

Automatic Power Transfer Equipment

PowerCommand® Soft Loading Closed Transition PLTS



Description

PowerCommand Automatic Power Transfer Equipment (model PLTS) is designed to coordinate with Cummins Power Generation generator sets with PowerCommand Digital Paralleling Controls to provide emergency automatic transfer functions between a utility service and a generator set. It provides a seamless transfer between a utility service and a generator set for situations when both sources are available. The PLTS incorporates a microprocessor-based control system that provides condition sensing for utility (mains) and generator set sources, time delays for various functions, and an optional network interface to facilitate communication to generator set controls and other remote monitoring systems. The control system is configurable using the alpha-numeric operator display, or by using InPower™, a service tool used by Cummins Power Generation service personnel for microprocessor-based power generation products.

Codes and Standards

The PLTS is suitable for use in applications that require listing or compliance to the following codes and standards:

- UL891, Low Voltage Switchboards*
- UL1008, Automatic Transfer Switches*
- CSA C22.2, No. 14 – M91 Industrial Control Equipment.*
- CSA 282, Emergency Electrical Power Supply for Buildings*
- EN55011, Class B Radiated Emissions*
- EN55011, Class B Conducted Emissions*
- IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity.* Similar waveforms are described in ANSI/IEEE 62.41-1991
- IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity*
- IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity*
- IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity*
- IEC 1000-4-6 Conducted Field Immunity*
- IEC 1000-4-11 Voltage Dip Immunity*

- NFPA70 – National Electrical Code. Suitable for use in systems in compliance to Article 700, 701, and 702.*
- NFPA99 – Essential Electrical Systems for Health Care*
- NFPA110 – Emergency and Standby Power Systems.* The transfer system meets all requirements for Level 1 systems.
- IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.*
- NEMA ICS10-1993 – AC Automatic Transfer Switches.*

Cummins Power Generation operates in compliance to ISO 9001 and holds third party certification verifying quality assurance in design, development, production, installation, and service.

Features

- Three-Phase Monitoring of Both Sources** – Monitors line to neutral voltage of all sources, for Over and Under voltage, loss of phase, and Over/Under frequency.
- Standard Programmable Time Delays** – Provides time delay start, stop, transfer and retransfer functions, and program transition during open transition mode.
- Membrane-Style Operator Panel** – Totally sealed operator panel with membrane switches provides protection to internal controls.
- Analog AC Load Metering** – Allows operator to see power conditions to the load at a glance.
- Alpha-Numeric Operator Controls** – Displays source conditions, operating history of transfer system, and other data. Allows setup and adjustment of the control via service access codes.
- PowerCommand Network Interface** – Provides a LonMark compliant interface to the control from external devices. Allows easy communication with LonMark compliant generator set controls and other devices.

Power Transfer Equipment



The PLTS utilizes electrically operated drawout power air circuit breakers for the transfer of power from source to source. The entire power transfer system is UL1008 listed and suitable for service to equipment in critical emergency, standby, and other power system applications.

Power circuit breakers offer the durability of traditional automatic transfer switches and high withstand ratings.

The standard drawout configuration allows service and maintenance of the power transfer contacts without extended service interruptions. Integrated overcurrent protection provides cost-effective system protection.

The power breakers are available in a standard transfer switch configuration with service entrance configuration.

Power Circuit Breakers

Electrically operated Square D Masterpact with long, short, and instantaneous trips. Breakers and all associated equipment are rated for operation at 800, 1200, 1600, 2000, 2500, or 3000 amps.

Breaker charging power is derived from the connected source. Closing is via AC operator. Opening is via DC shunt trip.

Breaker tripping is detected as a fault condition. The breaker will be tripped and locked out. The control system will initiate transfer to the alternate source.

Breakers are bus-connected to load lugs with silver plated copper bus. Bracing per UL standards and rated at 100KA.

Utility Protective Relaying

The PLTS control system includes a Basler GPR multifunction digital protective relay for utility service protection during the time period that the generator set is paralleled to the utility service. (The relay is disabled when the generator set is not paralleled to the utility.) The GPR relay provides adjustable over and under frequency protection, over and under voltage, and phase sequence voltage protection. Reverse power protection is available as an option, if required.

