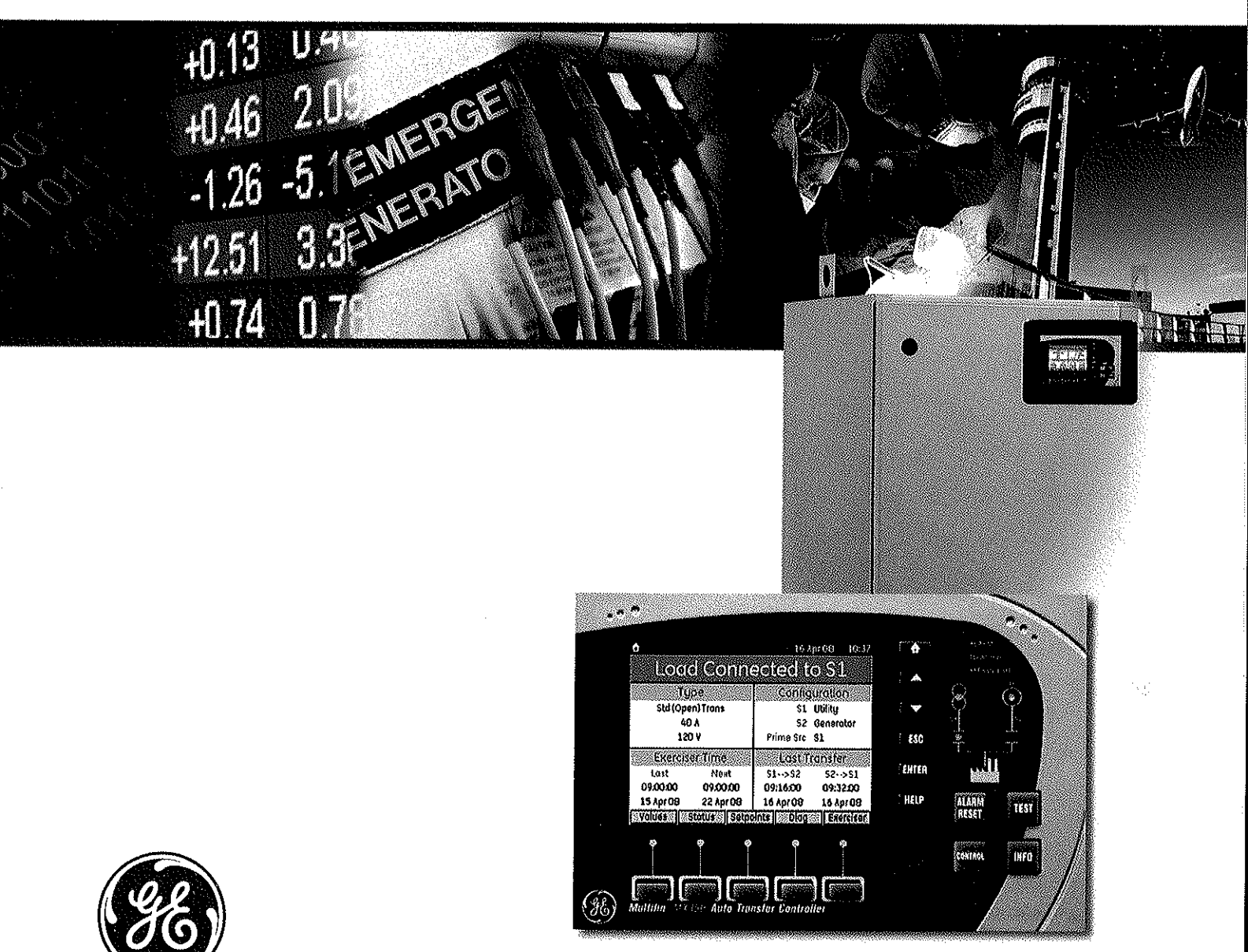
GE Digital Energy
Power Quality

ZTE

Automatic Transfer Switches

Power and Flexibility for
Critical Source Switching



GE Zenith Controls ZTE Series Transfer Switches

Power and flexibility for critical source switching







- Reliability
- Ease of operation
- Troubleshooting & diagnostics
- Flexibility to adapt to site changes
- Scalability to grow with a facility
- Simple & low-cost facility integration

Today's Challenges

Momentary loss of electric power to critical loads can endanger life, cause severe financial losses, or both.

Today's 7x24 service centers, critical healthcare facilities and data centers demand more than just continuity of power. The ***quality of power*** delivered to the load, the ***effectiveness of periodic system testing*** and the ***ability to diagnose outages and disturbances*** in the electrical system are issues that have serious implications for critical facilities.

Poor power quality damages equipment and increases maintenance costs. Inherent power problems stay hidden when testing is ineffective or incomplete. Going beyond source switching and addressing the issues of complete power quality requires a whole new level of ATS capability.

GE: Your Power Quality Partner

Since 1930, GE Zenith has designed and manufactured Automatic Transfer Switches (ATS) – products specifically designed to keep critical loads energized and protect personnel, facilities and businesses against losses. The technological advances of the ZTE firmly establish GE Zenith as not only a worldwide leader in the design and manufacture of ATS, but a trusted Power Quality Partner.

New Technology Solutions

The GE Zenith ZTE series of transfer switches go beyond just source switching. Integral metering and communications, high level diagnostics and unsurpassed flexibility make the ZTE a perfect solution for today's critical source switching.

Global Service Capability

The ZTE is backed by the global service capabilities and resources of one of the world's largest corporations, capable of providing solutions to all of your power quality needs.

APPLICATIONS

- Healthcare Facilities
- Critical Infrastructure
- 7x24 Call Centers, E-Commerce
- Data Centers
- Telecom Central Offices
- Process Control & Manufacturing
- Distributed Power & Load Management
- Institutional & Transportation Facilities

KEY BENEFITS

- **Reliability**
  Durable solenoid ATS operated mechanisms and robust electronics, tested for severe EMC and environmental conditions
- **Third-Party Certifications**
  UL 1008, IEC 60947-6-1 and CSA 22.2 Certifications, CE Marking, Seismic testing and certification to IBC 2003
- **Ease of Operation**
  Intuitive, color graphical display with built-in Help functions
- **Advanced Troubleshooting**
  High-speed event log and data logging
- **Diagnostics**
  Advanced system troubleshooting and event reporting
- **Low Cost Installation & Quick Commissioning**
  Built-in networking for reduced hardwiring, centrally located customer connections; simple field modification of features without need for factory service
- **Flexible & Expandable for Changing Site Needs**
  Modular, expandable I/O and field-upgradeable features for maximum flexibility
- **Power Quality Metering**
  True PQ metering, including waveform, harmonics and high-speed event capture
- **Simple & Low-Cost Facility Integration & Monitoring**
  Built-in networking, customizable User Data Map, and plug-and-play monitoring using EnerVista Viewpoint Monitoring™ software

FEATURES

Robust switching mechanisms

- 40-4000A, 2-4 Pole, standard and bypass isolation construction
- Proven solenoid operated mechanism
- GE-engineered and manufactured contacts and arc quenching components
- Standard/open two position transition plus delayed and closed transition
- UL/IEC 3-cycle (unconditional) short circuit withstand & closing ratings

Advanced user interface & controls

- ¼ VGA color display with built-in Help menus
- System status LEDs and menu-driven soft keys
- Dedicated control and navigational pushbuttons
- Front accessible USB programming port
- Password protected control switches

Built-in power quality metering

- 3-phase and neutral (ground) current, including voltage, power, energy, frequency and harmonics (THD)
- 20 Channel Data Logger with sampling rates user-configurable from 1 cycle to 60 minutes

Enhanced connectivity

- Built-in RS-485 serial and 10/100 base-T Ethernet
- Open protocols - Modbus RTU and Modbus TCP
- User-configurable data map
- Download of event, waveform and data log to PC
- Customized control logic using FlexLogic™
- Local/remote configuration via EnerVista™ MX350 Setup Software
- PC monitoring and control using EnerVista™ Viewpoint Monitoring software

Diagnostics & event recording

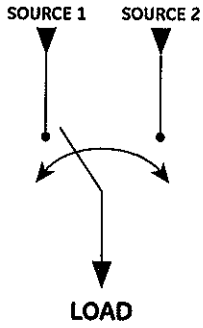
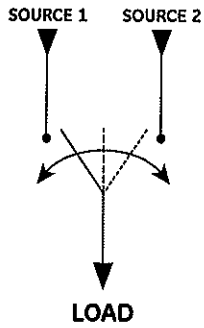
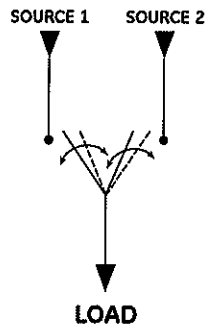
- Power source anomaly events recorder
- Detailed transfer event reporting
- Local storage of 256 time-stamped events with 1 ms resolution
- User-configurable alarms

Flexible feature assignment

- Field modification of control features
- User-configurable load control contacts
- Reduced commissioning delays from incorrect configurations

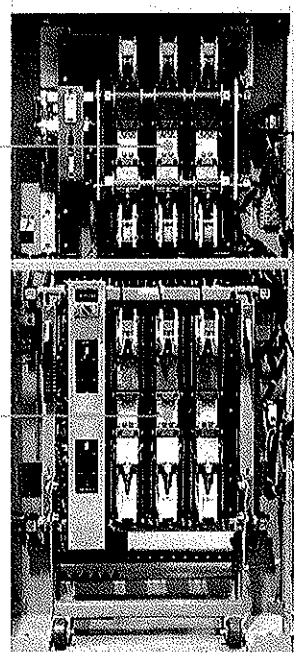
Transition Types

Non-Bypass

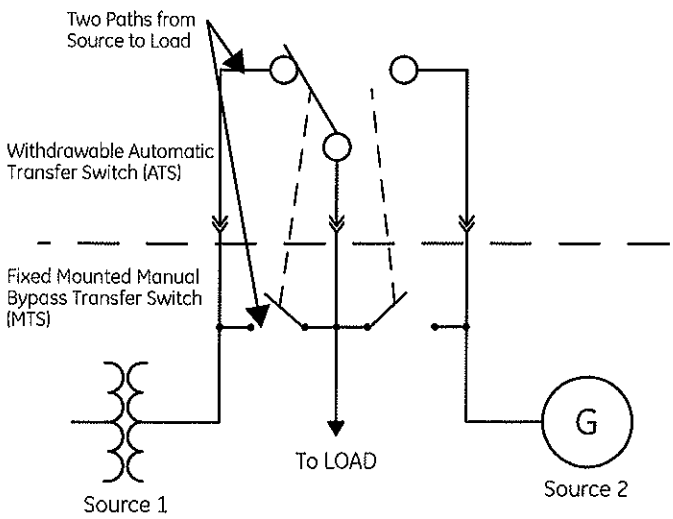
Product Specifications • Electrical Ratings • Design & Construction • Features • Sequence of Operations • Applications			
Transition Type	**Standard (Open) Transition**	**Delayed Transition**	**Closed Transition**
Electrical Ratings			
Ampere Ratings	40A to 4000A, Continuous Rated		
Poles	2, 3 or 4 Pole Switching		
Enclosure Types & Compliance	Open, NEMA 1, 3R, 4, 4X (Stainless Steel), 12, Compliance: UL 508, UL50, ANCI C33.76, ICS 6, NEMA 250		
Load Types	Emergency and standby applications on all load classifications, 100% tungsten rated through 400 amps. IEC 60947-6-1 Utilization Category 33A		
Short Circuit Withstandard	UL 1008 and IEC 60947-6-1 Utilization Category 33A Unconditionally-rated (3-cycle/Any-Breaker)		
Certifications	UL 1008 up to 480VAC, CSA C22.2 No. 178 up to 600VAC, IEC 60947-6-1 up to 415 VAC Seismic Test Qualified to IBC-2003 & IEEE 693-2005		
Design & Construction Features			
Code and Standards	NFPA (70,99, 101, 110), IEEE (466,241,602), NEC (517, 700, 701, 702), NEMA ICS-10		
Control System – Type Tests	UL 508/UL1053, CSA C22.2.14-05, IEC 60068,60255, 60529 (IP54 display, IP20 control), IEC 61000, C37.90, EN5022		
Construction	Double throw, solenoid operated, Break-before-Make mechanism, inherent mechanical interlock	Double throw, solenoid operated, Break-before-Make mechanism, inherent mechanical interlock, delayed transition mechanism with Center/Off Position	Double throw, solenoid operated, Make-before-Break mechanism, closed transition mechanism permitting (momentary) closure of two acceptable sources to the load
Safety Mechanism	Mechanically interlocked to inhibit simultaneous closure of both sources to the load		Supervisory/Backup Trip circuit to inhibit both source closure to load for > 100 ms
Transfer Speed	~30 to 70 ms	~80 ms + {Customer-programmable time delay setting}	Less than 100 ms parallel
Main Contacts	Segmented, silver tungsten alloy, GE engineered & manufactured		
Arcing Contacts	Arc quenching grids, enclosed arc chambers, and wide contact air gap for superior source-to-source isolation		
Sequence of Operations			
Sensing	3-phase sensing of Source 1 & Source 2 power source supplies		
On Loss of Primary Source	After programmed time delay, send start signal to backup generator. When acceptable Source 2 voltage and frequency is sensed (Genset or backup utility supply), transfer load to Source 2		
On Return of Primary Source	After programmed time delay, disconnect load from Source 2 and immediately re-connect to Source 1. Remove Generator start signal.	After programmed time delay, disconnect load from Source 2 and move to center/off position. Wait in center off until expiration of time delay period, then re-connect Source 1 to the load. Remove Generator start signal.	After programmed time delay, monitor Source 1 & 2 waveforms. When Source 1 & 2 source voltages match & waveforms are in synchronism connect Source 1 to the load. Immediately disconnect Source 2 from Load (make-before-break), then remove Generator start signal.
Applications			
Source Types	Generator-to-Utility, Generator-to-Generator, Utility-to-Utility		
Typical Applications	Fast, reliable, general source switching	Source Switching above UPS. Switching of motor, transformer and other regenerative loads.	Switching of Critical loads (general or motor) where a non load-break retransfer to the Primary Source is desired.

