CTE SERIES AUTOMATIC TRANSFER SWITCHES

The Cat® CTE Series transfer switches are configurable for applications requiring the dependability and ease of operation found in a full featured power contactor type transfer switch.

The CTE Series is equipped with the MX350 controller that is designed for the most demanding transfer or bypass switch applications providing enhanced connectivity for accurate and timely diagnostics and event recording.

FEATURES

ELECTRICAL RATINGS

- Ratings 40 to 4000 amperes
- 2, 3 or 4 Poles
- NEMA 1, 3R, 4, 4X and 12
- Seismic tested and certified to IBC 2006 & OSHPD
- Available to 600 VAC, 50 or 60 Hz
- CSA C22.2 No. 178 certified at 600 VAC
- IEC 947-6-1 listed through 480 VAC

PERFORMANCE FEATURES

- Standard open two position transition plus delayed and closed transition
- High close-in and withstand capability
- Temperature rise test per UL 1008 conducted after overload and endurance tests in unventilated enclosure – exceeds UL requirements
- Equipped with the MX350 Control Package

DESIGN AND CONSTRUCTION FEATURES

- Double throw, interlocked operation
- Electrically operated, mechanically held by a simple, over-center mechanism
- Silver alloy contacts with separate arcing contacts on 600 amp and above
- Arc quenching grids, enclosed arc chambers, and wide contact air gap for superior source to-source isolation on all units
- Durable solenoid ATS operated mechanisms and robust electronics, tested for severe Electro Magnetic Compatibility and Environmental conditions
- Control circuit disconnect plug and drive inhibit switch for safe maintenance
- Components accessible for inspection and maintenance without removal of the switch or the power conductors
- Mechanical indicator and contact chamber cover designed for inspection, safety and position designation

THE CTE SERIES OF AUTOMATIC TRANSFER SWITCHES

The Cat CTE Series power contactor type transfer switch makes use of a fully programmable/configurable microprocessor-based controller to allow the utmost in application flexibility. Further, the CTE Series is offered in a wide array of configurations enabling it to meet the needs of even the most highly critical load.

Available configurations include:

40-4000 Amps:

- CTE Automatic Transfer Switches
- CTED Delayed Transition Transfer Switches
- CTEM Manual Transfer Switches

100-4000 Amps:

- CTECT Closed Transition Transfer Switches
- CBTE Open Transition Bypass Switches
- CBTED Delayed Transition Bypass Switches
- CBTECT Closed Transition Bypass Switches

CTE ELECTRICAL RATINGS

- UL 1008 listed through 480 VAC
- CSA C22.2 No. 178 listed through 600 VAC
- IEC 947-6-1 listed through 480 VAC
- Codes and Standards
  NFPA 70, 99, 101, 110
  NEC 517, 700, 701, 702
  IEEE 446, 241
  NEMA ICS2-447
- Controls tested in accordance with:
  IEEE 472 (ANSI C37.90A)
  EN55022 Class B (CISPR 22)
  (Exceeds EN55011 & MILSTD 461 Class 3)
  EN61000-4-2 Class B (Level 4)
  EN61000-4-3 (ENV50140) 10v/m
  EN61000-4-4
  EN61000-4-5 (IEEE C62.41)
  EN61000-4-6 (ENV50141)
  EN61000-4-11
- Equipment (Controls and Power Section)
  Seismic Test Qualified to:
  IBC-2003
  IEEE-693-2005
  OSHPD
- Enclosures meet the requirements of:
  UL 508, UL 50, ICS 6, ANSI C33.76 and NEMA 250
- Quality System:
  ISO 9001 Registered

DRIVE MECHANISM

All CTS switches employ the simple “over-center” principle to achieve a mechanically locked position in either normal or emergency and a high speed drive assures contact transfer in 100 ms or less. High contact pressure and positive mechanical lock allow for high withstand and closing ratings, exceeding UL requirements.

