

INSTALLATION INSTRUCTIONS

DIGITAL ANNUNCIATOR DD-40NTV-O, DD-40NTV-U

FORM DD-40NTV II 12-09

**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 OVERVIEW

- 1.1** The Altronic DD-40NTV digital annunciator is an electronic, 40-point monitor and shutdown device. The annunciator has a built-in hourmeter/tachometer, overspeed and underspeed* protection, and pre-/post-lube control*. Local display and remote communication (via ModBus RTU) is included for all critical operating parameters, including the internal battery, supplied DC power, and CD ignition shutdown lead voltages.

NOTE: The DD-40NTV annunciator may also be used with the 691200-1 Power Supply to emulate the function of the DD-40NTS system. For more detail, refer to Form DD-40NTS II 5-02.



Features designated by an * in these Installation Instructions are NOT available if using the 691200-1 Power Supply.

- 1.2** The DD-40NTV annunciator is suitable for use in Class I, Division 2, Group C or D hazardous areas and consists of the following items:

- DD-40NTV-O Annunciator, 40 normally-open points
- DD-40NTV-U Annunciator, 40 normally-closed or open points (can be mixed)
- 691200-3 Power Supply: 10–30 Vdc, 50 mA max. or 100–400 volt negative ground CD ignition systems
- 693115-1 Cable, DB-25 (2 required for DD-40NTV-U unit only)
- 693116-1 Cable, D:B-9 (for RS-232 serial communications)

- 1.3** RS-232/RS-485 serial communications are provided for remote engine monitoring via modem or satellite. Serial communications require the use of the DC power option.

- 1.4** For reliable operation, the following instructions must be adhered to strictly.



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2.0 MOUNTING

2.1 ANNUNCIATOR UNIT:

Using four #10 screws, mount the Annunciator Unit 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. The annunciator unit box must be grounded.

2.2 691200-3 POWER SUPPLY:

The Power Supply mounts directly to the back of the Annunciator Unit using two 8-32 x 5/16" length screws provided.

3.0 WIRING (FIGS. 7 - 20)

3.1 The annunciator unit plugs into the power supply through a DB-9 connector.

3.2 The sensor leads connect to the removable terminal strips on the back of the annunciator. These terminal strips match those used with the earlier DD-40NT/DD-20NT systems.

3.3 At the terminal strip of the Annunciator unit, strip the insulation back 3/8"; twist the exposed wires tightly together. Insert the exposed wire end completely into the terminal strip and securely tighten the clamping screw. It is suggested that wire 18 AWG (max.) to 24 AWG (min.) be used for the connections directly to the annunciator terminal strip connector.

3.4 Wires running to the various sensors should be in good condition or replaced with new wiring. Terminations to the main panel terminal strip (if used) should be made with a suitable terminal and crimping tool or by soldering. There is no requirement for explosion-proof conduit or Class I enclosures; however, suitable physical protection should be provided.

NOTE: Avoid mounting with the LCD display facing direct sunlight.

The display temperature range is -40°F. to +175°F.

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



WARNING: REGARDING OLDER ALTRONIC OVERSPEED DEVICES

IF RETROFITTING INTO AN OLDER PANEL, THE DD-40NTV ANNUNCIATOR WILL NOT RECOGNIZE THE OUTPUT SIGNAL FROM OLDER ALTRONIC OVERSPEED DEVICES:

DT0-1000, DT0-1010, DT0-2200, DT0-3200
DTH0-2100, D0-3300, PTO-2100, PTH0-2100

THESE DEVICES WILL NOT WORK FOR OVERSPEED PROTECTION IN CONJUNCTION WITH A DD-40NTV ANNUNCIATOR. FOR SUCH PROTECTION, USE THE OVERSPEED FEATURE BUILT INTO THE DD-40NTV ANNUNCIATOR (REFER TO SECTION 6.3).



