

Paralleling Load Transfer Equipment Model PLTE



Description

The PowerCommand Digital Paralleling Load Transfer Control (PLTE) is a microprocessor-based utility paralleling system component, designed to interface directly with PowerCommand Digital Paralleling Generator Set control to provide automatic power transfer between live sources without disrupting power to loads. The PLTE is designed for use in low or medium voltage applications. The control panel provides system monitoring and control functions using a software-based design concept and utilizing a touchscreen operator interface. The control system provides flexibility to meet specific application requirements, ease of operator use, advanced functionality, and optimum system reliability and serviceability.

Comprehensive Standard Features

The Control offers a wide range of standard control and digital display features, and is specifically designed to allow easy addition of special features for individual applications. Key standard features include:

- Touchscreen with mimic panel for system monitoring and control.
- Comprehensive digital AC metering for both sources.
- Programmable Logic Controller (PLC) for system logic and control.
- Optional LED alarm indication.
- Optional Utility Grade Protective Relaying

The PowerCommand™ GenSet Control is a microprocessor-based generator set monitoring, metering, and control system. The control provides a local operator interface for the genset, digital voltage regulation, digital governing, and generator set protective functions. The integration of all the functions

into a single control system provides enhanced reliability and performance compared to conventional control systems.

The PowerCommand control is designed for mounting on the generator set.

Control power for PowerCommand and the Digital MasterControl is usually derived from the generator set starting batteries. The PLC and associated controls in the PLTE are backed up by an independent battery system.

PowerCommand systems are supported by a worldwide network of independent distributors, who provide parts, service and warranty support.

Codes and Standards

- **CSA C282-M1999** Compliance
- **CSA 22.2 No. 14 M91** Industrial Controls.
- **ISO 8528-4: 1993 Compliance**, Control Systems for Reciprocating Engine-driven Generator Sets
- **NFPA 70: US National Electrical Code.** PowerCommand controls are suitable for use in Emergency, Critical, and Standby applications, as defined in articles 700,701, and 702.
- **NFPA99: Standard for Health Care Facilities**
- **NFPA110** for level 1 systems.
- **UL508** Listed, Category NIWT7 for US and Canada.
- **UL1008** Listed

PowerCommand control systems and generator sets are designed and manufactured in ISO9001 certified facilities.

Control Panel

Operating Specifications

The control system including system touchscreen is designed for operation under the following conditions:

- Operating Temperature: 0 degrees C to +60 C.
- Storage Temperature: -30C to +70C.
- Humidity: Up to 95% relative, non-condensing.

Construction

The control system is housed in a rigid, freestanding, NEMA1/IP40 metal enclosed structure designed to require front access only. Framework is constructed of minimum 2.5-mm (12 gauge) steel sheet metal. The framework and all other sheet metal components of the system is primed with a rust-inhibiting primer and finished with satin finish ANSI 61 gray enamel.

Control components are totally isolated from power-carrying components by metal or insulating barriers. All components and surfaces operating at more than 50 volts is shielded to prevent inadvertent contact.

All control wiring is 105 degree C, 600 volt rated, and sized as required for safe, reliable operation. Each wire, device and functional component is identified by silk-screen or similar permanent identification.

Fuses are installed in DIN-rail mounted safety-type fuse holders, with integral "fuse blown" indicating lamps.

Terminal blocks are provided for all field connections on DIN-rail mounted devices.

Alarm and Status Display

An optional solid state alarm Annunciator panel provides general status information on all critical system parameters. Indicator lamps are high-intensity LED's, for long life and easy reading in any lighting condition.

Alarm and status conditions indicated on the panel include:

- Remote System Start
- System Test
- Check Generator Set
- Normal Source Available
- Connected to Normal
- Connected to Generator Set
- Generator Set Available
- Controller Malfunction
- Check Station Battery
- System Not in Auto

An alarm horn and a sealed "tactile feel" digital test/silence switch are included on the panel. The panel is designed to allow field reconfiguration of the system messages. Labels of all lamp conditions and lamp colors can be changed in the field. Alarm horn on/off dip switches are provided to allow configuration of the panel for specific project requirements.