NEUTRAL SWITCHING

The CTE Series is available in true four pole designs for multi-source power systems that require switching the neutral. The neutral contact is on the same shaft as the associated main contacts. This design ensures positive operation, and prevents any possibility that the neutral contact will fail to open or close, as is possible when the neutral pole is an add-on accessory. The neutral contacts are identical to the main contacts, having the same current carrying and high withstand /closing ratings as the mains. They are designed to *break last and make first* to negate the possibility of transients while switching the neutral.

SAFE MANUAL OPERATION

To operate the switch manually, a large easy-to- use handle is provided with the switch. When inserted, it fits securely, providing simple operation during installation and maintenance or in an emergency. Every CTE is provided with an operator inhibit switch to disconnect the electrical drive prior to maintenance. Fully enclosed wrap-around arc covers shield the main contacts and mechanical components, preventing operator exposure during manual operation

CTED Series: The CTED offers a delayed transition on transfer switches 40A and above. This programmed center-off position allows for the full decay of rotating motors or transformer fields. It can also be used for load shedding of selected circuits or other applications which require a means to disconnect the load from either source. Many UPS system manufacturers recommend delayed transition switches to support sequencing of their systems. .

CTECT Series: Cat closed transition switches combine CTED operation during a source failure with a highly engineered control system that allows momentary paralleling (100 ms) of two acceptable sources, thereby limiting the impact of transfer on the load.

Bypass Isolation Switches
CBTED & CBTECT

The bypass section is a Manual (MTS) switch that is provided with a quick break/quick make manual load transfer handle and 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 module has three positions:

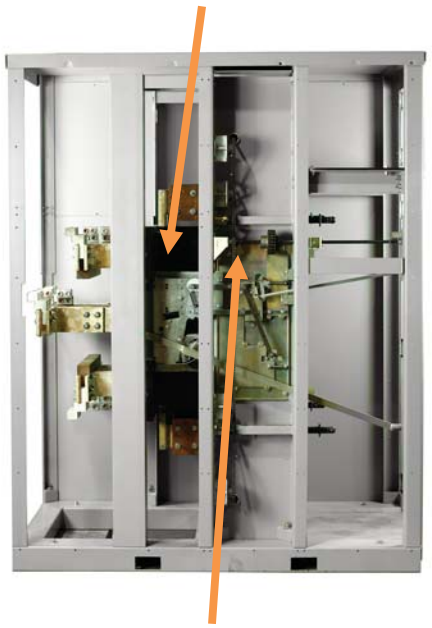
1. Automatic/Connected: The ATS is carrying the load, and the bypass MTS is in the open position. This is the normal operating position.
2. Test: The bypass MTS is closed and feeding the load. The ATS has control power and may be operated for test purposes via the test switch. The load is not affected 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 MTS 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.

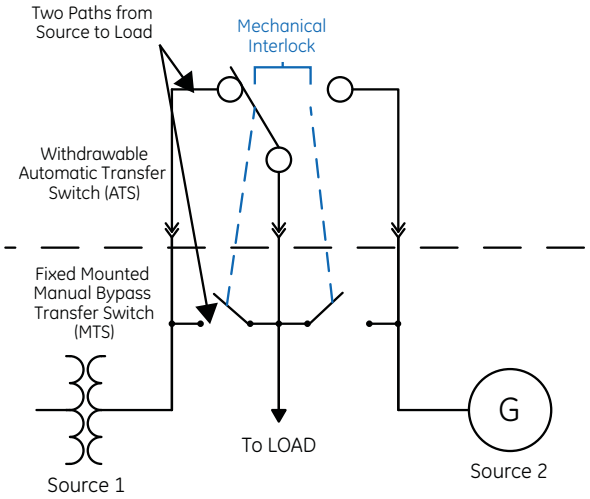
The bypass/isolation MTS module is the same basic design as the ATS module and thus has the same electrical ratings. Manually operated, it features high speed, quick break/quick make contact action. The bypass/isolation MTS has three basic positions:

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

Fixed Mounted Manual Bypass Transfer Switch MTS



Draw-out Automatic Transfer Switch ATS



The MX350 Controller

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.

