



ADVANCED POWER
TECHNOLOGIES

ATO Model: ATS-5335 Control System Module



Automatic Source Transfer Control System Module

Solutions Brochure

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**SAFE SMART SERVICEABLE SWITCHGEAR &
ENGINEERED POWER SYSTEM SOLUTIONS**



ALN: 569-ATO Rev. 01

ATO model: ATS-5335 Control



Figure 1: Standard ATO model: ATS-5335 Control System Module (Base Model) with Human Machine Interface (HMI) and Buttons

Automatic Open Transition Transfer Control System

- ⊙ Monitors Voltage and Frequency of Two Different Power Sources
- ⊙ Power Sources can be Utility, Generator, or a combination of both
- ⊙ Control System Module controls automatic transfer of load between the Preferred and Standby power sources during a power failure
- ⊙ Optional Current, Power, and Energy Monitoring
- ⊙ Dust tight and splash proof (from any direction) front panel and HMI:
 - Rated IP65/NEMA 12
- ⊙ HMI with easy-to-see backlit LCD HMI and menu navigation buttons
- ⊙ Alarm indication on LCD HMI
- ⊙ Line-Line or Line-Neutral Voltage Sensing
- ⊙ Real time clock
- ⊙ Optional Remote monitoring capability (Modbus RTU via RS485 and Modbus TCP/IP Ethernet) increases communication flexibility
- ⊙ Optional Load and/or No-Load Generator Set Exercise Scheduler
 - This enables genset testing & maintenance
- ⊙ Optional dry contacts for various alarm and status conditions

Operations Summary



Figure 2: Front Angle of Standard ATO model:
ATS-5335 Control System Module (Base Model)
with Human Machine Interface (HMI).

ATO Sequence of Operations

- ⊙ APT ATO model: ATS-5335 Automatic Source Transfer Control Module monitors the True RMS voltage and frequency of the two different power sources.
- ⊙ The power sources can be Utility, Generator, or any combination of both.
- ⊙ The module will monitor Source 1 (S1) and in the event of a failure of Source 1 will initiate automatic transfer of load to Source 2 (S2).
- ⊙ When Source 2 is available and its Voltage and Frequency are within set limits, the control module will control the transfer devices and switch the load from S1 to S2.
- ⊙ Once the S1 supply returns to within set limits, the control module will command a load return to S1 and shut down S2.
- ⊙ Additional features for operation:
 - Configure Source 1/Source 2 priority
 - Configure control of Source 1 and/or Source 2 Load Inhibit (customer supplied contact)
 - Configure for Automatic Return to Preferred Source inhibit (customer contact or local control)
 - Configure Automatic or Manual return to Preferred Source
 - Configure status display LEDs, with typical configuration for:
 - Source 1 available
 - Source 2 available
 - Source 1 supplying load
 - Source 2 supplying load
 - Warning alarm
 - System in Auto

