1.0 SYSTEM DESCRIPTION

1.1 The Altronic CPU-95, DC-powered ignition system is a microprocessor-based capacitor discharge system designed for application on natural gas fueled engines. The system features crankshaft-triggered timing accuracy and the capability to vary timing electronically by several means, including an external 4-20 mA control signal connected to the optional Display Module. The system is field-programmable and offers a variety of advanced control methods, emissions reduction, primary and spark diagnostics, self diagnostics, serial communications and engine protection features. The system consists of two main parts: an engine mounted Ignition Module and an optional user interface Display Module.

1.2 Various models of the Ignition Module are available:
- 791950-8 8-outputs, standard
- 791950-16 16-outputs, standard
- 791950-18 18-outputs, standard
- 791952-18 18-outputs, dual capacitor
- 791958-16 16-outputs, Varispark™ extended duration

1.3 The optional Display Module has a graphical, back-lit LCD display that shows the operating status, engine RPM, energy level, single or double-striking mode, current loop input value and ignition timing. Additional display screens show set-up and diagnostic information.

1.4 To allow for a simple and economical upgrade of existing Altronic CPU-90 installations, the CPU-95 utilizes the same ignition box mounting layout, existing Altronic coils, magnetic pickups, Hall-effect pickup and trigger magnet, pickup cables, primary wiring harness and junction box(es).

1.5 Power requirement is 24 Vdc, 5 amperes nominal for typical applications. For Ignition Module 791958-16, use a supply rated for 24 Vdc, 10 amperes. SEE SECTION 9.2 FOR DETAILS.
2.0 SYSTEM COMPONENTS

2.1 The system consists of an Ignition Module, a Display Module, wiring harnesses, (2) magnetic pickups and cables, a Hall-effect pickup and trigger magnet (4-cycle engines only), and an ignition coil for each spark plug; SEE FIGURE 4 for a complete system overview.

2.2 Use one of the following Altronic ignition coils:
   - Unshielded coils 501061 or 591010*
   - Shielded coils 501061-S or 591010-S*
   - Flange coils 591018 or 591012*
   - Integral coils 591007, 591011A or 591011B

   Refer to the Application List (form CPU-95 AL) for requirement details and SEE FIGURE 6 (unshielded) and FIGURE 7 (shielded).

3.0 MOUNTING THE CPU-95 IGNITION MODULE

3.1 SEE FIGURE 17 for physical dimension details. Select a mounting location meeting the following requirements:
   - On the engine.
   - Within 50 ft. of the Display Module.
   - Within 7 ft. of the primary junction box.
   - The front door of the Ignition Module should be easily accessible and free to swing open.
   - The maximum ambient temperature must not exceed 150°F (65°C).

3.2 The Ignition Module enclosure should be fastened securely to a rigid engine bracket using the shock mounts provided.

3.3 When replacing an existing Altronic CPU-90 system, the CPU-95 Ignition Module can be mounted in place of the CPU-90 unit; the mounting footprint is identical to facilitate the changeover.

4.0 MOUNTING THE CPU-95 DISPLAY MODULE

4.1 Mount the CPU-95 Display Module inside a control panel or to a suitable flat surface preferably off the engine in such a manner as to minimize exposure to vibration. The Display Module should be mounted so that the display is at a convenient viewing height. SEE FIGURE 18 for mounting dimensions. A NEMA 3R housing (720004-1) is also available as an alternative mounting option for the Display Module (FIGURE 19).

4.2 The Display Module should be mounted within 50 feet (15 m) of the Ignition Module which is to be mounted on the engine.
4.3 Operating temperature range is −40°F to 158°F (−40°C to 70°C). Humidity specification is 0-95%, non-condensing. Housed in an aluminum weatherproof enclosure, the CPU-95 Display Module is splash resistant; however, the mounting site should provide as much protection from inclement weather as is practical. Avoid mounting the LCD display and keypad in direct sunlight.

5.0 MOUNTING FLYWHEEL GEAR/DRILLING FLYWHEEL HOLES

5.1 The Altronic CPU-95 system requires a source of angular position pulses from the engine crankshaft. This can be a flywheel ring gear, a separately provided gear mounted on the crankshaft or specially drilled holes in the flywheel. The source of position pulses must meet the following requirements:

- Must be ferrous material
- Diameter of 18" or greater
- No. of teeth or holes of 180 or greater
- Maximum run-out referenced to the pickup of .007"

REFER TO FIGURE 2 and FIGURE 3 for further details.

