

ALTRONIC

CPU-95EVS Enhanced VariSpark® Digital Ignition System for Industrial Engines

*CPU-95EVS System
Designed for Caterpillar EIS®
Ignition-Equipped Engines*



altronic
CPU-95EVS Ignition System

PIN _____ SN _____

WARNING: KEEP COVER TIGHT
ALTRONIC, LLC
REPAIRS MUST BE PERFORMED BY
ALTRONIC, LLC

**WARNING: EXPLOSION HAZARD. DO NOT CONNECT
OR DISCONNECT UNLESS POWER HAS BEEN REMOVED
OR APLA IS KNOWN TO BE NON-HAZARDOUS.**

**WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR
RELIABILITY FOR DLY 2.**

**MUST BE INSTALLED PER FORM CPU-95EVS II
INSTALLATION CONFORMANCE CPU-95EVS II**

CE

ALTRONIC, LLC OHIO, OHIO, U.S.A. U.S. PATENT NO. 5,623,209
HOERBIGER

Features

VariSpark® Spark Profile Control

Users can select from one of six VariSpark spark energy profiles embedded within the system to insure maximized improved engine performance and combustion stability, ignition of lean mixtures for emissions reduction or improved starting and loading characteristics. Profiles can be changed via the keypad, Modbus, or the miscellaneous input switch while the engine is running to suit varying operating needs.

Comprehensive Display Capability

Large, backlit, graphical display indicates the following operating parameters:

- System status and mode
- Selected VariSpark® profile
- Global timing (in degrees BTDC)
- Individual cylinder timing
- Value of timing control signal (4-20mA)
- Relative spark plug voltage indication by cylinder
- Engine speed (in RPM)
- Engine overspeed setpoint
- Diagnostic messages

Ignition Timing Control Modes

Local and remote control of ignition timing (global or individual cylinder) allows engine starting and running performance to be optimized.

- One-step timing change vs. input signal or RPM
- Keypad control via display module
- Terminal program control via serial port
- Analog 4 to 20mA control
- Timing control vs. RPM

Serial Communications to PC or Engine Management System

All system features, display data, and configuration inputs are accessible via an integral RS-485 serial port enabling simultaneous use of both the system display and a supervisory control system utilizing ModBus RTU.

System Configuration

Engine-specific configuration parameters (engine firing pattern, gear teeth, timing control map) are contained in a plug-in memory (EEPROM) which can be moved to a spare unit if necessary. The memory can be configured in the shop or on location using a personal computer connected to the serial port.

Diagnostics, Testing, Shutdown Capabilities

Advanced and patented diagnostics, self-test, and alarm/shutdown capabilities are included with each CPU-95EVS system:

- Primary and secondary discharge faults identified as to cylinder
- Status of system pickups
- Test firing of selected cylinder(s) (optional)
- Overspeed condition
- Alarm and shutdown outputs

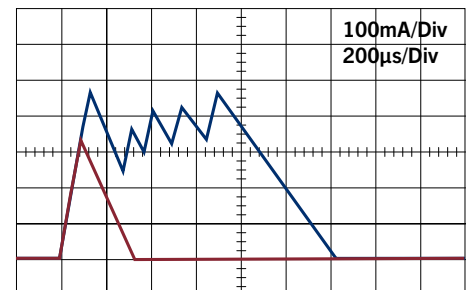
Retrofit Existing Altronic III, III-CPU, CPU-90, and CPU-95 Systems

Retaining many system components makes conversion to the CPU-95EVS simple and cost-effective.

What is VariSpark® and how is it implemented in the CPU-95EVS system?

VariSpark represents a wholesale departure from traditional CD ignition systems—a system that discharges a storage capacitor through the ignition coil during firing. VariSpark technology utilizes a specialized power supply and high speed switching technology to positively control the delivered spark energy. This provides the capacity to independently control spark intensity and duration—in many cases delivering energy orders of magnitude higher than any other ignition technology. The impact on engine operation: assured combustion of leaner mixtures, the ability to operate at higher efficiencies, and extended service intervals.