ATS-5335 CSM Diagrams

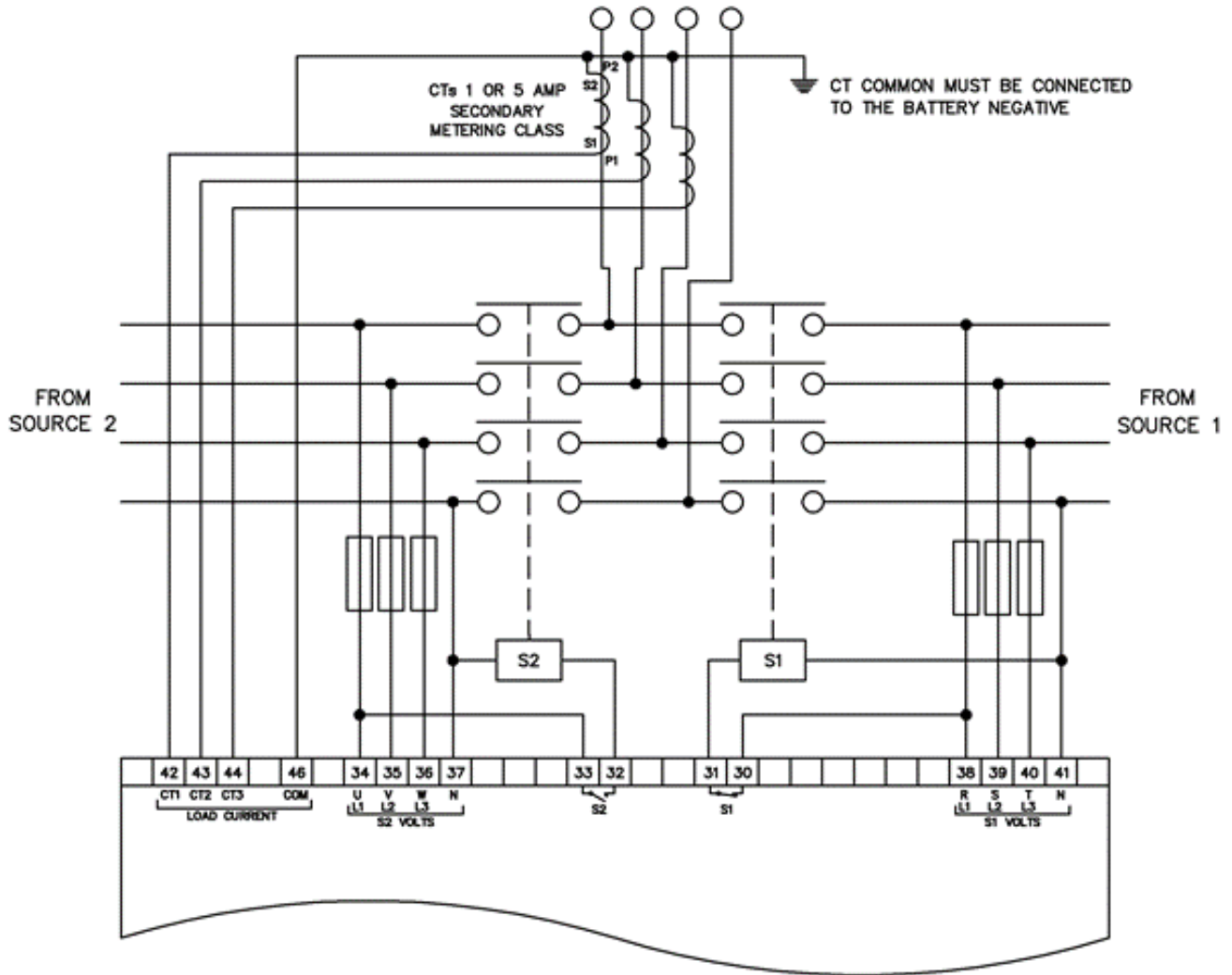


Figure 3: ATS-5335 Control System Module 3 Phase, 4 Wire Connection Diagram

ATS-5335 CSM Diagrams

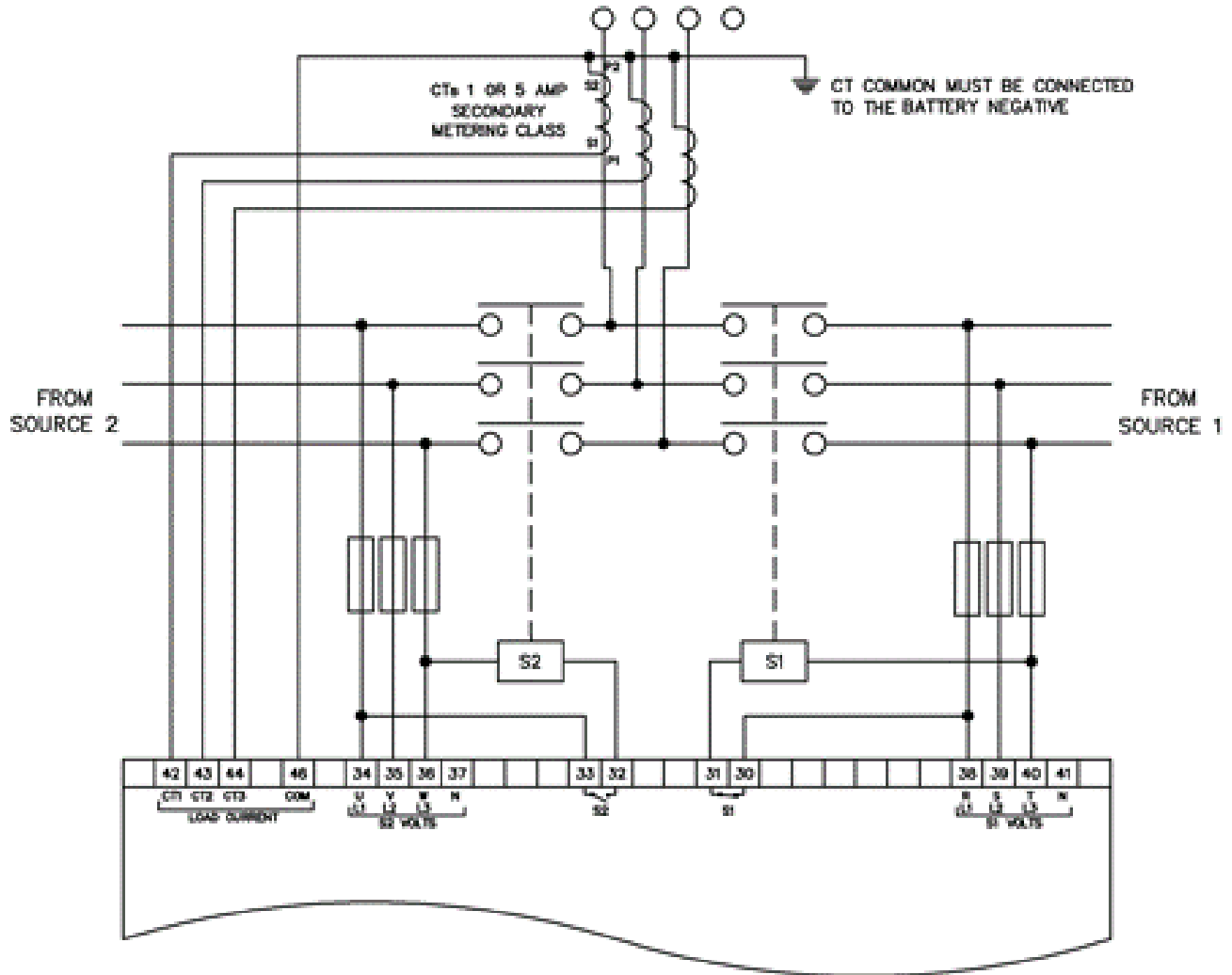


Figure 4: ATS-5335 Control System Module 3 Phase, 3 Wire Connection Diagram

ATS-5335 CSM Options

Configurable Timer Options	
Timer	Description
S1 Transient Delay	Used to delay the detection of S1 failure. This is normally used to prevent short transients or <i>brownout</i> conditions from being classified as an S1 Failure and opening the S1 breaker.
Start Delay (Time delay engine start)	Used if S2 is configured as Generator set. Active in AUTO mode only. Typically, this timer is used to prevent starting of the generator set upon short failures of Source 1 (S1).
Warm Up Time	The amount of time that the generator set will run BEFORE being allowed to take load.
S2 Fail Delay	The module a generator set (S2) start signal and waits for the period of this timer for S2 to become available. If it is not available when the timer expires, the <i>S2 failure</i> alarm is triggered.
Elevator Delay	Use to delay the <i>elevator control</i> output before and after load transfer takes place.
Transfer Time (Time Delay Neutral)	The time between S2 load switch being opened and the S1 load switch being closed (or vice versa). Used to give time for the motors and transformers to de-energize before connecting to another not synchronized source of power.
Return delay	A delay, used in auto mode only, that allows for short term removal of the request to stop the set before action is taken. This is usually used to ensure the generator set remains on load before accepting that the start request has been removed.
Cooling time	The amount of time that the set will be made to run OFF LOAD before being stopped. This is to allow the set to cool down and is particularly important for engines with turbo chargers.
S2 Transient Delay	Used to delay the S2 source under/over volts/frequency alarms. Typically, this is used to prevent nuisance alarms caused by large changes in load levels.
Fail to Stop Delay	If the set is called to stop and is still running after the fail to stop delay, a Fail to Stop alarm is generated.