AC Output Metering

True-RMS AC metering transducers provide input to the system PLC, so that AC metering data can be displayed on the system touchscreen.

Operator Panel

The operator panel provides the user with a complete package of easy to view and use information.

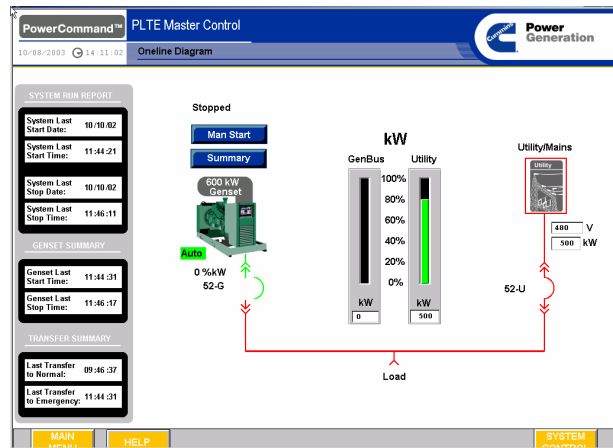
Touchscreen Operator Panel

A full color high-resolution 15 inch (diagonal) touchscreen operator interface panel (HMI) is provided to allow the operator to monitor and control the on site power system.

All data is configurable for display in either US standard or metric indications. Screens are configured with tabs for direct access to various screens. A 3-level password-based security system protects access to the system from unauthorized users.

The HMI includes the following screens and/or functions:

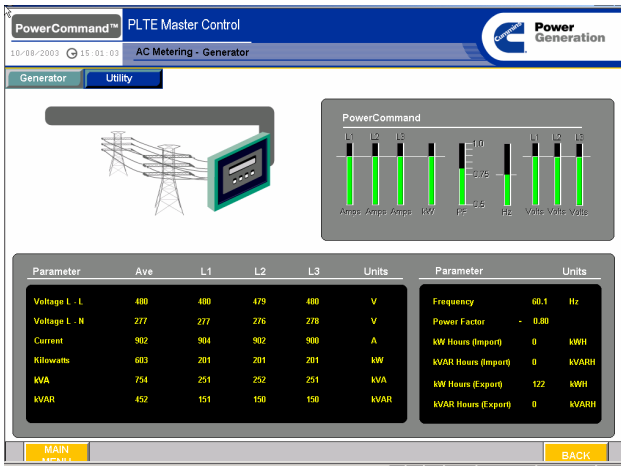
One Line Diagram



The one-line diagram screen displays system status by a combination of animation, changing screen color, and text messages. Conditions visible on the screen include:

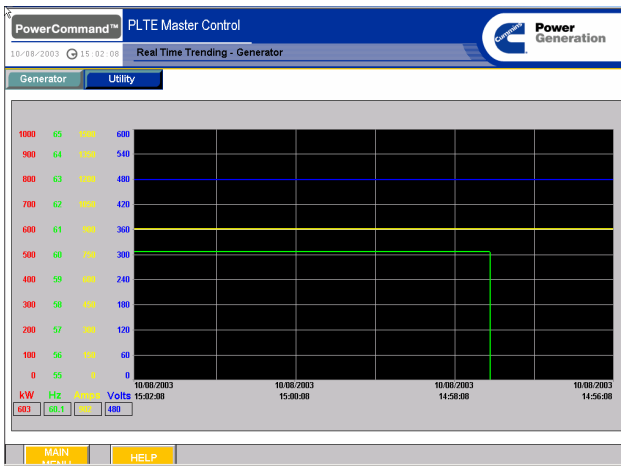
- **Generator Set, Utility, and Bus configuration**, with generator set, parallel breaker, bus, utility and utility breaker energized/de-energized indication (red indicating energized, green indicating de-energized).
- **Generator set designation**. Manual control and detailed data screens are accessible through hot keys (links) located on or adjacent to the genset icon.
- **Generator set status** (stopped, running, warning or shutdown).
- **Generator set and Utility breaker status**. (open/closed/tripped/racked out).

