

DTHO-1201/3201 Installation Instructions

Form DTHO II 11-24

NOTICE: The DTHO-1201/3201 devices are certified for use in Class I, Division 1 and 2, Group D hazardous locations when installed in accordance with these instructions.

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

APPLICATION NOTE:

The newer DTHO devices below may be setup to operate as shown:

- DTHO-1201 with serial number 5701 and higher
- DTHO-3201 with serial number 10101 and higher

TACHOMETER W/HOURMETER:

This is the default mode and duplicates the previous generation DTHO devices.

HOURMETER-ONLY WITH AND WITHOUT SET/RESET:

Use when replacing Altronic hourmeters DH-100A and 691026-2.

Older devices with a serial number lower than those listed above cannot operate in the HOURMETER-ONLY modes. These instructions still apply except for the Hourmeter-Only column in paragraph 1.2 and the entire section 5.3.

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1. Description
 2. Mounting
 3. Wiring
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1.0 DESCRIPTION

1.1 GENERAL - The DTHO-1201/3201 are electronic tachometers and hourmeters with a 5-digit LCD display and a settable overspeed or high limit hours output switch. Both the power and speed signal simultaneously come from either the shutdown lead of a C.D. industrial ignition system or from a magnetic pickup. An internal 3.6 volt lithium battery is used for reading accumulated hours and configuring the instrument when no external power is available. The device uses a micro-controller to process the input signal and a nonvolatile memory to store the accumulated hours, the configuration parameters and the setpoint values. An LCD display is used to display the RPM and total run-time HOURS as well as the various setup menus. A front mounted keypad is used to configure the device. A software filter stabilizes RPM display readings where the input signal is fluctuating.

1.2 OPERATION FORMATS - The device operates in two basic formats as detailed in the chart below:

| Tachometer Format | Hourmeter-Only Format |
|--|---|
| Duplicates the operation of the previous generation DTHO-1201/3201 devices. | Replicates the operation of former Altronic hourmeters DH-100A and 691026-2. |
| Tachometer with two modes of operation designed for measuring engine or turbo-charger speed with an integrated run-time hourmeter accessible through the keypad. | Hourmeter with a continuous display of hours and two modes of operation allowing the user to adjust the reading or to lockout any adjustment. |
| Overspeed setpoint established by the user through the keypad | High-limit hours setpoint established by the user through the keypad |

1.3 DISPLAY FORMATS - the 5-digit LCD display has additional icons displaying RPM, HOURS, MODE and PROGM.

- Tachometer display is in the format “XXXX RPM” or “XXX00 RPM” depending on the range selected in section 5. Leading zeros are not displayed.
- Hourmeter display is in the format “XXXXX HOURS”. Five digits are always shown.

1.4 POWER SOURCE - The device is powered from the input signal source, either a CD ignition system or a magnetic pickup. For tachometer operation, the frequency limit of the device is 10 kHz. Further information is in paragraph 3.2.

1.5 PACKAGING - the device is available in two industry-standard housings:

- DTHO-1201: Round, 4-1/2” – see figure 1A.
- DTHO-3201: Rectangular JIC package - see figure 1B.

2.0 MOUNTING

2.1 GENERAL - Mount the instrument inside a control panel or to a suitable flat surface so that the display is at a convenient viewing height. A drilling template is provided. NOTE: Avoid mounting tachometer with the LCD display facing direct sunlight. The operating temperature range of the tachometer including the display is -40°F to $+175^{\circ}\text{F}$ (-40°C to $+80^{\circ}\text{C}$).

2.2 MAGNETIC PICKUP 691118 SERIES - When used, mount the magnetic pickup securely to a rigid bracket or surface to maintain an air gap of $.005"/.020"$ from the gear teeth to obtain the lowest operational RPM. Be sure the sensed gear will not hit the pickup for the complete 360° of rotation. For best results, a gear with 20 pitch or courser should be used.

3.0 WIRING (SEE WIRING DIAGRAMS)

3.1 GENERAL - Take care not to damage the insulation and take precautions against damage from vibration, abrasion or liquids in conduits. Never run low voltage magnetic pickup, or output switch 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. Never run the tachometer wires in the same conduit as the ignition coil wiring.

3.2 SIGNAL / POWER WIRING – The device may be powered from either a C.D. ignition system or a magnetic pickup.

- SHUTDOWN LEAD, C.D. IGNITION SYSTEM - Use terminals marked IGNITION INPUT, terminals 1 and 2. The voltage range is 100 to 400 volts peak.
 - For NEG. GND. ignition systems, connect the shutdown lead to terminal 1 (+) and ground terminal 2 (–) to panel ground.
 - For POS. GND. ignition systems, connect the shutdown lead to terminal 2 (–) and ground terminal 1 (+) to panel ground.

The ground connection should be made by placing a short ground wire from the terminal on the back of the tachometer to panel ground which should be the same as engine ground. Use a fine gauge stranded wire such as Altronic 603102 (black) and 603103 (white) 24 AWG for ignition power connections. DO NOT connect the ground connection from the tachometer directly to the ignition system common coil ground on the engine.

- MAGNETIC PICKUP - Connect the two wires from the Altronic 691118 series (with 693104 series cable) or similar magnetic pickup to the back of the tachometer at terminals 3 and 4. This input is designed to accept frequency signals from 3 to 20 volts peak from magnetic pickups. Absolute minimum operating voltage required from the magnetic pickup at slow speeds is 3 volts peak.

3.3 OUTPUT SWITCH WIRING - An overspeed or high hours condition will cause the output switch, which is normally open, to close between terminals 5 (+) and 6 (-). The shelf state (unpowered) is an open condition. The output switch is a solid state FET type transistor that is isolated from the input signal power source and is non-latching. The switch is rated at 400 Vdc, 140 mA max. The output switch may be connected to an Altronic annunciator system or to pilot duty relays as shown in the wiring diagrams.

WARNING: THE OUTPUT SWITCH ON THE DTHO-1201/DTHO-3201 IS NON-LATCHING. WHEN USED FOR OVERSPEED, A LATCHING DEVICE (ALTRONIC ANNUNCIATOR SYSTEM OR TATTLETALE) MUST BE USED TO GROUND THE IGNITION SYSTEM SHUTDOWN LEAD.

3.4 HAZARDOUS AREA OPERATION - The DTHO-1201 and DTHO-3201 tachometers are CSA certified for *CLASS I, DIVISIONS 1 AND 2, GROUPS C & D* areas as described below.

CLASS I, GROUP D, DIVISION 2: Certified when mounted in a suitable panel enclosure.

CLASS I, GROUP D, DIVISION 1: Certified intrinsically safe, if the following conditions are met:

- The tachometer is powered from Altronic barrier 690107 or 690108 (follow the installation instructions supplied with the barrier) or powered from Altronic magnetic pickup 691118 series.
- The switch outputs must be connected to the sensor inputs of an Altronic DA or DD annunciator system with the 690 series power supply.

In addition, the following requirements must be met (see NFPA standard no. 493):

- The intrinsically-safe gauge wires within the panel enclosure must be kept at least two (2) inches away from other wiring.
- Wiring to valves, actuators and other control devices must have a grade of insulation capable of withstanding an AC voltage of 500 volts RMS.
- Control wires must be run in separate conduits and junction boxes from high voltage wires such as Ignition, fuel valve, and other high voltage wiring.

WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY AND/OR SUITABILITY FOR CLASS I, DIVISION 2.

DO NOT DISCONNECT EQUIPMENT IN A DIVISION 2 ENVIRONMENT UNLESS POWER IS SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

4.0 KEYPAD DESCRIPTION



KEYPAD - The DTHO-1201/3201 contains a four-key front keypad which is used to view or change the setpoint value and to configure the device. The four front panel keys are MODE, ENTER, and ▲ ▼ (up and down arrow keys).

MODE - The MODE key is used to enter configuration (or program) mode and to scroll through the setup menu.

ENTER - The ENTER key is used to accept and save new data to nonvolatile memory. At the end of a configuration when a new setup has been entered, press ENTER and the display will indicate "SAVE", the new data or configuration will be stored in the nonvolatile memory.

▲ ▼ - The up and down arrow keys are used to increase or decrease setup and setpoint values. When held down, these keys will rapidly increase or decrease display values.

5.0 CONFIGURATION

5.1 GENERAL - When received, the instrument will be powered by its internal 3.6 volt lithium battery (displaying "0" RPM). This allows for easy configuration on the bench. To enter configuration mode, press and hold the ENTER key and press the MODE key. This ENTER + MODE sequence is required to permit configuration changes to be made.

A flowchart is provided in the figures section that shows step-by-step progression through the configuration procedure. An "Error" message will appear if the user tries to make changes to the configuration without entering the two key ENTER + MODE sequence.

During configuration, the device allows 30 seconds between keystrokes to view or change and save a new setting. If the time lapses without a keystroke, the device will automatically return to the normal reading mode without making any changes. The new information is saved only if the ENTER key is pressed and the display shows "SAVE". To abort the configuration mode, either wait 30 seconds with no key press or continue pressing the MODE key to return to the normal RPM or HOURS reading.

Referring to the chart in paragraph 1.2, the device operates in two basic formats:

- TACHOMETER operation which duplicates the previous generation DTHO-1201/3201 devices. For configuration, see paragraph 5.2. Section 5.3 does not apply.
- HOURMETER-ONLY operation which replicates previous Altronic hourmeters DH-100A and 692016-2. For configuration, skip to paragraph 5.3. Section 5.2 does not apply.

