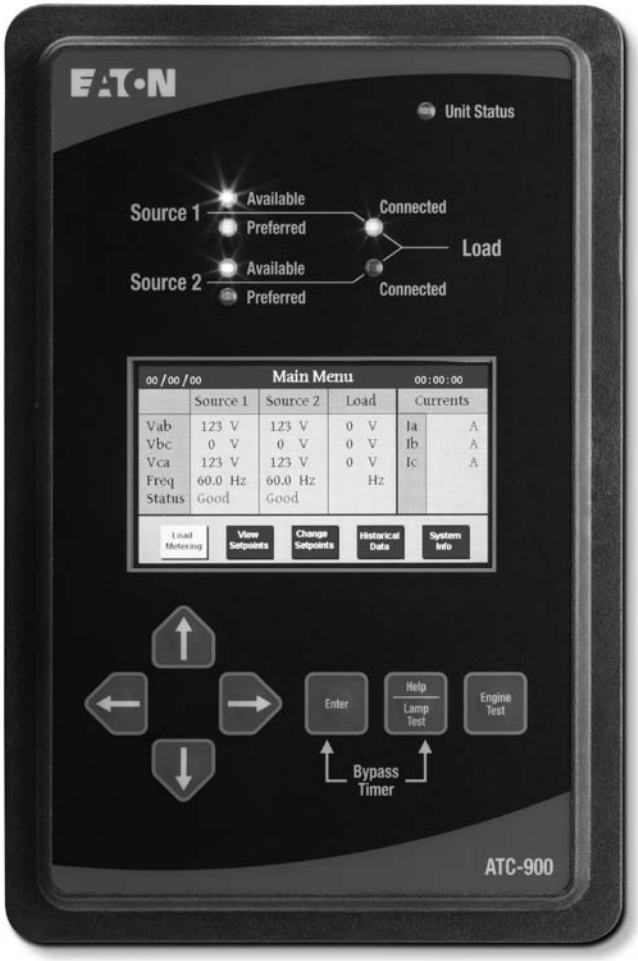
ATC-900 Automatic Transfer Switch Controller



Introduction

Description

Eaton's ATC-900 brings intelligence, adaptability, and enhanced supervisory and programming capabilities to Eaton's complete transfer switch product offering including contactor, breaker and Magnum® based transfer switches.

High reliability makes the ATC-900 ideal for mission critical installations in the healthcare, water, industrial, and data center industries. An intelligent control architecture allows the ATC-900 to address virtually any system requirements. Typical applications include utility-to-utility, utility-to-generator, and generator-to-generator transfer pairs and advanced programing features provide for control of three-source systems. Design flexibility allows for operations with open, in-phase, delayed or closed transition platforms.

Ease-of-use is a major benefit of the ATC-900 controller. The simple yet powerful user interface, includes many intuitive operating features. The color display and LED indications provide enhanced operator visibility of transfer switch status and system detail. Clear operational focus was achieved through design simplicity. Front arrow keys allow for quick screen navigation, removal of codes and abbreviations avoid potential confusion, and refined data screens provide for ease of viewing and edits.

The one standard model concept offers a variety of monitoring and control features, selective load shedding, remote load testing, along with event logging/recording and Modbus® communications. With configurable monitoring and control features and add-on accessory modules, the ATC-900 provides the flexibility to meet current and future system needs.

Primary functions

The ATC-900 Automatic Transfer Switch Controller offers these standard features:

- Monitor normal and emergency-source voltages and frequencies
- Provide transfer and re-transfer control signals
- Provide engine/generator start and shutdown signals
- Permit user programming of operational set points
- Display real-time and historical information
- Permit system testing
- Store customer and factory-established parameters in nonvolatile memory
- Provide faceplate source status indication
- Provide an LCD for programming and status readouts

Features and benefits

- LCD screen for system status, programming, system diagnostics, help, and troubleshooting
- Event logging and recording, 450 time stamped events
- 0–600V field programmable system voltage flexible configuration with assignable inputs and outputs
- Three-source ATS control—master and slave controller functionality
- Selective, automatic load shedding
- Industry standard communication protocols—Modbus RTU and/or Modbus TCP/IP communications interface
- USB drive for uploading and downloading of event data
- USB drive for uploading and downloading programmed set points