Normal Source Monitoring



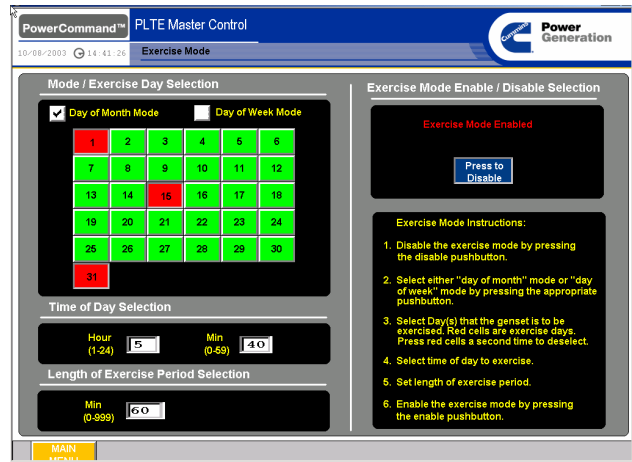
The normal (utility) source is monitored by the touchscreen with analog and alpha-numeric displays. Information includes 3-phase amps and volts (L-L, L-N, and average), hertz, kW, kVA, kVAR, power factor, kW Hours import and export, kVAR hours import and export.

Trending



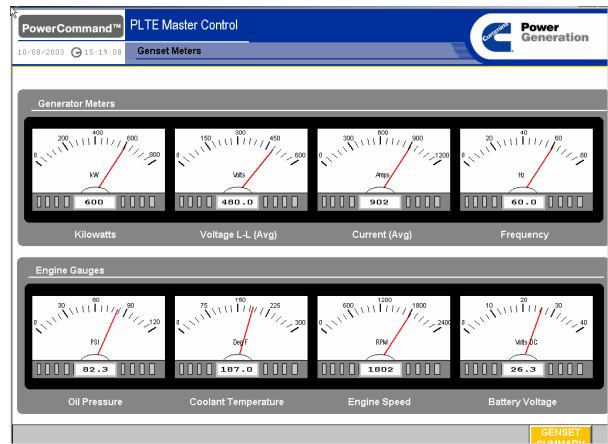
The Touchscreen provides real time trend charts for kW, volts, amps, and hertz. The chart is configurable for time period displayed.

Exercise Functions



The control system includes an exercisor clock for use in automatically operating the generator set for maintenance purposes. The clock can be set for any combinations of dates and times.

Analog AC Metering



AC metering functions can be displayed in needle-type metering form rather than bar graph form if desired.

Internal Components

System PLC

Paralleling control functions (synchronizing, load sharing, etc.) are provided by the PowerCommand Generator set paralleling controls. System control logic such as utility main breaker operation and system data display is performed by a programmable logic controller (PLC). The PLC is a DIN-rail mounted device to allow easy servicing of components. Other features of the PLC include:

- On-Line Changes.** The PLC may be interconnected to a personal computer and control sequences may be modified without shutting down the system.

- **Program Storage.** The PLC program is stored in non-volatile Flash memory, with additional battery backup of the PLC RAM for storing system configuration settings.
- **LED Status Indicators.** The PLC and Input/Output (I/O) blocks include LED status indicators for use in viewing system status and diagnosis of failures.
- **I/O Block Surge Suppressors.** Inputs and outputs to the PLC are connected via integral surge suppressors to provide protection against over voltage damage to the system and provide greater reliability.

A PLC failure will not prevent operation of the generator set during a power failure.

Protective Functions

Generator Set protective functions in the PLTE are provided by the PowerCommand generator set controls. These functions include over and under voltage, under frequency, over load, and phase sequence protection. The use of InPower software allows fast, consistent settings for all system protective functions; and they can also be adjusted through the system operator panels.

On a warning condition the control system indicates a fault by displaying the fault name and code on the genset operator interface, and a warning or shutdown message on the touchscreen. The nature of the fault and time of occurrence is logged in the genset control (based on engine operating hours) and in the PLTE control based on a system real time clock. The service manual and InPower service tool provide service keys and procedures based on the service codes provided.

