# INSTALLATION INSTRUCTIONS

## ALTRONIC CD200 IGNITION SYSTEM

FORM CD200 II 5-07

**WARNING:** DEVIATION FROM THESE INSTRUCTIONS MAY LEAD TO IMPROPER OPERATION OF THE MACHINE WHICH COULD CAUSE PERSONAL INJURY TO OPERATORS OR OTHER NEARBY PERSONNEL.

## 1.0 DESCRIPTION

**1.1** This manual provides installation and operating instructions for the Altronic CD200 ignition system. It is recommended that the user read this manual in its entirety before commencing operations.

**1.2** The Altronic CD200 ignition system consists of these basic components:

- CD200 Unit - 791070-x or 791080-x **(see FIG. 1 and FIG. 2)**
- Magnetic Pickup Sensor (one per system)
- Input Harness (one per system)
- Output Harness (one or two per system)
- Ignition coils (one per cylinder)

**1.3** The system requires a battery or a suitable power supply with a nominal 12 Vdc or 24 Vdc **(see FIG. 3)**. The CD200 unit steps up the DC supply voltage to charge an energy storage capacitor and contains a microprocessor and solid-state switching devices to release the stored energy to the ignition coils in programmed, timed sequence according to the application. Holes (one per cylinder) in a special timing disc signal the position of the engine crankshaft to the electronic circuitry in the CD200 unit. One additional hole trails after the last cylinder hole; this is the index signal that another revolution has started. Ignition timing may be varied by means of a manual switch, an analog timing signal and/or engine RPM.

**1.4** The CD200 system can operate as a single-firing or double-firing (firing on exhaust stroke) system up to twelve (12) cylinders. These instructions detail 4-, 6-, 8-, 10- and 12-cylinder, single-firing applications using CD200 units 791070-6, 791070-8, 791070-12, and 791080-6, 791080-8.

**1.5** As shipped from the factory, the CD200 is in the auto-detect mode and is set up for a trigger disc running at camshaft speed **(see SECTION 9.4)**. The setup is programmable by the use of the PC compatible CD200 terminal program **(FIGS. 14 & 15)** provided on a CD delivered with the unit. The programming of the unit is done via the RS-485 Modbus compatible communications port.

## 2.0 CD200 UNIT

**2.1** Select a location for the CD200 unit that will be at least 24 inches (600 mm) away from the ignition coils and spark plug leads. In addition, the mounting location must be relatively cool, preferably one benefitting from the engine fan stream (if any); the outside case temperature of the CD200 unit should not exceed 185°F. (85°C.) in continuous operation.

*NOTE: If possible, keep the original shipping container. If future transportation or storage of the ignition is necessary, this container will provide the optimum protection.*

**2.2** Secure the CD200 unit to a suitable mounting bracket with four 1/4 inch (6 mm) screws. Refer to **FIG. 1 or FIG. 2** for CD200 unit dimensions.

## 3.0 PICKUP SENSOR – CAMSHAFT DISC

**3.1** A disc with the appropriate hole pattern must be prepared for mounting at CAMSHAFT speed. The disc must be of magnetic material and 4.0" (100 mm) diameter or larger. **FIG. 4** details the hole spacing depending on the number of engine cylinders. Note the direction of rotation of the disc. The angular spacing is extremely important as this establishes the basic timing accuracy of the system.

**3.2** Locate a suitable mounting position for the pickup sensor in order to sense the holes in the rotating disc. Secure the pickup to a rigid bracket or surface. See **FIG. 4** for the dimensions of the 3/4"-16 pickup sensors.

*NOTE: Some MAN engines have a 12 mm thread port; use Altronic pickup 791035-2 or 791041-3.*

**3.3** Set the engine with no. 1 cylinder in the most advanced timing position. Noting the direction of rotation, set the drilled disc opposite the pickup in the position shown in **FIG. 4**.

**3.4** Adjust the tightening nut holding the pickup sensor to maintain an air gap as specified below:

- For magnetic pickups 791015-1 and 791016-2, the gap shall be set to .020" ± .005" (0.50 mm ± 0.12 mm).
- For magnetic pickups 791035-2 and 791041-3 (12 mm thread), the gap shall be set to .014" ± .004" (0.35 mm ± 0.10 mm).

The center of the pickup face must line up with the center of each drilled hole as the disc rotates.

*NOTE: Keep the pickup sensor wires at least 2" (50 mm) away from the coil primary wires and at least 8" (200 mm) away from the spark plug leads.*

**3.5** Plug the 2-pin pickup connector fully into the mating connector of the CD200 wiring harness.

## 4.0 IGNITION COILS

**4.1** USE ONLY THE ALTRONIC COILS INDICATED HERE:

- UNSHIELDED: 501061, 591010, 591040
- FLANGE: 591012, 591018
- SHIELDED: 501061-S, 591010-S
- INTEGRAL: 591007, 591011A, 591011B

**4.2** Mount the ignition coils as close to the spark plugs as possible keeping the high-tension lead length to a minimum but also keeping temperatures below 200°F. (95°C.) during operation.

## 5.0 PRIMARY WIRING

**5.1** The CD200 system requires a battery or other DC power source providing 12-28 Vdc for running and a minimum of 8 volts for engine starting. Refer to **FIG. 3** for details of the connection to the DC power source.

*WIRING DIAGRAMS:*
*FIG. 5 — 4-CYLINDER*
*FIG. 6 — 6-CYLINDER*
*FIG. 7 — 8-CYLINDER*
*FIGS. 8–11 — 12-CYLINDER*

**5.2** Primary wiring hookup is shown in the wiring diagrams – **FIGS. 5 THROUGH 11**.

**WARNING:** THE HOOKUP SHOWN IS FOR THE MOST COMMON ENGINE FIRING ORDER. CONNECT TO THE IGNITION COILS ACCORDING TO THE ACTUAL ENGINE FIRING ORDER.

Use the tables below to record the actual firing order and wiring.

| 791070-6, 791070-8* | A | B | C | D | E | F | H* | K* |
|---|---|---|---|---|---|---|---|---|
| ENGINE CYL. NO. | | | | | | | | |

| 791080-6, 791080-8* | A | B | C | D | E | F | H* | I* |
|---|---|---|---|---|---|---|---|---|
| ENGINE CYL. NO. | | | | | | | | |

| 791070-12 | A1 | A2 | B1 | B2 | C1 | C2 | D1 | D2 | E1 | E2 | F1 | F2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ENGINE CYL. NO. | | | | | | | | | | | | |

The common coil ground lead on -6 and -8 units is the J harness lead. On -12 units, the common coil ground leads are J1 and H2.

*NOTE: With unit 791070-12, follow FIG. 10 if the first engine firing angle is 60 degrees or less (for example, 30°–90°). Use FIG. 11 if the first engine firing angle is greater than 60 degrees (for example, 90°–30°). See section 9.20 for programming the slave firing angle with unit 791070-12.*

**5.3** All connections at unshielded coils should be made using ring-type terminals specified for 16 AWG (1.5 sq. mm) wire and #10 (5 mm) stud size. Terminals should either be soldered to the wire or attached with an appropriate staking tool. Protect primary wiring from physical damage, vibration and temperatures in excess of 200°F. (95°C.).

***NOTE: Keep the primary wiring at least 2" (50 mm) away from the spark plug leads.***

**5.4** For details of the hookup for the analog timing signal, see **FIG. 12**.

**5.5** Be sure the multi-pin harness connectors are fully plugged into the mating receptacles connected to the CD200 unit.

## 6.0 SHUTDOWN WIRING

**6.1** The CD200 system is shut-off by interrupting the DC power to the unit; use a switch or relay with contacts rated 24 VDC, 10 amps - refer to **FIG. 3**.

***NOTE: Do NOT run the input power line through a series of normally closed switches.***

**6.2** The CD200 can also be shutdown by using the G-lead of the output harness. To shutdown the unit, connect the G-lead of the output harness to ground. The CD200 will draw about 0.1 ampere from the power source when shutdown.

***NOTE: The CD200 should not be used to power ignition-powered panel instruments.***

## 7.0 SECONDARY WIRING

**7.1** With unshielded coils, spark plug leads should be fabricated from 7 mm, silicone insulated, ignition cable with suitable terminals and silicone spark plug boot.

***NOTE: The use of resistance spark plug cable or individual 5,000 ohm resistors (mounted either at the spark plug or coil) is recommended.***

**7.2** Keep spark plug leads as short as possible and 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.

**7.3** 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.

## 8.0 OPERATION

***NOTE: On the first start-up after system installation, verify correct ignition timing by cranking the engine with the fuel supply shut off.***

### 8.1 IGNITION DELAY:

On cranking, there will be a delay of two disc revolutions—after the power is ON and the engine begins rotating—before the CD200 unit commences outputs to the ignition coils. This delay is to allow identification of the pick-up index hole to insure proper synchronization with the engine. A greater delay of more revolutions to allow for engine purging can be added to the programming. **See section 9.9.**

***NOTE: DO NOT switch from position 7 to 0, or 0 to 7 while the engine is running. The large timing change may cause the engine to shut-down or be damaged.***

### 8.2 MANUAL TIMING SWITCH:

The CD200 unit has a TIMING switch located under a white plastic cap at the end of the case. Using a timing light, set the timing to the desired position with the engine running at NORMAL OPERATING SPEED. Replace the white cap over the timing switch once the proper timing is set. Switch position 7 gives the most advanced timing. The timing retards approximately one (1) engine degree for each switch position as the switch is moved to position 6, 5, 4, 3, 2, 1, 0. Switch position 0 is full retard. Larger timing changes per switch position can be programmed. **See section 9.14.**

***NOTE: The analog timing retard is added to the retard established by the manual timing switch (see section 8.2 above and FIG.12).***

### 8.3 ANALOG TIMING ADJUSTMENT:

The CD200 unit provides for analog timing adjustment in two ways:

- 0-1,000 ohm potentiometer connected between terminals E and F of the input harness.
- 4-20 mA signal applied to leads F and G of the input harness.

***NOTE: When checked at different speeds, timing will vary in accordance with the programmed RPM curve indicated.***

### 8.4 RPM BASED TIMING CURVE:

The CD200 unit is shipped with an RPM-based timing curve (default programming) providing a 6-degree advance as the engine speed increases from 0 to 600 RPM **(FIG. 12)**. This timing change is in addition to changes made with the manual switch **(section 8.2)** or the analog timing input **(section 8.3)**.

## 9.0 CUSTOMIZING THE CD200 UNIT

### 9.1 TERMINAL PROGRAM SETUP:

The CD200 is designed to be programmed by a Personal Computer via the RS-485 Modbus communications link. See **FIG. 13** for the proper hookup. The CD200 unit case must be securely grounded prior to programming.

The Terminal Program is included on the CD-ROM supplied with each CD200 unit. The first time that the terminal software is used on a PC, the Communications Port settings must be configured in order to establish communications. After loading the Terminal Program from the CD-ROM, click on the Connection icon on the upper tool bar. The Connection Setup window will appear. The port being selected for use with the CD200 should also be set for 9600 baud, no parity, 200 ms time out (8 data bits and 1 stop bit). The PC will now be set to communicate with the CD200. Set the ID# for the CD200 to 01.

***TERMINAL PROGRAM SCREENS:***

***FIG. 14 — 7910X0-6, -8***

***FIG. 15 — 791070-12***

***NOTE: Refer to sections 9.19 and 9.20 for additional programming of unit 791070-12.***

### 9.2 PROGRAMMING CUSTOM VALUES:

A variety of numeric parameters can be entered by the user for customized applications or the unit can be left at the factory default settings. Changes to numeric values are made by placing the cursor in the appropriate box and typing in the new value. When the new numeric value is first typed, it appears in red text on the PC screen. The values appearing in red have not yet been sent to the CD200 unit, but are being stored on the PC until being sent. Hitting the Enter key sends the selection to the CD200. The entered value turns green on the PC display, indicating that the new value has been successfully communicated to the CD200 and stored.