6.0 MOUNTING THE MAGNETIC PICKUPS

6.1 The system requires two magnetic pickup signals; the angular position pulses from the gear or drilled holes and a reset pulse six (6) degrees ahead of the most advanced firing position desired for no. 1 cylinder (SEE SECTION 7.0). The pickups must be mounted to rigid brackets to maintain an air gap of .015" ± .005" with respect to the rotating gear or flywheel. It is also important for maximum signal efficiency that the centerline of the rotating part pass through the center of the pickup - SEE FIGURE 2 for mounting details and FIGURE 16 for magnetic pickup dimensions.

7.0 MOUNTING THE FLYWHEEL RESET PIN

7.1 Set the engine with no. 1 cylinder six (6) degrees ahead of the most advanced firing point. Mark a point on the flywheel directly opposite the pole piece of the reset magnetic pickup; then rotate the engine to a position convenient for drilling and tapping the flywheel at the point marked above. The reset pin should be made from a steel (magnetic) ¼"-20 bolt or stud. SEE FIGURE 2 for details.

7.2 Rotate the engine so that the reset pin and magnetic pickup are in-line and adjust the air gap between the end of the reset pin and the magnetic pickup at .010" using a feeler gauge.
8.0 MOUNTING THE CYCLE TRIGGER
(4-CYCLE ENGINE ONLY)

8.1 The trigger magnet (260604 or 720002) must be mounted on the engine camshaft or other accessory drive operating at camshaft speed. An M8 (8 mm) tapped hole, 0.5 inches (13 mm) deep is required — SEE FIGURE 17 or FIGURE 14 for details. For proper operation the magnet MUST rotate on a diameter NOT EXCEEDING: 6 inches (150 mm) for magnet 720002, or 15 inches (375 mm) for magnet 260604.

8.2 Set the engine on the COMPRESSION stroke of no. 1 cylinder with the reset pin LINED-UP with the reset pickup. The Hall-effect pickup (591014-x) must be mounted LINED-UP with the trigger magnet (SEE SECTION 8.1) coincident with the reset pickup and pin being lined-up; SEE FIGURE 4.

The Hall-effect pickup dimensions are shown on FIGURE 15. The air gap between the Hall-effect pickup and trigger magnet must not exceed .040" (1.0mm).

9.0 IGNITION MODULE ELECTRICAL HOOKUP
(REFER TO FIGURE 10)

9.1 GENERAL: The power connections to the CPU-95 must be in accordance with the National Electrical Code. The CPU-95 is suitable for installation in Class I, Division 2, Group D locations.

9.2 POWER SOURCE: REFER TO FIGURE 5, power may be supplied as follows:
   A. 24-volt battery and charger with 5 amps minimum output (10 amps when using Ignition Module 791958-16).
   B. DC power supply capable of furnishing 24-28 Vdc, 5 amps (10 amps when using Ignition Module 791958-16).

WARNING: Although the device has internal protective fuses, two external 10 amp fuses near the power source are recommended for the protection of engine and building wiring. This will reduce the possibility of a fire occurring in the event of a short circuit in the wiring. See Drawing 709 961.

NOTE: The Hall-effect signal and the reset pickup signal must occur at the same time for the system to function.
**IMPORTANT:** For proper operation of the **CPU-95** system, voltage and current supplied must be sufficient during all selected modes of operation. **FIGURE 5** provides these details regarding the DC power hookup:

1. **CURRENT DRAW PER SYSTEM:**
   Formula varies depending on number of outputs used, engine cycle and RPM, and use of the multi-strike feature.

2. **MINIMUM WIRE GAUGE REQUIREMENTS:**
   **CHART 1 OF FIGURE 5** gives the requirement vs. the length of run between the power source and the **CPU-95** Ignition Module.

3. **MULTIPLE ENGINE INSTALLATIONS:**
   Multiply current required per system by the number of engines. Where more than one engine is powered from a common power source, see **CHART 2 OF FIGURE 5** for the minimum wire size required.

9.3 **WIRING SEPARATION:**
Power wiring and signal wiring (pickups and communications) must be in separate conduits and conduit entries into the Ignition Module to avoid undesired electrical interaction. All conduit entries are sized for a ½”-14 NPT male conduit fitting. Separate as follows:

<table>
<thead>
<tr>
<th>CONDUIT ENTRY</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT CONDUIT ENTRY</td>
<td>Input power wires</td>
</tr>
<tr>
<td>CENTER CONDUIT ENTRY</td>
<td>Magnetic pickups and Hall-effect pickup</td>
</tr>
<tr>
<td>LEFT CONDUIT ENTRY</td>
<td>Control inputs, alarm outputs, serial communications and power feed to Display Module</td>
</tr>
</tbody>
</table>

9.4 **RIGHT ENTRY:**
Input power supply wires (16 AWG minimum) should enter the right conduit entry and connect to the POWER (24 VDC + and GROUND −) terminals of the terminal block. **SEE FIGURE 10.**

9.5 **CENTER ENTRY:**
Run a separate conduit to the center entry for the two (2) magnetic pickup cable assemblies. These should terminate per description on the cover label in the Ignition Module which is **SEE FIGURE 10.**

4-CYCLE ENGINE ONLY: The cable from the Hall-effect pickup must also enter through the center hole and be connected as shown.
9.6 LEFT ENTRY:

Run a separate conduit to the left entry for all connections to the user interface terminal strips in the Ignition Module. Use 24 AWG, UL style 1015 wire or shielded cable for these connections; the 24 AWG wire is available from Altronic under part number 603102 (black) or 603103 (white).