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Table 1. ATC-900 features

Features	ATC-900
Hardware	
4.3-inch color TFT LCD display	✓
UV-resistant faceplate	✓
Mimic diagram and LED status indicators	✓
Suitable for application over a wide range of environmental conditions	✓
Positive feedback membrane pushbuttons for application in harsh environments	✓
Help function for detailed description of displayed message	✓
Password protected system test pushbutton	✓
Bypass time delay pushbutton	✓
Form-C engine start contact for Source 1 and Source 2	✓
S1 and S2 available Form-C contacts	✓
Self-diagnostic and system diagnostic functions with LED indication	✓
DC power input	Optional
Metering	
True rms voltage sensing of Source 1, Source 2, and Load	✓
Frequency sensing of Source 1, Source 2, and Load	✓
Voltage unbalance and phase rotation sensing	✓
Load current sensing	Optional
Sampling at 64 samples per cycle	Optional
Source 1 voltages (3Φ)	✓
Source 2 voltages (3Φ)	✓
Load voltages (3Φ)	✓
Source 1 frequency	✓
Source 2 frequency	✓
Load frequency	✓
Load currents (3Φ)	Optional
Load kW	Optional
Load kVAR	Optional
Load kVA	Optional
PF	Optional
Programming	
Programmable set points stored in nonvolatile memory	✓
System monitoring with historical data storage and display	✓
Digital set points for accurate and consistent performance	✓
Password-protected access to control functions and set point programming	✓
4 programmable control inputs	✓
4 programmable control outputs	✓
Expandable I/O modules (up to 20 I/O total)	Optional
Automatic plant exerciser—two plant exerciser schedules, Off, daily, 7-day, 14-day, 28-day, calendar, separate TDNE, TDEN, TDEC timers from normal operation, control input provided for remotely initiating an engine test	✓
Communications	
Modbus RTU	✓
Modbus TCP/IP	Optional
USB port for set point configuration and event-recording downloads	✓
Event history	
320 time-stamped events	✓
2 seconds of metered data stored before and after a transfer event	Optional

Table 2. Technical specifications

Parameter	Specification
Control power	120 Vac (50/60 Hz) (operating range 65–160 Vac) or 24 Vdc (±10%) with DCT module
Power consumption	18 VA
Environmental conditions	
Operating temperature	-4.0–158ºF (-20–70ºC)
Operating humidity	Up to 90% relative humidity (non-condensing)
Enclosure compatibility	NEMA® 12 (standard mounting) NEMA 4/4X (mounted with gasket between panel and device faceplate) NEMA 3R (outdoor) UV resistant ATC-900 faceplate
System voltage application	120–600 Vac (50/60 Hz) (single or three phase)
Voltage measurements	Source 1, Source 2 and Load (VAB, VBC, VCA for three-phase system)
Voltage measurement range	0–700 Vac
Voltage measurement accuracy	±1% of reading
Frequency measurements	Source 1 and Source 2
Frequency measurement range	40–80 Hz
Frequency measurement accuracy	±0.1 Hz
Applicable testing	UL® recognized component 2009 IBC, 2010 CBC and OSHPD certified in ATS assemblies Complies with UL 991 environmental tests Complies with IEC 61000-4-2, 61000-4-3, 61000-4-4, 61000-4-5, and 61000-4-6 Complies with CISPR 11, Class A Complies with FCC Part 15, Subpart B, Class A
CSA® conformance	C22.2 No. 178-1978 (reaffirmed 1992)
CE mark	European standards conformance

Reference documents and resources

- Instruction bulletin: IB01602088E
- Web-based demo: www.eaton.com/ats

Simple, powerful user interface

LED mimic diagram
Source 1 and *Source 2* color-coded LEDs provide *Available* and *Connected* status indication.

Status screen
The ATC-900 *Main Menu* screen provides transfer switch status at a glance. *Source 1*, *Source 2*, and load-metering data are displayed as well as any active alarms.

Display
The ATC-900 eliminates the use of codes and abbreviations for transfer switch functions. Data screens are grouped for ease of viewing and edits.

Arrow key navigation
Right and *Left Arrow Keys* are used to navigate menu options and *Up* and *Down Arrow Keys* are used to select and change set point values.

Unit status light
This LED blinks green indicating that the ATC-900 is operating and providing the transfer switch control function in keeping with programmed set points. If the LED is not lit or is on continuously, a problem may be indicated.

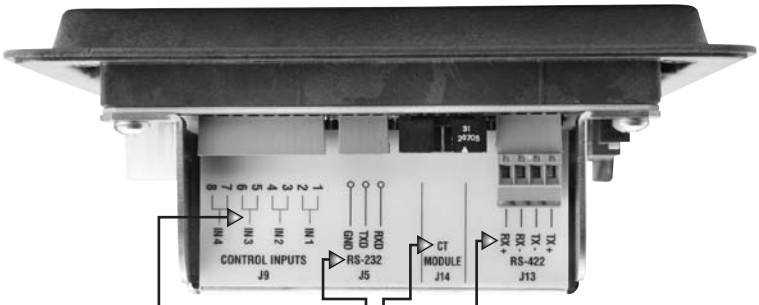
Help
Displays controller firmware version and user tips.