***NOTE: In order to program the values, the CD200 must be powered. Care should be taken in changing entries when the engine is operational to avoid unstable or dangerous operating conditions.***

### 9.3 SELECTING OPTIONAL FEATURES:

Other OFF/ON programming selections are made by activating or deactivating a blue status flag on the PC screen. When the mouse pointer is located over the status flag, a double-left click activates the status flag and makes it appear to be “ON” or glowing on the PC screen, a double-right click deactivates the feature and the status flag.

### 9.4 DISC TYPE SETTING:

This numeric entry configures the Disc Type (number of holes or protrusions) on the timing disc, excluding the index. This number is normally equal to the number of cylinders on the engine for a camshaft mounted disc and ½ the number of cylinders of the engine for a crankshaft mounted disc. This value is used to test for the correct disc and scales the rpm measurement and ignition timing angles to the specific disc chosen. Default setting = (0+1).

Entering a value of Zero (0+1), places the ignition in auto detect mode. In auto detect mode, the ignition will automatically scale rpm measurement and ignition timing angles to the disc pattern observed.

***NOTE: The disc test for a specific number of pulses is not performed in auto detection mode (0 entry for Disc Type Setting – section 9.4).***

**9.5 TEST DISC FLAG:**

When this status flag is ON, the CD200 will test for a match of the incoming signal pattern observed by the CD200 to the Disc Type specified. When enabled, this test is performed after synchronization to the disc pattern and before initiating firings. When the pattern does not match the setting, the ignition will not fire and the diagnostic LED on the unit will signal the error by turning off until rotation stops. Once the ignition is firing, the disc pattern will be monitored continuously and, if an error is detected, the unit will stop firing and the alarm output switch will open. Firings will be inhibited and the output switch will remain off for 5 seconds after input signals cease.

If the shutdown lead is grounded after the unit is firing, the firings will stop, the output switch will open and remain open for 5 seconds after rotation stops.

The diagnostic LED on the unit will turn off until rotation stops. After rotation stops it will blink the appropriate signal, see section 11.2. Default setting = OFF.

**9.6 ON CRANK FLAG:**

When this status flag is ON, the ignition scales rpm measurement and timing angles for a signal pattern coming from a crankshaft-mounted disc. When this status flag is OFF, the ignition scales rpm measurement and timing angles for a signal pattern from a camshaft mounted disc. Default setting = OFF.

**9.7 LINE UP ANGLE:**

This numeric entry has no impact on actual engine timing and is only used as a reference to calculate the spark timing number for display in the Terminal Software. When the pickup is aligned with the first hole or protrusion on the timing disc, the Line Up Angle is the angular position of the crankshaft with respect to TDC of the first cylinder in the firing order. Entry range is 0 to 100 engine degrees BTDC. This value will need to be fine-tuned to provide an accurate display of timing. Default setting = 40.0 degrees BTDC.

**9.8 INSERTION RETARD SETTING:**

This numeric entry configures the minimum internal electronic input signal delay. Entry range is 2.0 to 25.5 degrees of engine retard. Default setting = 2.0 degrees.

**9.9 PURGE DELAY SETTING:**

This numeric entry configures the number of disc rotations (engine cycles) following successful synchronization to delay before ignition outputs begin. Entry range is 0 to 255 cycles. Default setting = 0.

**9.10 OVERSPEED SETTING:**

This numeric entry configures the engine rpm at which the ignition will stop firing outputs due to an overspeed condition. The overspeed condition also turns off the alarm output switch. When rotation has fully stopped, the LED on the CD200 unit will blink the appropriate code and the alarm output switch is restored to normal (closed). Default setting = 2200 RPM.

**9.11 RUN SPEED SETTING:**
This numeric entry configures the transition speed from crank to run. This setting also determines the transition of the diagnostic LED on the CD200 from crank to run modes. Default setting = 500 RPM.

**9.12 LOW VOLTAGE SETTING:**
This numeric entry configures the threshold for the low voltage diagnostic of the DC input voltage to the CD200. If the DC voltage decreases to this setting, the diagnostic LED on the CD200 will blink the appropriate code. The CD200 will continue to try to fire outputs regardless of the voltage. Default setting = 6 volts.

**9.13 ENABLE LED DIAGNOSTICS FLAG:**
When this LED status flag is activated, the blink code diagnostics for primary and secondary outputs are enabled. Default setting is ON.

**9.14 SWITCH CAL:**
These numeric entries configure the timing retard for each position of the manual timing switch on the CD200 case. Entry range is 0 to 25.5 degrees of engine retard. The active entry is indicated in blue. Default setting is 7-6-5-4-3-2-1. If two degrees change per switch position is desired, enter 14-12-10-8-6-4-2.

**9.15 LOOP CAL:**
These numeric entries configure the interpolated lookup table for the ignition retard versus the analog current loop input signal. This allows the operator to create custom spark timing maps versus the current loop input signal. Entry range is 0 to 25.5 degrees of engine retard. The active entries are indicated in blue. Default sequence is 0 degrees retard at 4 mA, 16 degrees retard at 20 mA.

**9.16 RPM CAL:**
These numeric entries configure the interpolated lookup table for retard versus the engine speed. This allows the operator to create custom spark timing maps versus engine rpm. Entry range is 0 to 25.5 degrees of engine retard. The active entries are indicated in blue. Default sequence is 6 degrees retard at 0 RPM, decreasing to 0 degrees retard at 600 RPM.

**9.17 CYLINDER CAL:**
These numeric entries configure the amount of individual offset timing retard added to the global timing for each individual output. This feature can be used to map an evenly spaced timing disc to an odd firing angle engine pattern. Entry range is 0 to 50 degrees of engine retard. Default settings are 0. Contact the factory for further details of this feature.

### 9.18 ENERGY FLAGS:

Select one of four output energy settings for the CD200:

| | | | | |
|---|---|---|---|---|
| Bit 1 | OFF | Bit 0 | OFF | Vcap = 150 volts |
| Bit 1 | OFF | Bit 0 | ON | Vcap = 160 volts |
| Bit 1 | ON | Bit 0 | OFF | Vcap = 170 volts |
| Bit 1 | ON | Bit 0 | ON | Vcap = 180 volts |

Default setting is 160 volts at the capacitor. This voltage can only be measured using a device with an input impedance of 1 megaohm or higher with no other device connected.

### 9.19 UNIT 791070-12 – ENABLE SLAVE FIRING FLAG:

When this LED status flag is activated, the ignition will generate a second slave firing for each (x+1) reference pulse. For a (6+1) disc pattern, the ignition will fire 12 outputs when this flag is activated, and 6 outputs when this flag is not activated. Modification of this flag through the Terminal Program requires that the engine be stopped and the G-lead be grounded.

### 9.20 UNIT 791070-12 – SLAVE FIRING ANGLE SETTING:

This numeric entry configures the angle of the slave firing relative to the standard firings that are generated for each (x+1) reference pulse. Entry range is 25.0° to 60.0° which is used to set the slave firing angle on a 12-cylinder, 4-cycle engine. The slave angle must be the smaller of the two angles that define the engine firing pattern. For example, firing patterns of either 30°–90° or 90°–30° would require the slave angle be entered as “30”. Modification of this value through the Terminal Program requires that the engine be stopped and the G1 lead be grounded.

The following patterns are applications suitable for unit 791070-12:

| NO. CYLS. | ENGINE FIRING ANGLE | SECT. 9.4 DISC SETTING | SECT. 9.20 SLAVE ANGLE | WIRING DIAGRAM |
|---|---|---|---|---|
| 8 | 60°–120° | 4+1 | 60° | FIG. 10 |
| 8 | 120°–60° | 4+1 | 60° | FIG. 11 |
| 10 | 54°–90° | 5+1 | 54° | FIG. 10 |
| 10 | 90°–54° | 5+1 | 54° | FIG. 11 |
| 12 | 30°–90° | 6+1 | 30° | FIG. 10 |
| 12 | 40°–80° | 6+1 | 40° | FIG. 10 |
| 12 | 50°–70° | 6+1 | 50° | FIG. 10 |
| 12 | 55°–65° | 6+1 | 55° | FIG. 10 |
| 12 | 60°–EVEN | 6+1 | 60° | FIG. 10 |
| 12 | 75°–45° | 6+1 | 45° | FIG. 11 |
| 12 | 90°–30° | 6+1 | 30° | FIG. 11 |

## 10.0 PC TERMINAL DISPLAY FUNCTIONS

**10.1 ENGINE SPEED:**
Indicates current speed of the engine in RPM based on disc signal.

**10.2 SPARK TIMING:**
Indicates the global spark timing of the engine in degrees before TDC. This number is the LINE UP ANGLE setting less the TOTAL RETARD. Slight differences between this number and the timing reading obtained with a timing light may occur since the LINE UP ANGLE entered may differ slightly from the actual angular position of the engine when the input pulse event is received by the CD200. In this event, the Spark Timing number should be made to agree with the timing light by changing the LINE UP ANGLE entry.

**10.3 SWITCH POSITION:**
Indicates the current position of the manual timing switch on the CD200 case.

**10.4 LOOP INPUT:**
Indicates the value of the external input current loop.

**10.5 OBSERVED DISC:**
Indicates the number of input events (timing holes or protrusions) being recognized by the CD200 unit on the timing disc input signal at this time.

**10.6 INSERTION RETARD:**
Indicates the amount of electronic insertion retard at this time.

**10.7 SWITCH RETARD:**
Indicates the amount of timing retard being added by the current timing switch position at this time.

**10.8 LOOP RETARD:**
Indicates the actual amount of timing retard added from the current loop versus retard lookup table curve at this time.

**10.9 RPM RETARD:**
Indicates the actual amount of timing retard being added by the RPM versus retard lookup table curve at this time.

**10.10 TOTAL RETARD:**
Indicates the total global timing retard at this time. This number is the sum of the Insertion Retard, Switch Retard, Loop Retard and RPM Retard.

**10.11 COUNTER:**
Indicates the number of disc rotations (engine cycles) registered since the engine was last started.

**10.12 PURGE COUNTER:**
During a startup, indicates the number of purge cycles remaining before the outputs are activated.

**10.13 SUPPLY VOLTAGE:**
Indicates the measured DC voltage supply level to the CD200.

**10.14 SPARK REF. (A, B, C, ETC.):**
Indicates the current spark reference number for each cylinder.

**10.15 SYNCING:**
When red, indicates that engine rotation has been sensed and the synchronization process is taking place.

**10.16 INSYNC1:**
When red, indicates that the index input has been recognized once.

**10.17 INSYNC2:**
When red, indicates that the index has been recognized a second time and the ignition is ready to proceed.

**10.18 PURGING:**
When red, indicates that synchronization has been completed and the purge cycle countdown is taking place.

**10.19 TRYING:**
When red, indicates that the CD200 is trying to fire outputs, but a proper primary discharge event has not yet occurred.

**10.20 FIRING:**
When red, indicates that CD200 is successfully firing primary outputs.

**10.21 LOCKOUT:**
When red, indicates that firings are locked out until engine rotation has ceased for a minimum of 5 seconds.

**10.22 CRANKING:**
When red, indicates engine rotation below the Run Speed setting.

**10.23 RUNNING:**
When red, indicates engine rotation above the Run Speed setting.

**10.24 DISC ERROR:**
When red, indicates that the Test Disc status flag is activated and the timing disc pattern being sensed did not match the DISC TYPE selected.

**10.25 G-LEAD:**
When red, indicates that the G-lead is grounded.

**10.26 REMOTE:**
When red, indicates a remote serial shutdown command is active.

**10.27 SD-LEAD:**
When red, indicates that a shutdown has occurred which was the result of a grounded G-lead condition.

**10.28 SD-REMOTE:**
When red, indicates that a shutdown has occurred as a result of a remote serial shutdown command.

**10.29 SD-OVERSPEED:**
When red, indicates that a shutdown has occurred as a result of the engine reaching the Overspeed setting.