A. SHUTDOWN INPUT (terminal 1):

This input is open for normal operation of the ignition system and is connected to engine ground for shutdown. Use a normally-open dry contact that closes to engine ground to inhibit ignition firings for engine shutdown.

B. MISCELLANEOUS INPUT (terminal 2):

The miscellaneous input is a normally open input that when grounded provides the ability to activate various user selected features. The default feature is the one-step retard. The other available features are the multi-strike and max. energy level; any number of the three features can be used, but must first be configured through a PC (personal computer) using the terminal program. For programming and operating details, refer to the CPU-95 Operating Instructions form CPU-95 OI and Terminal Program user instructions form CPU-95 PI.

C. ALARM OUT (terminal 3), FAULT OUT (terminal 4), FIRE CONFIRM OUT (terminal 5):

Three output switches are available for monitoring ignition system status. Each output consists of a solid state normally-closed switch that is referenced to one common return path, COMMON OUT (terminal 6) which is isolated from engine or power ground. A fault condition will cause each normally-closed output switch to turn off. The maximum rating of the switches is 100 Vdc, 75 mA. The recommended hookup is shown on drawing 709 966. For further description, refer to the CPU-95 Operating Instructions form CPU-95 OI.

D. RS-485 SERIAL PORT:

The RS-485 serial port is used for connection to either the optional Display Module or to a PC. If a permanent connection is made to the RS-485 serial port, use a two conductor shielded cable of fine gauge stranded wire and connect the wires to the terminals marked SERIAL RS485+, SERIAL RS485– and shield.
10.0 DISPLAY MODULE ELECTRICAL HOOKUP  

SEE FIGURE 11

10.1 GENERAL:

Take care not to damage the wiring insulation and take precautions against damage from vibration, abrasion or liquids in conduits. In addition, **DO NOT** run low voltage power, current loop, or communications wires in the same conduit as the ignition wiring or other high energy wiring such as AC line power, etc. Keep wires at least **12 inches** away from all high voltage wiring.

10.2 POWER:

Power input must come from the Power Module to the Display Module and connect to **terminals 1 (+) and 2 (−)**, **SEE FIGURE 11.** **DO NOT** ground this device directly to the ignition system common coil ground.

**IMPORTANT:** To insure that both Power and Display Modules operate at the same ground potential, it is imperative to use the “daisy chain” hookup shown on **FIGURE 11.** Due to the much higher current requirement of the Power Module, this hookup eliminates the possibility of the Display Module operating at a higher voltage level. Altronic **4-conductor** shielded cable, part no. 503194-500, is recommended as shown on **FIGURE 11.**

10.3 COMMUNICATIONS:

The Display Module communicates to the Ignition Module via the two serial **RS-485** communication wires. Use a shielded cable of fine gauge stranded wire for connection from the Display Module, **terminals 3 (+) and 4 (−)**, to the Ignition Module, **terminals 7 (+) and 8 (−)**. Connect (+) to (+) and (−) to (−). Connect the shield to the terminal marked **SHIELD** in the Ignition Module only. In addition, the 791908-1 (Dual Port Display Module) and the 791909-1 (Enhanced Display Module) have an auxiliary Modbus RTU **RS-485** port for the customers use at terminals **6(+) and 7(−).**

**IMPORTANT:** Per **FIGURE 11,** use Altronic **4-conductor** shielded cable, part no. 503194-500, to connect the power and **RS-485** communications wires between the Power and Display Modules.

10.4 MISCELLANEOUS INPUT:

The miscellaneous input in the Display Module (terminal **8**) performs the same operations as in the Ignition Module. It is a normally open input that when grounded provides the ability to activate various user selected features. The default feature is the one-step retard. The other available features are the multi-strike and max. energy level; any of these features can be used, but must first be configured through a PC using the terminal program. For programming and operating details, refer to the **CPU-95** Operating Instructions, form **CPU-95 OI,** and Terminal Program User Instructions, form **CPU-95 PI.**

10.5 CURRENT LOOP INPUT:

The **4-20mA** timing control input, terminals **9 (+) and 10 (−)** accepts a **4-20 mA** loop current from various **2-wire or 3-wire** sources. The loop input is electrically isolated from all other terminals. Use **24 AWG, UL style 1015 wire,** Altronic part number 603102 (black) or 603103 (white), or equivalent for these connections. **SEE FIGURE 11** for connection details and timing curve **FIGURE 12.**
11.0 PRIMARY WIRING

11.1 The main wiring harness (293023-x, 293026-x, 793012-x, 793015-x or 793022-x) connects the Ignition Module to the engine junction box. Refer to FIGURE 1 if it is desired to shorten the conduit length of the harness. Insert the connector into the Altronic CPU-95 Ignition Module receptacle and tighten hand-tight; then carefully tighten an additional one-sixth turn with a wrench.