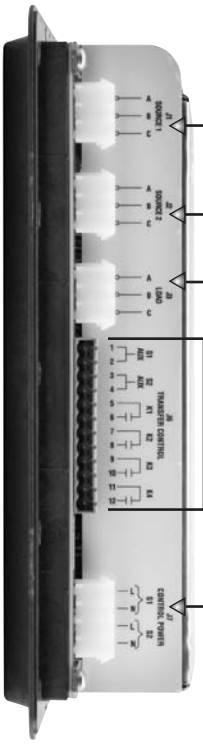
Lamp test
Pressing the *Lamp Test* pushbutton lights all LEDs and then displays ATC-900 controller information.

Engine test
Performs an engine test using the programmed engine run and cool down times. This is a password-protected feature.

Bypass time delays
Pressing the *Enter* and *Help* pushbuttons simultaneously reduces the active programmed time delay to zero to simplify test procedures.

Figure 1. ATC-900 user interface





Configurable inputs
System inputs are "wetted" contacts. System inputs can be configured to perform a preset list of functions. (Note: A factory configured input cannot be reconfigured in the field if the factory provides associated hardware.)

Factory use only
The sensing inputs are the connection points for monitoring Source 1, Source 2, and the Load. Three-phase systems are connected to Phase A, B and C. Single-phase systems are connected to points Phase A and Phase B.

Factory use only

- **Source 1 and Source 2 auxiliary:** These inputs are connected to the power switching devices position indication contacts.
- **K1, K2, K3 and K4:** These Form-A output contacts are utilized to control the power switching mechanism. They operate in conjunction with the Source 1 and 2 auxiliary inputs.

Control power inputs (Source 1 and Source 2)
The control power input range is 65–145 Vac, 50/60 Hz, 9–36 Vdc.

RS-422

DCT module

RS-232 (ATC-900 ECAM)

Modbus 485

Accessory I/O port

USB port

Earth ground
Provides a connection point for the common system ground.

Generator start
Form-C contact. This is a latching relay utilized to initiate startup and shutdown cycles of the engine/generator set. The *GENERATOR START* contact is rated 5 amperes at 250 Vac/30 Vdc.

Configurable outputs
Four Form-C dry relay contacts that can be configured to perform a preset list of functions. Contacts are rated 10 amperes at 250 Vac/30 Vdc. (Note: A factory-configured output cannot be reconfigured in the field if the factory provides associated hardware.)

Source 1 and Source 2 available
Form-C dry relay contacts that indicate Source 1 and Source 2 availability based on the programmed voltage and frequency set points. Contacts are rated 10 amperes at 250 Vac/30 Vdc.

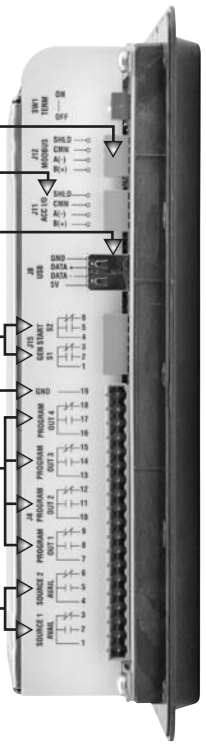


Figure 2. ATC-900 connections

ATC-900 programmable set points

Table 3 lists only controller features; switch features are not listed, as they are defined by switch construction. Transition settings are specific to the transfer switch construction.