Operation Set points and User-Configurable Inputs and Outputs

Operation set points define the acceptable electrical and time limits for both Source 1 and Source 2. These set points define dropout and restore values for over and undervoltage, over and under frequency, as well as the associated time delays.

CTE Series Option Package Descriptions

Option Package	Features
A	- Full function ATS control with full sensing and control capabilities - Expanded diagnostics, high-speed 256 event capture, 365 day exerciser - Monitoring Software (local or remote) - Four programmable inputs and four 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)
B	Includes Option Package **A** Features, plus: - Ten (10) customer programmable digital and eleven analog alarms - Ten (10) channel data logger, customer configurable sample period 1 cycle to sixty (60) minutes - Waveform capture, Ten channels, up to 64 cycles per channel Thirty two samples / cycle
C	Includes Option **B** Features, plus: - Four (4) additional inputs and outputs (total eight (8) in eight (8) out)
D	Includes Option Package **C** Features, plus: - Four (4) additional input and outputs (total twelve (12) in, twelve (12) out) Control Input / Output flexibility for user-customized control logic
M	Configuration for Manual Operation only (non-automatic)

Application Notes:

Metering and communications are available options on all configurations.
Contact the factory for more information.

CTE Configuration Option Package Features

Feature	Description	Note #	Code	Option Packages A	B	C	D	M
Contacts	ATS Source 1 and Source 2 Position Contacts, SPDT, Qty 2 each		2-A3, 2-A4	Yes	Yes	Yes	Yes	Yes
	Bypass MTS Source 1 & Source 2 Position Contacts, SPDT, Qty 1 each	1	1-AB3, 1-AB4	Yes	Yes	Yes	Yes	Yes
	Remote Load Test Signal, Dry Contact Input		Q2	Yes	Yes	Yes	Yes	Yes
Generator	Engine start contact, SPDT		E	Yes	Yes	Yes	Yes	Yes
	Source 1 to 2 In Phase Monitor (w/enable-disable)	2	R50	Yes	Yes	Yes	Yes	Yes
	Synchroscope (Gen Fast/Slow vs. Utility Source)	3	SYNC	Yes	Yes	Yes	Yes	Yes
	Programmable Gen Exerciser, Gen-Util Applications, 365 Day (user-selectable with/without load)	4	EX-1	Yes	Yes	Yes	Yes	No
	Automatic Load Shed, w/adj. Freq, Voltage & kW	5	LS-1	No	Yes	Yes	Yes	No