ATS-5335 CSM Options

Human Machine Interface (HMI) Front Panel Adjustable Parameters (Optional Features Included)

Section	Parameters Shown on Display	Values
Display	<ul style="list-style-type: none"> LCD Contrast LCD Page Timer Scroll Delay Date and Time 	<ul style="list-style-type: none"> 0% hh:mm:ss hh:mm:ss dd-mm-yyyy, hh:mm:ss
Source 1 (S1)	<ul style="list-style-type: none"> S1 Option Immediate S1 Dropout Under Voltage Trip Over Voltage Trip Under Frequency Trip Over Frequency Trip 	<ul style="list-style-type: none"> Generator, Utility (Mains) Inactive, Active 0 V 0 V 0 Hz 0 Hz
Source 2 (S2)	<ul style="list-style-type: none"> S2 Option Immediate S2 Dropout Under Voltage Trip (Generator Option) Over Voltage Trip (Generator Option) Under Frequency Trip (Generator Option) Over Frequency Trip (Generator Option) Under Voltage Trip (Utility Option) Over Voltage Trip (Utility Option) Under Frequency Trip (Utility Option) Over Frequency Trip (Utility Option) 	<ul style="list-style-type: none"> Generator, Utility (Mains) Inactive, Active 0 V 0 V 0.0 Hz 0.0 Hz 0 V 0 V 0.0 Hz 0.0 Hz
Timers	<ul style="list-style-type: none"> S1 Transient Delay Start Delay Warming Up Time S2 Fail Delay Elevator Delay Non-sync Transfer Time Check-Sync Transfer Time Return Delay Cooling Time Fail to Stop Enable Fail to Stop Delay S2 Transient Delay 	<ul style="list-style-type: none"> mm:ss hh:mm:ss hh:mm:ss mm:ss mm:ss mm:ss.s mm:ss.s mm:ss.s hh:mm:ss hh:mm:ss Inactive, Active mm:ss s.s

Temperature Ratings

Operating Temperature	-22 °F to +158 °F (-30 °C to +70 °C)
Storage Temperature	-40 °F to +176 °F (-40 °C to +80 °C)

ATS-5335 CSM Options

Generator Set Exercise Scheduler

Section	Parameters Shown on Display	Values
Scheduler Bank 1	<ul style="list-style-type: none"> • Scheduler Enable • Bank 1 Run Mode • Bank 1 Period • Bank 1 Event 1 Week • Bank 1 Event 1 Day • Bank 1 Event 1 Start Time • Bank 1 Event 1 Duration • Bank 1 Event 2 Week • Bank 1 Event 2 Day • Bank 1 Event 2 Start Time • Bank 1 Event 2 Duration • Bank 1 Event 3 Week • Bank 1 Event 3 Day • Bank 1 Event 3 Start Time • Bank 1 Event 3 Duration • Bank 1 Event 4 Week • Bank 1 Event 4 Day • Bank 1 Event 4 Start Time • Bank 1 Event 4 Duration • Bank 1 Event 5 Week • Bank 1 Event 5 Day • Bank 1 Event 5 Start Time • Bank 1 Event 5 Duration • Bank 1 Event 6 Week • Bank 1 Event 6 Day • Bank 1 Event 6 Start Time • Bank 1 Event 6 Duration • Bank 1 Event 7 Week • Bank 1 Event 7 Day • Bank 1 Event 7 Start Time • Bank 1 Event 7 Duration • Bank 1 Event 8 Week • Bank 1 Event 8 Day • Bank 1 Event 8 Start Time • Bank 1 Event 8 Duration 	<ul style="list-style-type: none"> • Inactive, Active • Do Not Transfer • Transfer to S1 • Transfer to S2 • S1 Off Load (When S1 = Gen) • S2 Off Load (When S2 = Gen) • Weekly, Monthly • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:m • hh:mm

ATS-5335 CSM Options

Generator Set Exercise Scheduler

Section	Parameters Shown on Display	Values
Scheduler Bank 2	<ul style="list-style-type: none"> • Bank 2 Run Mode • Bank 2 Period • Bank 2 Event 1 Week • Bank 2 Event 1 Day • Bank 2 Event 1 Start Time • Bank 2 Event 1 Duration • Bank 2 Event 2 Week • Bank 2 Event 2 Day • Bank 2 Event 2 Start Time • Bank 2 Event 2 Duration • Bank 2 Event 3 Week • Bank 2 Event 3 Day • Bank 2 Event 3 Start Time • Bank 2 Event 3 Duration • Bank 2 Event 4 Week • Bank 2 Event 4 Day • Bank 2 Event 4 Start Time • Bank 2 Event 4 Duration • Bank 2 Event 5 Week • Bank 2 Event 5 Day • Bank 2 Event 5 Start Time • Bank 2 Event 5 Duration • Bank 2 Event 6 Week • Bank 2 Event 6 Day • Bank 2 Event 6 Start Time • Bank 2 Event 6 Duration • Bank 2 Event 7 Week • Bank 2 Event 7 Day • Bank 2 Event 7 Start Time • Bank 2 Event 7 Duration • Bank 2 Event 8 Week • Bank 2 Event 8 Day • Bank 2 Event 8 Start Time • Bank 2 Event 8 Duration 	<ul style="list-style-type: none"> • Do Not Transfer • Transfer to S1 • Transfer to S2 • S1 Off Load (When S1 = Gen) • S2 Off Load (When S2 = Gen) • Weekly, Monthly • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm • 1-4 • Monday to Sunday • hh:mm • hh:mm