Table 3. Features and set points

Option number	Description	Range	Factory default
General settings			
—	Set new password	0000–9999	0900
—	Selected language	English, French or Spanish	English
—	Nominal frequency	50 or 60 Hz	As ordered
—	Nominal voltage	110–600V	As ordered
—	Number of phases	1 or 3	As ordered
—	Number of generators	0, 1 or 2	1
—	Preferred source	Source 1 or Source 2	Source 1
—	PT ratio	2:1–500:1	As ordered
—	CT ratio	200–5000	—
—	Daylight Saving Time	On or Off	1
—	Operating mode	Stand-alone/Master or Slave	Master
—	Phase sequence check	ABC, CBA or Off	Off
—	Commitment to transfer in TDNE	Yes or No	No
—	Manual retransfer	Auto, Manual or External	As ordered
—	Modbus address	1–247	1
—	Modbus baud rate	0 = 9600, 1, Even	9600
		1 = 9600, 1, Odd	—
		2 = 9600, 2, None	—
		3 = 9600, 1, None	—
		4 = 19,200, 1, Even	—
		5 = 19,200, 1, Odd	—
		6 = 19,200, 2, None	—
		7 = 19,200, 1, None	—
Transition settings			
47	Closed transition		
	Closed transition On or Off	On or Off	As ordered
	Closed voltage difference	1–5%	2%
	Closed frequency difference	0.0–0.3 Hz	0.3
32f/32d	Open—in-phase transition		
	In-phase On or Off	Disable, in-phase default to alarm, in-phase default to open transition	As ordered
	In-phase frequency difference	0.0–3.0 Hz	1.0
—	Synchronization timer	1–60 minutes	5
32a/32d	Open—delayed transition		
	Time delay neutral	0–120 seconds	0
	Load voltage decay	2–30% of nominal voltage	6%
Time delays			
1a	Time delay normal to emergency	0–9999 seconds	0:00
3a	Time delay emergency to normal	0–9999 seconds	5:00
35A	Time delay pre-transfer	0–120 seconds	0:01
35C	Time delay post-transfer	0–120 seconds	0:10
2A	Time delay engine 1 start	0–120 seconds	0:03
—	Time delay engine 2 start	0–120 seconds	0:03
4A	Time delay engine cool-off	0–9999 seconds	5:00
7A	Time delay engine fail timer	0–6 seconds	0:06
—	Voltage unbalance time delay	10–30 seconds	0:30
Source settings			
26P	Source 1 undervoltage dropout	70–97% of nominal	80%
	Source 1 undervoltage pickup	(dropout + 2%) to 99% of nominal	90%
5P	Source 2 undervoltage dropout	70–97% of nominal	80%
	Source 2 undervoltage pickup	(dropout + 2%) to 99% of nominal	90%
26K	Source 1 overvoltage dropout	105–120% of nominal (0 = disabled)	115%
	Source 1 overvoltage pickup	103% of nominal to (dropout - 2%) (0 = disabled)	105%
5K	Source 2 overvoltage dropout	105–120% of nominal (0 = disabled)	115%
	Source 2 overvoltage pickup	103% of nominal to (dropout - 2%) (0 = disabled)	105%
26J	Source 1 underfrequency dropout	90–97% of nominal (0 = disabled)	94%
	Source 1 underfrequency pickup	(dropout + 1 Hz) to 99% of nominal (0 = disabled)	96%
5J	Source 2 underfrequency dropout	90–97% of nominal (0 = disabled)	94%
	Source 2 underfrequency pickup	(dropout + 1 Hz) to 99% of nominal (0 = disabled)	96%
26N	Source 1 overfrequency dropout	103–110% (0 = disabled)	106%
	Source 1 overfrequency pickup	101% to (dropout - 1 Hz) (0 = disabled)	104%
5N	Source 2 overfrequency dropout	103–110% (0 = disabled)	106%
	Source 2 overfrequency pickup	101% to (dropout - 1 Hz) (0 = disabled)	104%
26L	Source 1 percent for unbalanced voltage dropout	5–20% of phase-to-phase voltage unbalance (0 = disabled)	12%
	Source 1 percent for unbalanced voltage pickup	3% to (dropout - 2%) (0 = disabled)	10%
5L	Source 2 percent for unbalanced voltage dropout	5–20% of phase-to-phase voltage unbalance (0 = disabled)	12%
	Source 2 percent for unbalanced voltage pickup	3% to (dropout - 2%) (0 = disabled)	10%
Engine test/plant exerciser (PE1 and PE2 are independently programmable)			
6B	Engine test pushbutton on panel		
	Test mode	No load, load transfer, disabled	Load transfer
	Engine run test time	0–600 minutes	
23M	PE time delay normal to emergency	0–9999 seconds	1 minute
	PE time delay emergency to normal	0–9999 seconds	1 minute
	PE time delay engine cooldown	0–9999 seconds	5 minutes
	PE1/PE2 test mode	No load, load transfer, disabled	Disabled
	PE1/PE2 run time	0–600 minutes	30 minutes
	PE1/PE2 schedule	Off, daily, 7-day, 14-day, 28-day or calendar date (up to 12 user-specified dates)	
	PE1/PE2 calendar date	Month: 1–12; Day: 1–31	
	PE1/PE2 day of week	1 Sunday, 2 Monday, 3 Tuesday, 4 Wednesday, 5 Thursday, 6 Friday or 7 Saturday	
	PE1/PE2 plant start time	HH:MM AM/PM	
Accessory I/O			
—	Accessory I/O modules	0–4	—

Table 3 is continued in column 2 of this page.

Flexible configuration

Designed for scalability, the ATC-900 can be configured for a wide variety of applications. A mix-and-match approach to features allows the user to build a transfer switch controller that meets the precise application needs.

