</td>
<td>I5</td>
<td>Output</td>
</tr>
<tr>
<td>G6</td>
<td>H6</td>
<td>I6</td>
<td>Common for outputs</td>
</tr>
<tr>
<td>G7</td>
<td>H7</td>
<td>I7</td>
<td>Input</td>
</tr>
<tr>
<td>G8</td>
<td>H8</td>
<td>I8</td>
<td>Input</td>
</tr>
<tr>
<td>G9</td>
<td>H9</td>
<td>I9</td>
<td>Input</td>
</tr>
<tr>
<td>G10</td>
<td>H10</td>
<td>I10</td>
<td>Input</td>
</tr>
<tr>
<td>G11</td>
<td>H11</td>
<td>I11</td>
<td>Input</td>
</tr>
<tr>
<td>G12</td>
<td>H12</td>
<td>I12</td>
<td>Input</td>
</tr>
<tr>
<td>G13</td>
<td>H13</td>
<td>I13</td>
<td>Input</td>
</tr>
<tr>
<td>G14</td>
<td>H14</td>
<td>I14</td>
<td>Common for inputs</td>
</tr>
</tbody>
</table>

Table T6-2: IO_L module connections

inputs I1 through I5 and outputs I7 through I13 (see Table T6-2).

Terminals G7 and G8 are always used for DS and Q2 functions, respectively, and cannot be adjusted. Depending on the type of switch and features ordered, Terminals G1 through G5 as well as G9 through G13 may not be available for customer configuration. See electrical schematic.

The MX350 microcontroller is a modular control and monitoring system designed specifically for low-voltage transfer switch applications. The MX350 provides the following key benefits:

- Flexible control and communication options to suit any low-voltage transfer switch application.
- Small footprint.
- Modular design, which reduces the number of spare components for maintenance and testing.
- Integrated pushbuttons and LED indicators which reduce required external components and wiring.
- Multiple communication protocols which permit simple integration into monitoring and control systems.
- A graphical control panel that provides local control and access to system information.

Detailed technical information on the MX350 controller is described in the manual Entelli Switch 350 Automatic Transfer Control System (Publication Number 1601-9071-A1).
Operation Setpoints and User-Configurable Inputs and Outputs

Operation setpoints define the acceptable electrical and time limits for both Source 1 and Source2. These setpoints define dropout and restore values for over and under voltage, over and under frequency, as well as the associated time delays.

Switch Exerciser

The MX350 controller has a built-in exerciser that can be enabled and set up from the \Exerciser\Info screen. This feature allows the user to test the system periodically or to setup a schedule for operating the system periodically in order to minimize utility costs.

From the \Exerciser\Info screen the operator can access all required setup parameters for scheduling exercises. It also indicates as to when the last exercise took place and when the next exercise will be performed.

The \Home\Exerciser\Setup page displays the MX350 Exerciser parameters as shown in Figure S6-17. Exercise type and schedule are user-defined here for starting time, duration of exercise and whether or not the switch is to transfer the load. The mode of operation of the exerciser function can be selected with a time base of 1 day, 1 week, 14 days, 28 days, or 365 days. With a time base of 365 days, up to 24 events can be scheduled (0-60 min). With all other time bases, the number of exercise events is limited to 7.

For each exercising event, the operator enters a start time as well as a time of duration. In addition, the operator can select the type of exercise as ‘Genstart and Transfer’ or as ‘Genstart only’. When the ‘Gen Start only’ mode is selected, the controller will start the engine, but does not actually transfer the load. In this mode, the readiness for the engine generator set is tested. It does not test the functionality of the Automatic Transfer Switch itself.

In the ‘Gen Start and Transfer’ mode, the controller starts the engine and actually transfers the load to the alternative source. This mode can be used to test the integrity of the emergency power system. It can also be used to setup a schedule for times of operation when the switch load will run on an alternative power supply. This could be done, e.g., to avoid demand charges from a utility company.

If the operator chooses to abort an ongoing test, there is a ‘Test Cancel’ button on the \Exerciser\Info screen. This screen also contains a ‘Test’ button that will take the user directly to the Test screen. The \Home\Exerciser\Test page displays the MX350 system test choices, as shown in figure S6-18. From the Test screen the user can perform the same operations as performed by the exerciser. Whereas exercises are performed automatically, a Test always has to be initiated by the user.