ATS-5335 CSM Options

LED Display and Customer Contact Output Options		
Audible Alarm	This output indicates that the internal alarm horn is operating to allow it to feed an external alarm horn. Operation of the Mute pushbutton will reset this output once activated.	Inactive if the internal alarm horn is not operating.
Battery High Voltage	This output indicates that a Battery Over voltage alarm has occurred.	Inactive when battery voltage is not High
Battery Low Voltage	This output indicates that a Battery Under Voltage alarm has occurred.	Inactive when battery voltage is not Low
Close S1 Output	Used to control the load switching device. Whenever the module selects S1 to be on load this control output will be active.	The output is inactive whenever S1 is not required to be on load
Close S2 Output	Used to control the load switching device. Whenever the module selects S2 to be on load this control output will be active.	
Close to Neutral Output	Used to control the load switching device. Whenever the module selects S1 and S2 to not supply the load this control source will be active.	
Common warning	Active when one or more warning alarms are active. The output is inactive when no warning alarms are present	
Cooling Down	Active when the Cool timer is in progress	The output is inactive at all other times
Elevator Control	Active during the <i>elevator delay</i> time before a load transfer takes place and remains active for the duration of the <i>elevator delay</i> after a transfer takes place (when <i>elevator post transfer</i> is enabled.)	Inactive at all other times
Fail to Reach Loading Frequency	Active when S2 has failed to reach the loading frequency.	
Fail to Reach Loading Voltage	Active when S2 has failed to reach the loading voltage.	
Fail to Start	Becomes active if S2 is not seen to be running after the configurable number of start attempts.	
Fail to Stop	If S2 is still running a configurable amount of time after it has been given the stop command, the output will become active. This is the <i>Fail to stop</i> timer.	
Load Shedding Control (1-5)	Becomes active when the engine kW exceeds Load Shedding Control Trip Setting.	Inactive when the engine kW returns to below the Load Shedding Control Return setting.
Open S1 Output	Used to control the load switching device. Whenever the module selects S1 to be off load this control source will be active.	The output is inactive whenever S1 is required to be on load
Open S2 Output	Used to control the load switching device. Whenever the module selects S2 to be off load this control source will be active.	Inactive whenever S2 is required to be on load

ATS-5335 CSM Options

LED Display and Customer Contact Output Options (Continued)