5.2 TACHOMETER CONFIGURATION - The chart below summarizes the configuration steps.

| | | |
|--|--------------------|-----------------------|
| Type See paragraph 5.2 A. | EnG to 9999 rpm | turbo to 99900 rpm |
| P: Pulses per revolution PPR See paragraph 5.2 B. | 0.5 to 450 | 0.1 to 45.0 |
| Overspeed setpoint See paragraph 5.2 C. | 1 to 9999 rpm | 100 to 99900 rpm |
| Hours reading and set/reset See paragraph 5.2 D | to 99999 hours | to 99999 hours |

A. TYPE - There are two modes for Tachometer operation:

- “EnG” (engine speed) – the tachometer will display in 1-RPM increments up to 9999 RPM.
- “turbo” (turbocharger speed) – the tachometer will display in 100-RPM increments up to 99900 RPM.

Establish the tachometer mode from the two choices above:

1. Press and hold the ENTER key and press the MODE key until the display indicates “EnG”, turbo”, “hour” or “hr – nr”.
2. Press the ▲ or ▼ arrow key to select either “EnG” or “turbo”.
3. When the display shows the desired selection, press ENTER to save the selection.

B. PULSE COUNT “P:” - Setting the pulse count (pulses per revolution or PPR) is required for the two tachometer operating modes of the device. The tachometer reads the pulse count as the number of pulses seen in one revolution of the speed of interest – see the examples below.

To set the pulse count:

1. Press and hold the ENTER key and press the MODE key until the display indicates "P: X". X is the numeric value representing the pulses per revolution.
2. Use the ▲ or ▼ arrow key to increase or decrease the value until the desired pulse count is reached. The count range is .5 to 450 for engine applications and .1 to 45.0 for turbo applications.
3. Press ENTER to accept and save the new value.

See the examples for calculating the PPR on the following page.

C.D. IGNITION SYSTEM APPLICATION USING SHUTDOWN LEAD:

n = no. of engine cylinders

| APPLICATION | P: |
|---------------------------|-----|
| 2-cycle, single capacitor | n |
| 2-cycle, dual capacitors | n/2 |
| 4-cycle, single capacitor | n/2 |
| 4-cycle, dual capacitor | n/4 |

MAGNETIC PICKUP APPLICATIONS:

RATIO = gear speed : display speed (speed of interest)

| APPLICATION | TEETH | RATIO | CALC. | P: |
|--------------------------|-------|--------|--------|-------|
| Crankshaft Gear | 208 | 1:1 | 208 | 208 |
| Camshaft Gear | 80 | 0.5:1 | 40 | 40 |
| 1.56 X Speed of Interest | 72 | 1.56:1 | 112.32 | 112 * |
| 0.45 X Speed of Interest | 66 | 0.45:1 | 29.7 | 30 * |

* Round to closest whole number.

C. OVERSPEED SETPOINT - The output switch is normally open below the trip point and closes above the setpoint. The output switch is non-latching.

The setpoint for overspeed can be set anywhere within the range of the tachometer.

- When set to “EnG” the setpoint range is 1 to 9999 RPM in 1 RPM increments.
- When set for “turbo”, the setpoint range is 100 to 99900 RPM in 100 RPM increments.

The overspeed switch has a fixed hysteresis value of 10 RPM when set to “EnG” and 100 RPM when set to “turbo”. Example: If the overspeed setpoint is set to 900 RPM, the output switch will close when the tachometer reaches 900 RPM and stay tripped or closed until the RPM goes below 890 RPM; at that point the switch will return to the open state.

Proceed as follows to view or change the setpoint value:

1. Press and hold the ENTER key and press the MODE key until the display shows a number with “RPM” and “MODE” on the right side; this is the current setpoint value. NOTE: Older devices do not display “MODE” in this screen.
2. Press the ▲ or ▼ arrow key to increase or decrease the value until the desired trip point is reached.
3. Press ENTER to accept and save the new value. The new value becomes effective only when the ENTER key is pressed and the display shows “SAVE”.

D. HOURS READOUT AND SET/RESET - The built-in 5-digit hourmeter has a 99,999 hour range and a resolution of 1 hour. The hourmeter counts at the rate of 1 per hour when it recognizes a suitable input at terminals 1,2 or 3,4 (see paragraph 3.2).

To display hours, press the ▲ or ▼ arrow key from the normal RPM screen. The display will indicate "XXXXX HOURS" for 30 seconds and then revert to the RPM reading.

To set the hours reading to a different value:

1. Press and hold the ENTER key and press the MODE key repeatedly until the display shows a 5-digit number with "HOURS" and "PROGM" on the right side. NOTE: Older devices do not display 'PROGM' in this screen.
2. Use the ▲ or ▼ arrow key to increase or decrease the reading to the desired value.
3. Press ENTER and proceed to section 6.

5.3 HOURMETER-ONLY CONFIGURATION - The chart below summarizes the configuration steps. NOTE: This section applies only to devices with S/N above 5701 for DTHO-1201 and above 10101 for DTHO-3201.

| | | |
|---|----------------------------------|--------------------------------|
| Type See paragraph 5.3 A. | hour | hr – nr |
| Hours reading and set/reset See paragraph 5.3 B. | to 99999 hours with set/reset | to 99999 hours no set/reset |
| Hours limit setpoint See paragraph 5.3 C. | 100 to 99900 hours | 100 to 99900 hours |

A. TYPE - There are two modes for continuous Hourmeter operation:

- "hour" - in this mode, the device will display hours continuously with set/reset capability. Use this mode when replacing an Altronic DH-100A hourmeter.
- "hr – nr" - in this mode, the device will display hours continuously starting with a zero reading and without any means to change the hour reading. Use this mode when replacing an Altronic 691026-2 hourmeter.

Establish the hourmeter mode from the two choices above:

1. Press and hold the ENTER key and press the MODE key until the display indicates "EnG", "turbo", "hour" or "hr – nr".
2. Use the ▲ and ▼ arrow keys to select "hour" or "hr – nr".

CAUTION: Once the "hr – nr" selection is made, it will not be possible for the user to change the hours reading or to change the configuration of the device.

3. If "hour" is selected, press ENTER to save the selection.
If "hr – nr" is selected, press the ENTER key for approx. 3 seconds until the display indicates "ConF". To confirm the selection, press ENTER again. NOTE: An "Error" message will appear if the user attempts to select a different configuration after the "hr – nr" selection has been selected.

B. HOURS READOUT AND SET/RESET - The built-in 5-digit hourmeter has a 99,999 hour range and a resolution of 1 hour. The hourmeter counts at the rate of 1 per hour when it recognizes a suitable input at terminals 1,2 or 3,4 (see paragraph 3.2). The hours display continuously.

NOTE: The set/reset feature below is not available if the “hr – nr” mode is selected in paragraph 5.3 A.

To set the hours reading to a different value:

1. Press and hold the ENTER key and press the MODE key repeatedly until the display shows a 5-digit number with “HOURS” and “PROGM” on the right side.
2. Use the ▲ or ▼ arrow key to increase or decrease the reading to the desired value.
3. Press ENTER.

C. HOURS LIMIT SETPOINT - When this feature is activated, the output switch is normally open below the trip point and closes at the setpoint. This feature may be used, for example, to alert the user to a maintenance interval. The output switch will remain closed (tripped) as long as the display reading is at or above the setpoint. In addition, the HOURS segment in the display will blink off and on as long as the output is in the faulted state.

The output switch will reset only if the hours reading goes below the setpoint value. This can be accomplished as follows:

- Reset the display reading (see paragraph 5.3 B.) to a lower number than the limit setting, or
- Change the high limit setting to a new, higher value. This is the only option if the “hr – nr” mode is selected in paragraph 5.3 A.

The setpoint for HOURS can be set from 100 to 99900 in 100 hour increments. Proceed as follows to activate the limit feature or to view or change the setpoint value:

1. Press and hold the ENTER key and press the MODE key until the display shows “OFF” or “XXXXX” with “HOURS” and “MODE” on the right side. OFF is the factory default setting. The high limit feature is not active unless numbers are entered setting the limit value.
2. Press the ▲ or ▼ arrow key to increase or decrease the value until the desired trip point is reached.
3. Press ENTER to accept and save the new value. The new value becomes effective only when the ENTER key is pressed and the display shows “SAVE”.