**10.30 WDOG1:**
When red, indicates that the microprocessor has re-booted since the ignition has been powered-up.

**10.31 WDOG2:**
When red, indicates that the microprocessor is currently re-booting. Disregard the first blink when first connecting.

**10.32 CHKSUM:**
When red, indicates a microprocessor checksum error.

**10.33 LOW VOLT:**
When red, indicates that the input DC voltage is at or below the Low Voltage setting input.

**10.34 NO CHARGE:**
When red, indicates that the primary storage capacitor has failed to charge properly within the last ~2 seconds.

**10.35 PRIMARY OPEN:**
When red, indicates that an open primary condition has been detected within the last ~2 seconds.

**10.36 PRIMARY SHORT:**
When red, indicates that a shorted primary condition has been detected within the last ~2 seconds.

**10.37 SECONDARY OPEN:**
When red, indicates that an open secondary condition has been detected within the last ~2 seconds.

**10.38 CRANKS LOG:**
Indicates the total number of crank attempts seen by the CD200.

**10.39 STARTS LOG:**
Indicates the total number of successful starts seen by the CD200 as defined by the Run Speed setting input.

**10.40 CYCLE LOG:**
Total number of engine cycles seen by the CD200.

**10.41 COLD BOOT LOG:**
Indicates the number of times the input DC voltage has been cycled to zero.

**10.42 WARM BOOT LOG:**
Indicates the number of times the microprocessor has restarted without a complete loss of power.

**10.43 GRAPHIC DISPLAY:**
The CD200 Terminal Software provides a real time graphic display of the secondary diagnostic numbers, global engine timing (y-axis/10) and engine speed (y-axis x 10).

## 11.0 CD200 UNIT LED DIAGNOSTIC BLINK CODES

**11.1 CD200 IGNITION BLINK CODES:**
Whenever the LED Diags status flag is enabled (blue) by using the CD200 Terminal Software, the blinking pattern of the LED on the side of the CD200 case can be used to interpret the general status of the CD200 diagnostics without the use of the Terminal Software. Within each group of conditions described below, the possible diagnostic states are listed according to their number of blinks. The LED is ON for about 2 seconds between each blink sequence and the blinks occur evenly spaced at a faster rate.

**11.2 LED SIGNALS WITH THE ENGINE STOPPED:**

**ON – STEADY = READY (NEW POWER UP OR LAST START ATTEMPT ABORTED)**
**ON – 1 BLINK – ON = FIRED LAST TIME ROTATING (STOPPED DUE TO STALL)**
**ON – 2 BLINK – ON = SHUTDOWN (BY GROUNDING G-LEAD WHEN RUNNING)**
**ON – 3 BLINK – ON = SHUTDOWN (BY REMOTE SERIAL REQUEST WHEN RUNNING)**
**ON – 4 BLINK – ON = SHUTDOWN (BY OVERSPEED WHEN RUNNING)**
**ON – 5 BLINK – ON = WRONG DISK PATTERN**
**ON – 6 BLINK – ON = LOW SUPPLY VOLTAGE (BELOW THRESHOLD WHEN RUNNING)**

**11.3 LED SIGNALS WITH ENGINE CRANKING:**
Rotating, and still below running RPM.

**ON/OFF/ON/OFF = PURGING (off first input pulse, toggles each revolution of purge)**
**ON – STEADY = FIRING NORMALLY (RPM below running set point value)**
**OFF = WRONG DISC PATTERN DETECTED**

**11.4 LED SIGNALS WITH ENGINE RUNNING:**
When firing, and above run speed.

**ON – STEADY = FIRING NORMALLY (NO DIAGNOSTICS TO REPORT)**
**ON – 1 BLINK – ON = OPEN SECONDARY ALARM**
**ON – 2 BLINK – ON = PRIMARY SHORT ALARM**
**ON – 3 BLINK – ON = PRIMARY OPEN ALARM**
**ON – 4 BLINK – ON = NO CHARGE ALARM**
**ON – 6 BLINK – ON = LOW SUPPLY VOLTAGE**

## 13.0 RS-485 COMMUNICATIONS, MODBUS RTU

**13.1** The CD200 is compliant to the Modicon Modbus RTU standard. Maximum number of registers that can be read at one time is limited to 32. Maximum number of booleans that can be read at one time is limited to 256. All communications are 8 data bits, no parity, 1 stop bit. The baud rate is 9600. The MODBUS address list follows:

**13.2** **24 READ-ONLY STATUS BITS READABLE IN MULTIPLES OF 8 BITS STARTING AT 8-BIT BOUNDARIES**

| ADDRESS | FUNCTION |
|---|---|
| 10001 | Syncing |
| 10002 | InSync1 |
| 10003 | InSync2 |
| 10004 | Purging |
| 10005 | Trying |
| 10006 | Firing |
| 10007 | LockOut |
| 10008 | FIRED |
| 10009 | Cranking |
| 10010 | Running |
| 10011 | Wrong Disk |
| 10012 | GLead Shutdown Grounded |
| 10013 | Remote Shutdown Present |
| 10014 | GLead Shutdown Logged |
| 10015 | Remote Shutdown Logged |
| 10016 | Overspeed Shutdown Logged |
| 10017 | WDOG1 Reset Latched |
| 10018 | WDOG2 Reset Event |
| 10019 | CheckSum Error |
| 10020 | LOW Supply Voltage |
| 10021 | No Charge |
| 10022 | Open Primary |
| 10023 | Shorted Primary |
| 10024 | Open Secondary |

## 13.3 READ ONLY STATUS REGISTERS

| ADDRESS | FUNCTION |
|---|---|
| 30001 | Input Bit Mirror 10016–10001 |
| 30002 | Input Bit Mirror 10032–10017 |
| 30003 | Input Bit Mirror 10048–10033 |
| 30004 | Input Bit Mirror 10064–10049 |
| 30005 | RPM |
| 30006 | Timing xxx.xDEG signed |
| 30007 | Switch Position 1–8 |
| 30008 | Current Loop Input xx.xmA |
| 30009 | Disk Observed X+1 |
| 30010 | Insertion Retard xxx.xDeg |
| 30011 | Switch Retard xxx.xDeg |
| 30012 | Loop Retard xxx.xDeg |
| 30013 | RPM Retard xxx.xDeg |
| 30014 | Total Retard xxx.xDeg |
| 30015 | Cycle Counter HI |
| 30016 | Cycle Counter LO |
| 30017 | Supply Voltage xx.xVolts |
| 30018 | Spark Ref. Num. Output 1 |
| 30019 | Spark Ref. Num. Output 2 |
| 30020 | Spark Ref. Num. Output 3 |
| 30021 | Spark Ref. Num. Output 4 |
| 30022 | Spark Ref. Num. Output 5 |
| 30023 | Spark Ref. Num. Output 6 |
| 30024 | Spark Ref. Num. Output 7 |
| 30025 | Spark Ref. Num. Output 8 |
| 30026 | Spark Ref. Num. Output 9 |
| 30027 | Spark Ref. Num. Output A |
| 30028 | Spark Ref. Num. Output B |
| 30029 | Spark Ref. Num. Output C |

| | |
|---|---|
| 30034 | Purge Delay Index Down Counter |
| 30035 | Distributor MUX code 0–15 |
| 30036 | KEYCOMMAND |
| 30037 | Period Predivider |
| 30038 | Period MS16BITS |
| 30039 | Period LS16BITS |
| 30040 | FireStat:DelayStat |

## 13.4 8 READ/WRITE CONFIGURATION BITS
SUPPORTS WRITE SINGLE ONLY
READABLE IN MULTIPLES OF 8 BITS
STARTING AT 8BIT BOUNDARIES

| ADDRESS | FUNCTION |
|---|---|
| 00001 | DISK ON CAM=0 CRANK=1 |
| 00002 | TEST FOR PROPER DISK YES=1 |
| 00003 | ENABLE SECONDARY DIAGS YES=1 |
| 00004 | ENERGY BIT0 00=~160 01=~170 |
| 00005 | ENERGY BIT1 10=~180 11=~190 |
| 00006 | SLAVE |
| 00007 | reserved |
| 00008 | reserved |

## 13.5 4 READ/WRITE REGISTERS MIRROR COIL BITS

| ADDRESS | FUNCTION |
|---|---|
| 40001 | REG40001=CoilBits 00016-00001 |
| 40002 | REG40002=CoilBits 00032-00017 |
| 40003 | REG40003=CoilBits 00048-00033 |
| 40004 | REG40004=CoilBits 00064-00049 |

## 13.6 8 READ/WRITE REGISTERS REGARDING APPLICATION

| ADDRESS | FUNCTION |
|---|---|
| 40005 | Disk+1 2,3,4,5,6,7,8,9,10,12 |
| 40006 | Disk Lineup to TDC xx.x DEG |
| 40007 | Insertion Ret MIN=2.0 DEG xx.x |
| 40008 | Purge Delay Cycles 0-255 |
| 40009 | RPM Over Speed Setpoint |
| 40010 | RPM Crank to Run Threshold |
| 40011 | Low Supply Voltage Limit xx.xV |
| 40012 | SLAVE ANGLE xx.x DEG |

## 13.7 12 READ/WRITE REGISTERS FOR CYLINDER RET. TABLE

| ADDRESS | FUNCTION |
|---|---|
| 40017 | OUTPUT 1 EXTRA RETARD DEG |
| 40018 | OUTPUT 2 EXTRA RETARD DEG |
| 40019 | OUTPUT 3 EXTRA RETARD DEG |
| 40020 | OUTPUT 4 EXTRA RETARD DEG |
| 40021 | OUTPUT 5 EXTRA RETARD DEG |
| 40022 | OUTPUT 6 EXTRA RETARD DEG |
| 40023 | OUTPUT 7 EXTRA RETARD DEG |
| 40024 | OUTPUT 8 EXTRA RETARD DEG |
| 40025 | OUTPUT 9 EXTRA RETARD DEG |
| 40026 | OUTPUT 10 EXTRA RETARD DEG |
| 40027 | OUTPUT 11 EXTRA RETARD DEG |
| 40028 | OUTPUT 12 EXTRA RETARD DEG |

## 13.8 8 READ/WRITE REGISTERS FOR TIMING SWITCH RET. TABLE

| ADDRESS | FUNCTION |
|---|---|
| 40033 | TIMING SWITCH POS 0 DEG |
| 40034 | TIMING SWITCH POS 1 DEG |
| 40035 | TIMING SWITCH POS 2 DEG |
| 40036 | TIMING SWITCH POS 3 DEG |
| 40037 | TIMING SWITCH POS 4 DEG |
| 40038 | TIMING SWITCH POS 5 DEG |
| 40039 | TIMING SWITCH POS 6 DEG |
| 40040 | TIMING SWITCH POS 7 DEG |

## 13.9 21 READ/WRITE REGISTERS FOR LOOP RET. TABLE

| ADDRESS | FUNCTION |
|---|---|
| 40049 | LOOP RET MAP 0mA 0.00V DEG |
| 40050 | LOOP RET MAP 1mA 0.25V DEG |
| 40051 | LOOP RET MAP 2mA 0.50V DEG |
| 40052 | LOOP RET MAP 3mA 0.75V DEG |
| 40053 | LOOP RET MAP 4mA 1.00V DEG |
| 40054 | LOOP RET MAP 5mA 1.25V DEG |
| 40055 | LOOP RET MAP 6mA 1.50V DEG |
| 40056 | LOOP RET MAP 7mA 1.75V DEG |
| 40057 | LOOP RET MAP 8mA 2.00V DEG |
| 40058 | LOOP RET MAP 9mA 2.25V DEG |
| 40059 | LOOP RET MAP 10mA 2.50V DEG |
| 40060 | LOOP RET MAP 11mA 2.75V DEG |
| 40061 | LOOP RET MAP 12mA 3.00V DEG |
| 40062 | LOOP RET MAP 13mA 3.25V DEG |
| 40063 | LOOP RET MAP 14mA 3.50V DEG |
| 40064 | LOOP RET MAP 15mA 3.75V DEG |
| 40065 | LOOP RET MAP 16mA 4.00V DEG |
| 40066 | LOOP RET MAP 17mA 4.25V DEG |
| 40067 | LOOP RET MAP 18mA 4.50V DEG |
| 40068 | LOOP RET MAP 19mA 4.75V DEG |
| 40069 | LOOP RET MAP 20mA 5.00V DEG |