Indication / Status	Color Graphical Display, with USB Caibration Port & Embedded Help		OIP, USB, HELP	Yes	Yes	Yes	Yes	Yes
	Status LED's for: Source 1 & 2 Connected, Source 1 & 2 Available		L1, L2, L3, L4	Yes	Yes	Yes	Yes	Yes
	Status LCD Indication of ATS in Center-off position	6	LN/P	Yes	Yes	Yes	Yes	Yes
	Event log, last 256 events		EL/P	Yes	Yes	Yes	Yes	Yes
	Customer Configurable Alarms, 10 Status-Digital & 10 Threshold-Analog		CCA-A, CCA-D	No	Yes	Yes	Yes	No
	Detailed Outage and Test Reports		info	Yes	Yes	Yes	Yes	Yes
	Event Waveform Capture		WC-1	No	Yes	Yes	Yes	No
	Data Logger		DL 1	No	Yes	Yes	Yes	No
	Control Input / Output Flexibility		FLEX	No	No	No	Yes	No
Sensing & Calibration	Calibration upload/download via monitoring software mx350 Setup		CAL 1	Yes	Yes	Yes	Yes	Yes
	Diagnostics Reports		DIAG 1, 2, 3	Yes	Yes	Yes	Yes	Yes
	Over/under Freq Source 1 & 2		J2E / J2N	Yes	Yes	Yes	Yes	Yes
	Over/under Voltage Source 1 & 2		R1, R1-3, R7, R8, R17, R2E	Yes	Yes	Yes	Yes	Yes
	Phase Rotation Sensing		R16	Yes	Yes	Yes	Yes	Yes
	Voltage Imbalance Sensing		VI	Yes	Yes	Yes	Yes	Yes
Time Delays	Neutral-Source 1 or Neutral-Source 2 Transfer	6	DT / DW	Yes	Yes	Yes	Yes	Yes
	Engine Start Timer, adj up to 10 sec	11	P1	Yes	Yes	Yes	Yes	Yes
	Source 2 - Source 1 Retransfer		T	Yes	Yes	Yes	Yes	No
	Emergency Source Failure Override Time Delay		ESO	Yes	Yes	Yes	Yes	No
	Engine Stop / Cool-Down		U	Yes	Yes	Yes	Yes	Yes
	Source 1 - Source 2 Transfer		W	Yes	Yes	Yes	Yes	No
Switches	Test Switch, Load / No Load Adjustable		6 / P	Yes	Yes	Yes	Yes	No
	Controller Disconnect Switch	7	DS	Yes	Yes	Yes	Yes	Yes
	Bypass Retransfer Time Delays, Source 1-2/2-1, Adjustable	8	BYP-T, BYP-W	Yes	Yes	Yes	Yes	No
	Manual Transfer, Source 1-2 / 2-1		YE/P, YN/P	No	No	No	No	Yes
	Preferred Source Selector Switch	9	S3/P	Yes	Yes	Yes	Yes	No
	Auto / Manual Transfer, Source 2 to Source 1		S5/P	Yes	Yes	Yes	Yes	No
	Auto / Manual Transfer, Source 2-1 / 1-2		S12/P	Yes	Yes	Yes	Yes	No
	Commi t / No Commit Transfer to Source 2		S13/P	Yes	Yes	Yes	Yes	No
	Transition Mode Selector Switch	3	TMS/P	Yes	Yes	Yes	Yes	No
Programmable I/O	4 INPUT and 4 OUTPUT	10		Yes	Yes	No	No	No
	8 INPUT and 8 OUTPUT	10		No	No	Yes	No	No
	12 INPUT and 12 OUTPUT	10		No	No	No	Yes	No