Referring to applicable FIGURE 8 or FIGURE 9, write in the engine firing order below:

IGNITION MODULE 791950-8 (8 OUTPUT) SEE FIGURE 8

<table>
<thead>
<tr>
<th>Lead</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>K</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyl. No.</td>
<td></td>
<td></td>
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</table>

IGNITION MODULE 791950-16 AND 791958-16 (16 OUTPUT) SEE FIGURE 8

<table>
<thead>
<tr>
<th>Lead</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>R</th>
<th>S</th>
<th>T</th>
<th>U</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyl. No.</td>
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</tr>
</tbody>
</table>

IGNITION MODULE 791950-18 AND 791952-18 (18 OUTPUT) SEE FIGURE 9

<table>
<thead>
<tr>
<th>Lead</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
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<th>S</th>
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<th>U</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyl. No.</td>
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</tbody>
</table>

11.2 Connect the harness leads in the junction box in accordance with the engine’s firing order. The leads from the junction box corresponding to the above system outputs connect to the ignition coil positive (+) terminals. The “J” lead and the common coil ground lead(s) connecting the negative (−) terminals of the ignition coils must be grounded to the engine in the junction box. Make each ground connection in the junction box to a separate bolt so that the ground connections are not stacked on top of each other. On V-engines, run a separate common ground lead for each bank. SEE FIGURE 6 (unshielded) or FIGURE 7 (shielded) for coil connection details.

11.3 Primary wire should be no. 16 AWG stranded, tinned copper wire. The insulation should have a minimum thickness of .016” and be rated 105°C or higher. Irradiated PVC or polyolefin insulations are recommended. Altronic primary wire number 503188 meets these specifications. All primary wiring should be protected from physical damage and vibration.

11.4 If two ignition coils per cylinder connected to a common output are used, use PARALLEL WIRING as shown on FIGURE 6 and FIGURE 7.

11.5 All unused primary wires should be individually taped so that they are insulated from ground and each other. The unused primary wires can then be tie-wrapped together for a clean installation.

NOTE: Some secondary diagnostic features are limited with two ignition coils wired in parallel.
12.0 SHUTDOWN WIRING

12.1 Two means are provided to shut off the DC-powered CPU-95 Ignition system.
   - a low voltage SHUTDOWN INPUT (terminal 1) in the Ignition Module
   - the output “G” lead (shutdown lead) in model 791950-16 only

12.2 To initiate an ignition shutdown using the low voltage shutdown input, ground terminal 1 (SHUTDOWN IN) in the Ignition Module. This input is open for normal operation and is connected to engine ground for shutdown. Use a switch rated 24 Vdc, 0.5 amps minimum.

12.3 In the 791950-16 model, a “G” lead is provided to stop the ignition and to power existing ignition powered instruments. This lead is open for normal operation and is connected to engine ground for shutdown. This lead can also be used for oscilloscope analysis.

**WARNING:** PLEASE NOTE THE FOLLOWING APPLICATION LIMITATIONS BETWEEN THE CPU-95 IGNITION SYSTEM AND THESE ALTRONIC INSTRUMENTS:

DO-3300
DTO-1010
DT/DTH/DTO/DTH-1200
DT/DTH/DTO-3200
DTUO-4200

The above Altronic ignition-powered tachometers and overspeed devices will NOT function correctly with any CPU-95 system operating in the Double-Strike mode.

**NOTE:** Tachometer and overspeed functions are provided by the CPU-95 Display Module; see sections 4.0 and 9.4 of operating instructions form CPU-95 OI. If a separate device is needed, Altronic models DSG-1201DU/DUP or DTO-1201P will function with all CPU-95 systems.
13.0 SECONDARY WIRING

13.1 Mount the ignition coils as close as possible to the engine spark plugs consistent with a secure mounting and avoidance of temperatures in excess of 185°F (85°C).