Bypass/Isolation Switching

Available in Standard, Delayed and Closed Transition Types



- Comprises two Transfer Switches bussed in parallel – (1) Automatic (ATS) and (1) Manual (MTS)
- ATS can be isolated from main power conductors similar to withdrawable circuit breakers
- (2) redundant paths from each source to load
- ATS and MTS are mechanically and electrically interlocked to prevent accidental closure of both sources
- Bypassing load power from ATS to Bypass MTS allows testing or maintenance
- If power fails while bypassed, genset is auto started to permit fast transfer using the Bypass MTS



Description and Operation

The bypass section is a Manual (MTS) switch provided with a quick break/quick make manual load transfer handle and GE Zenith's control/interlock system consisting of both mechanical and electrical interlocks. The bypass MTS is equipped with Source 1 failure sensing and a time delay to start the engine automatically if the Automatic Transfer Switch (ATS) has been removed for service. The ATS and MTS modules are mounted in a compact enclosure and completely interconnected requiring only Source 1 (normal), Source 2 (emergency) and load cable connections. Once installed, no cables need to be removed to isolate the transfer switch module for maintenance or inspection. The ATS may be withdrawn for testing or maintenance without disturbing the load. The ATS module has three positions:

1. **Automatic/Connected:** The ATS is carrying the load, and the bypass MTS is in the open position. This is the normal operating position.
2. **Test:** The bypass MTS is closed and feeding the load. The ATS has control power and may be operated for test purposes via the test switch. The load is not affected during testing.
3. **Isolate:** The ATS is withdrawn from all power sources and ready for maintenance. The load is served by the bypass MTS.

The ATS is installed on a draw-out mechanism, with electrical and mechanical interlocks for secure removal after load bypass. The ATS control/logic panel is mounted on the enclosure door and connected by a wire harness and multi-pin disconnect plugs. The ATS and/or the control panel may be tested, isolated and removed for maintenance without load interruption.

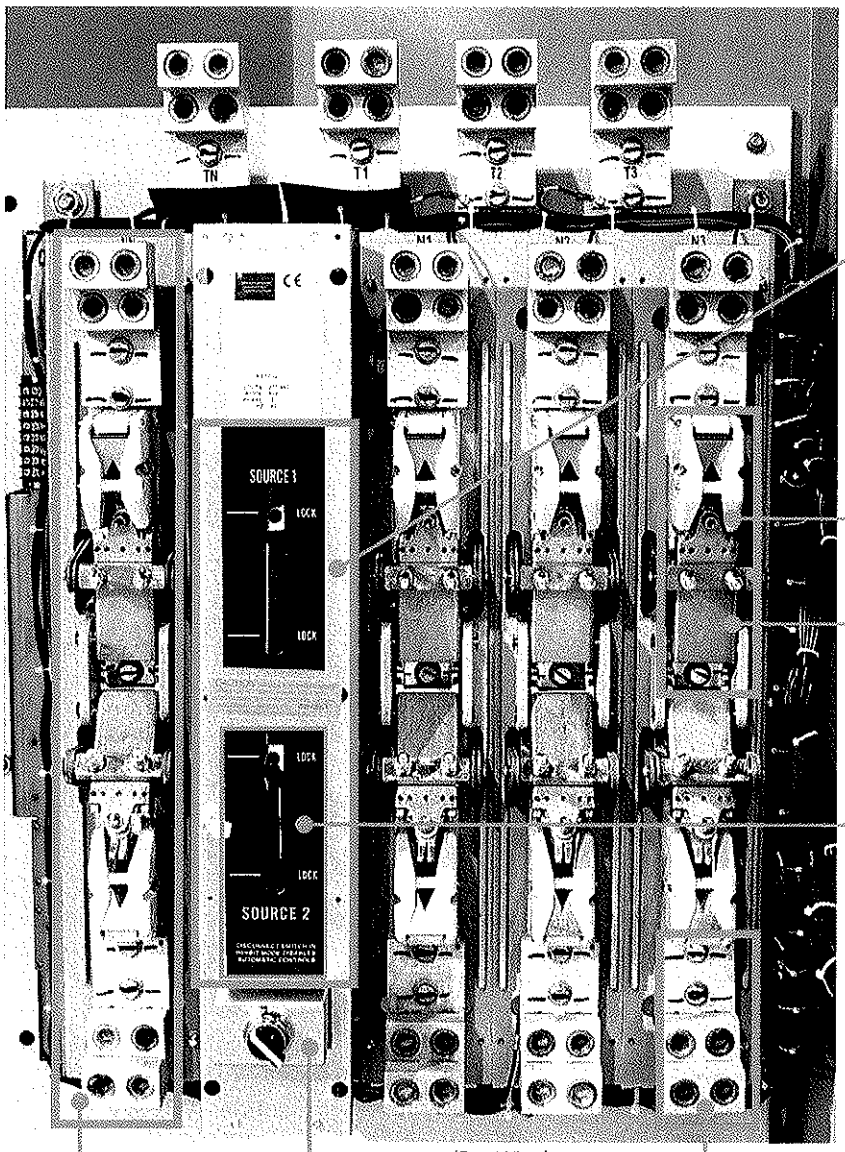
The bypass/isolation MTS module is the same basic design as the ATS module and thus has the same electrical ratings. Manually operated, it features high speed, quick break/quick make contact action. The bypass/isolation MTS has three basic positions:

1. **Automatic:** Source 1 (Normal) bypass contacts open, Source 2 (emergency) bypass contacts open.
2. **Bypass Normal:** Source 1 (Normal) bypass contacts closed, Source 2 (emergency) bypass contacts open.
3. **Bypass Emergency:** Source 1 (Normal) bypass contacts open, Source 2 (emergency) bypass contacts closed.

Robust Switching Mechanisms

Non-Bypass/Isolation Models

800A, 277/480V, 4-pole Closed Transition ATS shown (covers removed for clarity)



(Front View)

Electrically-operated, mechanically-held, over-center mechanism

* Operated via momentarily energized solenoid-driven mechanism
* Inherent mechanical interlock design inhibits closure of both sources to the load
* Fast operation – contact transfer speed less than 100 msec

For ease of inspection, main and arching contacts are visible without disassembly

High close-in and withstand capability

* UL/IEC 3-cycle (unconditional) fault ratings

Handles are provided for manual operation during de-energized maintenance

Disconnect switch locks out automatic switch operations for inspection or maintenance

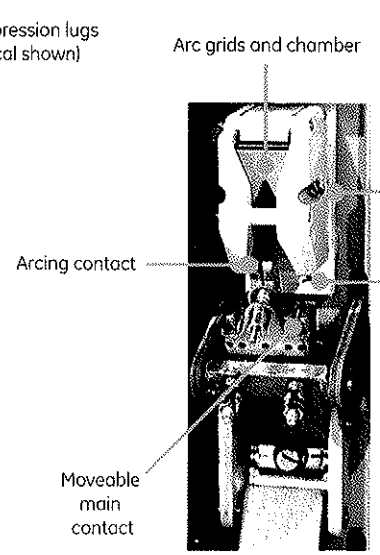
Mechanical and compression lugs available (mechanical shown)

True 4-pole/neutral switching

* Neutral pole switches on same mechanism as phase poles
* Neutral main and arching contacts have same rating as phase contacts
* A break-last/make-first neutral pole construction to minimize neutral switching transients and eliminate the possibility of the neutral pole failing to switch along with the phase poles

Two-piece contacts, including:

* Segmented main contacts of silver tungsten allow composition
* Arc quenching contacts, grids and chamber to protect main contacts from excessive wear during transfers

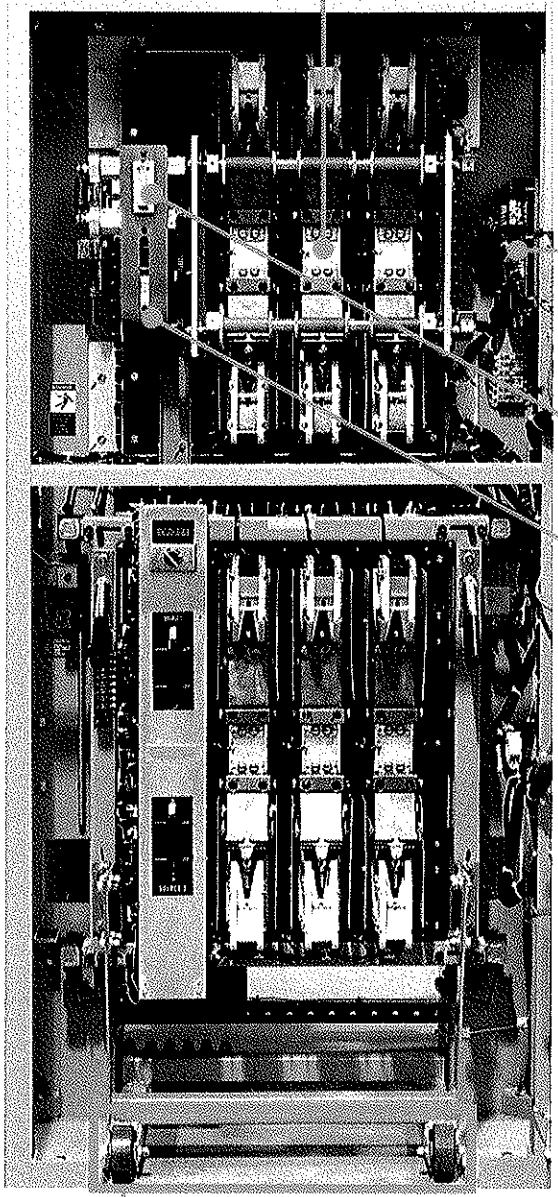


(Exploded View)

Robust Switching Mechanisms

Bypass/Isolation Models

2000A, 277/480V, 3-pole Delayed Transition shown (covers removed for clarity)