6.0 BATTERY - LOW INDICATION AND REPLACEMENT

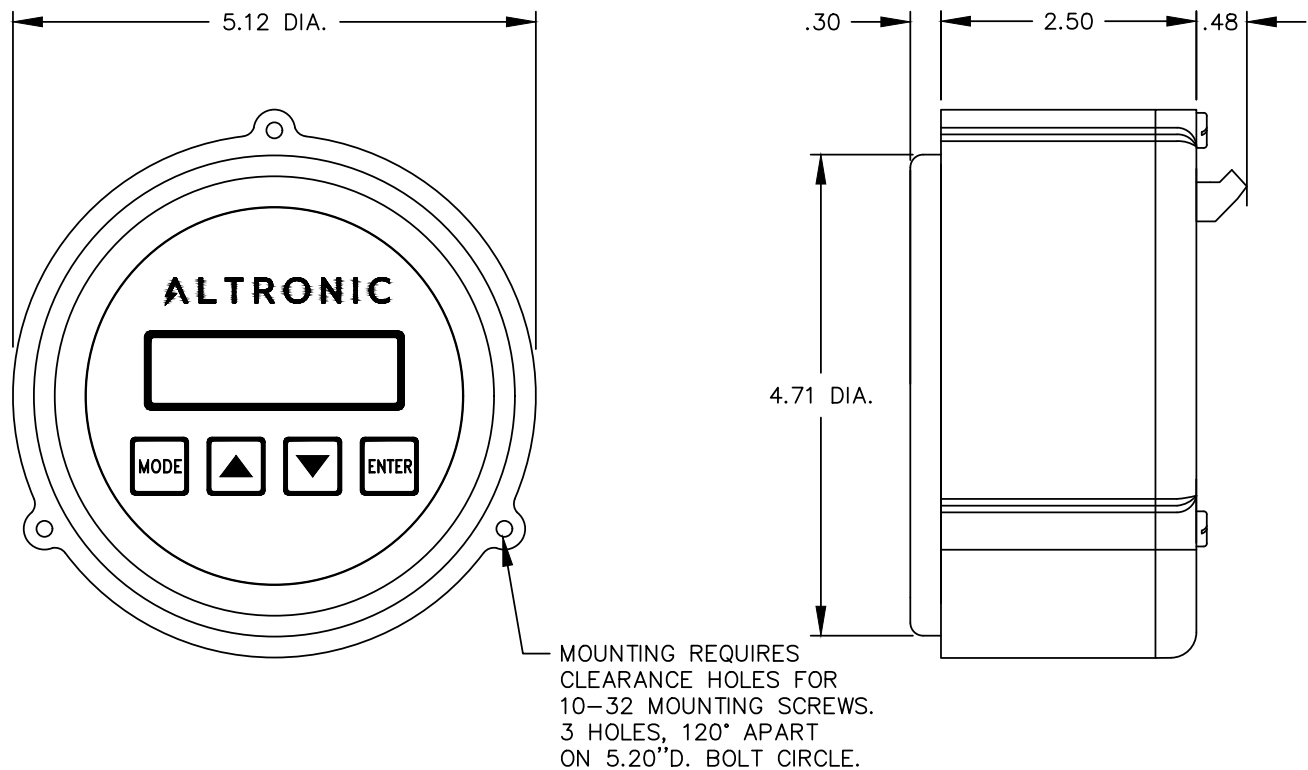
The tachometer is designed to give in excess of five (5) years of service life with the supplied, high energy density, extra-long life lithium battery. To test the battery, press the MODE key, the display will show "tEst", press ENTER and the display will show "bAt." for a good battery and "bAt.LO" when the battery needs replaced. Use 1 each "AA" size 3.6 volt high energy lithium battery, Tadiran model TL-5903/S or equivalent, Altronic P/N 601952. See figure 11 for battery replacement instructions. NOTE: DO NOT USE A STANDARD 1.5 VOLT "AA" BATTERY.

WARNING: TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, THE BATTERY MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS.

FIGURES SECTION:

- FIG. 1A Mounting Dimensions and Specifications – DTMO-1201
- FIG. 1B Mounting Dimensions and Specifications – DTMO-3201
- FIG. 2 Flowchart
- FIG. 3 General Electrical Connections
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- FIG. 6 Wiring Diagram – Magnetic Pickup Input
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FIG. 1A – DTHO-1201 MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER AND

SIGNAL INPUT: C.D. IGNITION "SHUTDOWN LEAD" (100 - 400V),
OR VARIABLE RELUCTANCE MAGNETIC PICK-UP: (3-20V PEAK)

CONFIGURATION: PROGRAMMABLE INPUT PULSE COUNT, ABILITY TO
ACCEPT INPUTS FROM UNEVEN PATTERNS.

DISPLAY: .4" 5 DIGIT LCD WITH DISPLAY INDICATORS.

RANGE: 0 TO 9999 (ENGINE), 0 TO 99,900 (TURBO).

DISPLAY UPDATE RATE: 1 TIME PER SECOND WITH DISPLAY FILTER.

INSTRUMENT ACCURACY: $\pm 0.5\%$, ± 1 DIGIT.

AMBIENT TEMPERATURE RANGE: -40° TO 175° F (-40° TO $+80^{\circ}$ C).

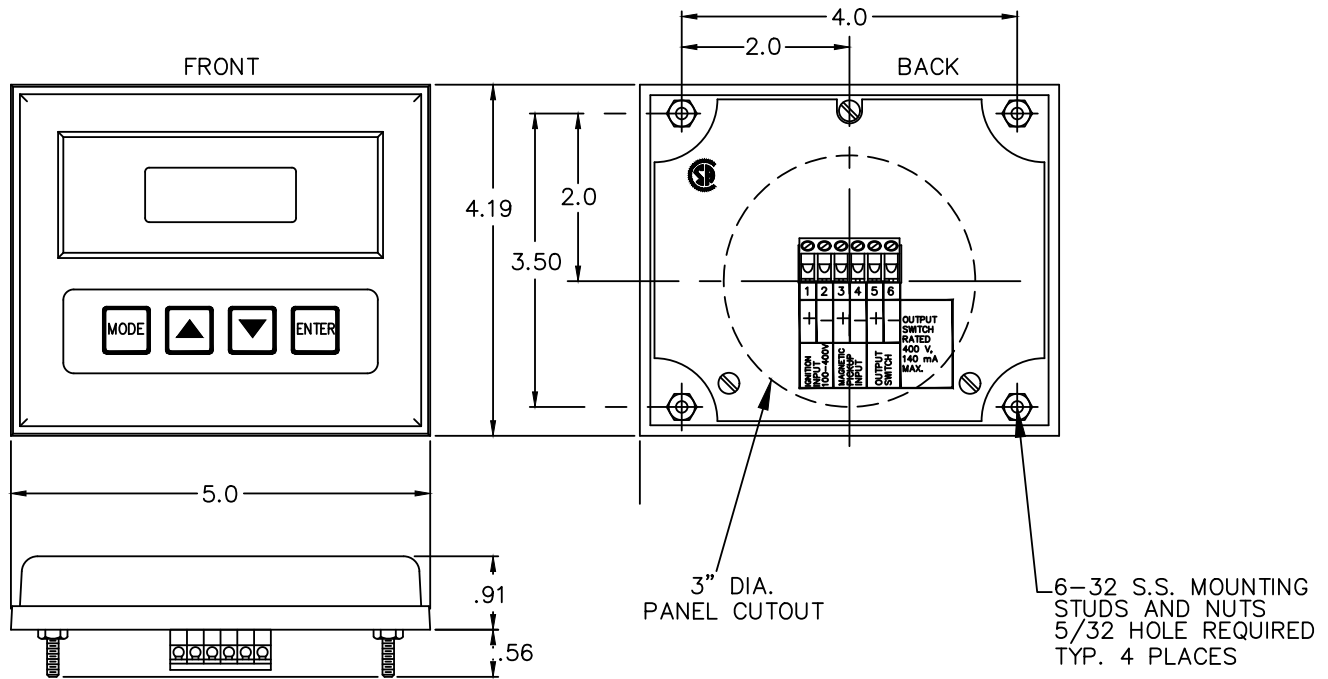
SETPOINT FOR ENG/TURBO MODE: 1 USER PROGRAMMABLE NORMALLY OPEN OVERSPEED SETPOINT.

SETPOINT FOR HOUR/HR-NR MODE: 1 USER PROGRAMMABLE NORMALLY OPEN HOURMETER SETPOINT.

OUTPUT SWITCH RATING: 400 VDC, 140mA CONTINUOUS.

HAZARDOUS AREA CLASSIFICATION: CLASS I, DIVISION 2, GROUPS C & D FOR DIRECT HOOK-UP.
INTRINSICALLY SAFE SÉCURITÉ INTRINSEQUE Exia.
CLASS I, DIVISION 1, GROUP D WHEN POWERED FROM
AN ALTRONIC ZENER BARRIER P/N 690107 OR 690108.
CLASS I, DIVISION 1, GROUPS C & D WHEN POWERED
FROM AN ALTRONIC 691118 MAGNETIC PICKUP.
MAX. AMBIENT TEMP. 80° C. T3

FIG. 1B – DTHO-3201 MOUNTING DIMENSIONS AND SPECIFICATIONS



SPECIFICATIONS:

POWER AND

SIGNAL INPUT: C.D. IGNITION "SHUTDOWN LEAD" (100 – 400V),
OR VARIABLE RELUCTANCE MAGNETIC PICK-UP. (3–20V PEAK)

CONFIGURATION: PROGRAMMABLE INPUT PULSE COUNT, ABILITY TO
ACCEPT INPUTS FROM UNEVEN PATTERNS.

DISPLAY: .4" 5 DIGIT LCD WITH DISPLAY INDICATORS.

RANGE: 0 TO 9999 (ENGINE), 0 TO 99,900 (TURBO).

DISPLAY UPDATE RATE: 1 TIME PER SECOND WITH DISPLAY FILTER.

INSTRUMENT ACCURACY: ±.5%, ±1 DIGIT.

AMBIENT TEMPERATURE RANGE: –40° TO 175°F (–40° TO +80°C).

SETPOINT FOR ENG/TURBO MODE: 1 USER PROGRAMMABLE NORMALLY OPEN OVERSPEED SETPOINT.

SETPOINT FOR HOUR/HR–NR MODE: 1 USER PROGRAMMABLE NORMALLY OPEN HOURMETER SETPOINT.

OUTPUT SWITCH RATING: 400 VDC, 140mA CONTINUOUS.