On sensing a disturbance on the utility service while paralleled, the GPR relay will trip and lock out the utility service.

The control system also includes “fail to open” and “fail to close” protection for the breakers in the system so that a failure to properly operate will result in action by the control system.

The generator set controls are programmed to operate in a failsafe manner (zero load) if the control system fails to disconnect the generator set from the utility service.

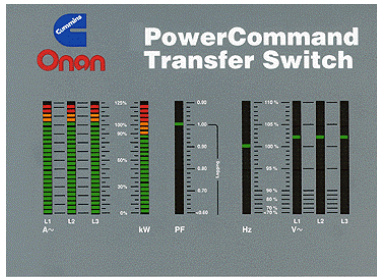
Enclosure

Metal-enclosed switchgear structure, designed for front and rear access. Enclosure material is selected per UL891 and UL1008 requirements. Enclosure is E-coated and baked, then top-coated with a light gray gloss enamel finish. Equipment designs are available to allow all top, all bottom, or top and bottom connection of sources and loads to the equipment. Refer to equipment drawings for dimensional information and power and control access locations.

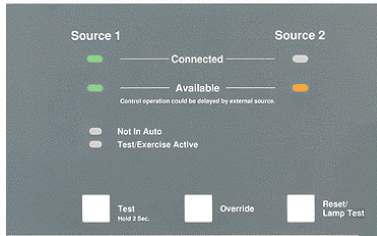
Environment

The control system is designed to operate over a temperature range of -40 to $+70\text{C}$.

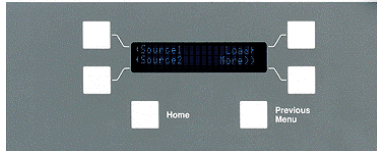
PowerCommand Power Transfer Control



Analog Metering



Status & Control



Alphanumeric Display

Configurable Operating Modes

The PowerCommand microprocessor-based control system includes the following field-configurable features and functions:

Open Transition. The system monitors source availability, starts the generator set when necessary, and operates the power transfer pair in a “break before make” sequence.

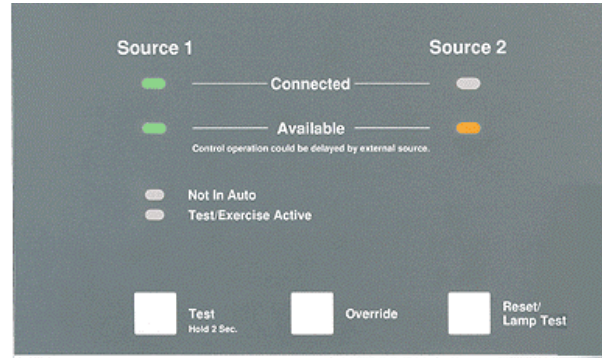
Closed Transition – Momentary. Operates as an open transition system when one source has failed. When two sources are available, the system actively synchronizes the generator set to the utility service, connects to the utility for 100 mS, and then disconnects from the initial source.

Closed Transition - Ramping. Operates in a similar fashion to momentary systems, but when sources are connected together, the load is ramped to the oncoming source over a preprogrammed period of time. This allows transfer of loads from one source to another with minimum disturbance to the loads.

Closed Transition – Extended Paralleling. Control system provides all the functions of other systems, and in addition provides the ability to parallel the generator set to the utility for an extended period of time, with controlled kW and kVAR output.

Test. Allows the operator to simulate a power failure in the utility service, and verify proper system operation. System is configurable for open or closed transition operation in this mode.

Operator Interfaces



The operator panel includes LED indicating lamps, pushbutton switches, and an alphanumeric display. The panel incorporates a single sealed membrane with embedded switches and lamps, for environmental protection of internal controls. Functions provided in the operator panel include:

Analog AC Metering Panel, monitors power supplied to the load. The analog metering provides a bargraph indication of 3-phase AC voltage and current, frequency, KW, and power factor. The metering is color-coded green for normal, amber for caution, and red for dangerous conditions.