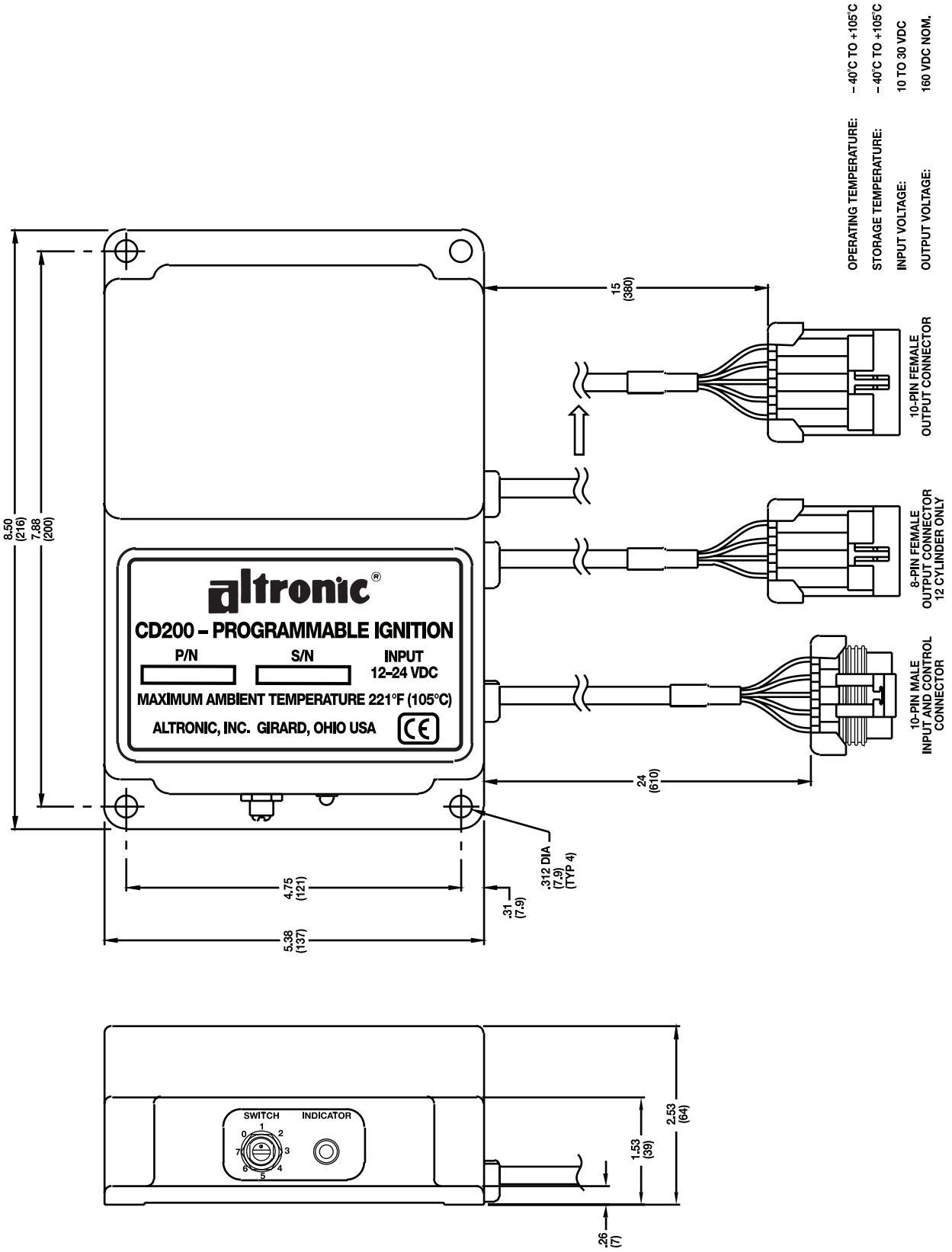
## 13.10 31 READ/WRITE REGISTERS FOR RPM RET. TABLE

| ADDRESS | FUNCTION | |
|---|---|---|
| 40070 | RPM RET MAP 0000 RPM | DEG |
| 40071 | RPM RET MAP 0100 RPM | DEG |
| 40072 | RPM RET MAP 0200 RPM | DEG |
| 40073 | RPM RET MAP 0300 RPM | DEG |
| 40074 | RPM RET MAP 0400 RPM | DEG |
| 40075 | RPM RET MAP 0500 RPM | DEG |
| 40076 | RPM RET MAP 0600 RPM | DEG |
| 40077 | RPM RET MAP 0700 RPM | DEG |
| 40078 | RPM RET MAP 0800 RPM | DEG |
| 40079 | RPM RET MAP 0900 RPM | DEG |
| 40080 | RPM RET MAP 1000 RPM | DEG |
| 40081 | RPM RET MAP 1100 RPM | DEG |
| 40082 | RPM RET MAP 1200 RPM | DEG |
| 40083 | RPM RET MAP 1300 RPM | DEG |
| 40084 | RPM RET MAP 1400 RPM | DEG |
| 40085 | RPM RET MAP 1500 RPM | DEG |
| 40086 | RPM RET MAP 1600 RPM | DEG |
| 40087 | RPM RET MAP 1700 RPM | DEG |
| 40088 | RPM RET MAP 1800 RPM | DEG |
| 40089 | RPM RET MAP 1900 RPM | DEG |
| 40090 | RPM RET MAP 2000 RPM | DEG |
| 40091 | RPM RET MAP 2100 RPM | DEG |
| 40092 | RPM RET MAP 2200 RPM | DEG |
| 40093 | RPM RET MAP 2300 RPM | DEG |
| 40094 | RPM RET MAP 2400 RPM | DEG |
| 40095 | RPM RET MAP 2500 RPM | DEG |
| 40096 | RPM RET MAP 2600 RPM | DEG |
| 40097 | RPM RET MAP 2700 RPM | DEG |
| 40098 | RPM RET MAP 2800 RPM | DEG |
| 40099 | RPM RET MAP 2900 RPM | DEG |
| 40100 | RPM RET MAP 3000 RPM | DEG |

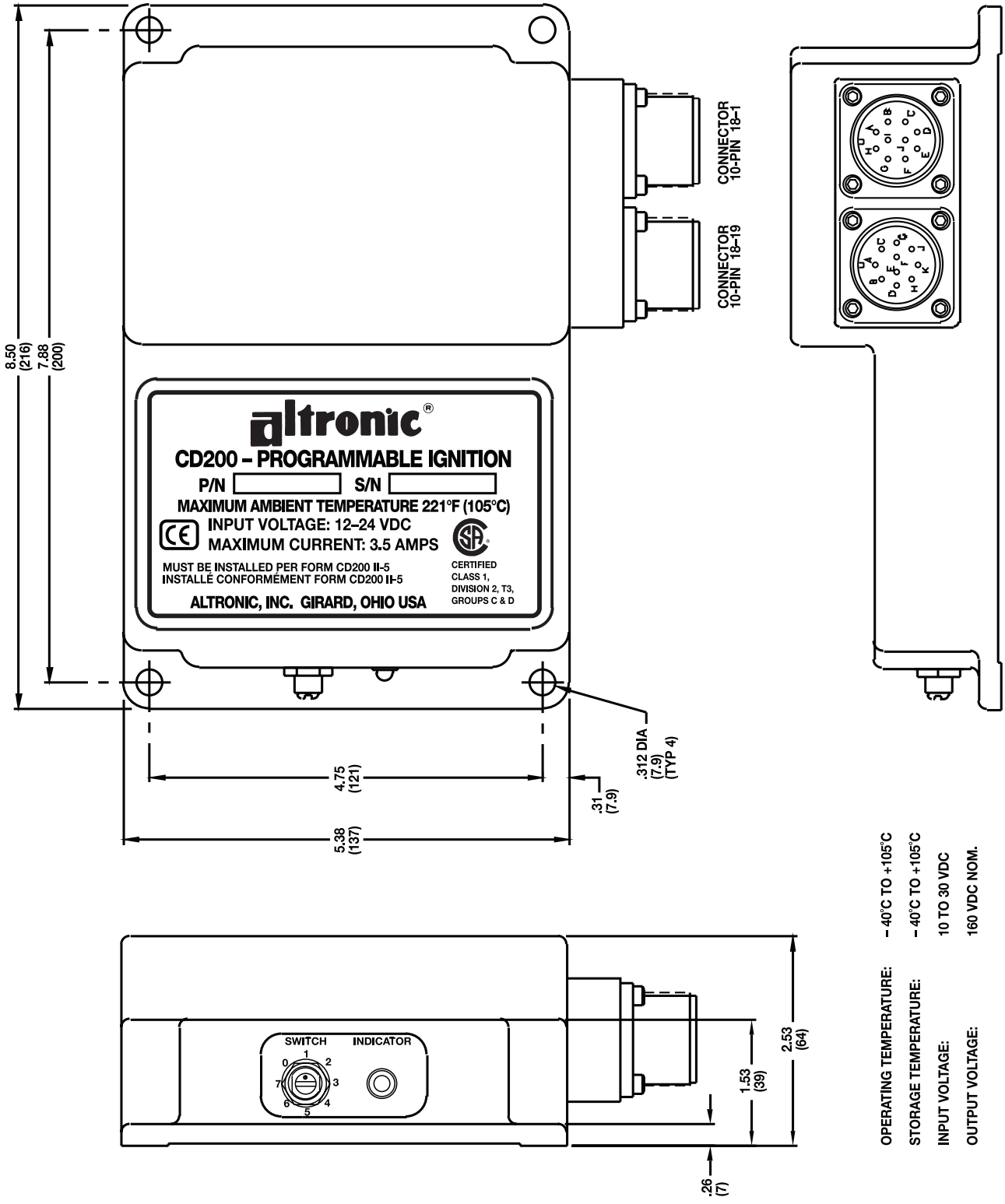
## 13.11 7 READ/WRITE MISC. REGISTERS

| ADDRESS | FUNCTION |
|---|---|
| 40122 | Crank Counter |
| 40123 | Start Counter |
| 40124 | Cycle Counter HIGH |
| 40125 | Cycle Counter LOW |
| 40126 | REG40005 MSB=BAUD LSB=NODEID fixed 9600n81:node1 |
| 40127 | Cold Boot (powerup) Count |
| 40128 | Warm Boot ( reset ) Count |