HAZARDOUS AREA CLASSIFICATION: CLASS I, DIVISION 2, GROUPS C & D FOR DIRECT HOOK–UP.
INTRINSICALLY SAFE SECURITE INTRINSEQUE Exia.
CLASS I, DIVISION 1, GROUP D WHEN POWERED FROM
AN ALTRONIC ZENER BARRIER P/N 690107 OR 690108.
CLASS I, DIVISION 1, GROUPS C & D WHEN POWERED
FROM AN ALTRONIC 691118 MAGNETIC PICKUP.
MAX. AMBIENT TEMP. 80°C. T3

FIG. 2 – DTHO-1201 / DTHO-3201 FLOWCHART

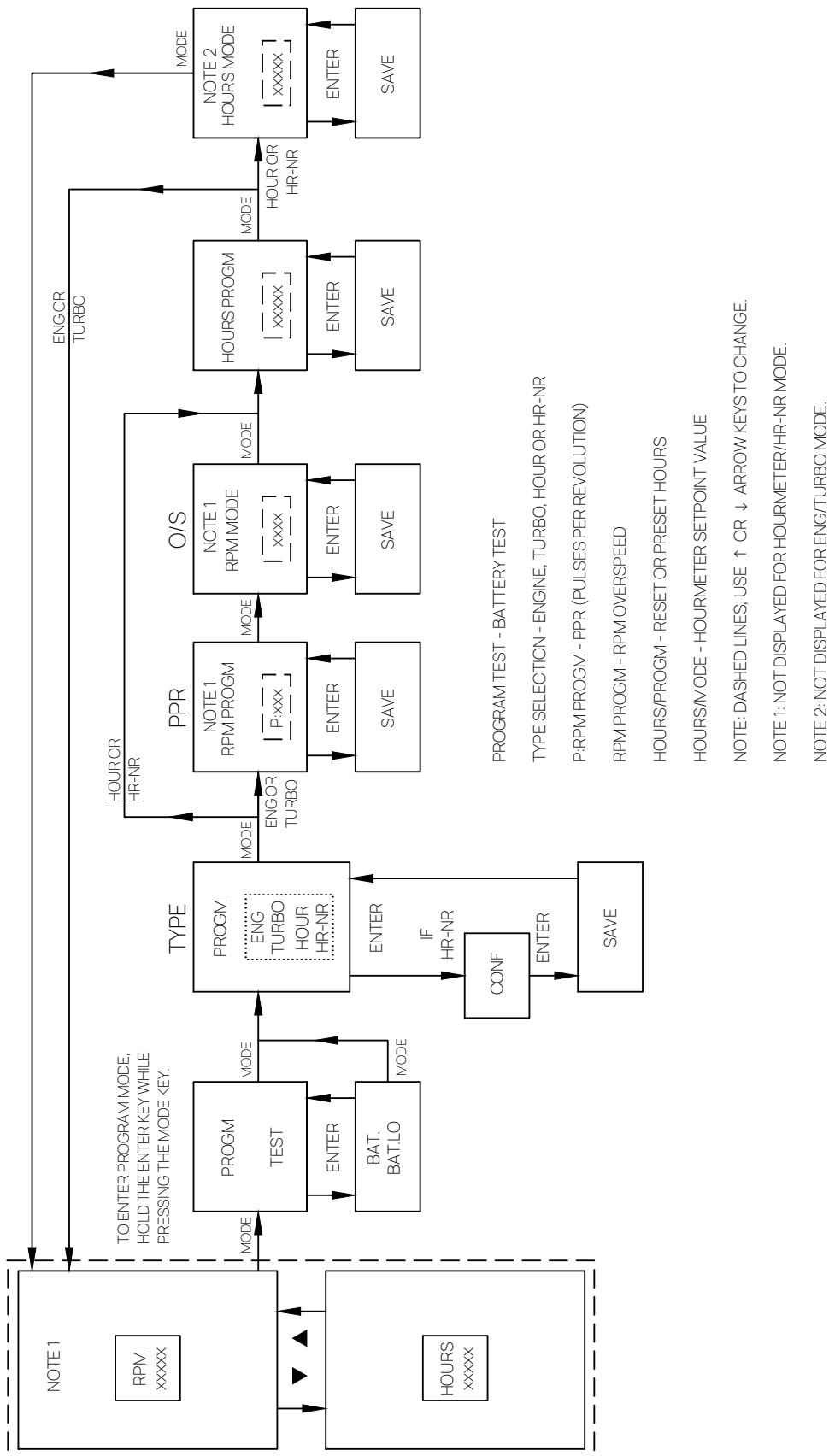