Load is not interrupted during Bypass operation

Dedicated controller to provide an Engine start signal if Source 1 power fails during Bypass operation – even with ATS in isolate position

Bypass switch (MTS) transfer position selector switch (Bypass to Source 1 – OPEN – Bypass to Source 2)

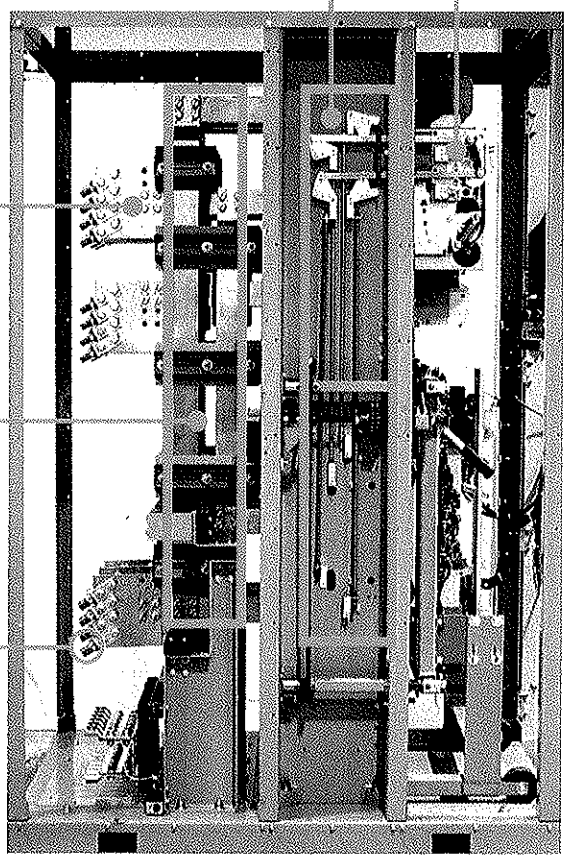
Manual Bypass handle for connection of MTS to Source 1 or Source 2. Mechanism ensures the operating speed of MTS contacts are independent of the bypass handle operating speed

(Front View)

ATS is located on drawout mechanism to facilitate inspection and maintenance

NEMA pattern bus is standard. Mechanical and compression lugs are available options. (compression lugs shown)

Mechanical and electrical interlocks prevent accidental connection of both sources to the load



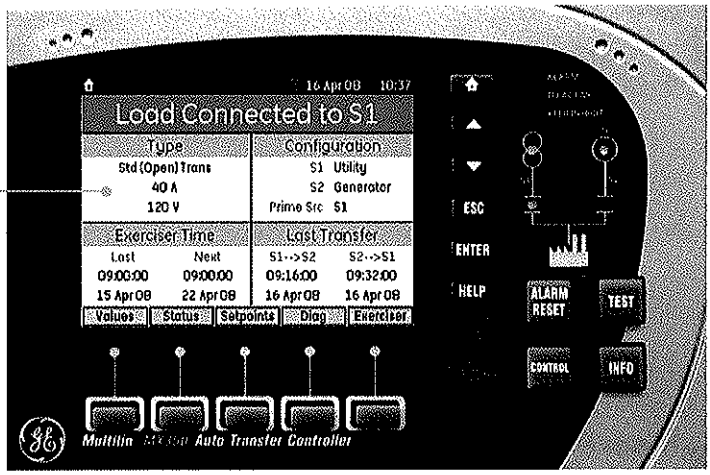
Silverplated copper bus interconnection of ATS and Bypass MTS switch on all amperage sizes

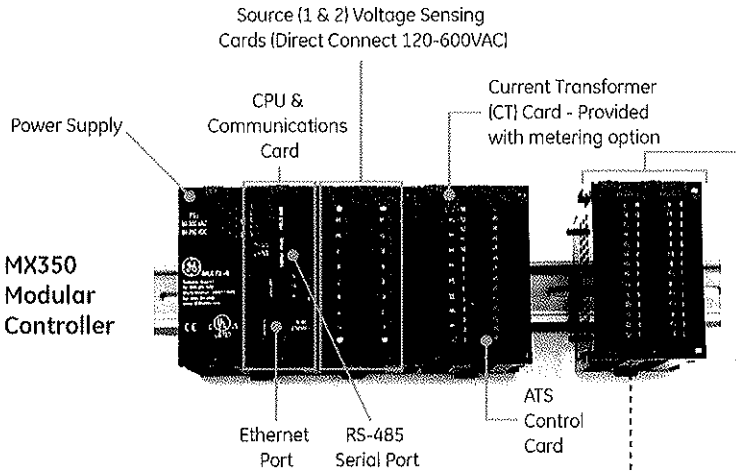
Power cables do not have to be disconnected to remove the ATS

(Side View)

The MX350 Control System on the ZTE

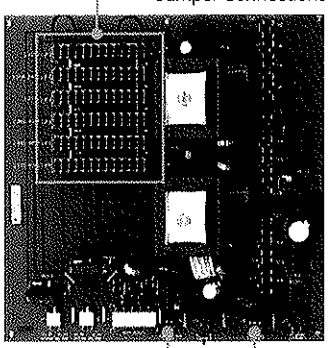
MX350 Graphical Operator Interface





MX350 Universal Transformer Assembly (UTA)

(cover removed for clarity)

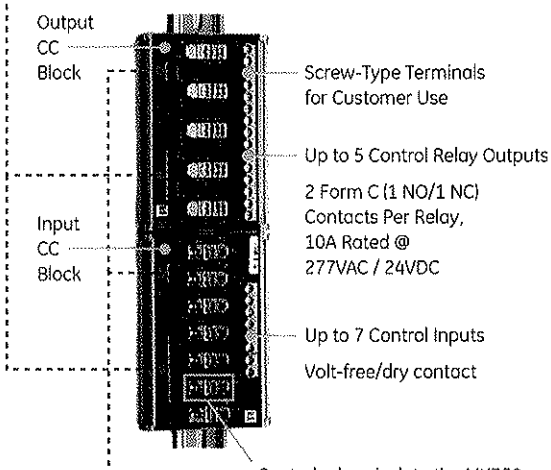


UTA Features:

* Best Source (1 or 2) Power Supply
* External 120VAC Power Supply Input to power controller in event of an extended outage of both sources
* External 24VDC Power Supply Input permits continued monitoring of control inputs in event of an outage of both sources
* Source Voltage Jumper Connections (user-selectable) permits the use of one UTA module across voltages 120-600VAC
* Provides 24VDC to permit all customer control connections to be volt-free type (i.e. dry contact)

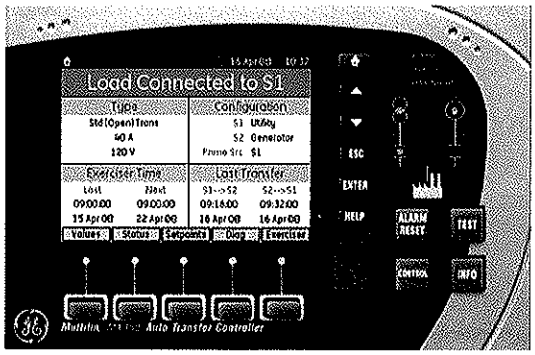
MX350 Din-Mount Customer Connection (CC) Blocks

(located on right sidewall of enclosure)



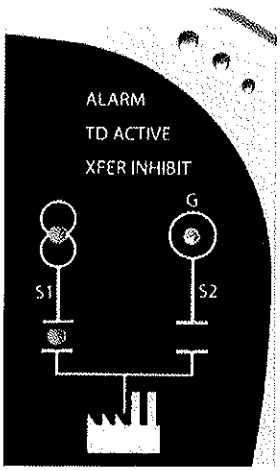
Advanced User Interface & Controls

The ZTE Series MX350 Graphical Operator Interface includes a ¼ VGA, color graphical display. The display design makes the ZTE one of the most intuitive and easy-to-operate ATS on the market. The ZTE is built on the **GE Multilin** time tested, software hardened UR relay and EPM metering platforms, which has thousands of installations in the field.



Easy-to-see status LEDs

- Source Availability (Source 1 Green, Source 2 Red) – Indicates source voltage and frequency are acceptable
- Source Connected (Source 1 Green, Source 2 Red) – Indicates source contacts are closed and load is being fed from the source
- Xfer Inhibit (1 Red) – Indicates ATS is being inhibited from automatic transfer to the unconnected source; inhibits may be commanded through external control contacts, AUTO/MANUAL control switch or remote communication
- Alarm (1 Red) – Indicates that an alarm condition is active
- TD Active (1 Red) – Indicates that the controller is actively timing to initiate an automatic sequence; an example is an active timer for re-transfer to Source 1



Easy-to-see status LEDs

USB programming port

- Provides a connection point for the EnerVista™ MX350 Setup software
- Front door-mounting provides capability for closed-door configuration and programming changes, without risk of contact with live electrical conductors and switching mechanisms inside the ATS



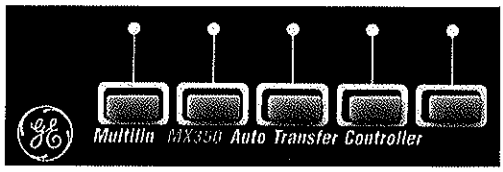
USB Programming Port (with cover closed)



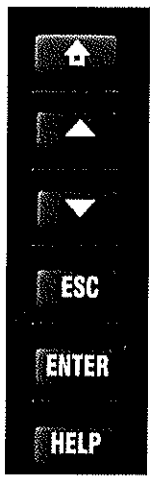
USB Programming Port (with cover removed)

Menu-driven soft keys, dedicated control and navigational keys

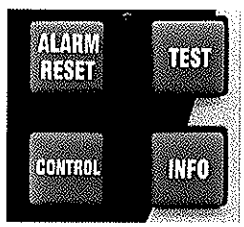
- (5) Soft keys below the graphical display change function based on user location in the menu structure
- Dedicated navigational keys for: HOME, SCROLL UP, SCROLL DOWN, ESC (Escape), ENTER, and HELP
- Dedicated control pushbuttons for: ALARM RESET, TEST, CONTROL and INFO
  - ALARM REST – Resets all latches alarm conditions
  - TEST – Permits selection of Test With Load, Test Without Load or Fast Transfer Test modes of operation
  - CONTROL – Brings operator immediately to a Control Menu, where operator-initiated control functions may be activated
  - INFO – Brings operator to a report screen that displays comprehensive data on the last outage or test event



Menu-driven soft keys



Navigational Keys



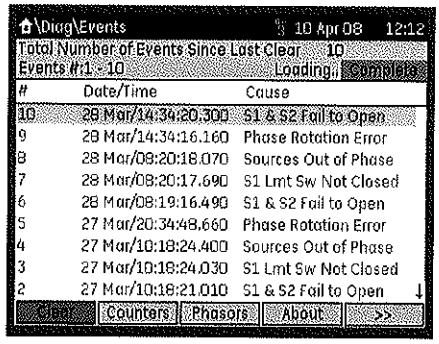
Dedicated Control Keys

Diagnostics and Event Recording

The advanced diagnostic features of the ZTE MX350 can significantly reduce the time needed for trouble-shooting source failure and a wide variety of power system anomalies.