The ATC-900 controller includes 4 user configurable inputs and outputs. The inputs and outputs can be assigned functions from a predefined list of options either at the factory or in the field.

- Inputs
  - Monitor mode
  - Bypass timers
  - Lockout
  - Manual retransfer On or Off
  - Manual retransfer
  - Slave in
  - Remote engine test
  - Preferred source selection
  - Go to emergency
  - Emergency inhibit
  - ATS on bypass
  - Go to neutral
- Outputs (control)
  - Load sequence
  - Selective load shed
  - Load bank control
  - Pre/post transfer
  - Pre transfer
  - Post transfer
  - User remote control
- Outputs (status/alarms)
  - Source 1 available (standard)
  - Source 2 available (standard)
  - Source 1 connected
  - Source 2 connected
  - ATS not in automatic
  - General alarm
  - ATS in test
  - Engine test aborted
  - Cooldown in process
  - Engine start contact status
  - Generator 1 start status
  - Generator 2 start status
  - Emergency inhibit on
  - ATS on bypass

Additional I/O can be added at any time by adding an external I/O module. Each I/O module contains 4 inputs and outputs and up to 4 modules can be daisy chained to the ATC-900 controller.

I/O module: The ATC-900 optional I/O module provides users with four additional assignable inputs and outputs. Up to four I/O modules can be added to an ATC-900 controller providing a total of 20 inputs and outputs.

Metering

Optional metering requires the addition of a DCT module. The DCT module mounts directly on the back of the controller.

The DCT module incorporates a current transformer interface to the ATC-900 allowing current to be metered along with voltage and frequency. Combined with the ATC-900, the DCT module serves as a multifunction power meter and provides measurement of the listed electrical parameters. Readings are displayed on the ATC-900 controller display or can be monitored through Modbus 485.

Figure 3. DCT module attached

Voltage inputs (measurement category)

- **Range:** universal, auto-ranging up to 416 Vac L-N, 721 Vac L-L
- **Supported hookups:** 3-Element Wye or Delta
- **Input impedance:** 2m ohm/phase
- **Burden:** 0.0022 VA/phase at 120V
- **Fault withstand:** meets IEEE® C37.90.1

Current inputs

- 5A nominal, 10A maximum
- **Burden:** 0.005 VA per phase maximum at 11A
- **Pickup current:** 0.1% of nominal
- **Connections:** Screw terminals
- **Max input wire gauge:** AWG #12/2.5 mm 2
- **Fault withstand:** 100A/10 seconds, 300A/3 seconds, 500A/1 second

Isolation

- All inputs are isolated to 2600 Vac

Measurement methods

- **Voltage, current:** true RMS
- **Power:** sampling at 64 samples per cycle on all channels measured readings simultaneously
- **A/D conversion:** 16 simultaneous 12 bit analog to digital converters

Table 4. Current voltage frequency metering data

Current metering	Units	Accuracy	Notes
IA, IB, IC	Amperes	±1% of reading	—
Voltage metering	**Units**	**Accuracy**	**Notes**
VAB, VBC, VCA	Volts	±1% of reading	Line-to-line voltage
Frequency metering	**Units**	**Accuracy**	**Notes**
Frequency	Hz	±0.2 Hz of reading	Range is 20–255 Hz

Table 5. Power and energy metering data

Power metering	Units	Accuracy	Notes
Power	kW	±2% of reading	Approximately 1-second update
kVA	kVA	±2% of reading	Approximately 1-second update
kVAR	kVAR	±2% of reading	Approximately 1-second update
PF (power factor)	—	0 to ±1.00	—

Diagnostics and troubleshooting

In a mission-critical application, a failure to transfer to the backup power system requires quick and decisive action. Eaton's ATC-900 controller provides users with the data required to quickly identify the root cause of a backup power system failure and minimize system downtime. This data allows the user to identify a specific event and obtain the detailed event information including a step by step breakdown of the transfer sequence.

Historical data

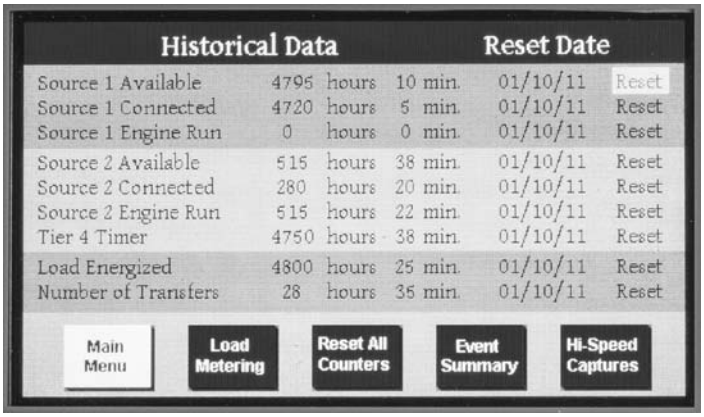


Figure 4. Historical data display

The historical data display indicates historical and cumulative counter values as follows:

- Source 1 available
- Source 1 connected
- Source 1 engine run
- Source 2 available
- Source 2 connected
- Source 2 engine run
- Tier IV timer
- Load energized
- Number of transfers

Historical counter resets are date and time stamped events that are captured in the event log.