13.2 The spark plug leads should be fabricated from silicone insulated 7 mm cable with suitable terminals and silicone spark plug boots. The use of leads with resistor spark plug boots (Altronic series 5932xx-xx) is recommended to minimize interference from emitted RFI on the operation of other nearby electronic equipment. Another option is the use of suppression ignition cable (Altronic part no. 503185). It is also essential to keep spark plug leads as short as possible and in all cases not longer than 24 inches (600 mm). Spark plug leads should be kept at least 2 inches (50 mm) away from any grounded engine part. In deep spark plug wells, use rigid insulated extenders projecting out of the well.

13.3 The use of a clear silicone grease such as Dow Corning DC-4, G.E. G-623 or GC Electronics Z5, is recommended for all high-tension connections and boots. This material helps seal out moisture and prevent corrosion from atmospheric sources.
DRAWINGS SECTION:

INSTALLATION DRAWINGS:

FIG. 1  SHIELDED HARNESS CONDUIT LENGTH ADJUSTMENT
FIG. 2  PICKUP MOUNTING DETAIL
FIG. 3  FLYWHEEL HOLE DRILLING
FIG. 4  IGNITION SYSTEM BASIC LAYOUT
FIG. 5  DC POWER HOOKUP
FIG. 6  COIL WIRING DIAGRAM, UNSHIELDED IGNITION SYSTEM
FIG. 7  COIL WIRING DIAGRAM, SHIELDED IGNITION SYSTEM
FIG. 8  HOOKUP DIAGRAM, IGNITION MODULE 791950-8 / 791950-16
FIG. 9  HOOKUP DIAGRAM, IGNITION MODULE 791950-18 / 791952-18
FIG. 10 WIRING DIAGRAM, IGNITION MODULE
FIG. 11 WIRING DIAGRAM, DISPLAY MODULE
FIG. 12 TIMING CURVE, 4-20 MA

DIMENSIONAL DRAWINGS:

FIG. 13 MAGNET ASSEMBLY SALES DRAWING
FIG. 14 MAGNET ASSEMBLY SALES DRAWING
FIG. 15 HALL-EFFECT PICKUP SALES DRAWING
FIG. 16 MAGNETIC PICKUP SALES DRAWING
FIG. 17 IGNITION MODULE MOUNTING DIMENSIONS
FIG. 18 DISPLAY MODULE MOUNTING DIMENSIONS
FIG. 19 NEMA 3R ENCLOSURE MOUNTING DIMENSIONS
TO SHORTEN HARNESS

1. LOOSEN AND DISENGAGE NUT (2) AND REMOVE CONDUT (1) COMPLETELY FROM CONNECTOR AND HARNESS ASSEMBLY (3).

2. REMOVE ITEMS (5), (4), AND (2) IN THAT ORDER FROM CONDUT (1). NOTE THREADS ON (5).

3. CUT CONDUT TO LENGTH WITH HACKSAW AND DRESS WITH FILE TO INSURE A CLEAN, SQUARE END. REMOVE PLUNGS FROM INSIDE CONDUT.

4. REINSTALL ITEMS (2), (4), AND (5) IN THAT ORDER.

5. INSTALL REASSEMBLED CONDUT INTO (3) AND TIGHTEN (2).
FIG. 2 PICKUP MOUNTING DETAIL

RESET PIN FABRICATION DETAILS

NOTE:

- FLYWHEEL GUARD NOT SHOWN FOR CLARITY.

- FABRICATE RESET PIN USING 1/4-20 X 3/4 INCH LONG FERROUS HEX BOLT TO DIMENSIONS SHOWN.

- PATH OF ROTATION IS PERPENDICULAR TO FLAT OF STUD.

- FABRICATED RESET PIN SHOWN WITH 1/4-20 JAMNUT.

NOTE:

- VISUAL PROPORTION OF THIS ILLUSTRATION WILL CHANGE WITH VARIATIONS IN GEAR AND FLYWHEEL SIZE AND RELATIONSHIP.

ENGINE BLOCK

TOOTH/HOLE PICKUP

RESET PICKUP

AIR GAP .015" OPTIMUM

RESET PROJECTION WITH NUT

BAR HOLES

1.0" MIN.

MOUNTING BRACKET .250" STEEL OR EQUIV.

TAP 5/8"-18 FOR PICKUPS.

DRILLED HOLES IN FLYWHEEL OR RING GEAR

FLYWHEEL
FLYWHEEL LAYOUT

MARK "A" AND MEASURE CIRCUMFERENCE A = A

MEASURE 1/2A = A
AND MARK "B"
NOTE: A - B = B - A

MEASURE 1/2A = B
AND MARK "C"
MEASURE AND MARK "D" IN THE SAME MANNER

MEASURE 1/2A = C
AND MARK "E"
MEASURE AND MARK "F", "G", AND "H" IN THE SAME MANNER
NOTE: CONFIRM INTERVALS BETWEEN MARKS ARE NOW EQUAL.