Application Notes:

1. Bypass Only
2. Utility to Generator Only
3. Closed Transition Only
4. Standaard on Gen-Utility Applications Only
5. Requires R15 for Transfer of ATS away from Source, Utilizes one 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. Refer to Page 7
10. Can be Extended Beyond ten (10) Seconds (up to 259 minutes) with Customer Supplied 120VAC External input (no extra CTE hardware required)

Option Package User-Configurable Inputs & Outputs

Feature	Description	Note #	Type Input / Output	Option 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	x	x	x	Out 12	x
	Connected to S2	2	Output	A3	x	x	x	Out 11	x
	Connected to Center (Delay type only)		Output	A34N	x	x	x	x	x
	Bypass MTS connected to S1 (or S2)		Output	AB4, AB3	x	x	x	x	x
Switch Status & Diagnostics	Switch Exercising		Output	EXC	x	x	Out 6	Out 6	x
	Engine Start Signal Active		Output	ESS	x	x	x	x	x
	Auto Transfer Occurred S1-S2 (or S2-S1)		Output	ATS2, ATS1	x	x	x	x	N/A
	Manual Transfer to S2 (from S1) Occurred		Output	MTS3S1	N/A	N/A	N/A	N/A	Out 3
	Manual Transfer to S1 (from S2) Occurred		Output	MTS1SA1	N/A	N/A	N/A	N/A	Out 4
	Transfer Inhibit S2 to S1 (or S1 to S2) On		Output	TIS2S1, TIS1S2	x	x	x	x	N/A
	Common Alarm (any alarm active)		Output	ALM	x	x	Out 7	Out 7	x
	Fail to Transfer to S1 Alarm		Output	FTS1	x	x	x	Out 9	x
	Fail to Transfer to S2 Alarm		Output	FTS2	Out 3	Out 3	Out 3	Out 3	x
	ATS Not in Auto Mode	5	Output	NIA	x	x	Out 8	Out 8	N/A
	Transfer to S2 Alarm		Output	CTAP	x	x	x	x	x
Remote Control	Remote Engine Start		Input	RES	In 4	In 4	In 4	In 4	In 4
	No Load Test	1	Input	TSNL	x	x	x	x	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	x	x	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/Manual Re-transfer S2 to S1		Input	S5R	x	x	x	x	N/A
	Initiate Manual Re-transfer to S1		Input	YNR	x	x	In 8	In 8	In 2
	Auto / Manual Transfer S1 to 2 & 2 to 1		Input	S12R	x	x	In 6	In 6	N/A
	Initiate Manual Transfer to S2		Input	YER	x	x	In 7	In 7	In 1
	Prime Source Select Switch		Input	S3R	x	x	x	In 12	N/A
	Commit/No Commit to Transfer to S2		Input	S13R	x	x	x	x	N/A
Programmable Load Control Relays	Load Control Relay #1	6	Output	LCE1, LCL1	Out 4	Out 4	Out 4	Out 4	x
	Load Control Relay #2	6	Output	LCE2, LCL3	x	x	Out 5	Out 5	x
	Load Control Relay #3 thru #6	6	Output	LCE3-6, LCL3-6	x	x	x	x	x
Auto Load Shed	Auto Load Shed Active		Output	ALS	N/A	x	x	Out 10	N/A
	Auto Load Shed Reset	3	Input	LS1R	N/A	x	x	In 19	N/A
	Auto Load Shed kW Pickup On/Off		Input	LS1KW	N/A	x	x	In 10	N/A
	Auto Load Shed Enable/Disable		Input	ALS1	N/A	x	x	In11	N/A
User Configurable Digital Alarms	S1 (or S2) Undervoltage		Output	UVS1, UVS2	N/A	x	x	x	N/A
	S1 (or S2) Overvoltage		Output	OVS1/2	N/A	x	x	x	N/A
	S1 (or S2) Underfrequency		Output	UFS1, UFS2	N/A	x	x	x	N/A
	S1 (or S2) Overfrequency		Output	OFS1/2	N/A	x	x	x	N/A
	Low PF		Output	LLPFA	N/A	x	x	x	N/A
	S1 (or S2) High Volts THD%		Output	VTHDS1, VTHDS2	N/A	x	x	x	N/A
	Current High THD%		Output	CTA	N/A	x	x	x	N/A
	kW Overload		Output	LOKWA	N/A	x	x	x	N/A
	Overcurrent (Phase A, B, C, or N)		Output	OCAPA/B/C, NOCA	N/A	x	x	x	N/A
	S1 (or S2) Voltage Imbalance		Output	VIAS1, VIAS2	N/A	x	x	x	N/A
	Current Unbalance		Output	CIA	N/A	x	x	x	N/A
User Configurable Digital Alarms	Digital Inputs (up to qty 10) for user Configurable Alarms and Control Input / Output Flexibility	4	Input	CCI-x	N/A	x	x	x	N/A
	Digital Alarms (up to qty 10)		Output	CCAD-x	N/A	x	x	x	N/A

GENERAL NOTE:

All of the above status and alarm items can be monitored via serial or ethernet network

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

NOTE 2: Two (2) Form C contact are provided as standard on all CTE switches.
These features may be used when additionsl contacts are required.

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

NOTE 4: For each of the Ten (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 transfe inhibit signal is being received.