Return Delay in Progress	Indicates that S2 is on load, and S1 is available, during the <i>return delay</i> timer operation.
S1 Failure Latched	Activates when the S1 failure alarm is active. Reset by digital input configured to <i>Alarm Reset</i>
S1 Failure Unlatched	Activates when the S1 failure alarm is active. Reset automatically when S1 becomes available
S1 High Frequency	Becomes active if S1's frequency goes higher than the configured trip setting.
S1 High Voltage	Becomes active if S1's voltage goes higher than the configured trip setting.
S1 In Limits	Activates when S1 becomes available and is within configured limits.
S1 Load Inhibited	Indicates that an input configured to <i>S1 Load Inhibit</i> is active, preventing the supply from taking load.
S1 Low Frequency	Becomes active if S1's frequency goes lower than the configured trip setting.
S1 Low Voltage	Becomes active if S1's voltage goes lower than the configured trip setting.
S2 Available	Activates when S2 becomes available. Ignores alarm conditions and the <i>S2 transient delay</i>
S2 Failure Latched	Activates when the S2 failure alarm is active. Reset by digital input configured to <i>Alarm Reset</i>
S2 Failure Unlatched	Activates when the S2 failure alarm is active. Reset automatically when S1 becomes available
S2 In Limits	Activates when the S2 becomes available, is within configured limits and the <i>Auxiliary S2 Ready</i> input is active.
S2 Load Inhibited	Indicates that an input configured to <i>S2 Load Inhibit</i> is active, preventing the supply from taking load.
S2 Ready	Activates when S2 becomes available and both the warming and cooldown time are not active. Ignores alarm conditions and the <i>S2 transient delay</i>
Scheduled Run	Active when the controller is requesting the set to run under control of the inbuilt <i>Scheduler</i> .
Start and Run S2	Active when the controller has requested for S2 to start and run.
Start Delay in Progress	Active when the controller is in the <i>start delay</i> timer, after which the set will be called to start.
System in Auto Mode	Active when unit is in Auto mode
System in Manual Mode	Active when unit is in Manual mode
System in Prohibit Return Mode	Active when unit is in Prohibit Return Mode
System in Start Inhibit mode	Active when unit is in Start Inhibit Mode
System in Stop Mode	Active when unit is in Stop Mode
System in Test Off-Load Mode	Active when unit is in Test Off-Load Mode
System in Test On-Load Mode	Active when unit is in Test On-Load Mode
Waiting For Manual Restore	Becomes active when S2 is on load and the S1 supply is healthy but an input configured to Manual Restore is active. This can be used to signal to an operator that action is required before the set can transfer back to the S1 supply.
Waiting For S2	Active when the controller has requested for S2 to start and is waiting for it to become available.
Warming Up	Active when S2 is running off load, during the warming timer, before taking load.

ATS-5335 CSM Options

Options for Customer Control Inputs

Function	Description
Alarm Mute	This input is used to silence the audible alarm from an external source, such as a remote mute switch.
Alarm Reset	This input is used to reset any latched alarms from a remote location. It is also used to clear any latched warnings which may have occurred (if configured) without having to stop/unload S2.
Auto Restore Inhibit	In the event of a remote start/S1 failure, S2 will be instructed to start and take load. On removal of the remote start signal/S1 return the module will continue to run S2 on load until the <i>Auto Restore Inhibit</i> input is removed. This input allows the controller to be fitted as part of a system where the restoration to S1 is controlled remotely or by an automated system.
Auto Start Inhibit	This input is used to provide an over-ride function to prevent the controller from starting S2 in the event of a remote start/S1 out of limits condition occurring. If this input is active and a remote start signal/S1 failure occurs the module will not give a start command to the S2. If this input signal is then removed, the controller will operate as if a remote start/S1 failure has occurred, starting and loading S2. This function can be used to give an ' AND ' function so that S2 will only be called to start if S1 fails and another condition exists which requires S2 to run. If the 'Auto start Inhibit' signal becomes active once more it will be ignored until the module has returned the S1 supply on load and shutdown. This input does not prevent starting of the engine in MANUAL or TEST modes.
Auxiliary S1 Fail	The module will monitor the incoming single or three phase supply for Over voltage, Under Voltage, Over Frequency or Under frequency. It may be required to monitor a different S1 supply or some aspect of the incoming S1 not monitored by the controller. If the devices providing this additional monitoring are connected to operate this input, the controller will operate as if the incoming S1 supply has fallen outside of limits, S2 will be instructed to start and take the load. Removal of the input signal will cause the module to act if S1 has returned to within limits providing that the S1 sensing also indicates that the S1 is within limits.
Auxiliary S2 Ready	Allows an external device (such as the engine control module) to instruct the controller that S2 is healthy and available to take load. The controller then monitors the voltage and frequency to check they are within acceptable limits before performing the load transfer function.

ATS-5335 CSM Options

Options for Customer Control Inputs (Continued)