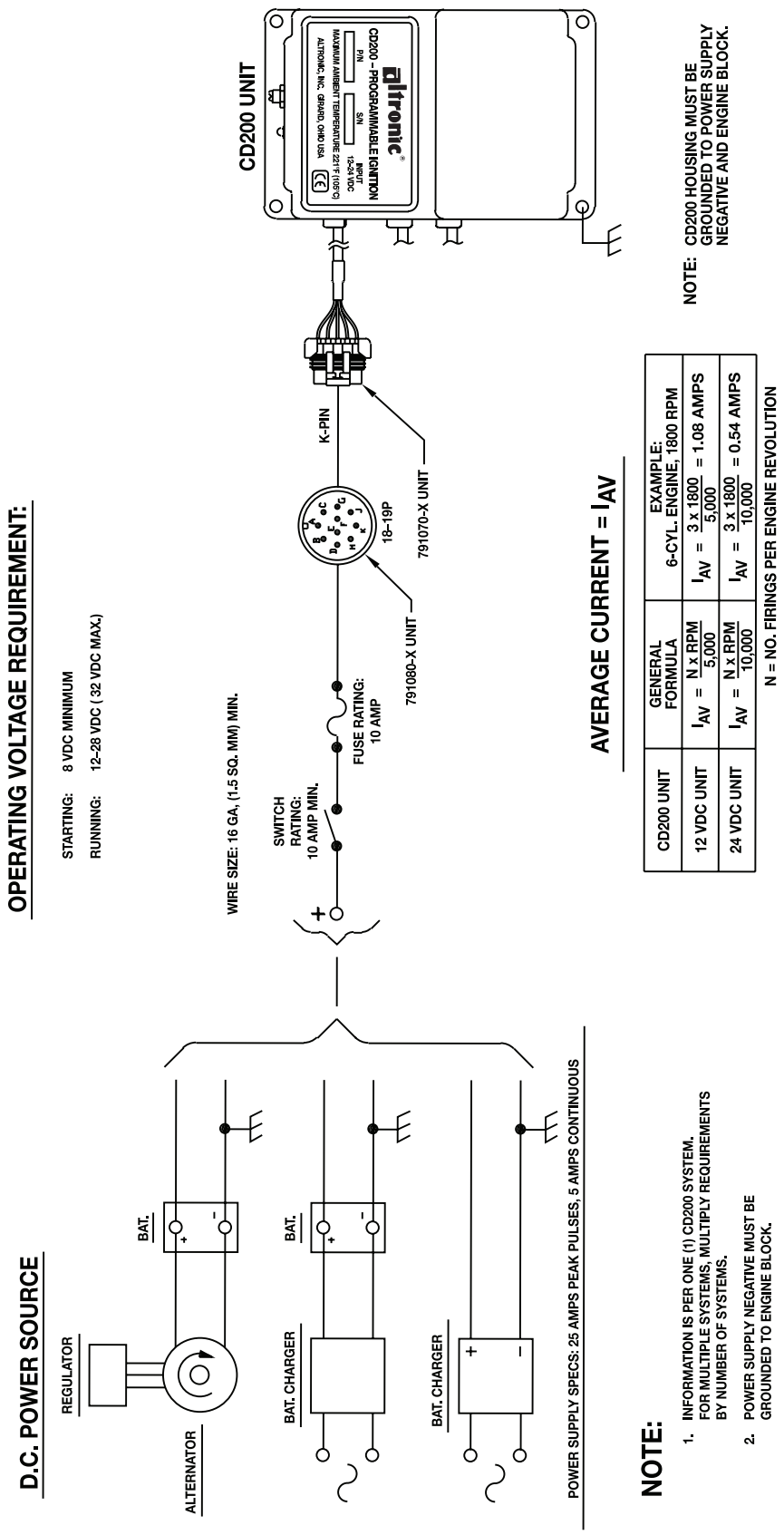
## FIG. 1 DIMENSIONS AND SPECIFICATIONS, 791070-X



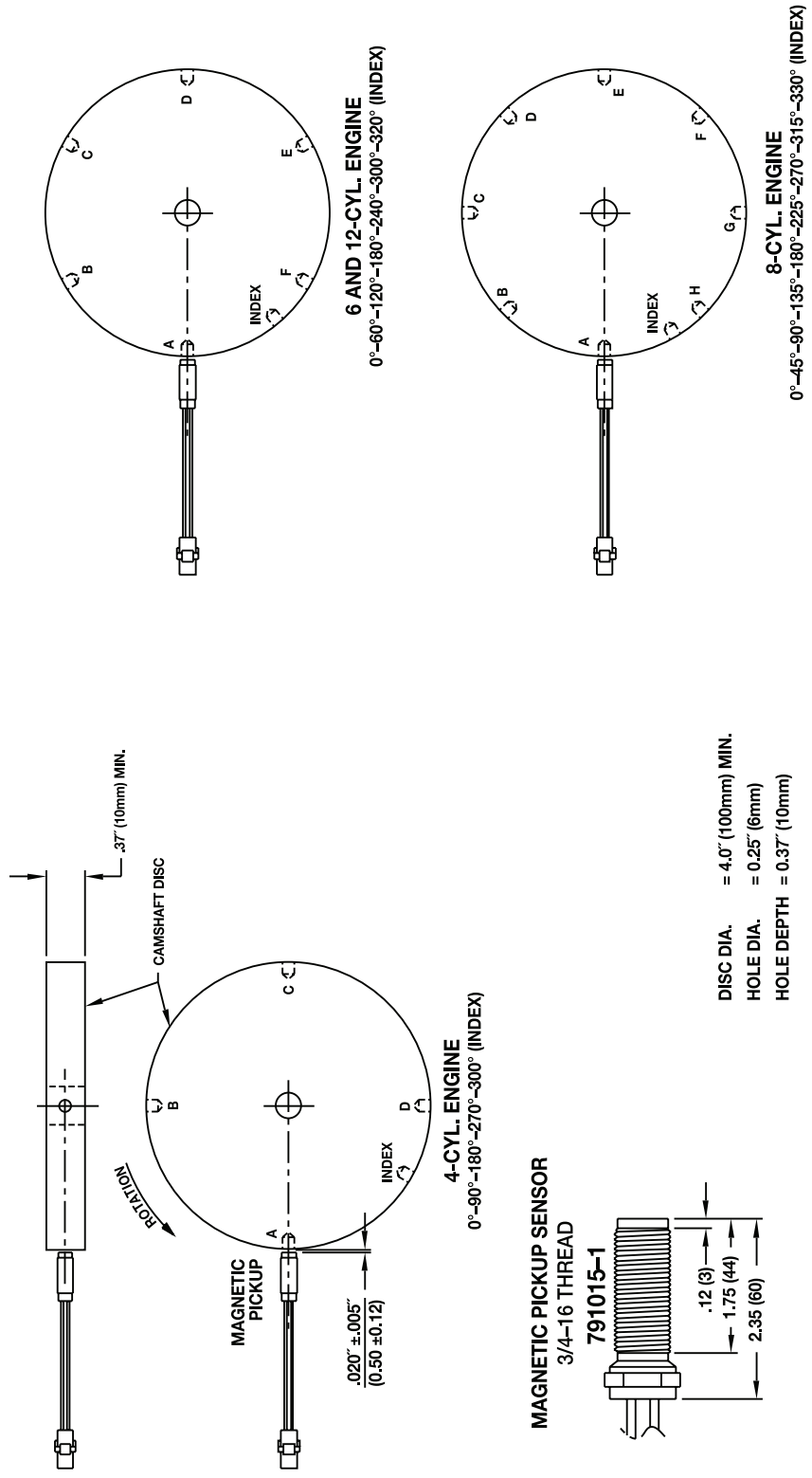
## FIG. 2 DIMENSIONS AND SPECIFICATIONS, 791080-X