Sequence of events recorder

- Local storage of 256 time tagged events with 1 ms resolution
- All MX350 controllers on an Ethernet network may be time-synchronized via Network Time Protocol (NTP) to a master PC to align each controller date time stamping



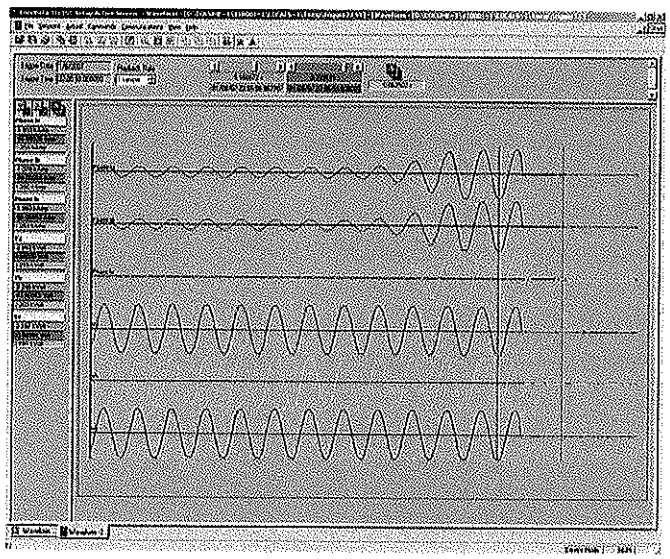
Event Recorder Screen

Data logger

- Configurable 20-channel data logger
- User-adjustable sampling rates from 1 cycle to 60 minutes

Waveform capture/oscillography

- Power source outage and other events can be recorded using 1920 samples/sec. waveform capture


EnerVista™ MX350 Setup Screen showing Voltage and Current Waveform Captures

Outage & test event recorder

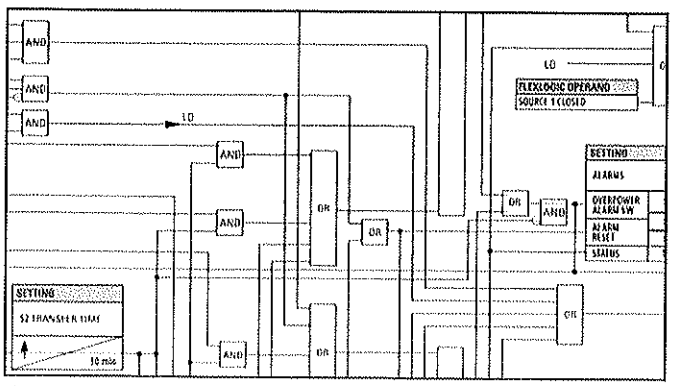
- Time-sequenced recording of test and utility outage events, including:
  - *Sequence of Events Recorder* (Time Genset start signal sent, Genset startup time, time transferred to Genset, time utility supply returned or test reset, time re-transferred to utility supply, time start signal removed)
  - *Genset loading performance Recorder* (max Genset voltage & frequency dip on connection of load)
  - *Genset on load performance Recorder* (max current, kW, Avg pF, Avg THD%), time utility supply returned or test reset, time re-transferred to utility supply, time start signal removed

Customer-configurable alarms

- Up to 10 digital and 11 analog alarms may be configured via the MX350 front keypad or EnerVista™ MX350 Setup software

FlexLogic™ Designer

The MX350 controller has an optional control logic engine called FlexLogic™. This provides the ability to create customized protection and control schemes, thereby minimizing the need for and the associated costs of auxiliary components and wiring. Using FlexLogic™, the ZTE can be configured to specify what actions will be taken based on the status of measured parameters or control inputs.

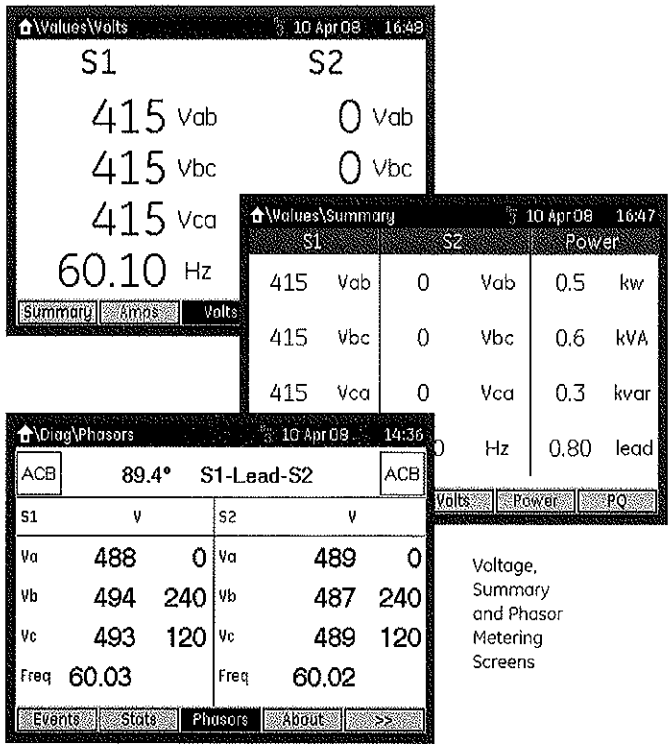


FlexLogic™ Designer Screen

Power Quality Metering

In addition to standard voltage and frequency monitoring of both sources, the ZTE MX350 can be equipped for extended metering of the connected load. The ZTE MX350 provides true RMS metering for current, voltage, real and reactive power, energy use, power factor and frequency. Direct metering of both source voltages make the MX350 metering equivalent to having power quality meters on *each* source. The advanced metering features of the ZTE MX350 include:

- 3 phase and neutral (ground) current: Ia, Ib, Ic, In plus average (Iavg)
- 3 phase voltage: Va, Vb, Vc, Vab, Vbc, Vca
- Voltage and current unbalance
- Hz, PF, W, Var, VA, Wh, VARh, VAh
- Voltage and Current Harmonics (% THD)
- Phase Rotation Sensing
- Syncroscope



Voltage, Summary and Phasor Metering Screens

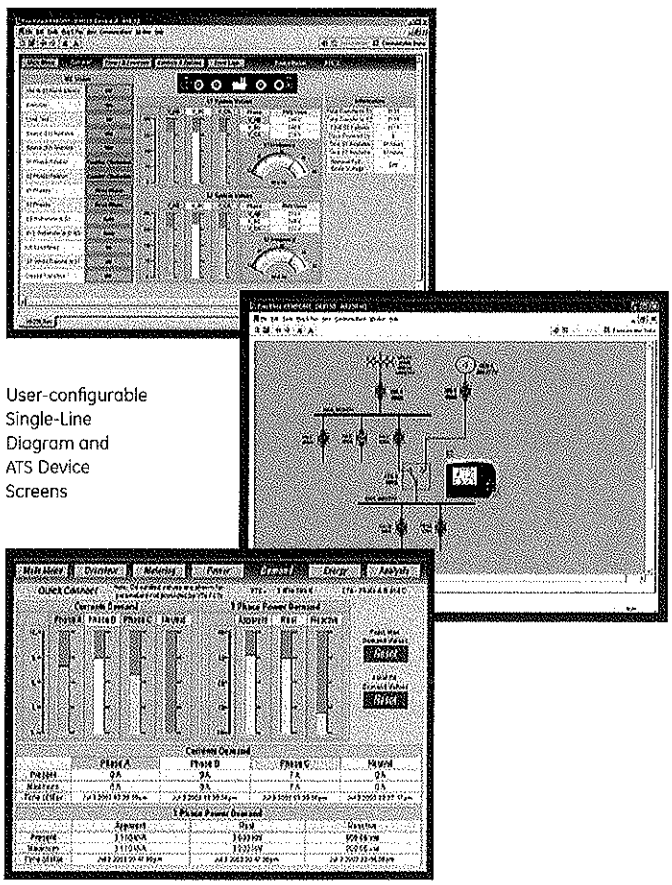
Connectivity

Networking

- Built-in, two-wire RS-485 serial and 10/100 base-T Ethernet
- Open protocols - Modbus RTU (Serial) and Modbus TCP
- Supports simultaneous communications on both Serial and 10/100 base-T ports
- Easily interfaces with third-party building management systems
- USB programming port accessible with ATS enclosure door closed

Facility Integration

- User-configurable customer data map
- Fast download of event, waveform and data logs
- Advanced system control using GE FlexLogic™
- Auto load shed capability, without need for system master control/PLC



User-configurable Single-Line Diagram and ATS Device Screens

Monitoring

Plug-&-Play, PC-based monitoring is available using GE Multilin's EnerVista™ Viewpoint Monitoring software. Viewpoint Monitoring is a simple-to-use and full-featured monitoring and data recording software package. EnerVista™ Viewpoint Monitoring provides a complete HMI package with the following functionality:

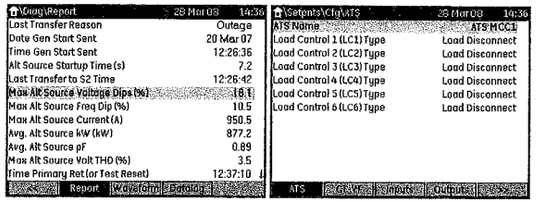
- Plug & Play Device Monitoring
- System Single-Line Monitoring & Control
- Annunciator Alarm Screens with e-mail notifications
- Trending Reports
- Automatic Event and Waveform Retrieval

EnerVista™

Connectivity Diagram

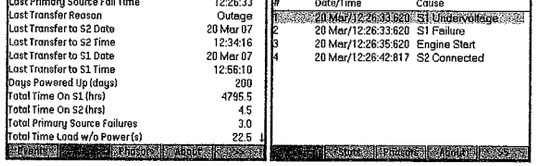
Motor Load

- Automatic recording of alternate source voltage and frequency dips during motor starting – Helps avoid inadvertent under-voltage trips
- Waveform recording and data logging triggerable on overload/trip or outage events – Permits fast and efficient fault diagnostics
- Up to (6) programmable Load Control relays, each with individual time delay settings – Simple field addition/removal of stages and timer adjustments



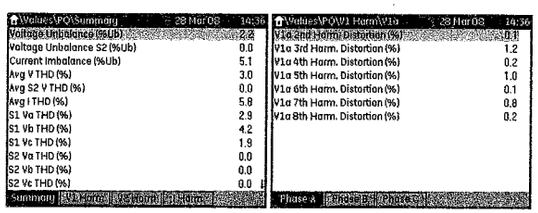
Emergency / Life Safety Load

- Critical switch statistics all on one (1) page - Quick and efficient interrogation of Standby System performance
- 256 Events stored locally, automatic upload to Master PC for infinite event storage, user selectivity on which events are logged – Log only the information that is useful
- Time synchonization of events from ATS to ATS - Permits true diagnostics on a consolidated ATS log built in the Master PC