MEASURE THE LENGTH A - E, DIVIDE BY 45, AND BEGINNING WITH "A" MARK OFF INTERVALS OF THIS LENGTH TO "E". COUNTING "A" AND "E" THERE SHOULD BE 45 MARKS.

DO THE REMAINING 7 SECTIONS IN THE SAME MANNER.

PROCEDURE FOR DRILLING
360 HOLES IN ENGINE FLYWHEEL

DRILLING DETAIL

NOTE: IF 2/3 "N" WORKS OUT TO BE BETWEEN STANDARD DRILL SIZES - USE NEXT SIZE LARGER.
FIG. 4 IGNITION SYSTEM BASIC LAYOUT

KEYPAD: ADJUSTABLE TIMING, GLOBAL OR INDIVIDUAL
KEYPAD: ADJUSTABLE ENERGY, GLOBAL
KEYPAD: SELECTED SINGLE OR MULTI-STAGE Firing
KEYPAD: ADJUSTABLE OVERSPEED SETTING
KEYPAD: SELECTED TEST MODE, GLOBAL OR INDIVIDUAL
DISPLAYS: OPERATING MODE, RPM, TIMING, STATUS
DISPLAYS: DIAGNOSTIC FAULT MESSAGES
24 VAC NOMINAL INPUT POWER
DIGITAL INPUT (N/C)
4–20 mA INPUT FOR TUNING CONTROL
DIGITAL OUTPUT, ALARM OR OVERTURE VIA RS485
MODBUS RTU VIA RS485 (791908-1, 791909-1)
USB (791909-1)

NOTE: POWER GROUNDS FOR THE IGNITION MODULE AND THE DISPLAY MODULE MUST BE AT THE SAME GROUND POTENTIAL FOR PROPER OPERATION OF THE RS485 COMMUNICATIONS.

RS485 SERIAL COMMUNICATIONS FROM P.C.
LOW VOLTAGE SHUTDOWN INPUT
MISCELLANEOUS INPUT
ALARM OUTPUT SWITCH
FAULT OUTPUT SWITCH
Diese ICON OUTPUT SWITCH

NOTE: RS485 SERIAL COMMUNICATIONS AND MISCELLANEOUS INPUT TO EITHER DISPLAY MODULE OR P.C., NOT BOTH AT SAME TIME.
**FIG. 5 DC POWER HOOKUP**

**D.C. POWER SOURCE**

1. IT IS RECOMMENDED THAT EACH SYSTEM BE CONNECTED SEPARATELY BACK TO THE POWER SOURCE. USE CHART 1 TO DETERMINE THE WIRE SIZE (GAUGE) REQUIRED.

<table>
<thead>
<tr>
<th>AVERAGE CURRENT DRAW</th>
<th>4-CYCLE</th>
<th>2-CYCLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE-STRIKE MODE</td>
<td>N x RPM</td>
<td>N x RPM</td>
</tr>
<tr>
<td>DOUBLE-STRIKE MODE</td>
<td>N x RPM</td>
<td>N x RPM</td>
</tr>
<tr>
<td>VENTS/SPARK MODE</td>
<td>N x 0.35 MAX</td>
<td>N x 0.35 MAX</td>
</tr>
</tbody>
</table>

NOTE: TO MULTIPLY BY NUMBER OF ENGINES FOR TOTAL REQUIREMENT.

**DISTANCE IN FEET**

<table>
<thead>
<tr>
<th>CHART 1</th>
<th>MINIMUM WIRE GAUGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP TO 25</td>
<td>16 AWG</td>
</tr>
<tr>
<td>26-40</td>
<td>14 AWG</td>
</tr>
<tr>
<td>41-65</td>
<td>12 AWG</td>
</tr>
<tr>
<td>66-100</td>
<td>10 AWG</td>
</tr>
<tr>
<td>101-150</td>
<td>8 AWG</td>
</tr>
<tr>
<td>151-250</td>
<td>6 AWG</td>
</tr>
<tr>
<td>251-400</td>
<td>4 AWG</td>
</tr>
</tbody>
</table>

**CHART 2**

<table>
<thead>
<tr>
<th>NO. OF SYSTEMS X DISTANCE IN FEET</th>
<th>MINIMUM WIRE GAUGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>26-40</td>
<td>14 AWG</td>
</tr>
<tr>
<td>41-65</td>
<td>12 AWG</td>
</tr>
<tr>
<td>66-100</td>
<td>10 AWG</td>
</tr>
<tr>
<td>101-150</td>
<td>8 AWG</td>
</tr>
<tr>
<td>151-250</td>
<td>6 AWG</td>
</tr>
<tr>
<td>251-400</td>
<td>4 AWG</td>
</tr>
</tbody>
</table>

NOTE: ABOVE 400, USE MULTIPLE PAIRS OF WIRING FROM THE POWER SOURCE TO THE ENGINE ROOM.