## FIG. 3 DC POWER HOOKUP

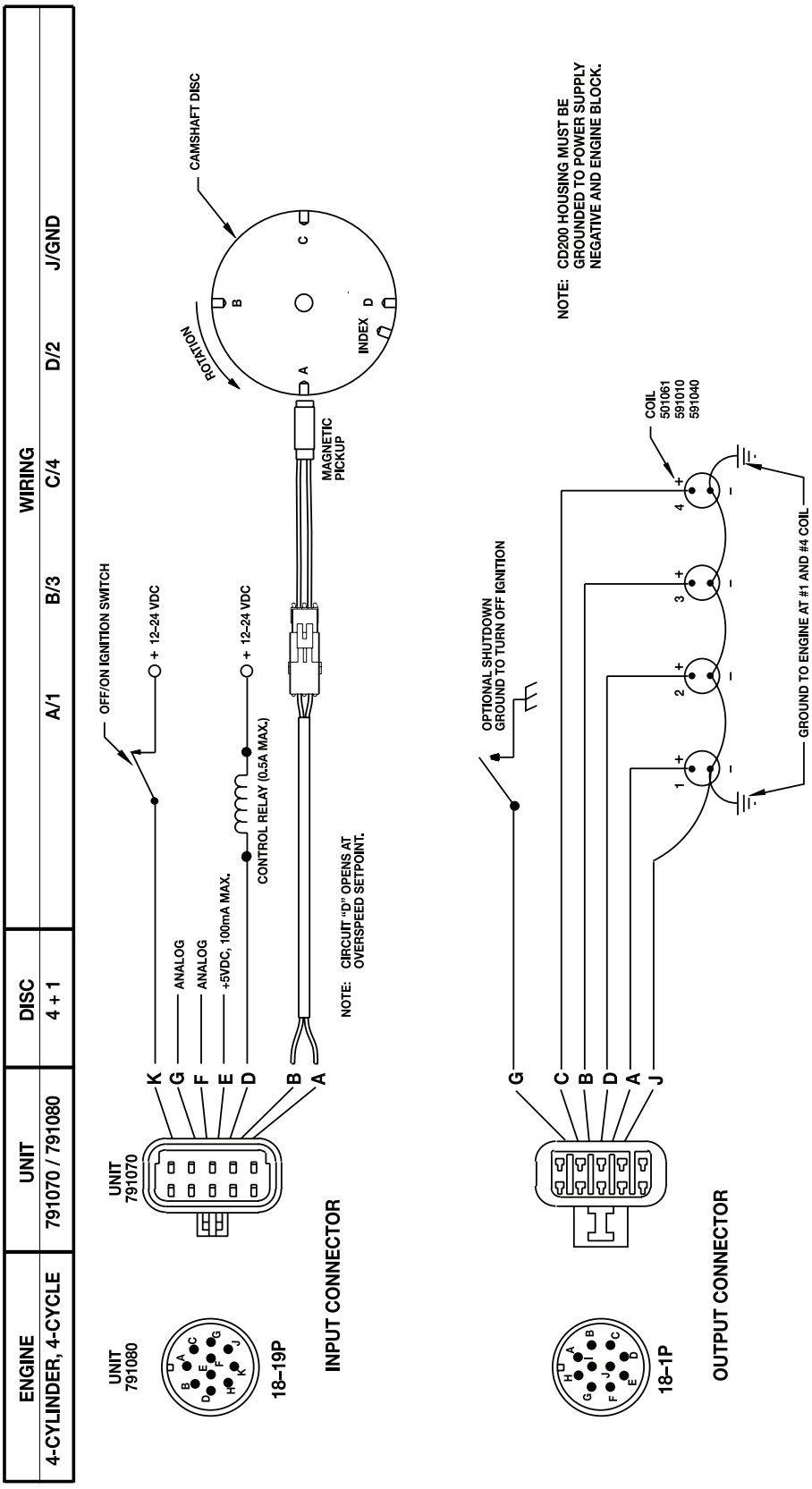


## FIG. 4 PICKUP AND DISC HOLE DETAIL



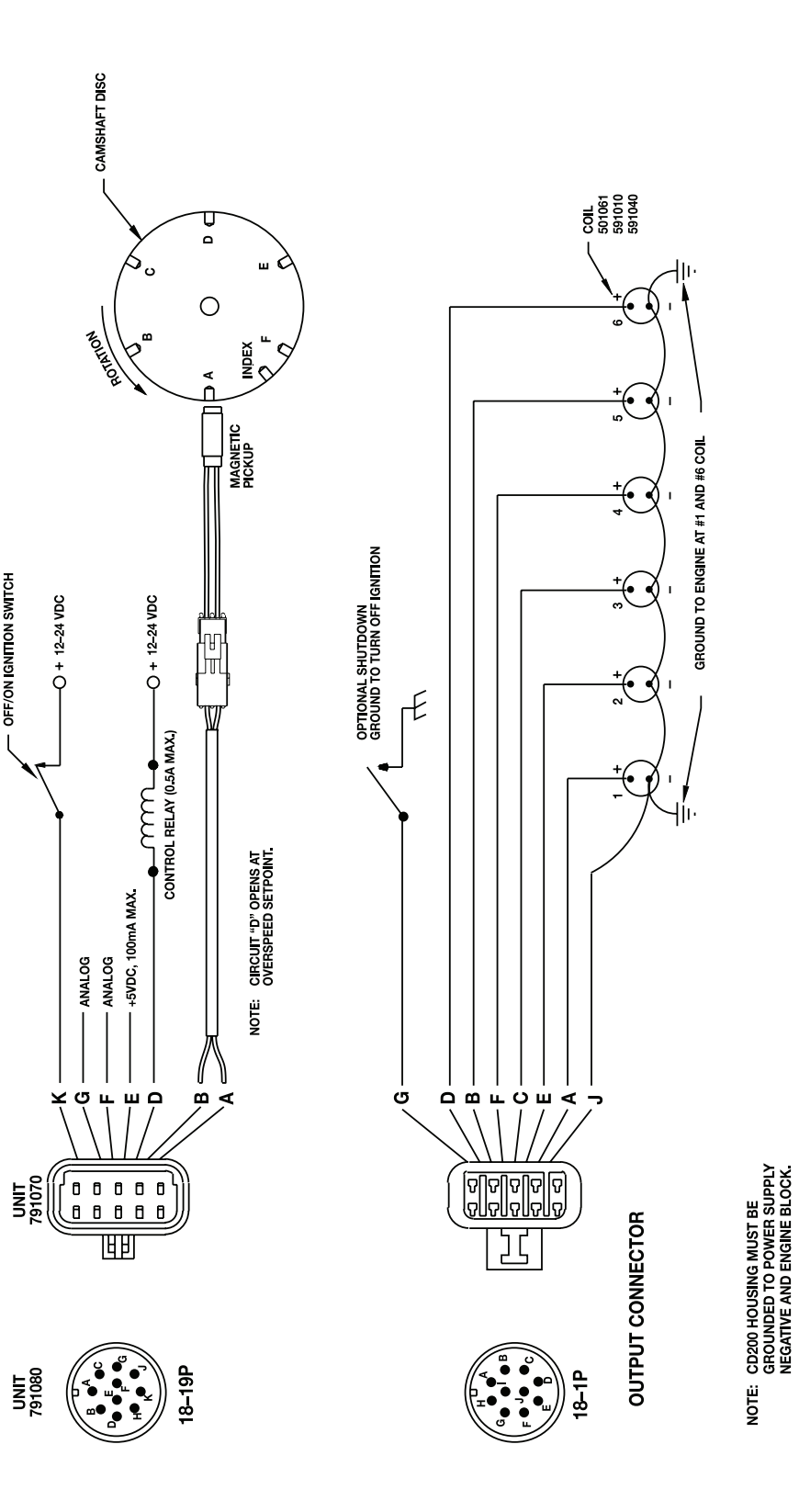
## FIG. 5 WIRING: 4-CYLINDER ENGINES

| ENGINE | UNIT | DISC | WIRING | | | | |
|---|---|---|---|---|---|---|---|
| | | | A/1 | B/3 | C/4 | D/2 | J/GND |
| 4-CYLINDER, 4-CYCLE | 791070 / 791080 | 4 + 1 | | | | | |



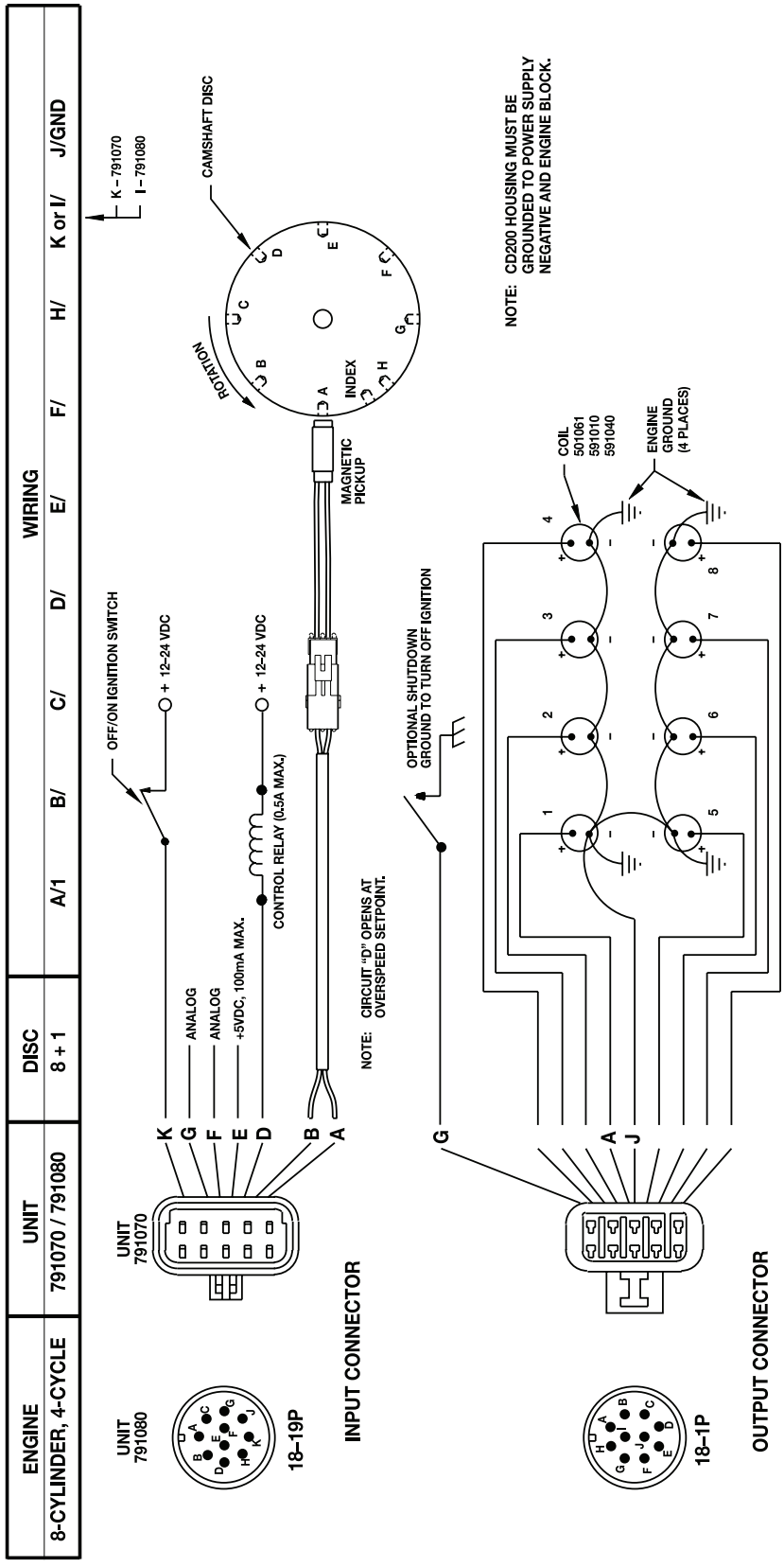
## FIG. 6 WIRING: 6-CYLINDER ENGINES

| ENGINE | UNIT | DISC | WIRING | | | | | |
|---|---|---|---|---|---|---|---|---|
| 6-CYLINDER, 4-CYCLE | 791070 / 791080 | 6 + 1 | A/1 | B/5 | C/3 | D/6 | E/2 | F/4 | J/GND |



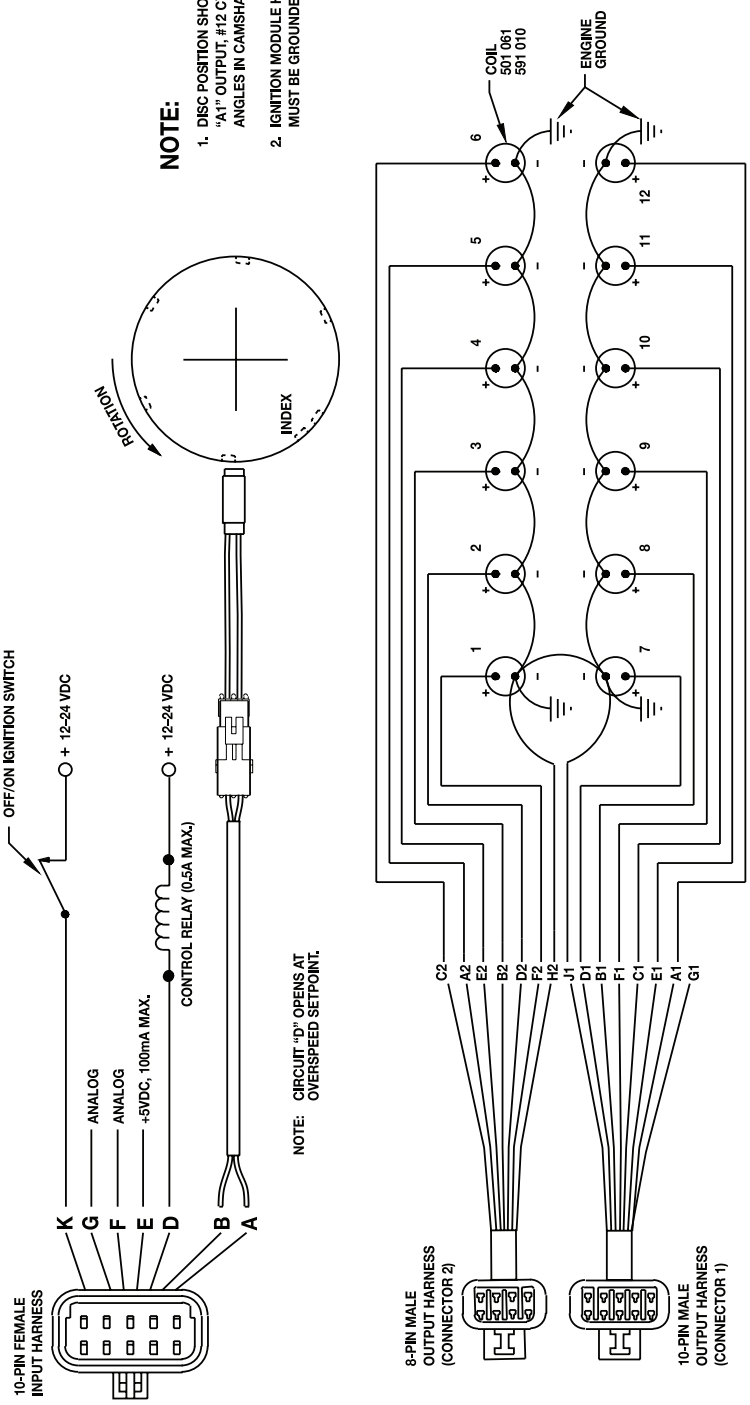
## FIG. 7 WIRING: 8-CYLINDER ENGINES

| ENGINE | UNIT | DISC | WIRING | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | A/1 | B/ | C/ | D/ | E/ | F/ | H/ | K or I/ | J/GND |
| 8-CYLINDER, 4-CYCLE | 791070 / 791080 | 8 + 1 | | | | | | | | | |