CTE SERIES DIMENSIONAL SPECIFICATIONS

CTE Series Transfer Switches							
		NEMA 1 Enclosed					
Ampere Rating	Poles	Height (A)	Width (B)	Depth (C)	Reference Figure	Weight	Application Notes
40,80, 100, 150 & 225	2,3	46 (1168)	24 (610)	14 (356)	A	120 (55)	1-7,11-12
	4	46 (1168)	24 (610)	14 (356)	A	126 (57)	
260 & 400	2,3	46 (1168)	24 (610)	14 (356)	A	168 (76)	1-7, 11-12
	4	46 (1168)	24 (610)	14 (356)	A	180 (82)	
600	2,3	74 (1880)	40 (1016)	20 (508)	B	410 (186)	1-8, 11-12
	4	74 (1880)	40 (1016)	20 (508)	B	440 (200)	
800, 1000 & 1200	2,3	74 (1880)	40 (1016)	20 (508)	B	460 (209)	1-8, 11-12
	4	74 (1880)	40 (1016)	20 (508)	B	490 (222)	
1600 & 2000	3	90 (2286)	36 (914)	48 (1219)	C	1010 (458)	1-8, 10-12
	4	90 (2286)	36 (914)	48 (1219)	C	1160 (526)	
3000	3	90 (2286)	36 (914)	48 (1219)	C	1130 (513)	1-12
	4	90 (2286)	36 (914)	48 (1219)	C	1396 (633)	
4000	3	90 (2286)	47 (1194)	60 (1524)	C	1595 (723)	1-12
	4	90 (2286)	47 (1194)	60 (1524)	C	1850 (839)	

Application Notes :

1. Dimensions are listed in inches (mm) and weights in pounds (kg).
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 and are not for construction use.**
4. Special enclosures (NEMA 3R, 4, 12, etc.) may include mounting tabs, etc. Consult the published dimension drawings for details.
5. Normal and emergency may be ordered inverted on any switch. The load may be inverted 500-1200 amps. Consult the factory for details.
6. Special lug arrangements may require different enclosure dimensions. For certified drawings, contact Caterpillar.
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 Caterpillar for details.
10. 1600-4000A switches have ventilation louvers on both sides and rear of the enclosure. Louvers must be clear for airflow with standard cable connections.
11. For Delayed and Closed Transition dimensions and weights consult the factory.
12. For Bypass Isolation dimensions and weight consult the factory.

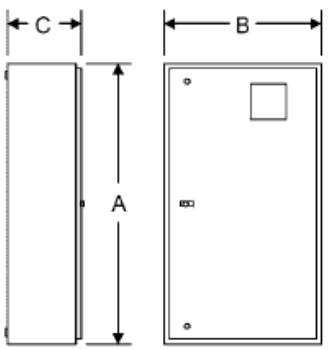


Figure A

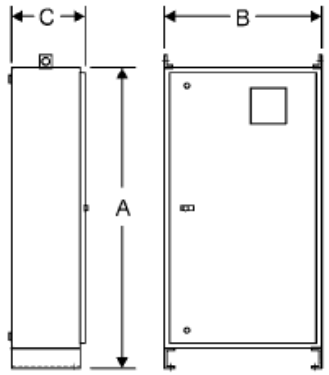


Figure B

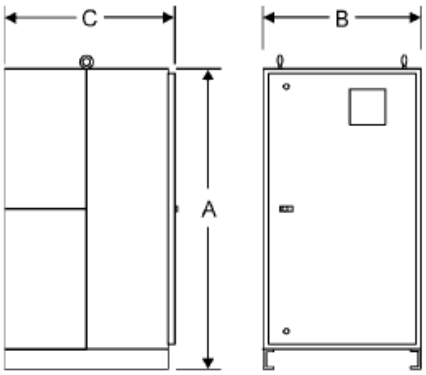


Figure C

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 per Pole	Range of Wire Sizes		Cables per Pole	Range of Wire Sizes
40-80	1	#8 to 3/0 AWG	600	2	#2 AWG to 600 MCM
100-150	1	#6 AWG to 250 MCM	800, 1000, 1200	4	#2 AWG to 600 MCM
225	1	#4 AWG to 600 MCM	1600, 2000,		*
260	1	#4 AWG to 600 MCM			
400	1	#4 AWG to 600 MCM	3000, 4000		

NOTES:

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

1. Special terminal lugs and neutral bars are available at additional cost.
   Contact 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 your Cat Dealer.