Function	Description
External Panel Lock	This input is used to provide security to the installation. If the External Panel lock input is active, the module will not respond to operation of the Mode select or start buttons. This allows the module to be placed into a specific mode (such as Auto) and then secured. The operation of the module is not affected, and the operator will still be able to view the various instrumentation pages etc. (<i>Front panel configuration access is still possible while the system lock is active</i>).
Inhibit Scheduled Run	This input is used to provide a means of disabling a scheduled run.
Lamp Test	This input is used to provide a test facility for the front panel indicators fitted to the module. When the input is activated all LED's will illuminate.
Load Shedding	Opens both the S1 and S2 load switch devices. See the section entitled <i>Breaker Scheme</i> for details of how this input interacts with the load switching control.
Open / Close S1	Allows connection of an external signal to control open and closing of the S1 load switching device.
Open / Close S2	Allows connection of an external signal to control open and closing of the S2 load switching device.
Remote Start off load	If this input is active, operation will be similar to the 'Remote Start on load' function except that S2 will not be instructed to take the load. This function can be used where an engine only run is required e.g. for exercise.
Remote Start on load	When in auto mode, the module will perform the start sequence and transfer load to S2. In Manual mode, the load will be transferred to S2 if the supply is already healthy, however in manual mode, this input will not generate start/stop requests of S2.
S1 Load Inhibit	This input is used to prevent the module from loading the S1 supply. If the S1 supply is already on load activating this input will cause the module to unload the S1 supply. Removing the input will allow S1 to be loaded again. NOTE: -This input only operates to control the S1 switching device if the module's load switching logic is attempting to load to S1. It will <u>not</u> control the S1 switching device when S2 is on load.
S2 Load Inhibit IEEE 37.2 - 52 AC circuit breaker	This input is used to prevent the controller from loading S2. If S2 is already on load, activating this input will cause the controller to unload S2. Removing the input will allow S2 to be loaded again. NOTE: -This input only operates to control the S2 switching device if the module's load switching logic is attempting to load S2. It will not control the S2 switching device when the S1 supply is on load.
Simulate S1 available	This function is provided to override the module's internal monitoring function. If this input is active, the module will not respond to the state of the incoming AC S1 supply.
Simulate S2 available	This function is provided to override the module's internal monitoring function. If this input is active, the module will not respond to the state of the incoming AC S2 supply.

About Advanced Power Technologies



Advanced Power Technologies (APT) is on the cutting edge of the latest engineered power system smart technologies, as it relates to microgrid & storage management, renewable & conventional energy source deployment, demand peak shaving, and facility back-up and co-generation power systems. Located in the central United States and headquartered in Lafayette, Indiana with solutions development engineers around the country, APT provides domestic and international products and services to industry leading companies from around the world. APT engineers have decades of power system experience from working with some of the largest companies in industry. Over the last two decades, we have produced successful solutions for hundreds of large-scale electric power projects involving utility/generator paralleling, transfer, peak shaving, and distribution. We pride ourselves in providing electrical power systems that are engineered and custom built, utilizing state-of-the-art technologies to fit our customer's exact needs. The core of our business is low & medium voltage engineered power systems for a wide range of indoor & outdoor applications, such as:

- ⊙ Utility(ies) and Generator(s) Paralleling/Transfer/Peak Shaving/Distribution Switchgear
- ⊙ Microgrids, Microgrid Master Control Panels, SCADA systems
- ⊙ Containerized Battery Energy Storage Systems (BESS)
- ⊙ Photovoltaic (PV) Solar Power Collection/Distribution & Renewable Energy Storage Systems
- ⊙ Low & High Resistance Grounding Systems, Grounding Systems for Photovoltaic Effective Grounding
- ⊙ High Efficiency Combined Heat and Power Switchgear & Control Systems (CHP, Co-generation)
- ⊙ Outdoor Walk-In Electrical Houses (E-Houses) & Skid-Mounted Switchgear
- ⊙ Motor Control Centers & Motor Control Switchgear
- ⊙ Automatic & Manual Load Transfer Switchgear
- ⊙ Bypass/Isolation & Power Distribution Circuit Breaker Switchboards
- ⊙ Generator/Loadbank Quick Connection Switchgear, Switchboards, & Tap Boxes
- ⊙ Industrial Control Panels

Please see our product webpages on www.appt-power.com for product brochures and relevant information. Actual products may look different from images shown on the website and in brochures, based on actual specifications.

APT cares and understands that each power system is different. We will evaluate various solutions to develop the best solution for a site. APT focuses on our ability to a combine several traditional pieces of equipment/functionality into as little of a footprint possible. This saves on space, the cost of equipment, cost of installation, and accomplishes the most optimal/state-of-the-art design your facilities. APT's desires to foster and grow a culture of continued open communication with each customer. Let APT be your source to provide fully engineered power system equipment solutions for the full customer facility on time, on or under budget, and in the smallest footprint possible. We are always available to assist customers and engineers representing customers in the development of complex power solutions for all facility types.