There are three types of tests: Fast Test, Xfer Load, and No Xfer. The screen also provides an END button to abort any of the three test types. To test the functionality of the switch the operator can use the Fast Test option. With this kind of test, the engine generator will start and the load will transfer without going through any time delays. In order to simulate a load transfer as if an outage was occurring, the operator can select the Xfer Load test. With this test type, the engine will start up and the load will transfer according the time delay of the W timer. When the test is ended (by depressing the END button), the switch will go through the U timer delay before actually transferring back to the utility.
Controller Power Supply
(UTA – universal transformer assembly)

System line voltage is transformed to 170Vdc to power the MX350 controller and 24Vdc ungrounded to power relays via the universal transformer assembly (UTA). The power supply is termed “universal” because the same unit handles all line voltages from 120Vac through 600Vac via an internal six-position jumper array. Figure S6-23 shows the external connections points for the UTA. The UTA also features a 120Vac uninterruptible power supply input and 24Vdc input battery options. 120Vac and 24Vdc (ungrounded) must be supplied together from an uninterrupted power source. In addition, test terminals are included for transformer voltage monitoring (see figure S6-24 for connection point definitions and figure S6-25 for the UTA schematic).
NOTES:
1. ATS shown in source-1 position with no power available.
2. Components drawn in dashed lines are option package and customer connections of the transfer switch.
3. Q2 (test with load) is provided as standard (pre-configured) feature.
4. R15 (load shed) is provided as an option (pre-configured) feature.
5. Unless otherwise specified, all customer connection wires to be #14 awg, 600V.
6. Engine start contact is rated 10 Amps at 28VDC/120VAC.
7. Output strip contacts are rated 10 amps at 30VDC/250VAC.
8. Engine start contact may be on separate terminal block for bypass switches. Refer to electrical schematic for terminal location.

Figure S6-19: Representative schematic of Terminal Board, output strip and input strip
## Non-Bypass ATS

<table>
<thead>
<tr>
<th>NAME</th>
<th>ITEM#</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB #1</td>
<td>1</td>
<td>Engine Start - NC</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Engine Start - COM</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Engine Start - NO</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Connected to Source 1 - NC</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Connected to Source 2 - COM</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Connected to Source 2 - COM</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Connected to Source 2 - COM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NAME</th>
<th>ITEM#</th>
<th>FACTORY SETTING</th>
</tr>
</thead>
<tbody>
<tr>
<td>G Output Strip</td>
<td>G 1 (NO/NC/Common)</td>
<td>Load Shed from S2 (R15) Factory Use Only</td>
</tr>
<tr>
<td></td>
<td>G 2 (NO/NC/Common)</td>
<td>Alternative Source Fail to Start</td>
</tr>
<tr>
<td></td>
<td>G 3 (NO/NC/Common)</td>
<td>S1 Failure</td>
</tr>
<tr>
<td></td>
<td>G 4 (NO/NC/Common)</td>
<td>S2 Failure to Connect</td>
</tr>
<tr>
<td></td>
<td>G 5 (NO/NC/Common)</td>
<td>Load Control 1</td>
</tr>
<tr>
<td>G Output Strip</td>
<td>G 7</td>
<td>Disconnect Switch (DS) Factory Use Only</td>
</tr>
<tr>
<td></td>
<td>G 8</td>
<td>Test with Load (Q2) Factory Use Only</td>
</tr>
<tr>
<td></td>
<td>G 9</td>
<td>Load Shed from S2 (R15) Factory Use Only</td>
</tr>
<tr>
<td></td>
<td>G 10</td>
<td>Bypass Xfer Time Delay to S1</td>
</tr>
<tr>
<td></td>
<td>G 11</td>
<td>Inhibit Xfer to S2 (Q3)</td>
</tr>
<tr>
<td></td>
<td>G 12</td>
<td>Inhibit Xfer to S1 (Q3)</td>
</tr>
<tr>
<td></td>
<td>G 13</td>
<td>Engine Start (SW1)</td>
</tr>
<tr>
<td></td>
<td>Com</td>
<td>+24VDC Factory Use Only</td>
</tr>
</tbody>
</table>
# Bypass ATS

<table>
<thead>
<tr>
<th>NAME</th>
<th>ITEM#</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>TB #1</td>
<td>1</td>
<td>Engine Start - NC</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Engine Start - COM</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Engine Start - NO</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>6*</td>
<td>Connected to Source 1 - NC</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Connected to Source 1 - NO</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Connected to Source 1 - COM</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>Connected to Source 2 - COM</td>
</tr>
<tr>
<td></td>
<td>13*</td>
<td>Connected to Source 2 - NC</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Connected to Source 2 - COM</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Connected to Source 2 - NO</td>
</tr>
<tr>
<td></td>
<td>17</td>
<td>Connected to Source 2 - COM</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Connected to Source 1 - Bypass - NO</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Connected to Source 1 - Bypass - COM</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Connected to Source 2 - Bypass - NO</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>Connected to Source 2 - Bypass - COM</td>
</tr>
</tbody>
</table>

* Contacts will not be active on Bypass Units.