**OPERATING VOLTAGE REQUIREMENTS:**

- **STARTING:** 20 VDC MIN
- **RUNNING:** 24-28 VDC

**POWER SUPPLY SPEC:** 5 AMP CONTINUOUS
FIG. 6  COIL WIRING DIAGRAM, UNSHIELDED IGNITION SYSTEM
INSTALLATION INSTRUCTIONS

FIG. 8 HOOKUP DIAGRAM, IGNITION MODULE 791950-8 / 791950-16

791950-8
791950-16
791958-16
IGNITION MODULE

<table>
<thead>
<tr>
<th>NO. OUTPUTS</th>
<th>MEMORY CODE</th>
<th>IGNITION SYSTEM FIRING ORDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>D2x, D4x</td>
<td>A-B-C-D</td>
</tr>
<tr>
<td>5</td>
<td>E2A, E4A</td>
<td>A-B-C-D-E</td>
</tr>
<tr>
<td>6</td>
<td>F2x, F4x</td>
<td>A-B-C-D-E-F</td>
</tr>
<tr>
<td>7</td>
<td>G2A, G4A</td>
<td>A-B-C-D-E-F-K</td>
</tr>
<tr>
<td>8</td>
<td>H2x, H4x</td>
<td>A-B-C-D-E-F-K-L</td>
</tr>
<tr>
<td>9</td>
<td>I2A, I4A</td>
<td>A-B-C-D-E-F-K-L-M</td>
</tr>
<tr>
<td>10</td>
<td>J2x, J4x</td>
<td>A-B-C-D-E-F-K-L-M-N</td>
</tr>
<tr>
<td>12</td>
<td>L2x, L4x</td>
<td>A-B-C-D-E-F-K-L-M-N-P-R</td>
</tr>
<tr>
<td>14</td>
<td>N2x, N4x</td>
<td>A-B-C-D-E-F-K-L-M-N-P-R-S-T</td>
</tr>
<tr>
<td>16</td>
<td>P2x, P4x</td>
<td>A-B-C-D-E-F-K-L-M-N-P-R-S-T-U-V</td>
</tr>
</tbody>
</table>
### CPU-95 Digital Ignition System

**Fig. 9** Hookup Diagram, Ignition Module 791950-18 / 791952-18

![Ignition Module Diagram](image)

<table>
<thead>
<tr>
<th>No. Outputs</th>
<th>Memory Code</th>
<th>Ignition System Firing Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>D2x, D4x</td>
<td>A-B-C-D</td>
</tr>
<tr>
<td>5</td>
<td>E2A, E4A</td>
<td>A-B-C-D-E</td>
</tr>
<tr>
<td>6</td>
<td>F2x, F4x</td>
<td>A-B-C-D-E-F</td>
</tr>
<tr>
<td>7</td>
<td>G2A, G4A</td>
<td>A-B-C-D-E-F-G</td>
</tr>
<tr>
<td>8</td>
<td>H2x, H4x</td>
<td>A-B-C-D-E-F-G-H</td>
</tr>
<tr>
<td>9</td>
<td>I2A, I4A</td>
<td>A-B-C-D-E-F-G-H-K</td>
</tr>
<tr>
<td>10</td>
<td>J2x, J4x</td>
<td>A-B-C-D-E-F-G-H-K-L</td>
</tr>
<tr>
<td>12</td>
<td>L2x, L4x</td>
<td>A-B-C-D-E-F-G-H-K-L-M-N</td>
</tr>
<tr>
<td>14</td>
<td>N2x, N4x</td>
<td>A-B-C-D-E-F-G-H-K-L-M-N-P-R</td>
</tr>
<tr>
<td>16</td>
<td>P2x, P4x</td>
<td>A-B-C-D-E-F-G-H-K-L-M-N-P-R-S-T</td>
</tr>
<tr>
<td>18</td>
<td>R2x, R4x</td>
<td>A-B-C-D-E-F-G-H-K-L-M-N-P-R-S-T-U-V</td>
</tr>
</tbody>
</table>
NOTE: ALARM, FAULT, AND FIRE CONFIRM OUTPUTS ARE ISOLATED TERMINALS WHICH ARE NOT CONNECTED TO GROUND OR +24 VOLT SUPPLY. THESE TERMINALS CAN BE REFERENCED TO AN EXTERNAL ISOLATED SUPPLY IF REQUIRED.