Accessing one of the six VariSpark spark profiles embedded within the CPU-95EVS can be accomplished from the system keypad, via Modbus, and/or through the use of the Miscellaneous Input Switch. This allows for the use of the single and double-strike configurations that are part of the standard CPU-95 system for lower demand operating conditions, and for the use of more current intensive, longer-duration profiles when proper combustion is more difficult—lean operation, light load, etc.



E1 SS (RED): Emulates SS mode of standard CPU-95.
E3 SS (BLUE): 5x the energy of single spark.

Overview

- Incorporates Altronic-patented VariSpark spark current control technology to assure combustion in lean operating environments, on engines with poorly mixed air/fuel charges, under light load, and on low-btu fuel applications
- A simple, cost-effective system upgrade for existing CPU-90/95 systems – All system accessories including the primary harness, coils, secondary leads, pickups, and pickup cables are retained
- Delivers full-time system, primary discharge, and secondary discharge diagnostics (patented)
- Features an advanced, user-friendly Display Module to adjust all critical operating parameters and to access all system and spark diagnostics
- Class I, Div 2, Group C and D certified

The Altronic CPU-95EVS is a micro-processor-based digital ignition system designed for application to medium-range industrial gas engines. Advantages include the patented VariSpark® spark energy control system, a full-featured user display and interface, advanced timing adjustment options, serial communications, and state-of-the-art diagnostics. Full access to all CPU-95EVS operating data and control functionality is available through an advanced, user-friendly Display Module as well as via a PC operating the provided CPU-95EVS Terminal Program. Both options display essential engine and ignition data such as RPM, timing angle, VariSpark® spark profile, and diagnostic messages, along with global and individual cylinder timing adjustments and over-speed setpoint. Extensive spark reference number graphing and trending is included to support analysis of spark voltage

demand by cylinder on both an immediate and long-term basis.

Patented CPU-95EVS diagnostics and prognostics (predictive diagnostics) supervise all ignition system-related functions. The secondary analysis capabilities detect shorted spark plugs and leads, as well as spark plugs that exhibit high voltage demand or are not firing at all. A display of the relative voltage demand of each spark plug is provided, allowing spark plug changes to be predicted and scheduled. Module and pickup operation, timing input, and primary output functions are also monitored for operation within preset limits.

The CPU-95EVS system is shop- or field-configurable. Using the standard Terminal Program and the CPU-95 Display Module, the user has the added flexibility and convenience associated with a USB-based connection to the system for programming. Operation of the Display Module also enables the user to download and retain the ignition operating parameters (firing code, number of monitored gear teeth, 4-20mA or RPM control loop, etc.) from the connected Ignition Module. Should the ignition module ever require replacement, the Display Module can then simply upload the correct ignition operating parameters into the new unit without need for a laptop, the Terminal Program, or the services of an instrumentation technician.

Components

Each CPU-95EVS system is composed of the VariSpark® Ignition Module, a VariSpark® Power Supply Module, two magnetic pick-

ups and cables, a primary wiring harness, and an ignition coil for each spark plug. A system Display Module, typically used (but not required), is also available. A Hall-effect pickup and cable, as well as a magnet turning at camshaft-speed are utilized on 4-cycle applications only.

Operation

The diagram at right illustrates how these components are integrated into an operating system. To insure that the spark is delivered at precisely the right moment for each engine cylinder on each revolution, the CPU-95EVS determines the position of the engine crankshaft through the use of a magnetic pickup sensing starting ring gear teeth or holes drilled into the flywheel allowing precise determination of crankshaft angular position in real time. Matching that to a pre-programmed system memory, the CPU-95EVS system can achieve extremely high ignition timing accuracy. A second, flywheel-based magnetic pickup, is used to generate a once per crankshaft revolution reset pulse. Four-cycle applications also utilize a Hall-effect pickup sensing a magnet turning at camshaft speed to determine the compression cycle of the engine.