Utility (Mains) Protective Relaying

Utility grade drawout protective relaying is available for protection of the utility/mains service when the generator set is paralleled to the utility. Relay functions are optional based on customer specification, but commonly include:

- Electronic phase sequence/over-under voltage relay (ANSI 27/47/59).
- Electronic high speed over and under frequency relay (ANSI 81 o/u).
- Electronic reverse power relay (ANSI 32).

Other relaying which is required by the local utility service company or by applicable codes and standards is available as an option.

Control Power System

Control power for the system is derived from the generator set 24VDC starting batteries. A station battery and charger back up the generator set control power systems so that the PLTE has multiple redundant control power. The PowerCommand genset control

provides high and low DC voltage monitoring for the control power system.

The PLTE control station battery also includes battery and charger failure testing and indication.

Sequence of Operation (typical)

Loss of Normal Power:

System is given a signal to start by receipt of start signal from the transfer pair control voltage sensing or a remote device. On receipt of this signal, the generator set automatically starts, and accelerates to rated frequency and builds up to rated voltage. The control system verifies that the generator set is at 90% or rated voltage and frequency or more, and the breaker pair operates to open the utility breaker and connect loads to the generator set.

Fail to Crank or Fail to Start

On receipt of a start signal, following a start time delay, issues a command to start the engine. The PowerCommand genset control verifies that the engine is rotating when the start command is issued. If the engine does not rotate when the start command is issued, the unit stops cranking, then tries again. If the engine still does not rotate, the generator set is shut down and a "FAIL TO CRANK" shutdown alarm is issued. If the generator set cranks but fails to start, after the overcrank time delay (in the generator set control) has expired, the unit will be shut down, and an alarm will sound.

Fail to Transfer

The control system continuously monitors the breakers as they are issued signals to operate. If a breaker does not operate properly, the control system provides fallback operation modes to prevent operation of the generator set in parallel with the utility service for sustained periods of time.

Return of Normal Power

When all of the system start signals are removed from the digital power transfer control, the system will begin a retransfer process in either an open or closed transition mode, as selected by the operator.

If running in the closed transition mode, the system synchronizes the generator set to the utility, closes the utility breaker, ramps down load on the generator breaker to a minimum value, then opens the generator bus breaker.

If running in the open transition mode, the system transfers back to the utility by opening the generator bus breaker, then closing the utility breaker at an operator-programmed time period later.

When all loads have been transferred back to the utility, the generator set operates at no load for a cooldown period. When the cooldown period has been completed, the generator set shuts down.

If a system start signal is received during the cooldown period, the system immediately retransfers to generator set power, as described in "Loss of Normal Power".

Fail to Synchronize

If the generator set fails to synchronize, after a preset time delay an alarm will sound, but the unit will continue to attempt to synchronize until signaled to stop by manual operation of the control switches on the generator set.

Exercise Modes

The system is configurable to operate the generator set in loaded or unloaded exercise modes. In the loaded exercise operation modes, the system is configurable for open or closed transition transfer operation, or it can be configured to exercise in base load mode (paralleled to the utility at a fixed load level).

Base Load and Peak Shave Modes

The control can be locally or remotely commanded to initiate peak shaving or base load modes. In these

modes the genset control actively synchronizes to the normal utility service, connects, and provides power to the system while operating in parallel to the utility grid. The system is configurable to operating at a fixed set point load level (base load) or to maintain a specific power flow level through the utility main breaker.

Network

The MasterControl includes optional network communications over a Cummins PowerCommand Network. The network utilizes the widely used Echelon™ Lonworks™ technology as a basis. The network is suitable for local or (optional) remote control and monitoring functions.

Warranty

PowerCommand systems are a part of a complete power system provided by Cummins, and are covered by a one-year limited warranty as a standard feature.

Extended warranty options are available for coverage up to 10 years. Contact your Cummins distributor for more information.

See your distributor for more information



Cummins Power Generation
1400 73rd Avenue N.E.
Minneapolis, MN 55432
763.574.5000
Fax: 763.574.5298

Cummins Power Generation is a subsidiary of Cummins Inc.
PowerCommand is a registered trademark of Cummins Inc.
AmpSentry is a trademark of Cummins Inc.
Windows is a registered trademark of Microsoft.
LONWORKS AND LONMARK are registered trademarks of Echelon

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.