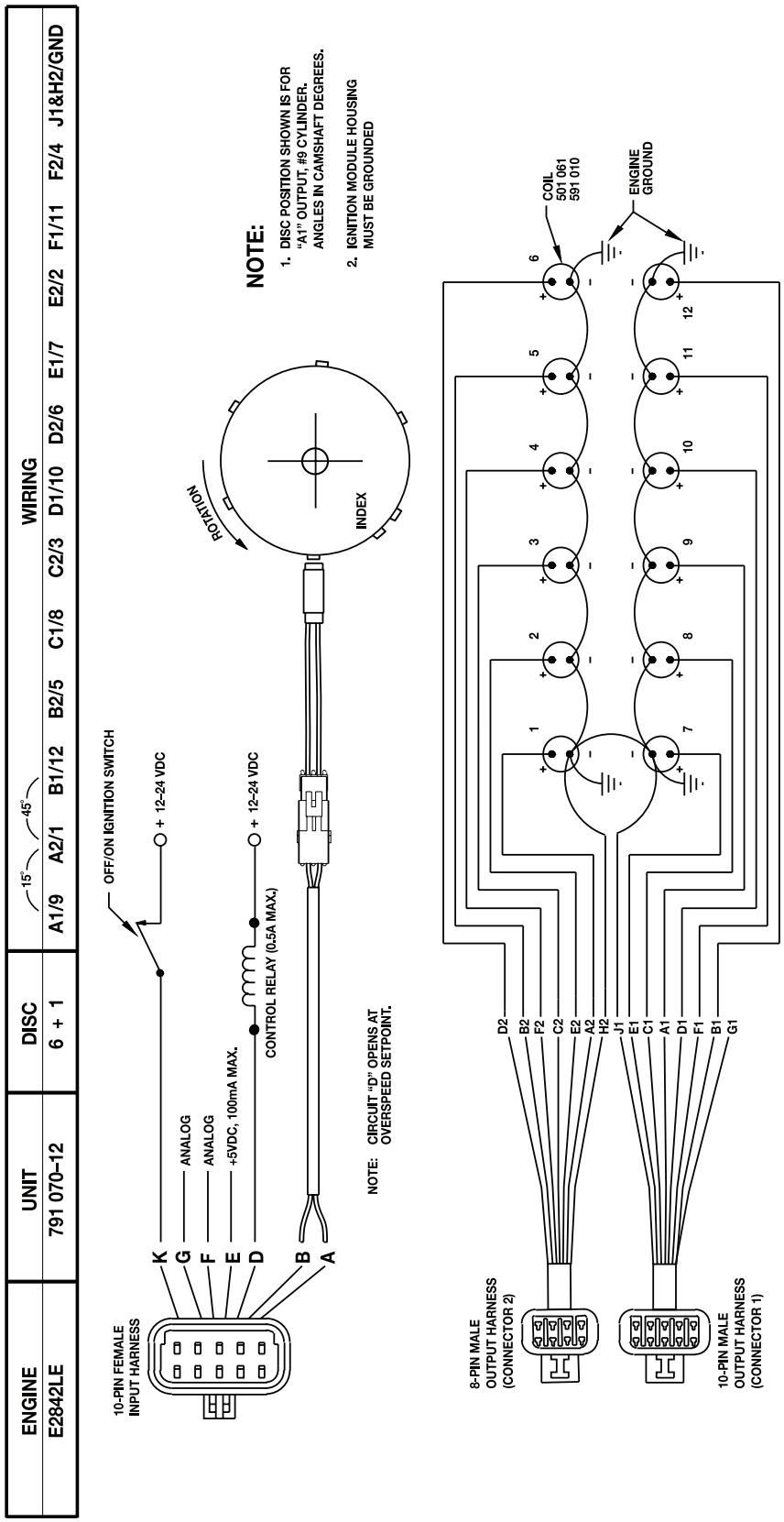


## FIG. 8 WIRING: 12-CYLINDER MAN 2842 LE

| ENGINE | UNIT | DISC | WIRING | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 15° A1/12 | A2/5 | 45° B1/8 | B2/3 | C1/10 | C2/6 | D1/7 | D2/2 | E1/11 | E2/4 | F1/9 | F2/1 | J1&H2/GND |
| E2842LE | 791 070–12 | 6 + 1 | | | | | | | | | | | | | |

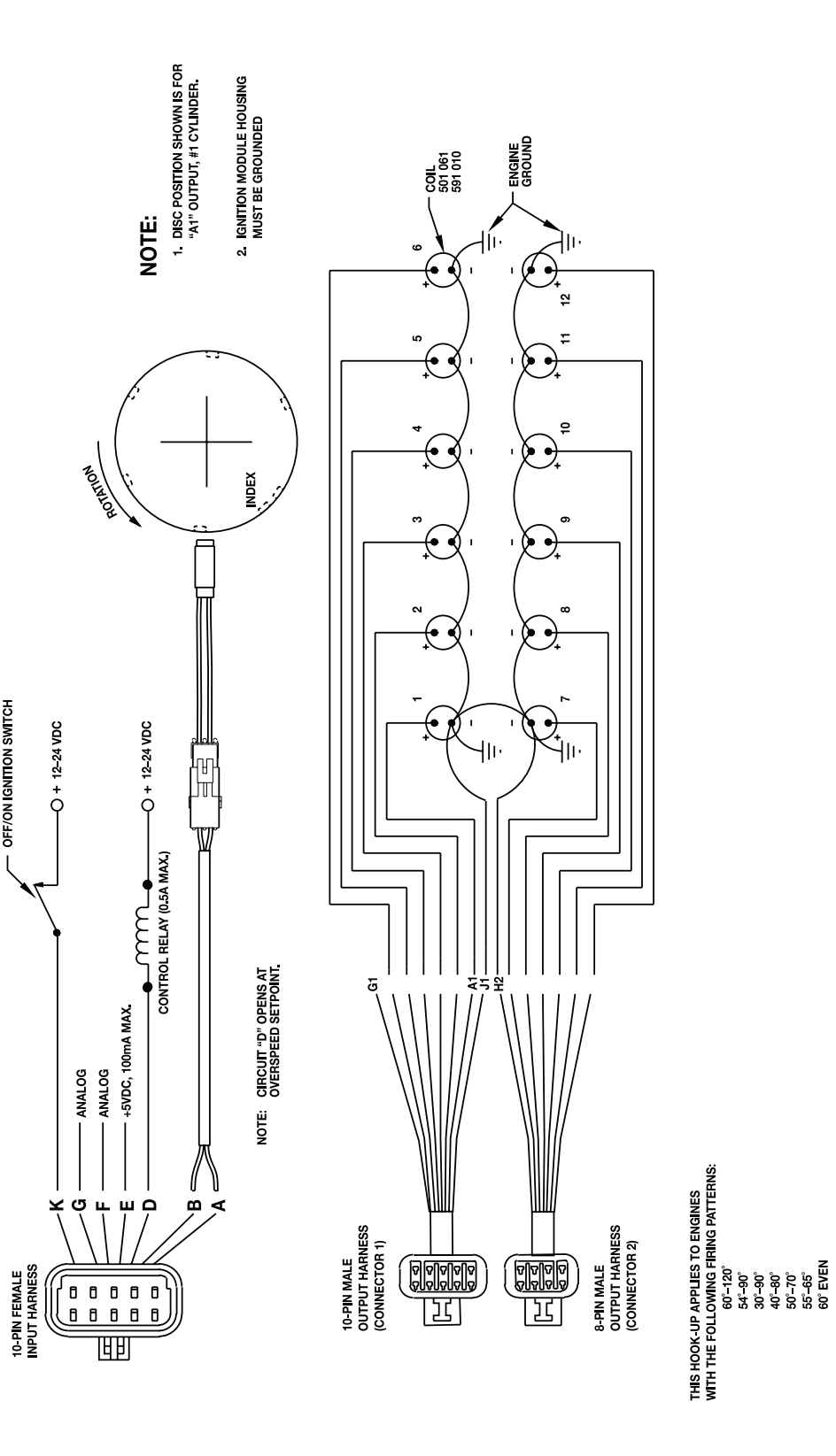


## FIG. 9 WIRING: 12-CYLINDER MAN 2842 LE — USING CAMSHAFT GEAR



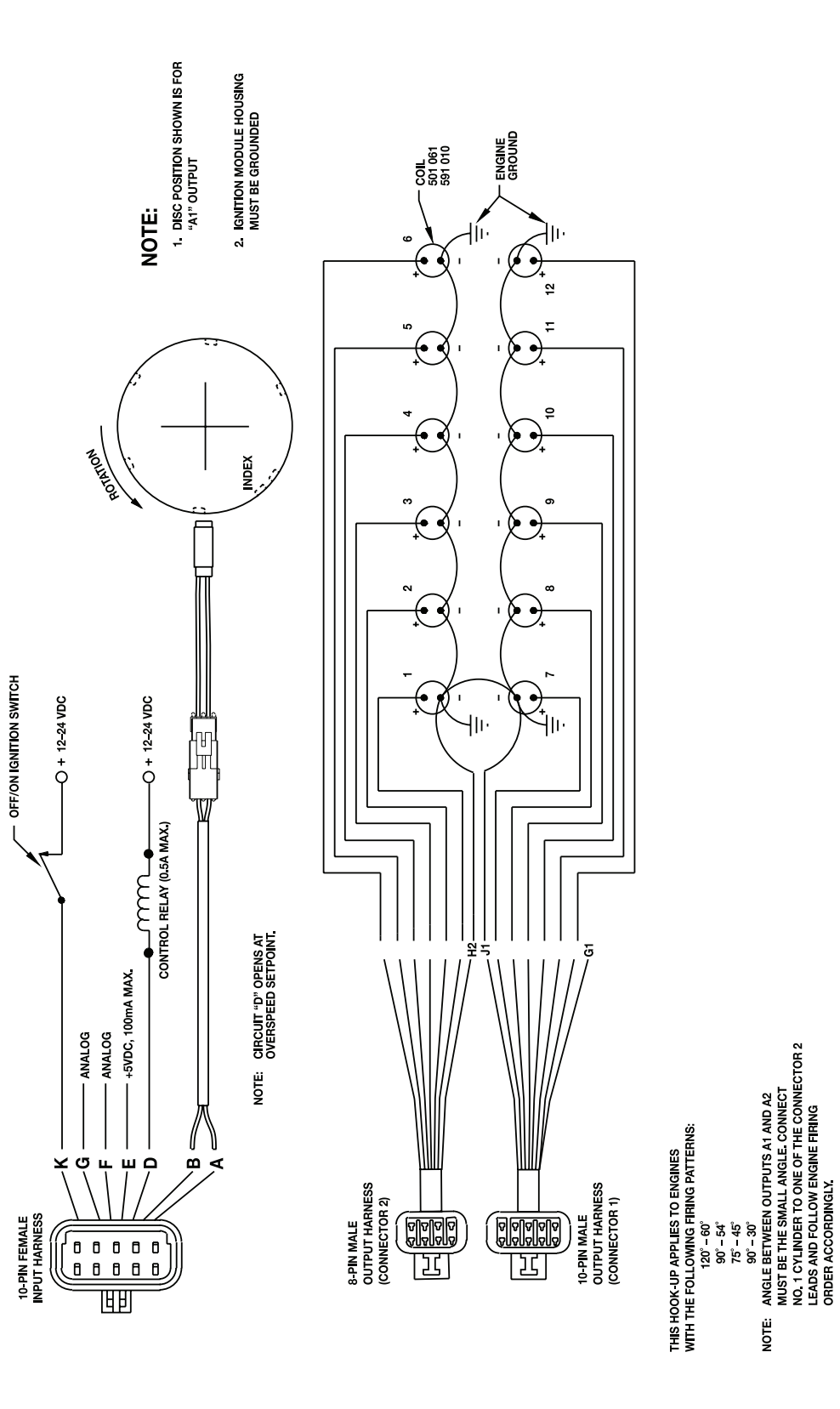
## FIG. 10 791070-12 WITH FIRST ENGINE FIRING ANGLE ≤ 60°

| ENGINE | UNIT | DISC | WIRING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1/1 | A2/ | B1/ | B2/ | C1/ | C2/ | D1/ | D2/ | E1/ | E2/ | F1/ | F2/ | J1&H2/GND |
| 12-CYLINDER, 4-CYCLE | 791070–12 | 6 + 1 | | | | | | | | | | | | | |