Event summary

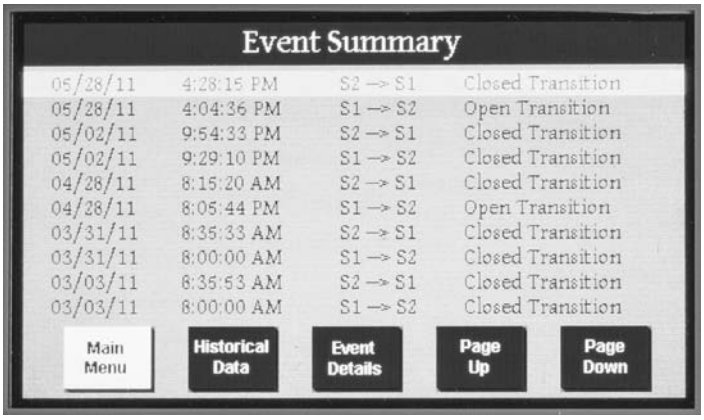


Figure 5. Event summary display

The ATC-900 controller stores 100 transfer summaries, 350 transfer details, 100 alarms, and 20 time adjustments.

Events include:

- Actions of the transfer sequence
- Alarms
- Changes to the set points
- Changes to the time/date
- Resetting a historical counter
- Engine run test

Time-stamping resolution of 1 second.

Event details

Figure 6. Event details display

Each transfer event can be exploded to view a step by step, time stamped, sequence of operation for a transfer event. All metered values are also logged for each event and can be viewed on the event data screen.

Time stamping resolution of 0.1 seconds.

Hi-speed capture

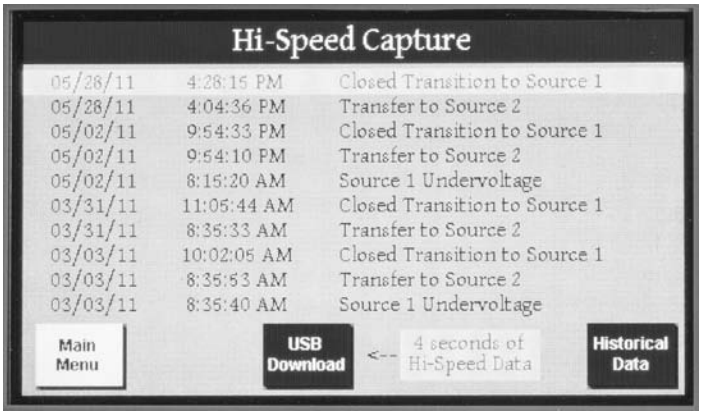


Figure 7. High speed capture display, pre and post event

The ATC-900 stores metered data updated on a continuous 20 millisecond basis for specific events. The data is captured 2 seconds before and 2 seconds after the event (except for a power failure, which is 4 seconds before). Oscillographic data for 10 events is stored in the controller and may be downloaded over USB or displayed graphically.

Events Include:

1. Source unavailability actions that initiate a transfer sequence (undervoltage, overvoltage, etc.)
2. Successful transfers (at the point of breaker/contactor closure)
3. Unsuccessful transfers (at the point of breaker/contactor failure to close or open)

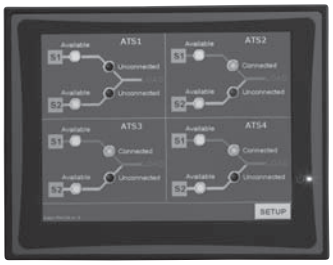
Industry standard communication protocol

Every ATC-900 controller includes a standard Modbus RTU communications interface with an option to upgrade to Modbus TCP/IP.

The ATC-900 is also compatible with Eaton's Power Xpert® Gateway for web-based monitoring, Modbus TCP/IP, SNMP, or BACnet®/IP. The Power Xpert Gateway can be used to consolidate data from up to 64 devices, including communications ready transfer switch controllers, trip units, and meters, as well as other Eaton devices. Versions of the Power Xpert Gateway include email event notification and data-logging functionality.