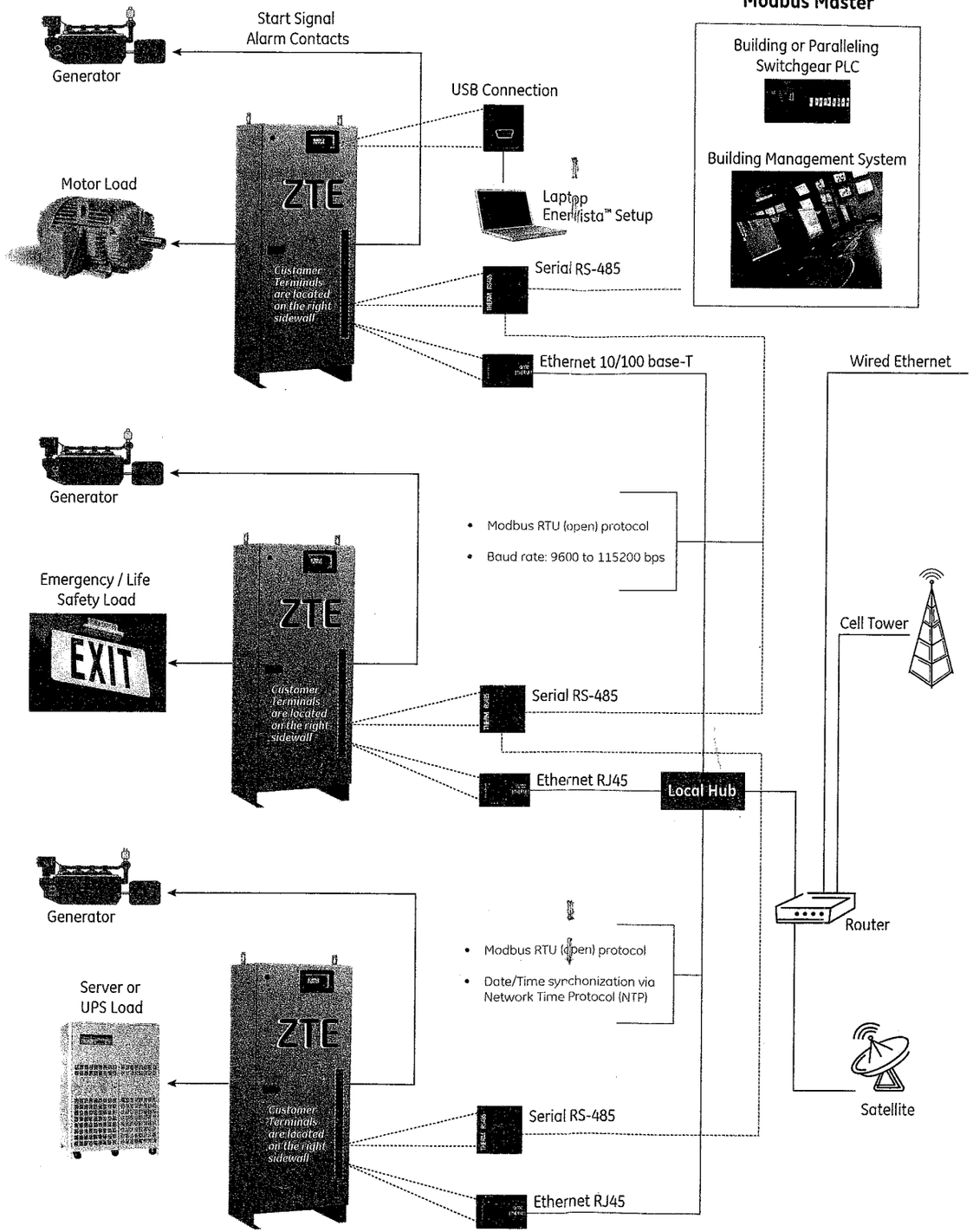


Server or UPS Load

- Full Power Quality Metering – Mins, Max, Unbalances, Volts and Current THD%, pf, etc. - Know exactly what is going on with the loads at all times
- Custom Alarm Capability – Alert maintenace staff to any/all power anomolies before problems occur
- Per source, and per Phase Harmonic monitoring – Perfect for systems with mixed single phase and three phase UPS/Server loads

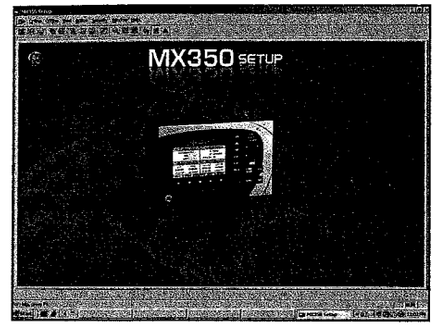


Load Types



Network Solutions

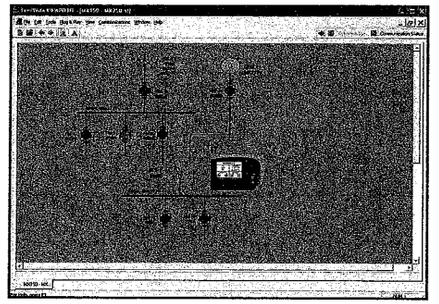
Software Solutions



EnerVista™ MX350 Setup Software Screen (Free Software)

EnerVista™ MX350 Setup Software

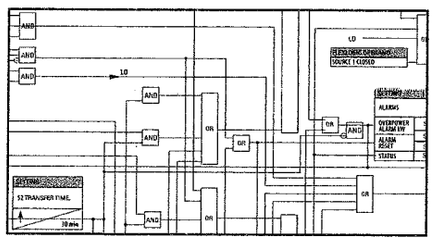
- Communicate with multiple ZTE switches at same time
- Access to all switch adjustments and settings in an easy-to-use, PC-based format - configure devices on-line or offline
- Upload/Save/Download settings from local or remote location
- Real time data logging
- View waveform data stored in ZTE



EnerVista™ Viewpoint Monitoring Single-Line Diagram Screen

EnerVista™ Viewpoint Monitoring

- Pre-configured screens for instand monitoring
- Create custom single-line diagrams in minutes
- Effortless data archiving
- View waveforms recorded in the ZTE
- Automatic uploads of wave-form capture files with added diagnostic capabilities
- Customizable Alarm notification – automatic e-mail notification for user-configured events



EnerVista™ Viewpoint Engineer Screen

EnerVista™ Viewpoint Engineer

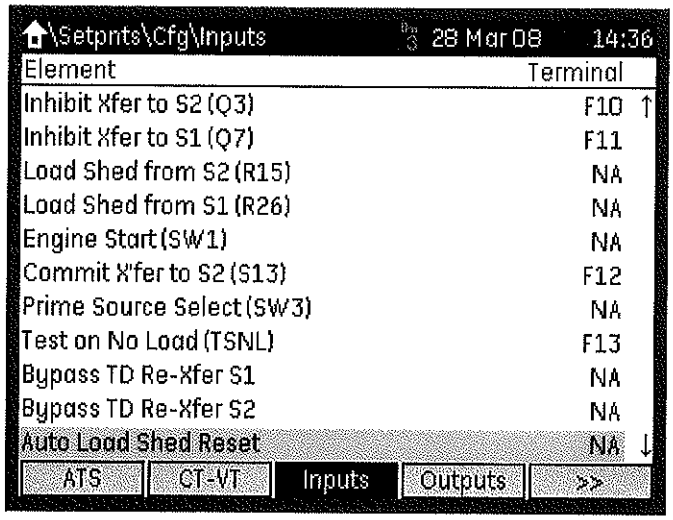
- Design control logic in an intuitive, easy-to-use IEC 1131 graphical editor
- Design logic with drag-and-drop ease using a library of inputs, outputs, logic gates, symbols and configuration tools
- Real time monitoring and feed-back of logic and program status monitoring – Perfect for systems with mixed single phase and three phase UPS/Server loads
- Design "PLC like" logic for ATS and load controls with FlexLogic™

Flexible Feature Assignment

Prior to ZTE, control features necessary to meet project requirements had to be selected at time of order. Features such as elevator pre-signals, auxiliary contacts and external transfer inhibit signals required factory wiring and configuration. If transfer switches were ordered incorrectly, or site conditions changed, a visit by a factory certified technician was traditionally required to reconfigure the ATS control logic.

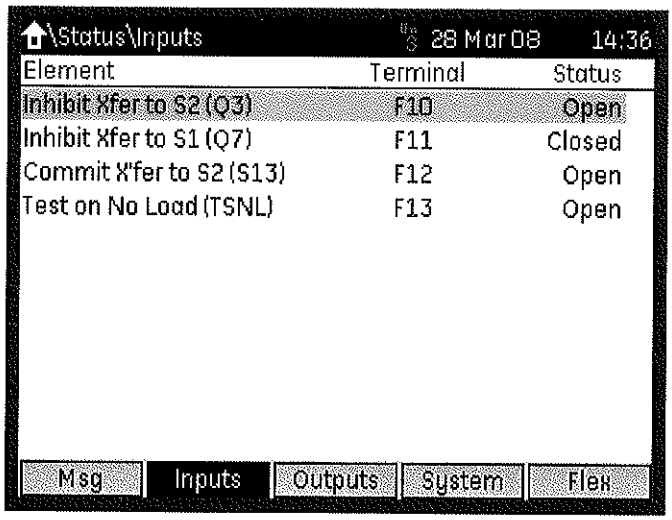
The ZTE transfer switch provides complete flexibility to add, delete or modify switch features in the field, without the cost and time associated with an on-site personnel field service visit.

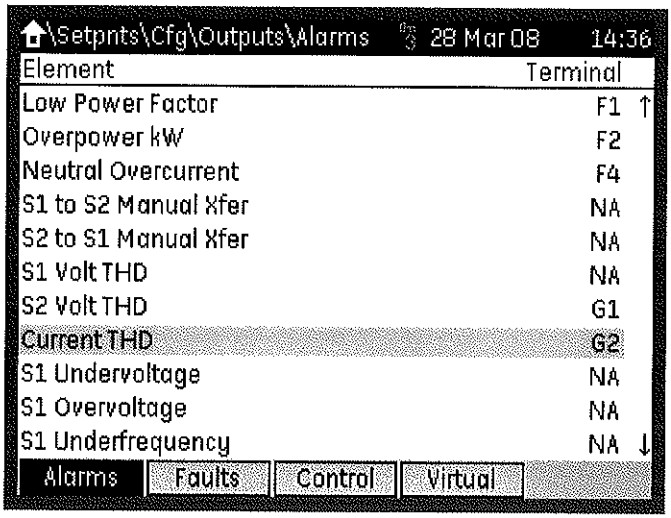
The ZTE switches are configured similar to a programmable logic controller (PLC), with a preset quantity of inputs and outputs (I/O). Option packages "A" through "D" provide increasing amounts of customer programmable I/O. The I/O provided on the ZTE is user-assignable to any of a large list of available control features. These features can be specified at the time of order, or a standard configuration of the I/O can be ordered and user re-assigned on site once requirements are known.



Available inputs being enabled and assigned to user-configurable input terminals

Once assigned, input status can be viewed





Available outputs being enabled and assigned to user-configurable output terminals

The flexible feature assignment capability of the ZTE greatly reduces the risk of commissioning delays due to incorrect switch configuration, and it makes the task of specifying ATS easy, as there is no longer a need to match features to project-specific requirements.

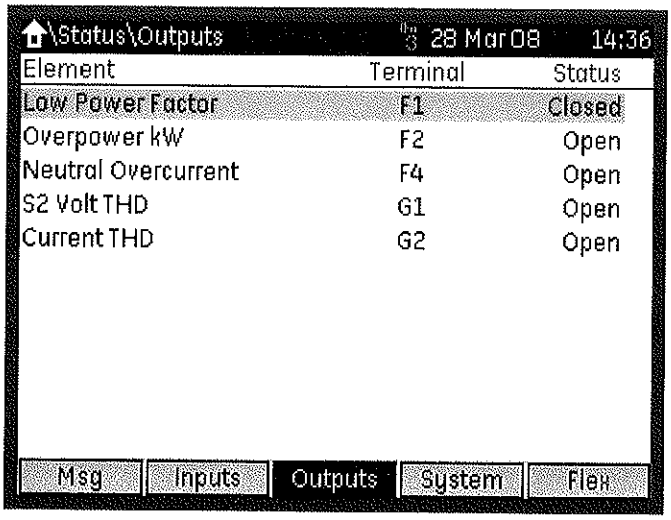
Examples of user-assignable inputs include:

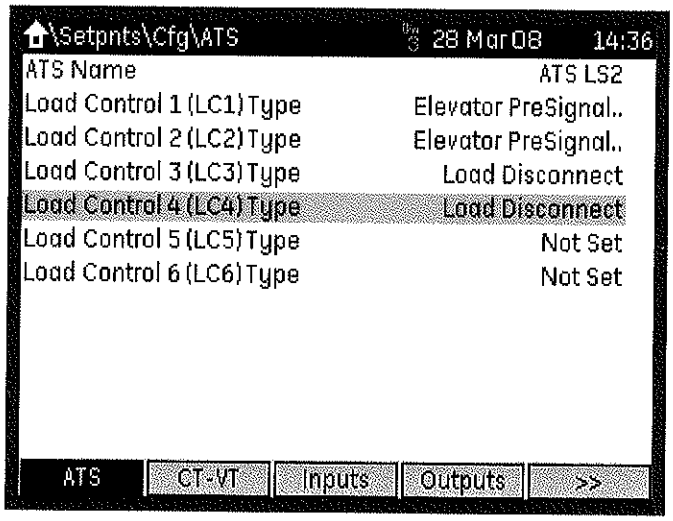
Inhibit transfers, load sheds, control switch activation via remote dry contacts, time delay bypass commands, etc.

Examples of user-assignable outputs include:

Switch position contacts, source availability status, load shed and load control commands, elevator pre-signals, user-configurable alarms, etc.