The CPU-95EVS Ignition Module is typically mounted on or near the engine. The associated Power Supply Module accepts 24VDC and provides a 185 VDC output. The Ignition Module accepts and processes the input data derived from the engine-based pickups and any control data being brought into the system through the CPU-95EVS Display Module,



Terminal Program, or engine management system. This control information, including timing adjustments and VariSpark spark profile selections influences both the moment at which the spark is delivered and the important characteristics of that spark. A 4-20mA timing control input from a supervisory control system or an instrument monitoring a specific operating parameter (such as fuel manifold pressure or air manifold temperature) is also available as an additional means of optimizing performance.

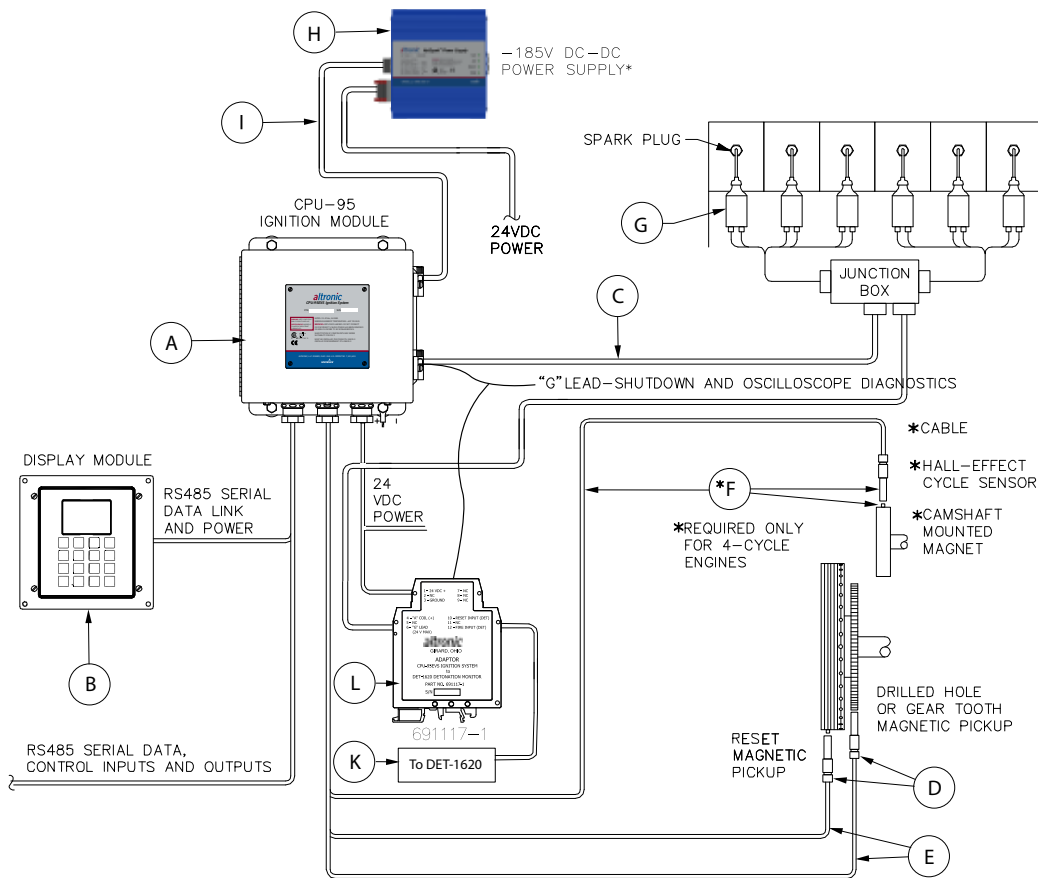
Diagnostics

To assist operators of gas engines in properly locating and diagnosing the source

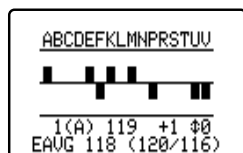
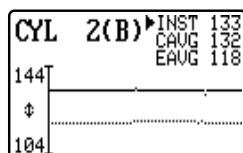
of ignition-related problems, a suite of comprehensive, easy-to-use, troubleshooting diagnostics have been developed and imbedded into the CPU-95 system. The goal of these diagnostics is simple: reduce engine downtime and all of the costs associated with it.