LED indicating lamps for source availability, source connected indication, and system is not in an automatic mode, and TEST mode.

Control switches to initiate TEST mode, override time delays, and to test lamps or reset faults.

Alphanumeric Digital Display. A digital display provides convenient monitoring of the condition of sources and system load, allows adjust of transfer system operating parameters, monitoring network status, or review of transfer system events. Simple menu system allows quick navigation to desired information. Password protection limits access to adjustments to authorized personnel. The display is a vacuum fluorescent device that is clearly visible in both most lighting conditions, and over a broad viewing angle.

AC Metering and Data

Voltage and Frequency: Provides line to line and line to neutral (when used) voltage displays, and a frequency display for both sources. All phases are displayed on a common screen to allow viewing of phase balance.

Load Data: Displays 3-phase load voltages (line to line and line to neutral), 3-phase load current, load frequency, kW, kVA, power factor, and neutral current.

Statistics: Displays run time on source 1 and source 2, average transfer time, number of transfers, number of source 1 and source 2 failures, battery and charger condition, and control operating hours.

Events: The control maintains and displays a data log of the 50 most recent events, including power failures and alarms in the control.

Run Time: Records and displays the number of hours connected to each source

System Data: The control can display data from other PowerCommand transfer switches and generator sets that are connected via a PowerCommand Network. For each system device, the control will display device name, load in kW, status, and indicate if any alarms are present on the device, along with the nature of the alarm.

Software Adjustments

The following adjustments can be made via the operator panel:

Generator Set Start: 0-15 seconds. Prevents nuisance generator set starts.

Transfer Normal Service to Generator Set: 0-120 seconds. Allows generator set to stabilize before application of load. Prevents needless power interruption if normal source variation or loss is momentary.

Retransfer Generator Set to Normal Service: 0-30 minutes. Allows utility service to stabilize before retransfer of loads. Prevents needless power interruption if the return of the normal service is momentary.

Generator Set Stop: 0-30 minutes. Maintains generator set availability for immediate reconnection in the event that the normal source fails after retransfer. Allows generator set cooldown by running unloaded.

Program Transition Time. Controls the time that the system is disconnected from both sources to allow load induced voltages to decay to a safe level before connecting to a live source.

Source Availability Sensing

Over/Under Voltage, Monitors all phases on both sources:

Under voltage pickup: 85% to 98% of nominal voltage. Default is 95%.

Under voltage dropout: 75% to 98% of nominal voltage. Default is 85%.

Under voltage dropout time delay: 0.5 seconds, fixed.

Over voltage pickup: 95% to 99% of dropout setting. Default setting is 95%.

Over voltage dropout: 105% to 135% of nominal voltage. Default setting is 105%.

Over voltage dropout time delay: 0.5 to 120 seconds. Default setting is 3 seconds.

Over and Under Frequency, Monitors both sources. Operation is adjustable in a range of plus or minus 5% to 20% from nominal frequency setting. The over and under frequency setting has an adjustable time delay of 1 to 15 seconds. Default is 10% and 1 second.

Voltage Imbalance Monitors both sources. Drop-out settings are adjustable between 2% and 10%, in 1% increments. Pick-up setting is fixed at 10% of the drop-out value. Time delay is adjustable from 2 to 20 seconds. Default dropout point is 10% and 10 seconds.

Phase Rotation. Prevents transfer to generator set service unless the phase relationship of the normal and generator set source are the same.

Loss of a Single Phase, monitors both sources.

Other Features

Service Diagnostic LED indicators. Circuit boards include a series of LED indicator lamps used for service diagnostics.

Real Time Clock. Provides time sequence of exercise functions and date and time stamping of events and fault conditions.

Firmware Data Plate. The system includes recordings of the transfer system model, serial number, and other data, stored in EEPROM memory. This provides a permanent, easily accessible record of transfer switch information.

Fault Condition Monitoring. Monitors for breaker operation failures and failure of the system to disconnect from the utility service. Monitors the microprocessor for proper operation and failure of the generator set to synchronize to the utility service.