Once assigned, output status can be viewed



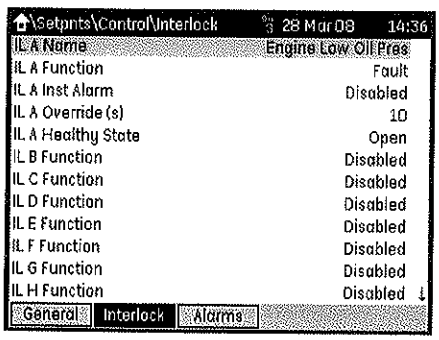


Flexible load control contacts being enabled and configured

Customer-Configurable Alarms

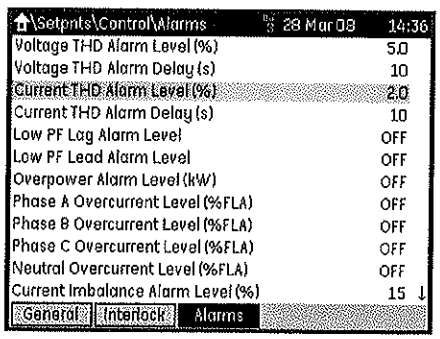
Up to 11 analog alarms and 10 digital alarms are customer-configurable.

Alarms may be assigned to available configurable outputs, viewed locally, or monitored via Serial or Ethernet communications.



Digital Alarm Screen

Analog Alarm Screen



ZTE Series Option Package Descriptions

Option Package	Features	Application
"A"	• Full function ATS control with full sensing and control capabilities • Expanded diagnostics, high-speed 256-event capture, 365-day exerciser, EnerVista™ launchpad USB interface for calibration upload/download (local or remote) • (4) programmable inputs and (4) outputs assignable to additional ATS features • Full complement of programmable ATS control switches (AUTO/MAN, Preferred Source Select, Commit/No Commit Xfer, Transition Mode Select for Closed Transition models)	• Standard Mission-Critical Switching • Standard Density I/O
"B"	**Option Package "A" Features, plus** • (10) customer programmable digital and (10) analog alarms • (20) channel data logger, customer configurable sample period 1 cycle to 60 minutes • Waveform capture, (10) channels, up to 256 cycles each 16 samples/sec. • Auto load shed with voltage, frequency and kW triggers	• Custom Alarm Capability • High-Speed Diagnostics • Standard Density I/O
"C"	**Option Package "B" Features, plus** • (4) additional inputs and outputs (total 8 in, 8 out)	• Custom Alarms & Diagnostics • Medium Density I/O
"D"	**Option Package "C" Features, plus** • (4) additional input and outputs (total 12 in, 12 out) • FlexLogic™ for user-customized control logic	• Custom Alarms & Diagnostics • High Density I/O • Customizable Control Logic

"M"	Configuration for Manual operation only (non-Automatic)	• Non-automatic switching • Standard Density I/O

Application Notes:

Metering and communications are available options on all configurations (see model number descriptions, page 20-21)

Option Package User-Configurable Inputs and Outputs

Feature	Description	See Note #	Type (Input/ Output)	Code	Factory Default I/O Configuration "A" 4 In/4 out	"B" 4 In/4 out	"C" 8 In/8 out	"D" 12 In/12 out	"M" 4 In/4 out
Source Status	Source 1 (S1) Failure		Output	A1	Out 1	Out 1	Out 1	Out 1	Out 1
	Source 2 (S2) Failure		Output	A1E	Out 2	Out 2	Out 2	Out 2	Out 2
Switch Position	Connected to S1	2	Output	A4	*	*	*	Out 12	*
	Connected to S2	2	Output	A3	*	*	*	Out 11	*
	Connected to Center (Delay type only)		Output	A34N	*	*	*	*	*
	Bypass MTS connected to S1 (or S2)		Output	AB4, AB3	*	*	*	*	*
Switch Status & Diagnostics	Switch Exercising		Output	EXC	*	*	Out 6	Out 6	*
	Engine Start Signal Active		Output	ESS	*	*	*	*	*
	Auto Transfer Occurred S1-S2 (or S2-S1)		Output	ATS2, ATS1	*	*	*	*	N/A
	Manual Transfer to S2 (from S1) Occurred		Output	MTS2S1	N/A	N/A	N/A	N/A	Out 3
	Manual Transfer to S1 (from S2) Occurred		Output	MTS1S2	N/A	N/A	N/A	N/A	Out 4
	Transfer Inhibit S2 to S1 (or S1 to S2) On		Output	TIS2S1, TIS1S2	*	*	*	*	N/A
	Common Alarm (any alarm active)		Output	ALM	*	*	Out 7	Out 7	*
	Fail to Transfer to S1 Alarm		Output	FTS1	*	*	*	Out 9	*
	Fail to Transfer to S2 Alarm		Output	FTS2	Out 3	Out 3	Out 3	Out 3	*
	ATS Not in Auto Mode	5	Output	NIA	*	*	Out 8	Out 8	N/A
	Transfer to S2 Alarm		Output	CTAP	*	*	*	*	*
Remote Control	Remote Engine Start		Input	RES	In 4	In 4	In 4	In 4	In 4
	No Load Test	1	Input	TSNL	*	*	*	*	In 3
	Bypass Time Delay on Transfer to S1		Input	BYPTR	In 1	In 1	In 1	In 1	N/A
	Bypass Time Delay on Transfer to S2		Input	BYPWR	*	*	In 5	In 5	N/A
	Inhibit Transfer to S1		Input	Q7	In 3	In 3	In 3	In 3	N/A
	Inhibit Transfer to S2		Input	Q3	In 2	In 2	In 2	In 2	N/A
	AUTO/MAN Re-transfer S2 to S1		Input	S5R	*	*	*	*	N/A
	Initiate Manual Re-transfer to S1		Input	YNR	*	*	In 8	In 8	In 2
	AUTO/MAN Transfer S1 to 2 & 2 to 1		Input	S12R	*	*	In 6	In 6	N/A
	Initiate Manual Transfer to S2		Input	YER	*	*	In 7	In 7	In 1
	Prime Source Select Switch		Input	S3R	*	*	*	In 12	N/A
	Commit/No Commit to Transfer to S2		Input	S13R	*	*	*	*	N/A
Programmable Load Control Relays	Load Control Relay #1	6	Output	LCE1, LCL1	Out 4	Out 4	Out 4	Out 4	*
	Load Control Relay #2	6	Output	LCE2, LCL2	*	*	Out 5	Out 5	*
	Load Control Relay #3 thru #6	6	Output	LCE3-6, LCL3-6	*	*	*	*	*
Auto Load Shed	Auto Load Shed Active		Output	ALS	N/A	*	*	Out 10	N/A
	Auto Load Shed Reset	3	Input	LS1R	N/A	*	*	In 9	N/A
	Auto Load Shed kW Pickup On/Off		Input	LS1KW	N/A	*	*	In 10	N/A
	Auto Load Shed Enable/Disable		Input	ALS1	N/A	*	*	In 11	N/A
User-Configurable Analog Alarms	S1 (or S2) Undervoltage		Output	UVS1, UVS2	N/A	*	*	*	N/A
	S1 (or S2) Overvoltage		Output	OVS1/2	N/A	*	*	*	N/A
	S1 (or S2) Underfrequency		Output	UFS1, UFS2	N/A	*	*	*	N/A
	S1 (or S2) Overfrequency		Output	OFS1/2	N/A	*	*	*	N/A
	Low PF		Output	LLPFA	N/A	*	*	*	N/A
	S1 (or S2) High Volts THD%		Output	VTHDS1, VTHDS2	N/A	*	*	*	N/A
	Current High THD%		Output	CTA	N/A	*	*	*	N/A
	kW Overload		Output	LOKWA	N/A	*	*	*	N/A
	Overcurrent (Phase A, B, C, or N)		Output	OCAPA/B/C,NOCA	N/A	*	*	*	N/A
	S1 (or S2) Voltage Imbalance		Output	VIAS1, VIAS2	N/A	*	*	*	N/A
	Current Unbalance		Output	CIA	N/A	*	*	*	N/A
User-Configurable Digital Alarms	Digital Inputs (up to qty 10) for User-Configurable Alarms & Flexlogic™	4	Input	CCDI-x	N/A	*	*	*	N/A
	Digital Alarms (up to qty 10)		Output	CCAD-x	N/A	*	*	*	N/A

GENERAL NOTE: All of the above status and alarm items above can be monitored via serial or ethenet network (see networking options on page 21)

NOTE 1: Test with Load (Q2) is provided as a standard (pre-configured) feature on all ZTE switches

NOTE 2: (2) Form C contacts are provided as standard on all ZTE switches. These features may be used when additional contacts are required.

NOTE 3: Auto Load Shed features may also be controlled via the front display, without need for remote control inputs.

NOTE 4: For each of the (10) alarms, user-programmable alarm text, time delay, and normal state (open/close) adjustments are field programmable.

NOTE 5: Activates when ATS is either in MANUAL mode, or an active transfer inhibit signal is being received.

NOTE 6: Each load control relay is programmable as either elevator pre-signal type or load disconnect type.

* - Indicates feature may be customer-enabled in the field by de-selecting the factory-default parameter and re-assigning the input to the desired feature

Application Guide

HEALTHCARE / HOSPITAL



Application Profile

1. Typically 1 or 2 utility supplies, diesel genset(s) backup
2. Multiple load classifications in the same facility: Life Safety, Essential, Non-Essential
3. Always open - 24/7, 365-day operation
4. Strict regulatory requirements for testing, operation and maintenance

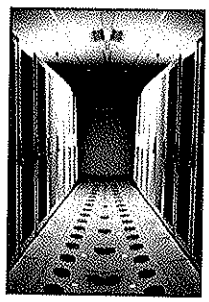
Application Challenges

1. Keeping Life Safety loads less than the capacity of one (1) Genset (per NFPA regulations)
2. Quick notification of any failures to connect loads to the backup supply during power disturbances
3. Efficient collection and reporting of data to satisfy regulatory agencies (e.g. JCAHO)
4. Assuring that the ATS has the correct interface signals for motors, elevator pre-signals, etc. The ability to modify the ATS to accommodate facility changes and upgrades.

ZTE Solutions

1. Automatic generation of the Test and Outage Report, giving the maximum Genset %V and %Hz dips on connection of Priority 1 loads (Life Safety)
2. Automatic e-mails to PDAs from EnerVista™ immediately on connection of any/all loads to the Genset supply
3. 256 Events, 1 ms accuracy Sequence of Events Recorder with full Genset loading characteristic (max kW, max amps, pf, etc.) for direct data collection for JCAHO reporting
4. All I/O is field re-configurable. Load signaling (motor, elevator) and building interface signals (inhibit transfers, test signals, etc.) can all be added, deleted or changed in minutes.
5. Option packages "B", "C" and "D" typically used

DATA CENTER / TELECOMMUNICATIONS / IT



Application Profile

1. Typically multiple utility feeds with 80-100% Genset backup
2. High percentage (%) electronic loads (Servers, UPS, Ethernet Switches, etc.)
3. High power system uptime/ reliability needs (99.999999%)

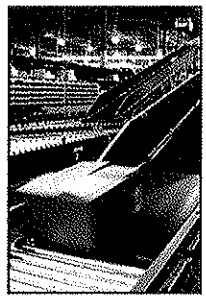
Application Challenges

1. Identifying system faults or anomolies during testing vs. during outages
2. Preventing a device (cable, circuit breaker, switchboards, transformer) from overloading when servers are added or moved
3. Ability to monitor, diagnose and re-configure remote equipment (e.g. cell towers) from central location

ZTE Solutions

1. Time-synchronized Sequence of Events recorders, 32 samples/sec waveform capture, 1 ms-resolution datalogging and full Power Quality metering provides precise information on system performance during test events
2. Built-in Power Quality Metering, including harmonic %THD, with user-configurable overcurrent and overpower alarms
3. Full remote access to timers, setpoints and calibrations using built-in TCP/IP Ethernet communications and free EnerVista™ MX350 Setup software. The device settings can be saved in a central location for quick addition of devices from a remote location.
4. Option packages "A", "B", "C" and "D" typically used

MFG / PROCESS CONTROL / PETRO CHEMICAL



Application Profile

1. Single or multiple utility feeds, often limited Genset capacity
2. High variety load types (motor, arc welding, HVAC, process sensors, etc.)
3. Interruption-sensitive operations (batch processing, plastics/molds, high-speed part inspection, etc.)