Notes:
1. See Field connection wiring diagram for additional wiring details.
2. Controller inputs and outputs are field reconfigurable. *Factory Settings* indicate configuration at time of shipment.
3. From MX350 Display, go to UHOME\Inputs or UHOME\Outputs to see current configuration.
4. Record user configuration in "Field Setting" area below.

![Figure S6-21: MX350 Graphical Display Components](image)

---

Zenith Automatic Transfer Switch  |  new.abb.com/low-voltage  |  52
Figure S6-22: MX350 Softkey Hierarchy
Note 1: Both Aux inputs (120VAC and 24VDC) must be supplied from an uninterrupted power source. Supplying only one Aux input may result in malfunction.
Figure S6-25: Universal Transformer Box Assembly (UTA) Schematic
Section 7: Accessories Description

General Information
A wide range of accessories are compatible with all ZT30 series Automatic Transfer Switches regardless of nominal rating, transition mode or construction. Each accessory requires minimum number of fasteners and is mounted to the transfer switch product either in the factory or in the field.

List of Major Accessory Items
Below is a list of major accessories available for ZT30 series Automatic Transfer Switch:
- Protective Shutter Assembly
- Wire Harness for Inverted Option
- Ground bar
- Thermostat and Heater
- Lug Option
- Battery Charger
- Surge Protective Device (SPD)

---

**WARNING**
**Improper Installation Operation and Maintenance**
Ensure only qualified personnel install, operate, service and maintain all electrical equipment.
**Failure to comply with these instructions could result in death or serious injury.**

---

---

**WARNING**
**Both power sources must be disconnected before installing accessories.**

---
### Troubleshooting and Diagnostics

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ANNUNCIATION</th>
<th>POSSIBLE CAUSE(S)</th>
<th>TROUBLESHOOT STEP 1</th>
<th>ACTIONS TO BE TAKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATS will not transfer to SOURCE 1</td>
<td>SOURCE 1 AVAILABLE LED off</td>
<td>Source 1 voltage or frequency not within acceptable parameters</td>
<td>Check utility and utility breaker</td>
<td>Notify factory of the conditions of all Status and Contact position indication. Only certified GE Zenith technicians are allowed to perform further troubleshooting tasks.</td>
</tr>
<tr>
<td>None</td>
<td>Power supply connector unplugged</td>
<td>Plug in connector</td>
<td></td>
<td></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>
<td></td>
</tr>
<tr>
<td>None</td>
<td>Power supply connector unplugged</td>
<td>Plug in connector</td>
<td></td>
<td></td>
</tr>
<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>
<td></td>
</tr>
<tr>
<td>Generator is in OFF position</td>
<td>Investigate why Engine Control Switch was turned off</td>
<td></td>
<td></td>
<td></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>
<td></td>
</tr>
<tr>
<td>SOURCE 1 POSITION, and SOURCE 1 and SOURCE 2 AVAILABLE LEDs on, but U timer has timed out</td>
<td>Engine start wires not terminated properly</td>
<td>Check engine start connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Generator in MANUAL</td>
<td>Place generator in AUTO</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| ATS will not transfer electrically to intended source | LCD Display "EXPECT SN ACTUAL SE" or "EXPECT SE ACTUAL SN" | Mechanical issues | 1. Determine source availability.  
2. Control Switch should be in Auto Mode  
3. Check controller indicator status. This needs to be consistent with mechanical indicator via the ATS access panel.  
4. Determine Status and Contact position of ATS. This can be performed by opening the ATS access panel of the enclosure or observing via the fascia.  
5. Refer to table T1-1 for interpretation of Status and Contact position indication. | Rack into Auto position. Validate with Status Annunciation Lights. |
| Incorrect position of the Bypass Isolation ATS | For Bypass isolation offering: Check if Isolation ATS is in the Auto position. This can be determined via the Status Annunciation Lights on door (Refer to figure S5-31). | | | |
| ATS will not transfer manually to intended source | LCD Display "EXPECT SN ACTUAL SE" or "EXPECT SE ACTUAL SN" | Mechanical issues | 1. Determine source availability.  
2. Control Switch should be in Auto Mode  
3. Check controller indicator status. This needs to be consistent with mechanical indicator via the ATS access panel.  
4. Determine Status and Contact position of ATS. This can be performed by opening the ATS access panel of the enclosure or observing via the fascia.  
5. Refer to table T1-1 for interpretation of Status and Contact position indication.  
DANGER: Due to mechanical interlocking, manual close operation will only be allowed if the opposite source is open. | Notify factory of the conditions of all Status and Contact position indication. Only certified GE Zenith technicians are allowed to perform further troubleshooting tasks. |