HM*i* Remote Annunciator and Controller

The HMi Remote Annunciator and Controller monitors and controls up to eight transfer switches on a 7" LCD touchscreen. It is compatible with either Modbus RTU or Modbus TCP/IP protocols. A basic mimic bus for each transfer switch displays source availability, source connected and preferred source. Users can drill down to metered source values and event history for each transfer switch. All control features are password-protected and include engine test, transfer to emergency (peak shaving), manual re-transfer, and bypass time delays.



USB programming port

Every ATC-900 transfer switch includes a front panel, NEMA 4X rated USB port for use in configuring set points or downloading event data to a USB flash drive. To reduce the time spent on site for commissioning, set points can be configured at a PC using the ATC-900 configuration software and saved to a USB flash drive to be uploaded to one or multiple controllers. Set points are also easily copied from one controller to another.

Downloading event capture data provides the user the ability to more thoroughly analyze high speed capture data using a PC, or data can be emailed to Eaton's Technical Support Team when offsite troubleshooting support is required.

Power Xpert Architecture

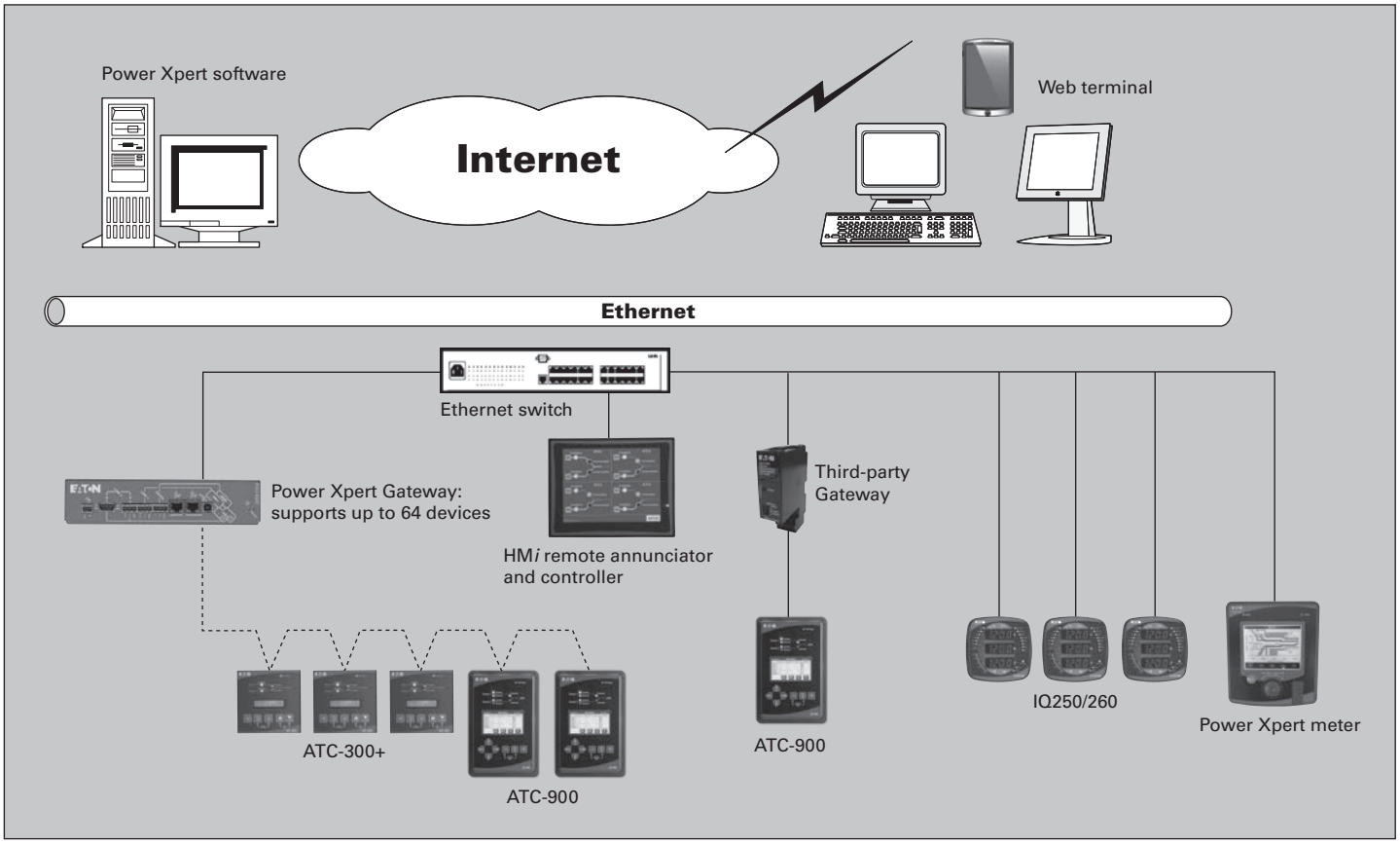


Figure 8. Power Xpert Architecture with ATC-900

Special applications

Three-source ATS control

The ATC-900 Master/Slave controller functionality provides the user with the ability to use two independent transfer switches in three-source systems consisting of a utility and two generator sources. In a three-source system, the Master ATS controls the engine starting and stopping of the Slave ATS.