Application Challenges

1. Real-time values with frequent addition/removal of loads (e.g. process lines added, removed, relocated)
2. Prevent overloading of limited genset supply capacity
3. Efficient, affordable integration of critical equipment into the Facility Management system
4. Complex load adding/shedding sequences due to large content motor loads and often limited Genset supply

ZTE Solutions

1. Easy install/de-install of devices on serial or ethernet network, with all necessary communication parameters accessible via front panel display
2. Auto-upload and synchronization of ATS device data logs along with loading info (dips, maximums, pf, etc.) to central EnerVista™ PC station gives precise Genset loading and performance after each test or outage event
3. Utilize open/non-proprietary (Modbus) protocols, setup simultaneous serial and ethernet connectivity, user-configurable digital and analog alarms points (ATS or non-ATS/system related) and user-configurable data maps for fast, flexible and low-cost building network interface
4. Fully user-configurable Auto Load Shed capability, plus addition of advanced load and system control logic using Flexlogic™ Designer
5. Option packages "A", "B" and "C" typically used

WASTE TO ENERGY / WASTE WATER TREATMENT



Application Profile

1. High capacity utility feed(s), typically with partial Genset backup
2. High percentage (%) motor loads with varying starting types (across line, VFD, soft start, etc.) high content automation
3. Community critical 7x24 operation for health and safety

Application Challenges

1. Loads trip and poor power quality due to voltage dips
2. Keeping equipment on-line and reporting status during outage events
3. Making required operations intuitive and status monitoring easy to understand

ZTE Solutions

1. Genset loading info (% dips) on each test event using Test and Outage Report, setup 10-channel waveform captures to trigger on starting of larger motors for precise analysis of system performance under large inrush conditions
2. Utilize standard auxiliary power supply inputs on controller to keep CPU, communications and I/O all energized - even during temporary outage of both sources of power to the ATS
3. Embedded help messages, high visibility status LEDs, dedicated control pushbuttons, easy navigation menu system, high-resolution color graphical display, banner display showing exact state of ATS at all times (ex: "Timing to connect to Source 2", "Waiting for Source 2 available", etc.)
4. Option packages "B", "C" and "D" typically used

ZTE Configuration

Option Package Features

Feature	Description	See Note #	Code	Option Package "A"	"B"	"C"	"D"	"M"
Contacts	ATS Source 1 and Source 2 Position Contacts, SPDT, Qty 2 ea		2-A3, 2-A4	✓	✓	✓	✓	✓
	Bypass MTS Source 1 & Source 2 Position Contacts, SPDT, Qty 1 ea	1	1-AB3, 1-AB4	✓	✓	✓	✓	✓
	Remote Load Test Signal, Dry Contact Input		Q2	✓	✓	✓	✓	✓
Generator	Engine start contact, SPDT		E	✓	✓	✓	✓	✓
	Source 1 to 2 In Phase Monitor (w/enable-disable)	2	R50	✓	✓	✓	✓	✓
	Synchroscope (Gen Fast/Slow vs. Utility Source)	3	SYNC	✓	✓	✓	✓	✓
	Programmable Gen Exerciser, Gen-Util Applications, 365 Day (user-selectable with/without load)	4	EX-1	✓	✓	✓	✓	
	Automatic Load Shed, w/adj. Freq, Voltage & kW	5	LS 1		✓	✓	✓	
Indication/ Status	Color Graphical Display, with USB Calibration Port & Embedded Help		OIP, USB, HELP	✓	✓	✓	✓	✓
	Status LED's for: Source 1 & 2 Connected, Source 1 & 2 Available		L1, L2, L3, L4	✓	✓	✓	✓	✓
	Status LCD Indication of ATS in Center-off position	6	LN/P	✓	✓	✓	✓	✓
	Event log, last 256 events		EL/P	✓	✓	✓	✓	✓
	Customer Configurable Alarms, 10 Status-Digital & 10 Threshold-Analog		CCA-A, CCA-D		✓	✓	✓	
	Detailed Outage and Test Reports		INFO	✓	✓	✓	✓	✓
	Event Waveform Capture		WC-1		✓	✓	✓	
	Data Logger		DL 1		✓	✓	✓	
	FlexLogic™		FLEX				✓	
Sensing & Calibration	Calibration upload/download via Enervista™ MX350 Setup		CAL 1	✓	✓	✓	✓	✓
	Diagnostics Reports		DIAG 1, 2, 3	✓	✓	✓	✓	✓
	Over/under Freq Source 1 & 2		J2E/J2N	✓	✓	✓	✓	✓
	Over/under Voltage Source 1 & 2		R1, R1-3, R7, R8, R17, R2E	✓	✓	✓	✓	✓
	Phase Rotation Sensing		R16	✓	✓	✓	✓	✓
	Voltage Imbalance Sensing		VI	✓	✓	✓	✓	✓
Time Delays	Neutral-Source 1 or Neutral-Source 2 Transfer	6	DT/DW	✓	✓	✓	✓	✓
	Engine Start Timer, adj up to 10S		P1	✓	✓	✓	✓	✓
	Source 2 - Source 1 Retransfer		T	✓	✓	✓	✓	✓
	Emergency Source Failure Override Time Delay		ESO	✓	✓	✓	✓	✓
	Engine Stop/Cool Down		U	✓	✓	✓	✓	✓
	Source 1 - Source 2 Transfer		W	✓	✓	✓	✓	✓
Switches	Test Switch, Load/No Load Adjustable		6/P	✓	✓	✓	✓	✓
	Controller Disconnect Switch	7	DS	✓	✓	✓	✓	✓
	Bypass Retransfer Time Delays, Source 1-2/2-1, Adjustable	8	BYP-T, BYP-W	✓	✓	✓	✓	✓
	Manual Transfer, Source 1-2/2-1		YE/P, YN/P					✓
	Preferred Source Selector Switch	9	S3/P	✓	✓	✓	✓	
	Auto/Manual Transfer, Source 2 to Source 1		S5/P	✓	✓	✓	✓	
	Auto/Manual Transfer, Source 2-1/1-2		S12/P	✓	✓	✓	✓	
	Commit/No Commit Transfer to Source 2		S13/P	✓	✓	✓	✓	
	Transition Mode Selector Switch	3	TMS/P	✓	✓	✓	✓	
Programmable I/O	4 INPUT 4 OUTPUT	10		✓	✓			✓
	8 INPUT 8 OUTPUT	10				✓		
	12 INPUT 12 OUTPUT	10					✓	

Application Notes:

1 Bypass only
2 Utility to Generator Only
3 Closed Transition Only
4 Standard on gen-utility applications only
5 Requires R15 for transfer of ATS away from source, utilizes (1) programmable output if only signal to downstream load required
6 Delayed Transition only
7 Not available if CTAP option selected on ATS
8 Automatic switches only
9 Not available with load shed option/R15 and R15D
10 Refer to Pg. 15

ZTE Dimensions and Weights

Ampere Rating	Poles	NEMA 1 Height (A)	NEMA 1 Width (B)	NEMA 1 Depth (C)	NEMA 1 Reference Figure	Weight Open Type	Weight NEMA 1	Application Notes
40, 80, 100, 150, 225	2, 3	46 (117)	24 (61)	14 (36)	A	14 (7)	120 (55)	1-7, 11-13
	4					20 (9)	126 (57)	
260, 400	2, 3	46 (117)	24 (61)	14 (36)	A	59 (27)	168 (76)	1-7, 11-13
	4					70 (32)	180 (82)	
600	2, 3	74 (188)	40 (102)	19.5 (50)	B	150 (68)	410 (186)	1-8, 11-12
	4					180 (82)	440 (200)	
800, 1000, 1200	2, 3	74 (188)	40 (102)	19.5 (50)	B	190 (86)	460 (209)	1-8, 11-12
	4					230 (104)	490 (222)	
1600, 2000	3	90 (229)	35.5 (90)	48 (122)	C	345 (156)	1010 (458)	1-12
	4					450 (204)	1160 (526)	
3000	3	90 (229)	35.5 (90)	48 (122)	C	465 (211)	1130 (513)	1-12
	4					670 (304)	1396 (633)	
4000	3	90 (229)	46.5 (118)	60 (152)	C	770 (349)	1595 (723)	1-12
	4					1025 (465)	1850 (839)	

Application Notes

1. Metric dimensions (cm) and weights (Kg) shown in parenthesis adjacent to English measurements in inches and pounds.
2. Includes 1.25" door projection beyond base depth. Allow a minimum of 3" additional depth for projection of handle, light, switches, pushbuttons, etc.
3. All dimensions and weights are approximate and subject to change without notice.
4. Special enclosures (NEMA 3R, 4, 4X, 12, etc.) dimensions and layout may differ. Consult the GE Zenith factory for details.
5. Normal and emergency may be ordered inverted on any switch. Consult the GE Zenith factory for details.
6. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact the GE Zenith factory.
7. Packing materials must be added to weights shown. Allow 15% additional weight for cartons, skids, crates, etc.
8. Add 4" in height for removable lifting lugs.
9. Lug adapters for 3000-4000A limits may be staggered length for ease of entrance. Consult the GE Zenith factory for details.
10. 1600-4000A switches have ventilation louvers on both sides and rear of enclosure. Louvers must be clear for airflow with standard cable connections.
11. For Delayed and Closed Transition dimensions and weights, consult the GE Zenith factory.
12. For Bypass/Isolation dimensions and weights, consult the GE Zenith factory.
13. A ZTE 40-400A, when ordered with any more options (i.e. TVSS, battery charger) may require a larger enclosure. For certified drawings, please contact the GE Zenith factory.

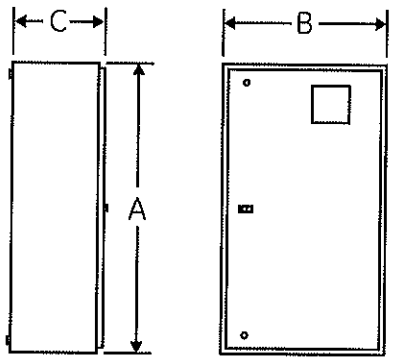


Figure A

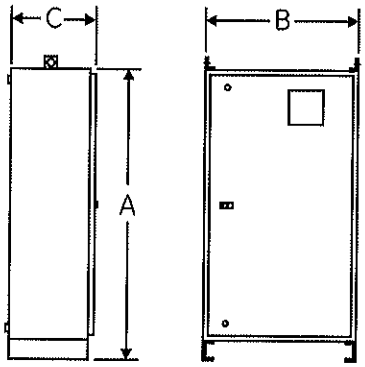


Figure B

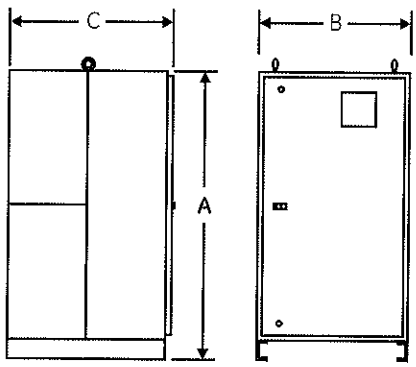


Figure C

ZTE Power Connection Terminals

AL-CU UL Listed Solderless Screw-Type Terminals for External Power Connections

Switch Size Amps	Normal, Emergency & Load Terminals		Switch Size Amps	Normal, Emergency & Load Terminals	
	Cables/ Pole	Wire Ranges		Cables/ Pole	Wire Ranges
40-80	1	#8 to 3/0	600	2	#2 to 600 MCM
100, 150	1	#6 to 250 MCM	800, 1000, 1200	4	#2 to 600 MCM
225	1	#4 to 600 MCM	1600, 2000, 3000, 4000	*	
260	1	#4 to 600 MCM			
400	1	#4 to 600 MCM			

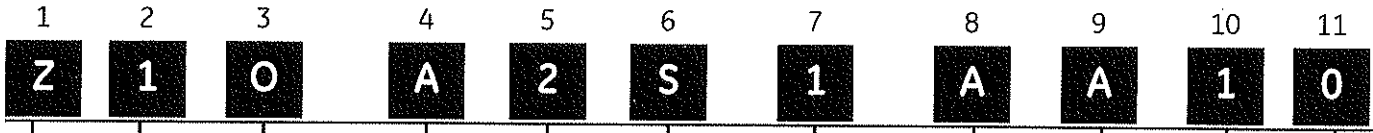
Notes

* Line and load terminals are located in rear and arranged for bus bar connection. Terminal lugs are available as an accessory. Contact GE Zenith factory for more details.