FIG. 3 – DTHO-1201 / DTHO-3201 GENERAL ELECTRICAL CONNECTIONS

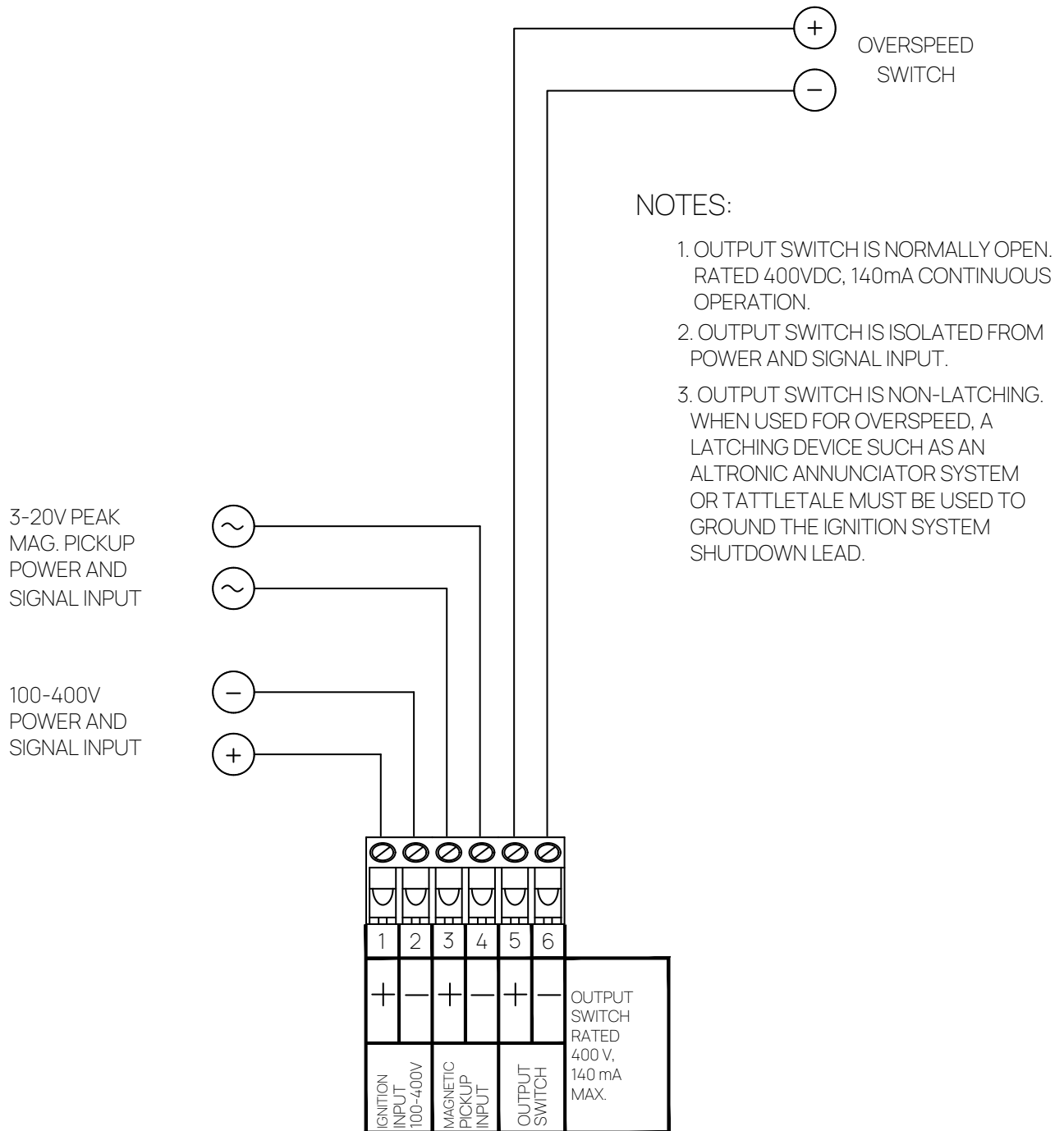


FIG. 4 – DTHO: NEGATIVE GROUND C.D. IGNITION SHUTDOWN LEAD INPUT

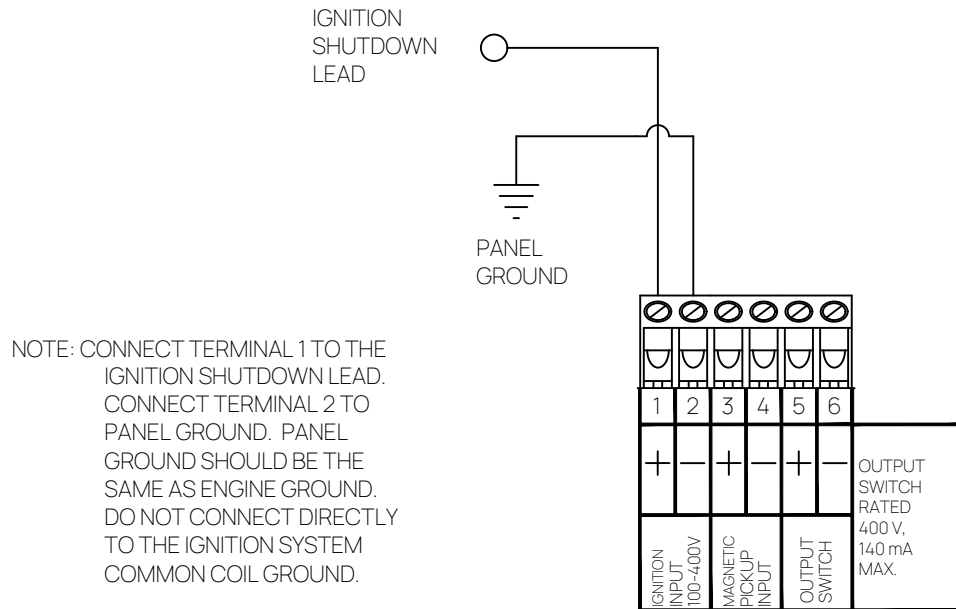


FIG. 5 – DTHO: POSITIVE GROUND C.D. IGNITION SHUTDOWN LEAD INPUT

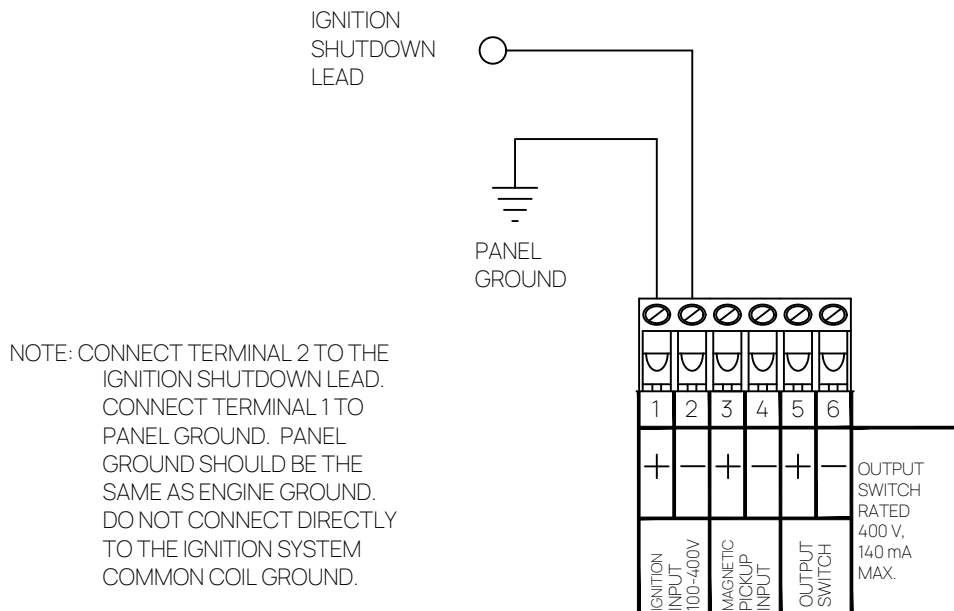


FIG. 6 – DTHO: MAGNETIC PICKUP INPUT

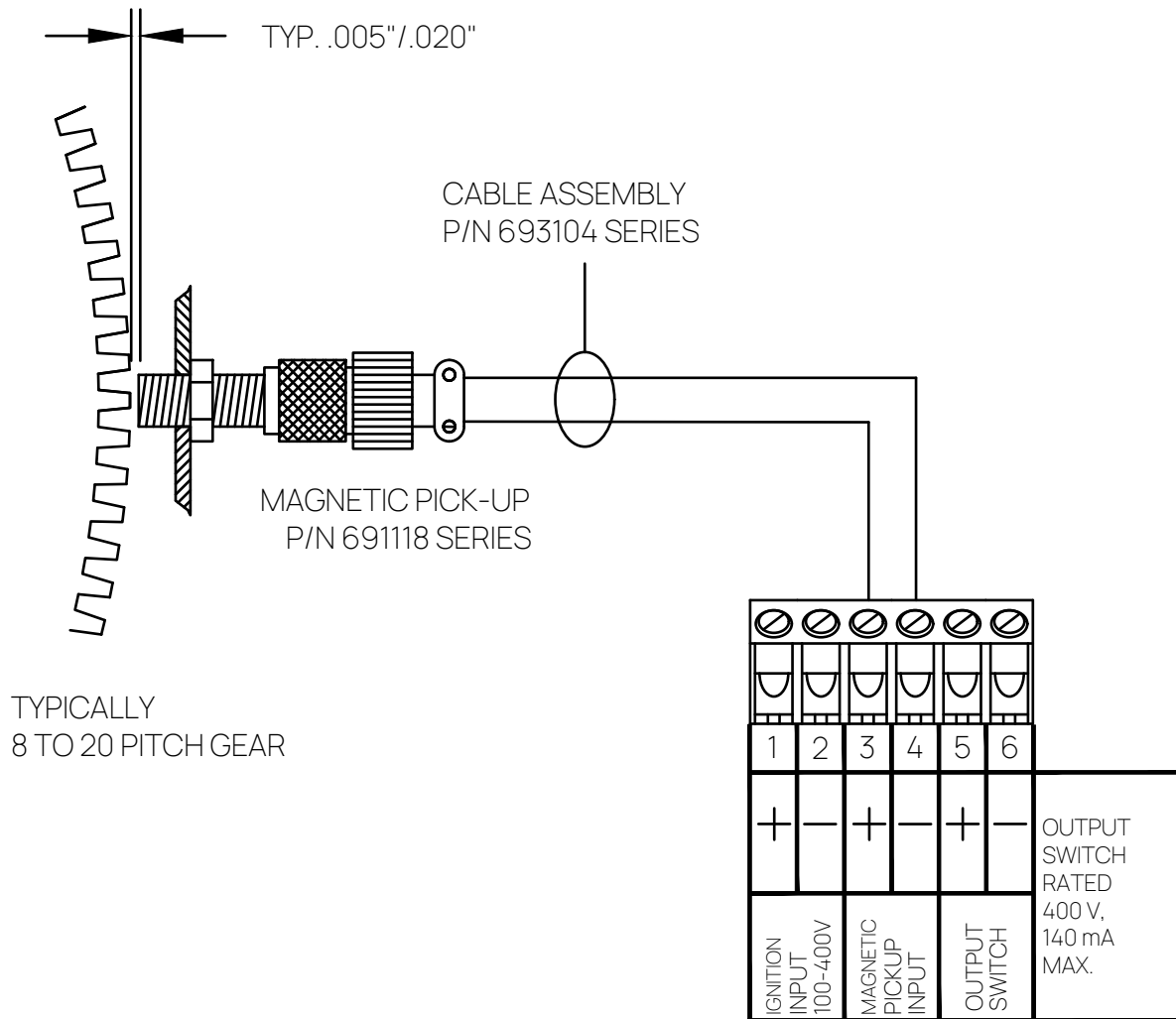
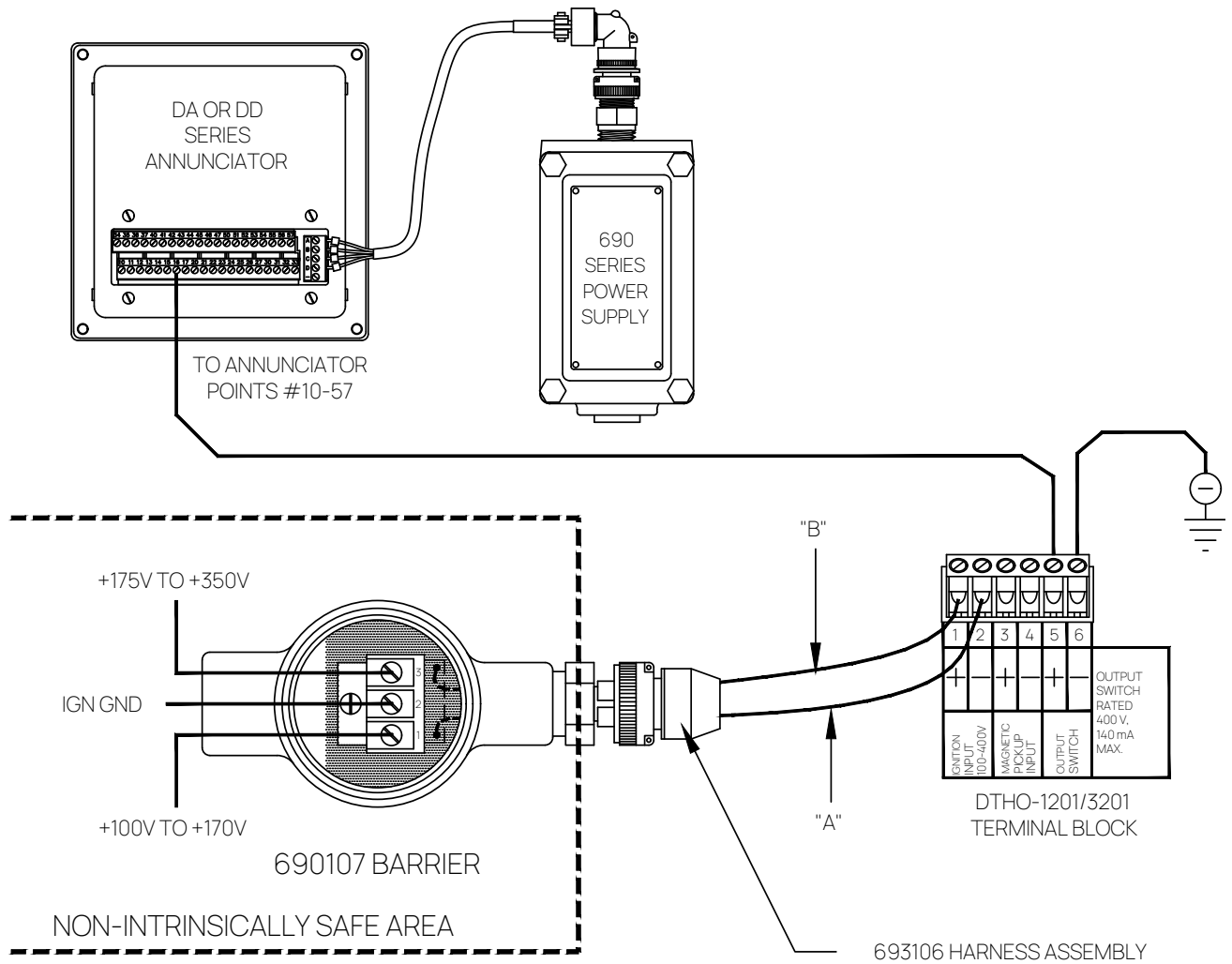