In the event of a Source 1 power failure, the Master ATS engine start relay closes signaling the Slave ATS to start both generators. (Note: The Slave ATS requires continuous power using either the DCT Module for a DC power input or a UPS input.) The Master ATS handles all transfer time delays between the utility to generator transfer. If the preferred generator does not start within the programmed time delay, the Slave ATC-900 will initiate a transfer to the non-preferred generator. If "None Preferred" is selected, then both generators will start and the Slave ATS will transfer to the first generator source available. The ATC-900 will sense the load is connected to a good source and shut down the second generator.

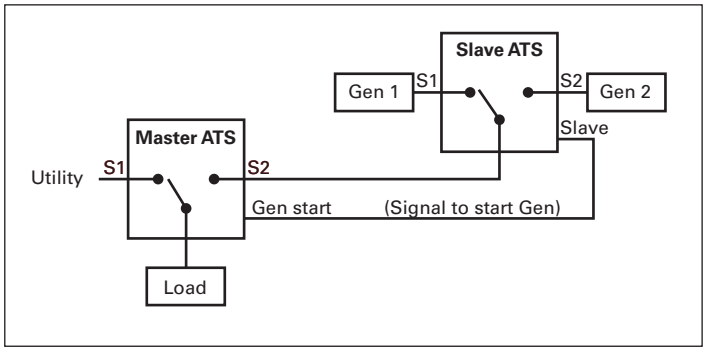


Figure 9. Three-source transfer switch arrangement

Load management

The ATC-900 includes several features to enhance the user's ability to manage load while on the alternate source.

- Integrated load metering: Provides metering data that allows the user to monitor energy utilization and manage system loading.
- Selective load shedding: Selectively drop non-essential loads when a user-defined kW level is reached. The transfer switch remains on generator.
- Load shed to neutral (where ATS construction allows): Provides the ability to load shed to a neutral position from a generator source.
- Pre/post transfer signals: Provides the ability to stop select loads during the transfer process.
- Load bank disable output: Disengages a load bank if utility power is lost during an engine test.

Dimensions in inches (mm)

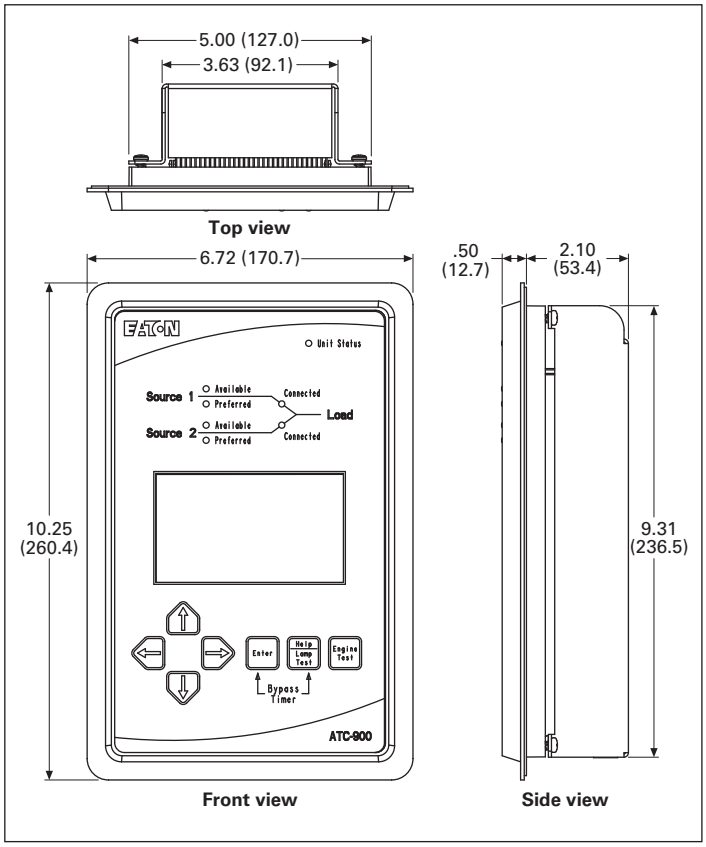


Figure 10. ATC-900

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