1. Special terminal lugs and neutral bars are available at additional cost. Contact the GE Zenith factory and advise cable sizes and number of conductors per pole.
2. Fully rated neutral provided on 3 phase, 4 wire system.
3. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact the GE Zenith factory.

Ordering Information

ZTE Model Number Key



Product Type
Z1 = ATS
Z2 = Bypass/Isolation Vertical Construction
Z3 = Bypass/Isolation Horizontal Construction
(Consult factory for availability)

Operation
O = Open Transition
D = Delayed Transition
C = Closed Transition

Amperage
A = 40 Amp
B = 80 Amp
C = 100 Amp
D = 150 Amp
F = 225 Amp
G = 260 Amp
I = 400 Amp
J = 600 Amp
K = 800 Amp
L = 1000 Amp
M = 1200 Amp
N = 1600 Amp
O = 2000 Amp
Q = 3000 Amp
R = 4000 Amp

# of Poles
2 = 2 Pole
3 = 3 Pole
4 = 4 Pole

Application
S = Utility to Generator
U = Utility to Utility
G = Generator to Generator **(Note 1)**

Controller Language
1 = English
2 = English & Spanish
(Consult factory for availability)
3 = English & Chinese
(Consult factory for availability)

Enclosure
X = Open
A = NEMA 1
B = NEMA 1A
C = NEMA 3R
D = NEMA 3R-Htr & Thermostat
E = NEMA 4
F = NEMA 12
G = NEMA 4X

Bypass/Isolation Products Only:
H = NEMA 1 w/Adapter Bay
I = NEMA 3R w/Adapter Bay
J = NEMA 3R/Htr & Thermostat/Adapter Bay
K = NEMA 4 w/Adapter Bay
L = NEMA 12 w/Adapter Bay
M = NEMA 4X w/Adapter Bay

Option Package
A = Option Package "A"
B = Option Package "B"
C = Option Package "C"
D = Option Package "D"
M = Option Package "M"

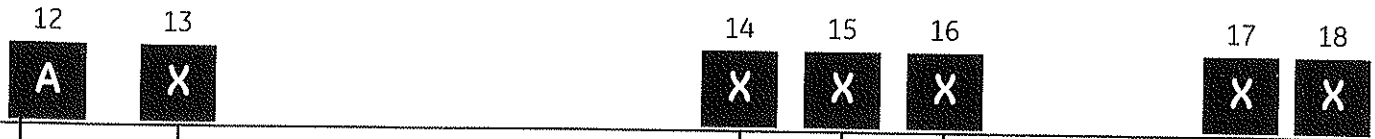
Voltage

2-Pole Units:
10 = 120V,1PH,2W,60HZ (ZVC10)
20 = 120/240V,1PH,3W,60HZ (ZVC20)
22 = 110/120V,1PH,3W,50HZ (ZVC22)
24 = 220V,1PH,2W,50HZ (ZVC24)
25 = 240V,1PH,2W,50HZ (ZVC25)
26 = 208V,1PH,2W,60HZ (ZVC26)
53 = 440V,1PH,2W,60HZ (ZVC53)
55 = 460V,1PH,2W,50HZ (ZVC55)
57 = 480V,1PH,2W,60HZ (ZVC57)
63 = 575V,1PH,3W,60HZ (ZVC63)
65 = 600V,1PH,2W,60HZ (ZVC65)
71 = 277V,1PH,2W,60HZ (ZVC71)
82 = 380V,1PH,2W,50HZ (ZVC82)

3-Pole Units:
12 = 120V,3PH,3W,60HZ (ZVC12)
30 = 240V,3PH,3W,60HZ (ZVC30)
31 = 208V,3PH,3W,60HZ (ZVC31)
32 = 220V,3PH,3W,50HZ (ZVC32)
39 = 220V,3PH,3W,60HZ (ZVC39)
50 = 480V,3PH,3W,60HZ (ZVC50)
51 = 440V,3PH,3W,60HZ (ZVC51)
52 = 440V,3PH,3W,50HZ (ZVC52)
54 = 480V,3PH,3W,50HZ (ZVC54)
60 = 575V,3PH,3W,60HZ (ZVC60)
64 = 600V,3PH,3W,60HZ (ZVC64)
75 = 460V,3PH,3W,60HZ (ZVC75)
94 = 400V,3PH,3W,50HZ (ZVC94)
96 = 416V,3PH,3W,60HZ (ZVC96)
97 = 380V,3PH,3W,60HZ (ZVC97)
98 = 380V,3PH,3W,50HZ (ZVC98)
99 = 416V,3PH,3W,50HZ (ZVC99)

3- & 4-Pole Units:
35 = 139/240V,3PH,4W,60HZ (ZVC35)
38 = 120/208/240V,3PH,4W,High-Leg Delta,60HZ (ZVC38)
40 = 120/208V,3PH,4W,60HZ (ZVC40)
41 = 127/220V,3PH,4W,60HZ (ZVC41)
42 = 127/220V,3PH,4W,50HZ (ZVC42)
43 = 133/230V,3PH,4W,60HZ (ZVC43)
46 = 120/208V,3PH,4W,50HZ (ZVC46)
58 = 254/440V,3PH,4W,60HZ (ZVC58)
59 = 254/440V,3PH,4W,50HZ (ZVC59)
61 = 347/600V,3PH,4W,60HZ (ZVC61)
62 = 331/575V,3PH,4W,60HZ (ZVC62)
66 = 347/600V,3PH,4W,50HZ (ZVC66)
70 = 277/480V,3PH,4W,60HZ (ZVC70)
73 = 230/400V,3PH,4W,60HZ (ZVC73)
74 = 266/460V,3PH,4W,60HZ (ZVC74)
90 = 240/416V,3PH,4W,60HZ (ZVC90)
91 = 220/380V,3PH,4W,60HZ (ZVC91)
92 = 220/380V,3PH,4W,50HZ (ZVC92)
93 = 240/416V,3PH,4W,50HZ (ZVC93)
95 = 230/400V,3PH,4W,50HZ (ZVC95)

Notes:
1 Source 1 or Source 2 must be set as Primary Source. Includes start circuit for (1) alternate source only. For other control schemes, please contact the factory for availability.



Metering & Accessories

X = None
A = R15/R15D Load Shed: Transfer to dead normal or center off (if delay type)
B = CTAP - Audible horn and alarm on transfer to Non-preferred source
C = P2 - Extended engine start delay (adjustable 0.5 - 300 sec)
D = MPQ - Power Quality Metering

MULTIPLE METERING & ACCESSORIES INCLUDED

	A	B	C	D
E =	✓	✓		
F =	✓		✓	
G =	✓			✓
H =	✓	✓		✓
I =	✓	✓	✓	
J =	✓	✓	✓	✓
K =		✓	✓	
L =		✓		✓
M =		✓	✓	✓
N =			✓	✓
O =	✓		✓	✓

Lugs (Note 3)
X = Std. Mechanical Lugs (40-1200A), Std. Rear Bus Connection (1600-4000A)
A = 40 Amp-#2 Compression-Qty.1 per phase-18A (Note 2)
B = 80 Amp-1/0 Compression-Qty.1 per phase-18B (Note 2)
C = 100 Amp-1/0 Compression-Qty.1 per phase-18C (Note 2)
D = 150 Amp-3/0 Compression-Qty.1 per phase-19A (Note 2)
E = 225 Amp-250MCM Compression-Qty.1 per phase-19B
F = 260 Amp-350MCM Compression-Qty.1 per phase-19C
G = 400 Amp-500MCM Compression-Qty.1 per phase-20
H = 600 Amp-500MCM Compression-Qty.2 per phase-21
I = 800 Amp-500MCM Compression-Qty.3 per phase-22A
J = 1000 Amp-500MCM Compression-Qty.4 per phase-22B
K = 1200 Amp-500MCM Compression-Qty.4 per phase-22C
L = 1600/2000 ATS/BYP-500MCM Compression-Qty.4 per phase-23A
M = 1600/2000 ATS/BYP-750MCM Compression-Qty.6 per phase-23B
N = 1600/2000 ATS/BYP-500MCM Compression-Qty.8 per phase-23C
O = 3000 ATS/BYP-500MCM Compression-Qty.8 per phase-25A
P = 3000 ATS/BYP-750MCM Compression-Qty.6 per phase-25B
Q = 4000 ATS/BYP-500MCM Compression-Qty.12 per phase-27A
R = 4000 ATS/BYP-750MCM Compression-Qty.12 per phase-27B
S = 1600/2000 ATS-600MCM Mechanical-4 port per phase-23
T = 1600/2000 BYP-600MCM Mechanical-4 port per phase-23
U = 1600/2000 ATS-600MCM Mechanical-8 port per phase-24
V = 1600/2000 BYP-600MCM Mechanical-8 port per phase-24
W = 1600/2000 ATS-750MCM Mechanical-8 port per phase-24A
Y = 1600/2000 BYP-750MCM Mechanical-8 port per phase-24A
Z = 3000 ATS/BYP-600MCM Mechanical-8 port per phase-25C
1 = 3000 ATS/BYP-750MCM Mechanical-8 port per phase-25D
2 = 4000 ATS/BYP-600MCM Mechanical-12 port per phase-26A
3 = 4000 ATS/BYP-750MCM Mechanical-12 port per phase-26B

TVSS
X = None
A = TVSS-ME1-(65kA) Load Connected
B = TVSS-ME2-(80kA) Load Connected
C = TVSS-ME3-(100kA) Load Connected
D = TVSS-HE1-(100kA) Load Connected
E = TVSS-HE2-(150kA) Load Connected
F = TVSS-HE3-(200kA) Load Connected
G = TVSS-HE4-(300kA) Load Connected

Battery Charger
X = None
1 = Battery Charger-12 Volt-3 Amp
2 = Battery Charger-12 Volt-10 Amp
3 = Battery Charger-24 Volt-3 Amp
4 = Battery Charger-24 Volt-10 Amp

Ground Bus
X = None
1 = Ground bus-Mech Lugs (Qty. 3) #14-1/0-GB1
2 = Ground bus-Mech Lugs (Qty. 6) #8-1/0-GB2
3 = Ground bus-Mech Lugs (Qty. 6) #6-250MCM-GB3
4 = Ground bus-Mech Lugs (Qty. 12) #6-250MCM-GB4
5 = Ground bus-Mech Lugs (Qty. 8) #2-600MCM-GB5
6 = Ground bus-Mech Lugs (Qty. 12) #2-600MCM-GB6
7 = Ground bus-Mech Lugs (Qty. 24) #2-600MCM-GB7
8 = Ground bus-Mech Lugs (Qty. 36) #2-600MCM-GB8

Communications
X = None
S = CCM S-Modbus RTU (Serial) communication module
E = CCM E Modbus TCP/IP (Ethernet) communication module plus Modbus RTU (Serial) communication module

Notes:
2 Compression lugs are not available on ZTE open transition below 225 Amp. If needed, order 225 Amp ZTE with compression lug options A-E.
3 Lugs are provided on all three phases (A, B, C) and neutral for three phase, 4-wire voltage configurations