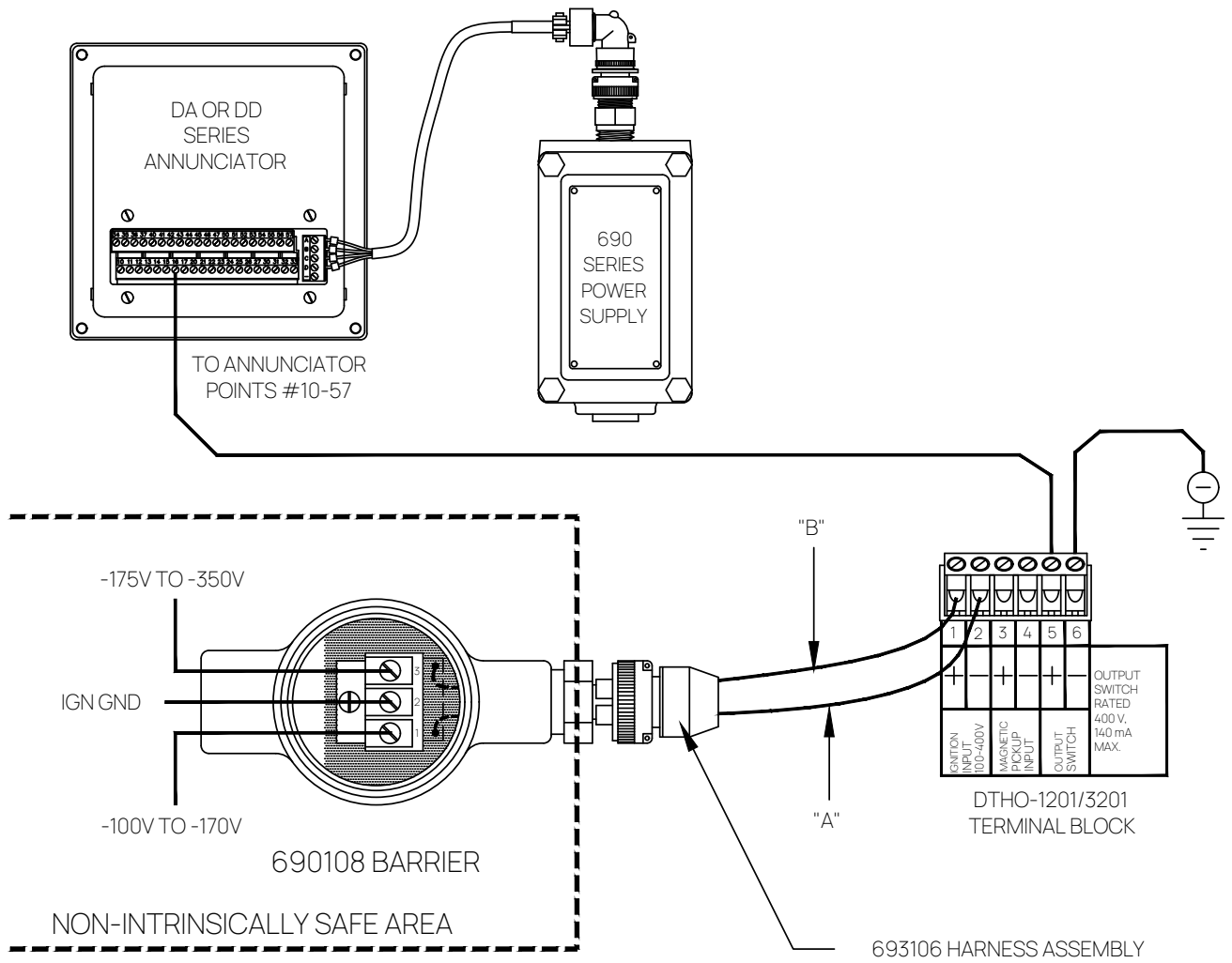
FIG. 7A – DTHO: INTRINSICALLY SAFE, NEGATIVE GROUND IGNITION SYSTEM



NOTES:

1. FOR CLASS I, DIV 1, GROUP D, INTRINSICALLY SAFE OPERATION, POWER THROUGH AN ALTRONIC 690107 ZENER BARRIER (FROM A CD IGNITION SHUTDOWN LEAD). FOLLOW ALL INSTRUCTIONS SUPPLIED WITH THE BARRIER. IF USED, CONNECT OUTPUT SWITCH TO DA OR DD SERIES ANNUNCIATOR WITH 690 SERIES POWER SUPPLY.

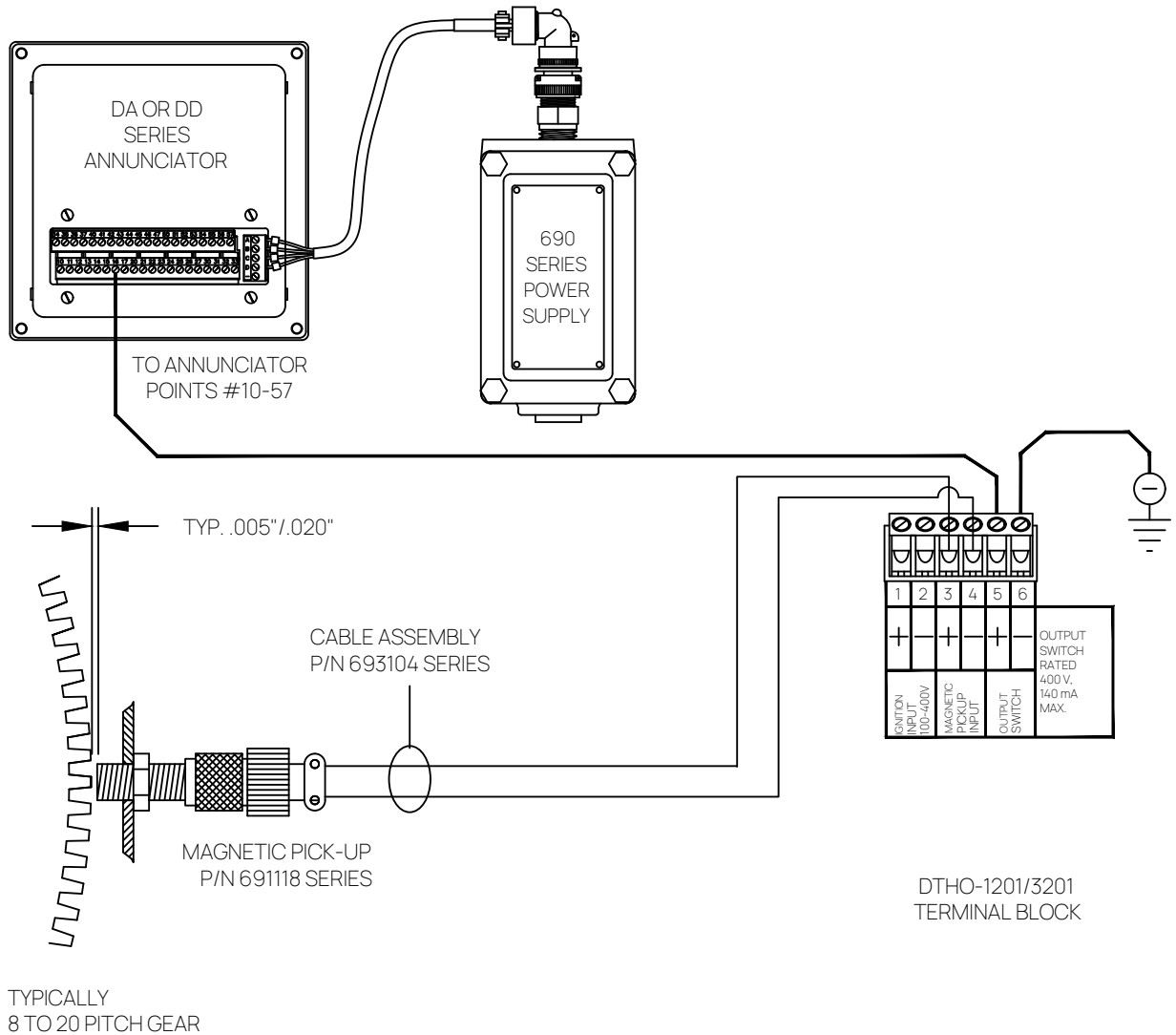
FIG. 7B – DTHO: INTRINSICALLY SAFE, POSITIVE GROUND IGNITION SYSTEMS



NOTES:

1. FOR CLASS I, DIV 1, GROUP D, INTRINSICALLY SAFE OPERATION, POWER THROUGH AN ALTRONIC 690108 ZENER BARRIER (FROM A CD IGNITION SHUTDOWN LEAD). FOLLOW ALL INSTRUCTIONS SUPPLIED WITH THE BARRIER. IF USED, CONNECT OUTPUT SWITCH TO DA OR DD SERIES ANNUNCIATOR WITH 690 SERIES POWER SUPPLY.