CPU-95 diagnostics are split into two separate groups. System diagnostics are those that relate primarily to the operation of the ignition system itself or to the inputs into the system (pickups, control inputs, etc.). The second group encompasses Altronic's patented primary and secondary discharge diagnostics (U.S. Patent No. 7,401,603).

These powerful, non-intrusive diagnostics are unique in the industry for their reliability and the fact that they do not require a special ignition coil, any add-on probes or clamps, or any other special equipment. Instead, Altronic primary and secondary diagnostics utilize standard ignition coils (typically the same ignition coil that is on the engine during a retrofit) in assessing secondary voltage demand. This valuable capability assists users in determining the proper point at which to change their spark plugs, in troubleshooting problematic primary and secondary connections, and in detecting combustion anomalies in the cylinder (such as air/fuel ratio or imbalance conditions).



CPU-95EVS System Display Module



User can monitor spark reference numbers individually and simultaneously.

For users integrating their CPU-95EVS system into an existing or planned supervisory control or remote monitoring system, Altronic offers its Display Module (791909-1).

In addition to incorporating a Modbus RTU-enabled serial port for communication with a remote monitoring system or local controller, the CPU-95EVS Display Module also supports USB connectivity to a PC and the associated CPU-95 Terminal Program. An innovative ignition memory “cloning” system allows this advanced Module to upload the ignition system configuration file (number of cylinders, firing pattern, number of monitored gear teeth, 4-20mA or RPM curve, etc.) from a connected Ignition Module, retain it indefinitely in its own memory, and—without need of a laptop—to download that memory information to a new Ignition Mo-

odule in the event that the existing module is damaged or requires replacement.

The larger system display allows for the simultaneous display of large amounts of information, and the ability to “map” the CPU-95EVS Ignition Outputs to the appropriate cylinder designation. Thus, the user retains indication of the appropriate CPU-95EVS output (A, B, C, etc.) while also getting diagnostic indications in terms of the on-engine cylinder reference (5L, 3R, #6, etc.). Advanced spark reference number graphing is also made possible by the incorporation of the larger display (see sample displays above).

“Live” and data log-based XY graphing of the monitored Spark Reference Number for a given cylinder and “at-a-glance” indication of the relative value of the Spark Reference Number across all cylinders gives the user unparalleled access and convenience in ignition system trouble-

shooting and monitoring.

Display Module capabilities also include an on-board data logging function which retains up to one-hundred (100) date and time-stamped records of the Spark Reference Number for each output which have been recorded at user-adjustable intervals. These records are stored in a rolling “first in-first out” fashion and are accessible for download via the Display Module for offline trending and analysis.

- Larger display for greater single-screen access to operating, diagnostic, and setup data
- Features an integral graphing and data-logging capability for convenient spark reference number analysis
- Allows for display mapping of individual outputs (Output A = Cylinder 1L, Output B = Cylinder 1 R, etc.)
- Incorporates a unique upload-download capability to assist users in configuring a new or replacement CPU-95 Ignition Module without need of a laptop
- On-board USB connectivity and a Modbus RTU-capable serial port are included for simple connection to a PC for continuous monitoring and/or automation system integration
- Password protection of key operating characteristics including overspeed setpoint, spark configuration, and diagnostic thresholds