Table T7-1: Troubleshooting and diagnostics
### Troubleshooting and Diagnostics (Cont.)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>ANNUNCIATION</th>
<th>POSSIBLE CAUSE(S)</th>
<th>TROUBLESHOOT STEP 1</th>
<th>ACTIONS TO BE TAKEN</th>
</tr>
</thead>
</table>
| No power to controller           | None         | Input power disconnected  
DANGER: Electric current could still be present on current carrying elements on ATS. | Check for position of Maintenance Switch on Electrical Panel (refer to item D on figures S5-12 and S5-13)  
Check fuse status on Electrical Panel input fuse holder (refer to item C on figures S5-12 and S5-13)  
Turn Maintenance Switch to the ON position  
Replace fuse                                                                                                                                                                                                                                                                       | For the Racking Solenoid to allow racking operation:  
Power source availability (check controller indication)  
Maintenance Switch on Electrical Panel is turned ON (refer to item D on figures S5-12 and S5-13)  
Bypass ATS is closed into either source  
Isolation ATS is in between the Isolate and Auto position  
Control Switch is in the "INHIBIT" position  
If above conditions are met, determine if racking solenoid is in working condition. Refer to Section 4G for racking solenoid location.                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                          |
| Isolation ATS will not rack in   | N/A          | Racking operation inhibited                                                      | Check if Racking Solenoid is preventing racking operation                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                          |
| Unable to insert Racking Handle  | N/A          | Padlock Latch is in the Lock position                                            | Check to see if Padlock Latch assembly is preventing handle insertion (Refer to figure S5-2).                                                                                                                                                                                                                                                                                                                                                                                                                                               | Unlock latch assembly.                                                                                                                                                                                                                                                      |

Table T7-1 cont: Troubleshooting and diagnostics
## Replacement Parts List

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>NON-BYPASS</th>
<th>BYPASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Movables</td>
<td>MX250: 26P-3621</td>
<td>MX350: 26P-3621</td>
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<td>MX250: 26P-3620</td>
<td>26P-3620</td>
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<td>MX250: S-3031</td>
<td>S-3031</td>
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<td>MX250: 26P-3642</td>
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<td>MX250: 26P-3182</td>
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<td>MX250: S-3060</td>
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<td></td>
<td>MX250: S-1529</td>
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<tr>
<td></td>
<td>MX250: L-5029</td>
<td>1863</td>
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<td>MX250: 26P-1864</td>
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<td>MX350: 9T58K2913</td>
<td>9T58K2913</td>
</tr>
<tr>
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<td>MX350: 9T58K0090</td>
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<td>MX350: 9T58K0070</td>
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<td>MX350: 9T583718</td>
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<td>MX350: 9T58K2913</td>
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<td>MX350: 9T58K0090</td>
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<td></td>
<td>Fuselage - 30A, 600VAC</td>
<td>KTK-30</td>
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<td>Fuselage Block - USM2</td>
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<td>Fuselage Block - USM3</td>
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<td>MOV assembly - 26P-3161</td>
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<td>MOV assembly - 500V</td>
<td>P9XPLVGD</td>
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<td>MOV assembly - 24V</td>
<td>P9PDTVDLV</td>
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<td>MOV assembly - 32V</td>
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<td>MOV assembly - 420</td>
<td>50P-1224</td>
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<td>MOV assembly - 420</td>
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<td>MOV assembly - 420</td>
<td>50P-1231RPL</td>
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Table T7-2: Recommended spare parts List
### Replacement Parts List (Cont.)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>NON-BYPASS</th>
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<th>BYPASS</th>
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<tbody>
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<td></td>
<td>MX250</td>
<td>MX350</td>
<td>MX250</td>
<td>MX350</td>
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<tr>
<td>MX250 Micro Control Assembly</td>
<td>50P-1161</td>
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<tr>
<td>UTA Assembly</td>
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<tr>
<td>Contact lubricant</td>
<td>MM-602</td>
<td>MM-602</td>
<td>MM-602</td>
<td>MM-602</td>
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<tr>
<td>Multi-purpose lubricant</td>
<td>MM-600</td>
<td>MM-600</td>
<td>MM-600</td>
<td>MM-600</td>
</tr>
</tbody>
</table>

Table T7-2 cont: Recommended spare parts List

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305 Gregson Drive
Cary, NC 27511

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