Neutral Current Monitoring. Monitors neutral current flow for over-current conditions. Issues a warning to the Digital Display whenever the neutral current exceeds an adjustable limit (100% to 150% of rated current) for a time period (10 - 60 sec).

SEQUENCE OF OPERATION:

Modes of Operation:

Under normal operating conditions, utility power is provided to the load through the normal (utility) circuit breaker. The emergency (GenSet) circuit breaker is open and the GenSet is stopped. Four modes of operation are available and can be configured from the front panel of the PowerCommand ATS controller. This is a password protected function.

Open transition will provide a load break transfer between sources.

Momentary Closed transition will provide a non-load break transfer but depending on the GenSet size and the load on the system could cause a voltage and frequency transient. During a momentary transfer the two sources are connected together for a maximum of 100 ms which will effectively block load the GenSet with the full system load, possibly causing voltage and frequency deviations that exceed desired levels. Special attention should be used in selecting the proper GenSet for this application.

Soft Loading Closed Transition will provide a non-load break transfer and a smooth transition of the load between sources at a rate that can be adjusted at the GenSet control.

Closed transition extended paralleling will allow the two sources to be permanently connected and the GenSet loaded to its base load setting (adjustable at the GenSet control). In this mode if the system load is less than the

GenSet base load setting, power will be exported to the utility.

Loss of Normal Power:

On the loss of normal power the PowerCommand ATS controller will signal the GenSet to start (hard wired and network output) and after the time delay start has expired, the GenSet will start and accelerate to rated speed and voltage. When the frequency and voltage reach their normal operating range, and after the transfer time delay has expired the controller will signal the normal (utility) breaker to open, and permit the emergency (GenSet) breaker to close.

Return of Normal Power:

Once the normal power returns the PowerCommand ATS control will respond according to the mode that has been selected by the operator.

If open transition is selected, the PowerCommand ATS controller will wait for the retransfer time delay and then issue the emergency breaker open signal. It will verify that the emergency breaker is open, wait for the program transition time delay and then initiate a normal (utility) breaker close signal. The control will remove its start signal from the GenSet, the GenSet will continue to run for a cool down period and then shut down.

If closed transition momentary is selected, following the retransfer time delay the controller will signal the GenSet to enable the synchronizer (GenSet function), the GenSet will synchronize to the normal source and hold the two sources in sync. The ATS controller monitors the two sources and when they are in sync according to the adjustable in-sync acceptance criteria a normal (utility) breaker close signal is initiated. The controller verifies that the normal breaker has closed and starts timing for the maximum parallel time (100ms). As soon as the time expires or the controller receives an input signal from the GenSet indicating it is unloaded, it will issue the emergency breaker open signal. At no time during the transfer is there an interruption in the power supplying the loads. The ATS controller will remove its start signal from the GenSet, the GenSet will continue to run for a cool down period and then shut down.

If closed transition ramping or extended paralleling is selected, following the retransfer time delay the controller will signal the GenSet to enable the synchronizer (GenSet function), the GenSet will synchronize to the normal source and hold the two sources in sync. The ATS controller monitors the two sources and when they are in sync according to the adjustable in-sync acceptance criteria a normal (utility) breaker close signal is initiated. The controller verifies that the normal breaker has closed and starts timing for the maximum parallel time. When the GenSet sees both source breakers closed and the unload signal on its external load set lines, it will ramp the load onto the utility source. As soon as the time expires or the controller receives an input signal from the GenSet indicating it is unloaded, it will issue the emergency breaker open signal. At no time during the transfer is there an interruption in the power supplying the loads. The ATS

controller will remove its start signal from the GenSet, the GenSet will continue to run for a cool down period and then shut down.

Test/Exercise Mode

Once the test or exercise mode is selected the PowerCommand ATS controller will respond according to the mode that has been selected by the operator.