NOTE: POWER WIRING AND SIGNAL WIRING MUST BE IN SEPARATE CONDUITS AND CONDUIT ENTRIES TO THE IGNITION MODULE. SEPARATE AS FOLLOWS:
- RIGHT CONDUIT ENTRY = POWER WIRING
- CENTER CONDUIT ENTRY = MAGNETIC PICKUPS AND HALL-EFFECT PICKUP
- LEFT CONDUIT ENTRY = CONTROL INPUTS, SERIAL COMM., AND ALARM OUTPUTS
NOTE:

1. INPUT POWER REQUIREMENT FOR DISPLAY MODULE IS 24 VDC 150 mA NOMINAL.

2. POWER GROUNDS FOR THE DISPLAY MODULE AND THE IGNITION MODULE MUST BE AT THE SAME GROUND POTENTIAL FOR PROPER OPERATION OF THE RS-485 COMMUNICATIONS.

3. USE 4-CONDUCTOR SHIELDED CABLE (RECOMMEND ALTRONIC 503914-500) FOR POWER AND RS-485 CONNECTIONS. CONNECT SHIELD IN IGNITION MODULE.

4. IF TWO CONDUCTOR SHIELDED CABLE IS USED TERMINATE SHIELD AS SHOWN.

5. USB PORT MUST NOT BE CONNECTED UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS, ONLY FOR TEMPORARY CONNECTION. (791909-1)

NOTE:

1. LOOP INPUT IMPEDANCE: 250 OHMS ±1%

2. FIELD WIRING MUST BE 24 AWG WIRE SUITABLE FOR CLASS I, DIV.2, HAZARDOUS LOCATIONS IN SEPARATE CONDUIT AWAY FROM ALL OTHER WIRING.
INSTALLATION INSTRUCTIONS

FIG. 12 TIMING CURVE, 4-20 MA

2-WIRE TRANSMITTER
EXAMPLE: ROSEMONT, FOXBORO

3-WIRE TRANSMITTER
EXAMPLE: ALTRONIC 1200P, 1300P, 1500P, ETC

NOTE:
1. LOOP INPUT IMPEDANCE: 250 OHMS MAX
2. FIELD WIRING MUST BE 24 AWG OR LARGER
3. USE SEPARATE CONDUIT AWAY FROM ALL OTHER WIRING.
FIG. 13  MAGNET ASSEMBLY SALES DRAWING
FIG. 14 MAGNET ASSEMBLY SALES DRAWING

M8-1.25 THREAD

.394 (10)

.315 (8)

.709 (18)

NORTH POLE FACING OUT

3/8 HEX
FIG. 15  HALL-EFFECT PICKUP SALES DRAWING

<table>
<thead>
<tr>
<th>ALTRONIC P/N</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>591014-2</td>
<td>2.50&quot;/63.5mm</td>
<td>4.03&quot;/102.0mm</td>
</tr>
<tr>
<td>591014-4</td>
<td>4.50&quot;/114.3mm</td>
<td>6.03&quot;/153.0mm</td>
</tr>
</tbody>
</table>

NOTE:
1. NORTH POLE OF MAGNET MUST FACE SENSING END WITH AIR GAP OF .030/0.40 (.76/1.02).
2. CENTERLINE OF MAGNET'S ROTATION MUST RUN THROUGH CENTERLINE OF PICKUP.
FIG. 16  MAGNETIC PICKUP SALES DRAWING

*NOTE:

ELECTRICAL VALUES GIVEN ARE ABSOLUTE RATINGS ASSURED 100% BY TEST.
POLARITY PIN # 1 POSITIVE WITH RESPECT TO PIN # 4 WITH THE APPROACH OF A FERROUS TARGET.

<table>
<thead>
<tr>
<th>ELECTRICAL DATA *</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>MAX. COIL INDUCTANCE</td>
<td>420 μH</td>
<td></td>
</tr>
<tr>
<td>MIN. COIL RESISTANCE</td>
<td>800-1000Ω</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ALTRONIC P/N</th>
<th>T</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>69116-1</td>
<td>1.75/44.5mm</td>
<td>3.20/87.3mm</td>
</tr>
<tr>
<td>69116-2</td>
<td>2.50/63.5mm</td>
<td>4.05/102.8mm</td>
</tr>
<tr>
<td>69116-3</td>
<td>3.50/76.2mm</td>
<td>4.95/115.6mm</td>
</tr>
<tr>
<td>69116-4</td>
<td>4.57/114.3mm</td>
<td>6.05/153.7mm</td>
</tr>
<tr>
<td>69116-5</td>
<td>6.25/152.4mm</td>
<td>7.25/191.8mm</td>
</tr>
</tbody>
</table>
FIG. 17  IGNITION MODULE MOUNTING DIMENSIONS

Dimentions in inches and (mm)
FIG. 18 DISPLAY MODULE MOUNTING DIMENSIONS
FIG. 19  NEMA 3R ENCLOSURE MOUNTING DIMENSIONS