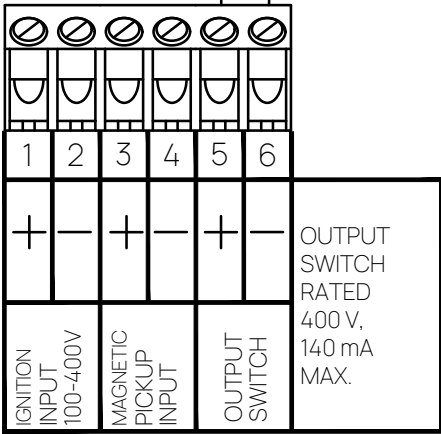
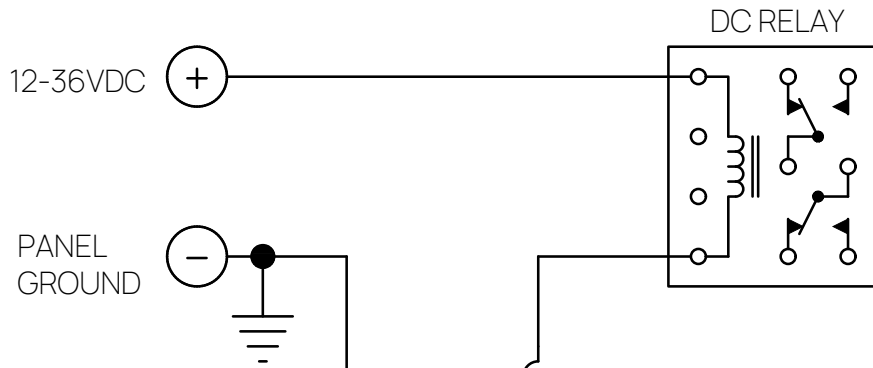
FIG. 7C – DTHO: INTRINSICALLY SAFE, MAGNETIC PICKUP 691118 SERIES



NOTES:

1. FOR INTRINSICALLY SAFE OPERATION, POWER THROUGH AN ALTRONIC 691118 SERIES MAGNETIC PICKUP.
2. CLASS I, DIV 1, GROUPS C & D WHEN OUTPUT SWITCH IS NOT USED. CLASS I, DIV 1, GROUP D WHEN CONNECTED TO 690 SERIES POWER SUPPLY AND DA OR DD SERIES ANNUNCIATOR.

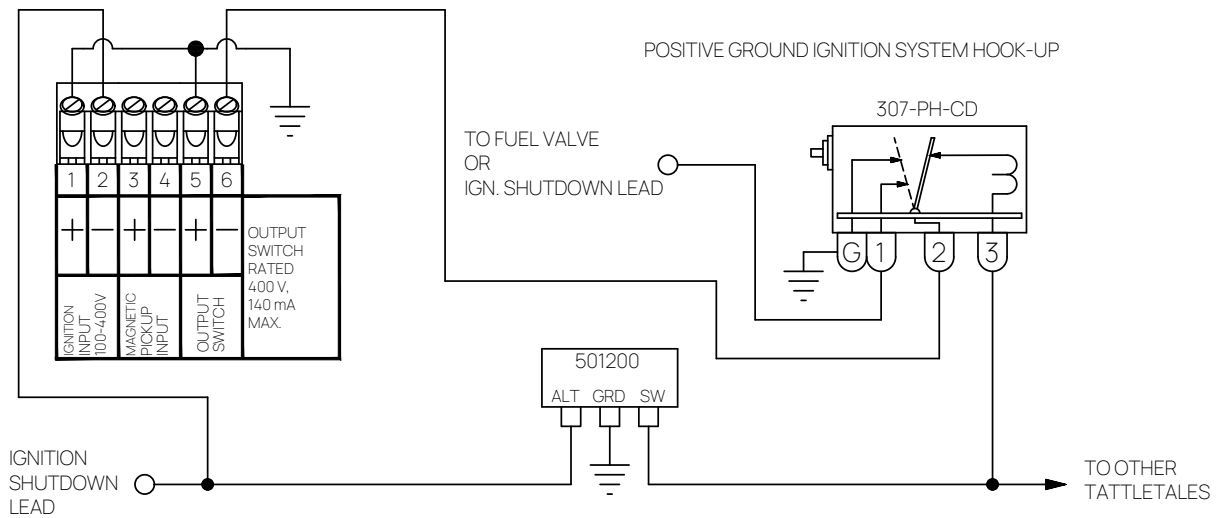
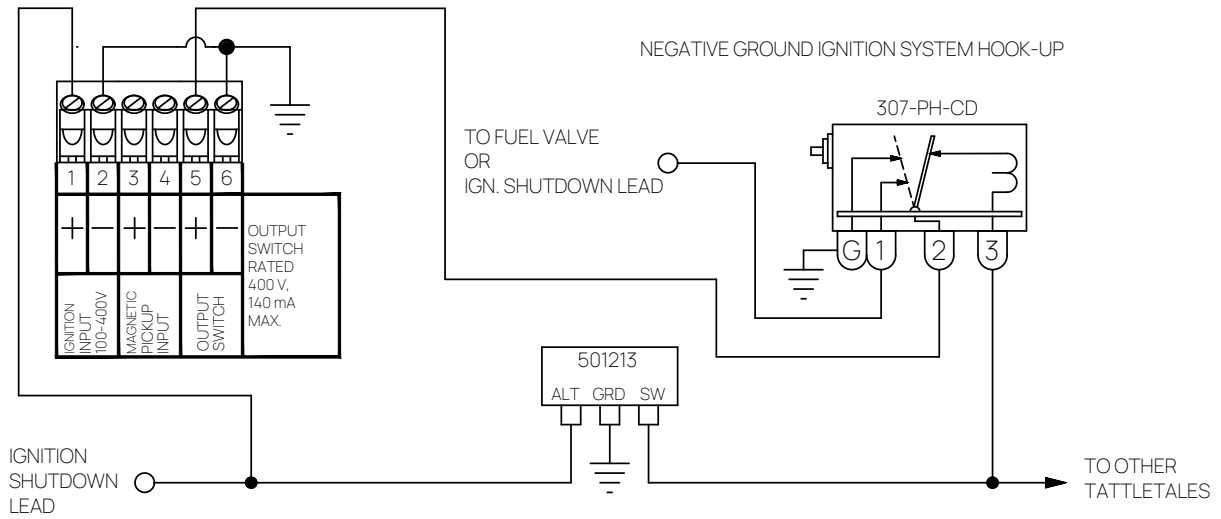
FIG. 8 – DTHO: DC RELAY



NOTES:

1. OUTPUT SWITCH IS RATED 400VDC, 140mA MAX.
2. OUTPUT SWITCH IS NON-LATCHING.

FIG. 9 – DTHO: TATTLETALE



12-24VDC MURPHY TATTLETALE HOOK-UP

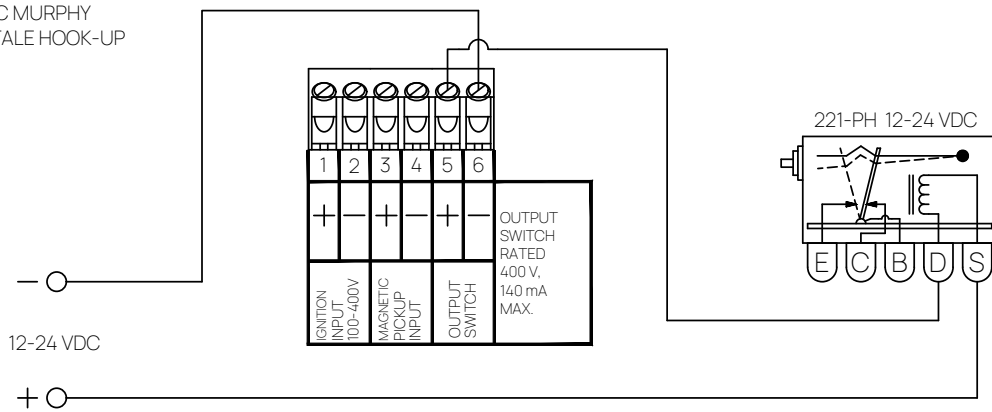


FIG. 10 – DTHO: PNEUMATIC VALVE

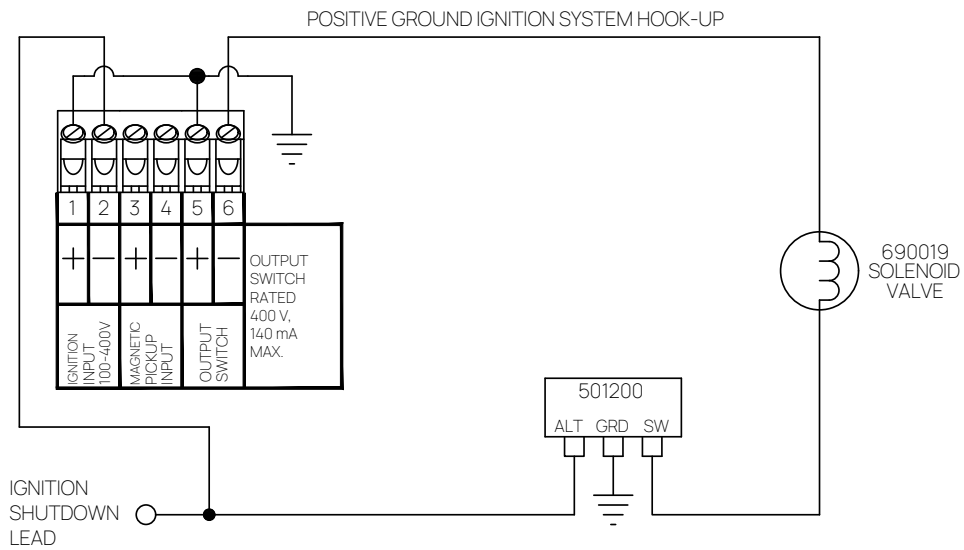
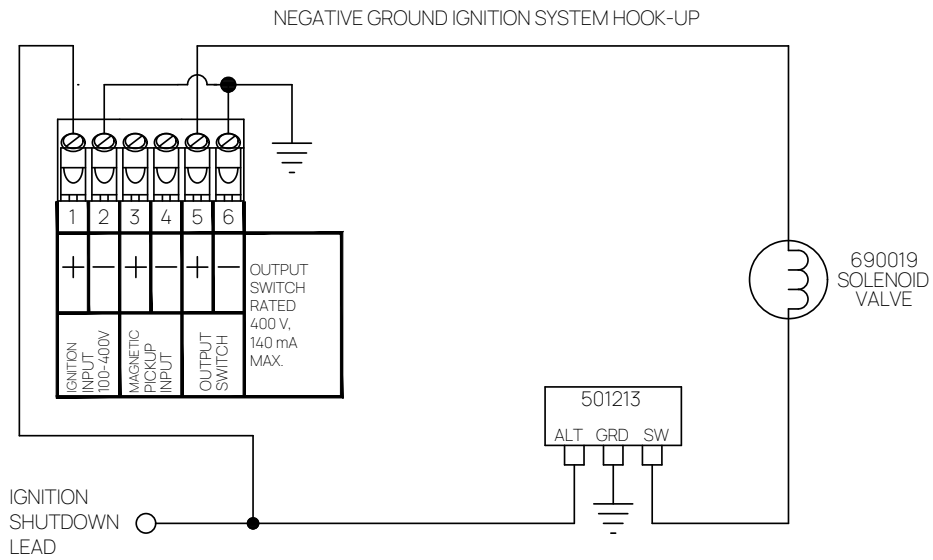
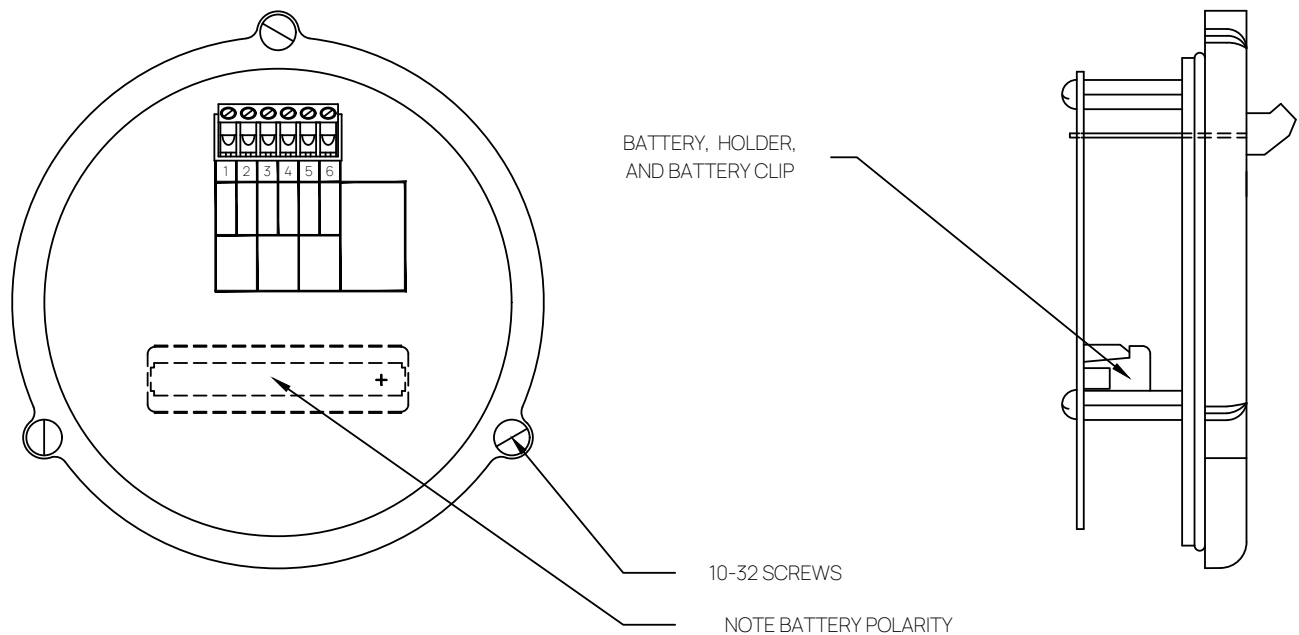


FIG. 11A – DTHO-1201 BATTERY REPLACEMENT



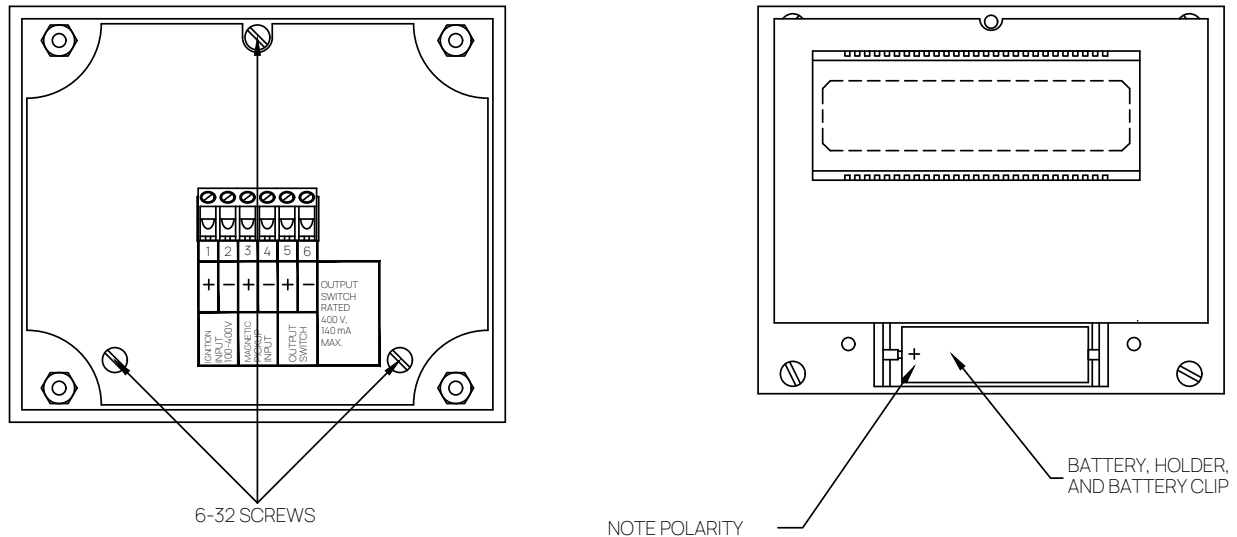
WARNING: TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS.

USE 1 EACH "AA" SIZE 3.6 VOLT HIGH ENERGY LITHIUM BATTERY, TADIRAN MODEL TL-5903/S, ALTRONIC P/N 601952.

NOTE: DO NOT USE A 1.5 VOLT "AA" SIZE BATTERY.

1. SEPARATE FRONT COVER FROM THE BACK HOUSING BY REMOVING THE (3) 10-32 SCREWS SHOWN.
2. LOCATE THE BATTERY, BATTERY HOLDER AND BATTERY CLIP, LOCATED ON THE BACK OF THE PCB.
3. REMOVE THE BATTERY CLIP FROM THE HOLDER.
4. REPLACE THE BATTERY, NOTING THE POLARITY INDICATED ON THE BACK VIEW OF TACHOMETER.
5. REPLACE BATTERY CLIP AND FRONT COVER.

FIG. 11B – DTHO-3201 BATTERY REPLACEMENT



WARNING: TO PREVENT IGNITION OF A HAZARDOUS ATMOSPHERE, BATTERIES MUST ONLY BE CHANGED IN AN AREA KNOWN TO BE NON-HAZARDOUS.

USE 1 EACH "AA" SIZE 3.6 VOLT HIGH ENERGY LITHIUM BATTERY, TADIRAN MODEL TL-5903/S, ALTRONIC P/N 601952.

NOTE: DO NOT USE A 1.5 VOLT "AA" SIZE BATTERY.

1. SEPARATE FRONT COVER FROM THE BACK HOUSING BY REMOVING THE (3) 6-32 SCREWS SHOWN.
2. LOCATE THE BATTERY, BATTERY HOLDER AND BATTERY CLIP, LOCATED ON THE FRONT OF THE PCB.
3. REMOVE THE BATTERY CLIP FROM THE HOLDER.
4. REPLACE THE BATTERY, NOTING THE POLARITY INDICATED ON THE BACK VIEW OF TACHOMETER.
5. REPLACE THE BATTERY CLIP AND FRONT COVER.