If open transition is selected, following the transfer time delay the PowerCommand ATS controller will signal the GenSet to start (hard wired and network output) and after the time delay start has expired, the GenSet will start and accelerate to rated speed and voltage. When the frequency and voltage reach their normal operating range and after the transfer time delay has expired, the controller will signal the normal (utility) breaker to open, wait for the program transition time delay and then permit the emergency (GenSet) breaker to close so that the GenSet will be supplying the full facility load.

If closed transition momentary is selected, following the transfer time delay the controller will signal the GenSet to start. The GenSet will start, accelerate to rated speed and voltage and synchronize (GenSet function) to the normal source and hold the two sources in sync. The ATS controller monitors the two sources and when they are in sync according to the adjustable in-sync acceptance criteria the GenSet breaker close inhibit is removed allowing the breaker to close. The controller verifies that the GenSet breaker has closed and starts timing for the maximum parallel time (100ms). As soon as the time expires or the controller receives an input signal from the utility indicating it is unloaded, it will issue the normal breaker open signal. At no time during the transfer is there an interruption in the power supplying the loads. The GenSet will continue to carry the load until the test/exercise mode is terminated either by the operator or a time-out at which time the load will be transferred back to the normal source as described in the "Return of Normal Power" section above.

If closed transition ramping is selected, following the transfer time delay the controller will signal the GenSet to start. The GenSet will start, accelerate to rated speed and voltage and synchronize (GenSet function) to the normal source and hold the two sources in sync. The ATS controller monitors the two sources and when they are in sync according to the adjustable in-sync acceptance criteria the GenSet breaker close inhibit is removed allowing the breaker to close. The controller verifies that the GenSet breaker has closed and starts timing for the maximum parallel time. When the GenSet sees both source breakers closed and the load signal on its external load set lines, it will ramp the load onto the GenSet source. As soon as the time expires or the controller receives an input signal from the utility indicating it is unloaded, it will issue the normal breaker open signal. At no time during the transfer is there an interruption in the power supplying the loads. The GenSet will continue to carry the load until the test/exercise mode is terminated either by the operator or a time-out at which time the load will be transferred back to the normal source as described in the "Return of Normal Power" section above.

If closed transition extended paralleling is selected, following the transfer time delay the controller will signal the GenSet to start. The GenSet will start, accelerate to rated speed and voltage and synchronize (GenSet function) to the normal source and hold the two sources in sync. The ATS controller monitors the two sources and when they are in sync according to the adjustable in-sync acceptance criteria the GenSet breaker close inhibit is removed allowing the breaker to close. The controller verifies that the GenSet breaker has closed. When the GenSet sees both source breakers closed and the load signal on its external load set lines, it will ramp the load onto the GenSet source up to the base load setpoint. At no time during the transfer is there an interruption in the power supplying the loads. If at anytime the system load drops below the base load setting on the GenSet, the GenSet will continue to generate at base load with the excess power being exported to the utility grid. The two sources will remain in parallel with the GenSet at base load until the test/exercise mode is terminated either by the operator or a time-out at which time the load will be transferred back to the normal source as described in the "Return of Normal Power" section above.

Optional Equipment

- Service Entrance Listing.** Option provides additional equipment and labeling for UL50 service entrance listing of the equipment.
- Power Distribution Equipment.** PLTS equipment can be supplied with bus-connected group mounted molded case distribution equipment. Use of factory-mounted distribution equipment minimizes site installation work.
- Ground Fault Protection.** In general, 3-phase/4-wire systems that operate with a voltage of more than 150 volts (line to neutral) and a rating of over 1000 amps must be provided with ground fault protection when operating on the utility service, and ground fault alarm or protection when operating on the generator set source. PLTS equipment is available with factory-installed ground fault sensing equipment and logic to provide effective operation of the equipment under ground fault conditions, both when operating on the utility and on the generator set.
- LonWorks® Network Interface.** Provides a LonMark® compliant network interface to the transfer switch. Allows remote monitoring of all transfer switch data, network control interface to the generator set provided (when it is supplied with a LonMark-compliant interface), and communication with remote annunciation system equipment.
- NEMA 3R Non Walk-in Enclosure**

See your distributor for more information



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Warning: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.