Specifications

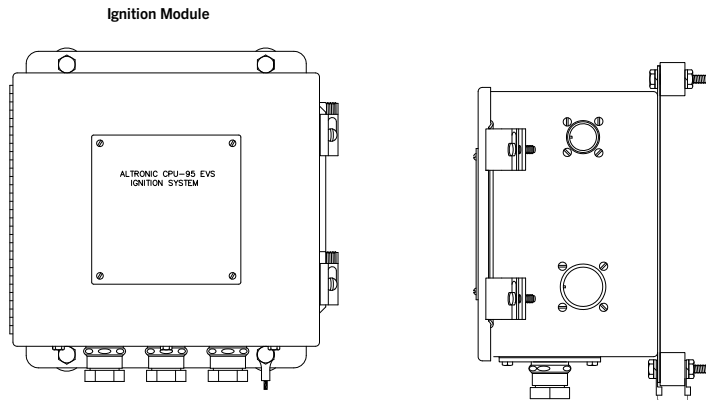
- Input Signals:** Magnetic pickups, (1) ring gear teeth or drilled holes
(1) reset (1/engine revolution)
Hall-effect for compression stroke reference (4-cycle only)
- Control Inputs:** Shutdown input, "G-Lead"
- Timing Control Inputs:** Manual (display module keypad)
Analog (4-20mA control signal)
Digital (RS-485 serial data)
- Output:** 47kV maximum output voltage
- Control Outputs:** Normal fire confirm
Solid State, NC switches Alarm fault
Shutdown fault
- Communications:** RS-485 serial, USB, Modbus RTU (Enhanced Display Only)
- Display:** Alphanumeric, backlit
- Power Rqmt:** 24VDC, 1–20 amps typ. (varies by application)
NOTE: On many applications, power can be supplied by engine-driven Altronic 24Vdc alternator; see form ALT.
- Temperature:** -40°F to +158°F (-40°C to +70°C)

Ordering Information

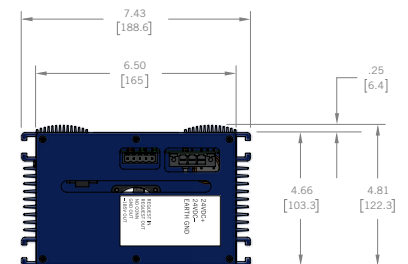
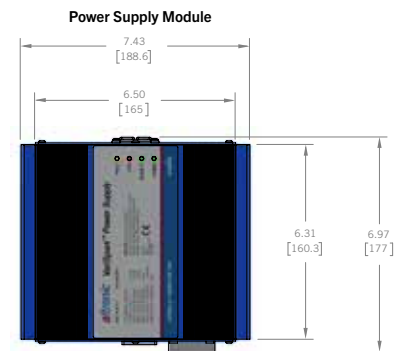
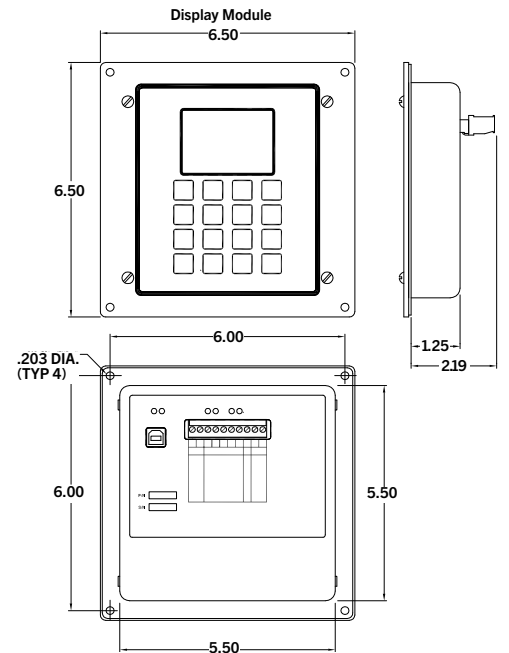
CPU-95EVS VariSpark® Ignition System

- 791963-16A* CPU-95 EVS Ignition Module, Standard
- 791963-8E* CPU-95 EVS Ignition Module, EIS® Replacement (8-Output)
- 791963-16E* CPU-95 EVS Ignition Module, EIS® Replacement (16-Output)
- 791911-1 Power Supply Module, Varispark
- 791909-1 CPU-95 Display Module

*Note: All models available in stainless steel (-SS)



Dimensions



ALTRONIC

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