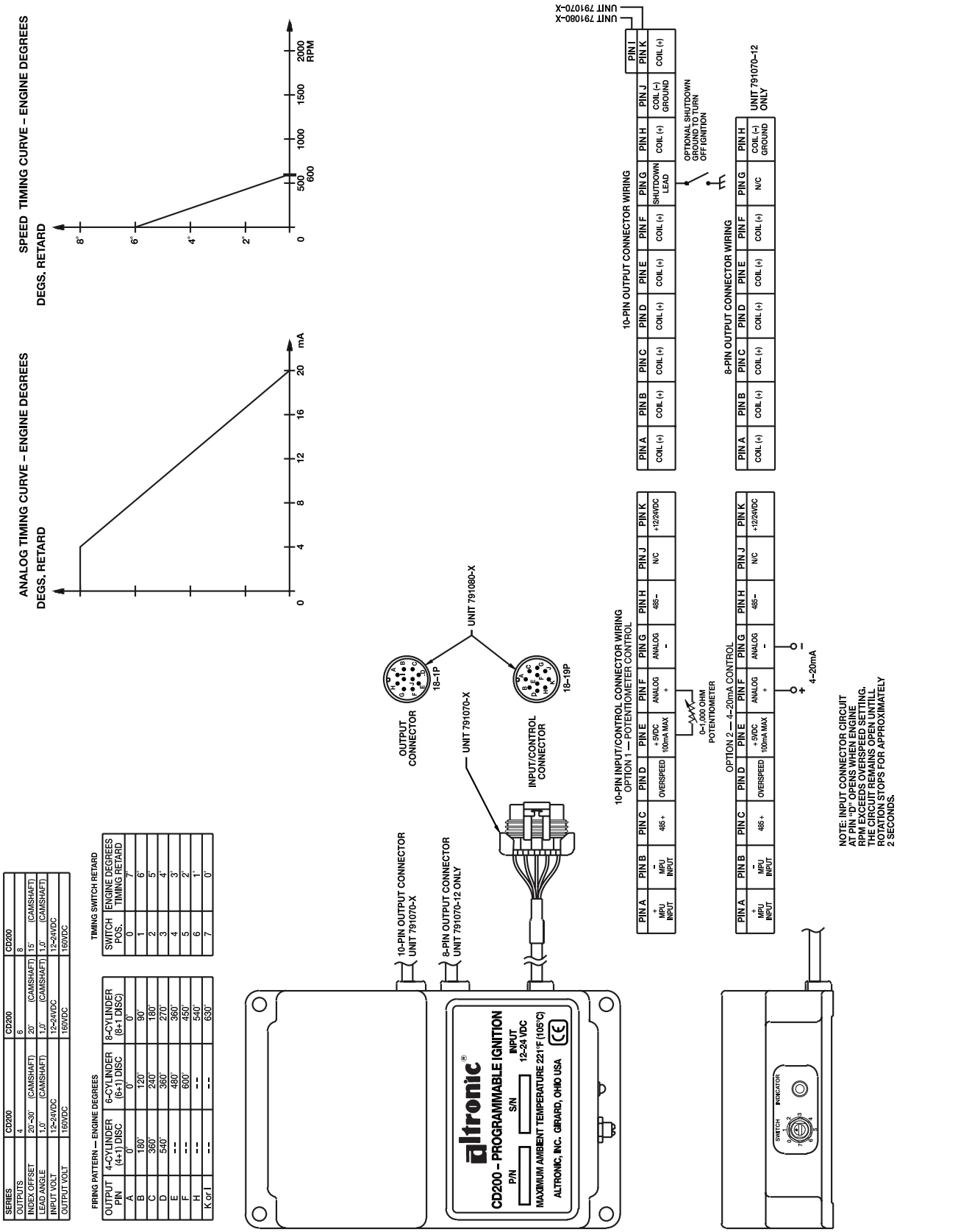


## FIG. 11 791070-12 WITH FIRST ENGINE FIRING ANGLE > 60°

| ENGINE | UNIT | DISC | WIRING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | A1/ | A2/ | B1/ | B2/ | C1/ | C2/ | D1/ | D2/ | E1/ | E2/ | F1/ | F2/ | J1&H2/GND |
| 12-CYLINDER, 4-CYCLE | 791070–12 | 6 + 1 | | | | | | | | | | | | | |



## FIG. 12 HOOK-UP FOR ANALOG TIMING SIGNAL




| SERIES | CD200 | CD200 | |
|---|---|---|---|
| OUTPUTS | 4 | 6 | 8 |
| INDEX OFFSET | 20–30° (CAMSHAFT) | 20° (CAMSHAFT) | 15° (CAMSHAFT) |
| LEAD ANGLE | 1.0° (CAMSHAFT) | 1.0° (CAMSHAFT) | 1.0° (CAMSHAFT) |
| INPUT VOLT | 12–24VDC | 12–24VDC | 12–24VDC |
| OUTPUT VOLT | 160VDC | 160VDC | 160VDC |

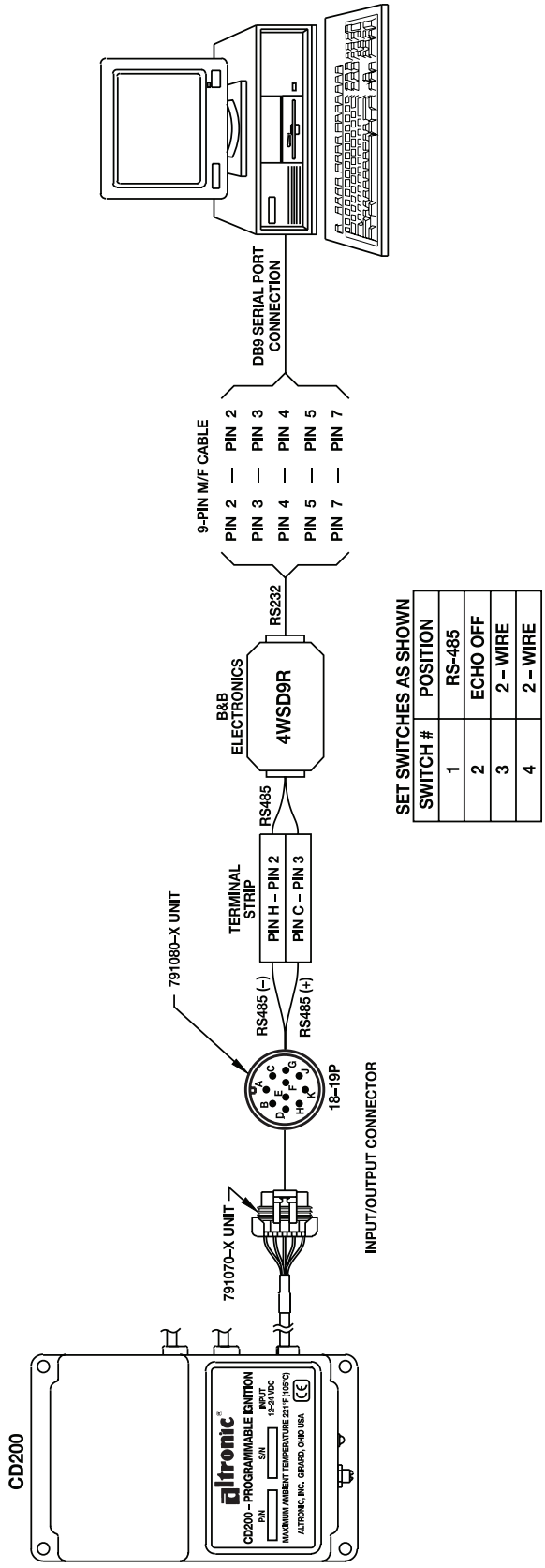
FIRING PATTERN — ENGINE DEGREES

| OUTPUT PIN | 4-CYLINDER (4+1) DISC | 6-CYLINDER (6+1) DISC | 8-CYLINDER (8+1 DISC) |
|---|---|---|---|
| A | 0 | 0 | 0 |
| B | 180° | 120° | 90° |
| C | 360° | 240° | 180° |
| D | 540° | 360° | 270° |
| E | -- | 480° | 360° |
| F | -- | 600° | 450° |
| H | -- | -- | 540° |
| K or I | -- | -- | 630° |

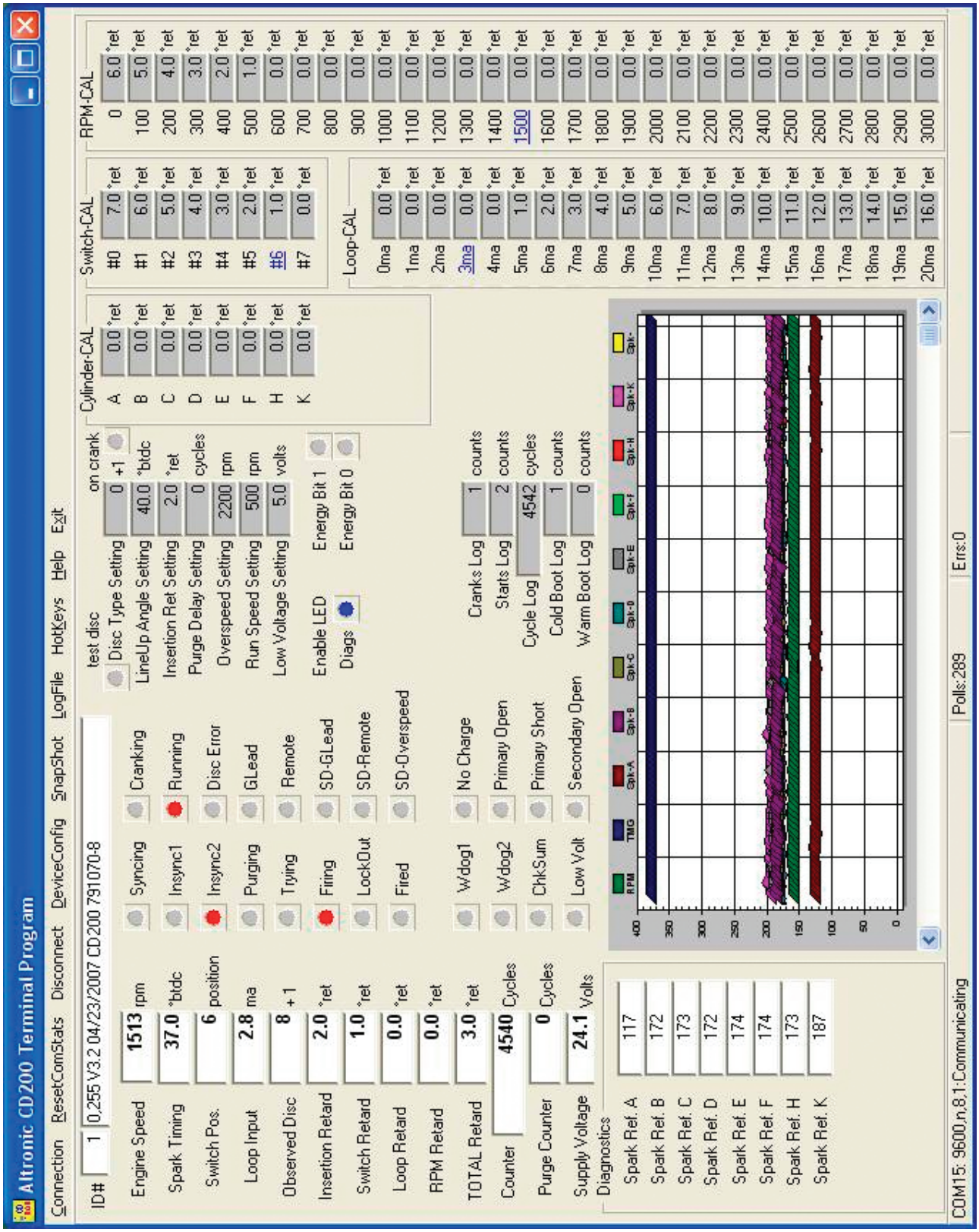
TIMING SWITCH RETARD

| SWITCH POS. | ENGINE DEGREES TIMING RETARD |
|---|---|
| 0 | 7° |
| 1 | 6° |
| 2 | 5° |
| 3 | 4° |
| 4 | 3° |
| 5 | 2° |
| 6 | 1° |
| 7 | 0° |

**FIG. 13 PC TO CD200**



## FIG. 14 TERMINAL PROGRAM: 4-, 6-, 8-CYLINDER ENGINES



## FIG. 15 TERMINAL PROGRAM: 12-CYLINDER ENGINES