CAUTION:

- A. **SENSOR WIRING:** SENSOR WIRES WITHIN THE PANEL ENCLOSURE MUST BE KEPT AT LEAST TWO (2) INCHES FROM OTHER WIRING. USE A SEPARATE JUNCTION BOX FOR IGNITION AND FUEL VALVE WIRES. RUN SENSOR LEADS LEAVING THE PANEL IN A CONDUIT SEPARATE FROM ALL OTHER WIRING AND KEEP SEPARATE THROUGHOUT THE INSTALLATION. WIRING TO THE SENSORS MUST HAVE A GRADE OF INSULATION CAPABLE OF WITHSTANDING AN AC VOLTAGE OF 500 V. RMS. SENSOR LEADS MAY BE CONNECTED TO ANY PASSIVE DEVICE USING CONTACTS SUCH AS STANDARD SWITCH GAUGES OR LEVEL SWITCHES. DO NOT CONNECT SENSOR LEADS TO RELAY CONTACTS OR TO ANY VOLTAGE PRODUCING ELEMENT.
- B. SENSORS WILL BE EXPOSED TO MUCH LOWER VOLTAGES AND CURRENT THAN WITH THE STANDARD MURPHY TATTLETALE OR SIMILAR TYPE SYSTEM. IN THE CASE OF A FIELD CONVERSION WHERE SENSORS HAVE PREVIOUSLY BEEN USED WITH MURPHY TATTLETALES, IT IS RECOMMENDED THAT THE SENSORS BE CHECKED FREQUENTLY WHEN THE DD SYSTEM IS FIRST PUT INTO USE. SENSOR CONTACTS MAY BE BURNED OR PITTED FROM PAST EXPOSURE TO IGNITION SYSTEM PRIMARY VOLTAGE. IT IS ADVISABLE TO REPLACE SUCH SENSORS.
- C. IF IT BECOMES NECESSARY TO CHECK SENSOR TO PANEL WIRING WITH AN OHMMETER OR OTHER CHECKER, FIRST DISCONNECT THE PLUG-IN TERMINAL STRIPS FROM THE BACK OF THE ANNUNCIATOR UNIT. APPLYING VOLTAGE TO THE ANNUNCIATOR THROUGH THE SENSOR LEADS MAY DAMAGE THE DEVICE. IN ADDITION, THE AREA SHOULD BE TESTED AS NON-HAZARDOUS BEFORE SUCH TESTING COMMENCES.

4.0 ANNUNCIATOR CONFIGURATION

- 4.1 The DD-40NTV series unit MUST be configured prior to use. If replacing an older series DD series annunciator, modes 1 and 4 can be used to directly emulate the older system's performance. Mode 1 duplicates the operation of the DD-40 series and mode 4 duplicates the DD-20 series units. To configure the unit, press the **MENU** key to reach the configuration headings from the normal display mode. After a selection has been made, press the **ENTER** key to save the selection. Press **MENU** to move to the next step. A flowchart (**REFER TO FIG. 6A or 6B**) is provided that shows step-by-step progression through the annunciator configuration procedure.

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4.2 CONFIGURE MODE:

The mode selection allows the unit to be programmed in one of four modes as shown. The **RESET** button must be pressed after a change in mode number.

MODE	TYPE OF POINTS	CHANNELS	NOTES
1	24 Class A 16 Class B1	30-37, 40-47, 50-57 10-17, 20-27	Duplicates operation DD-40NT series.
2	24 Class A 12 Class B1 4 Class B2	30-37, 40-47, 50-57 10-17, 20-23 24-27	
3	24 Class A 10 Class B1 2 Class B2 4 Class C	30-37, 40-47, 50-57 10-17, 20-21 22-23 24-27	
4	12 Class A 8 Class B1	20-27, 30-32, 40 10-17	Duplicates operation of DD-20NT series.

NOTE: A keypad sequence (password) is required to edit values. From the status screen press and hold the **ENTER** key, then press the **MENU** key allow values to be modified. Otherwise, selected items may only be viewed. There is no similar protection for the **TIMER** button (Class B1 and B2 timers) or hourmeter.

Class Definitions:

Class A Point is always armed.

Class B1 Point is armed B1 time after power-up or pressing the **RESET** key.

Class B2 Point is armed B2 time after power-up or pressing the **RESET** key.

Class C Point is armed after it clears.

Use the **UP** and **DOWN** keys to select the mode and press the **ENTER** key to save the mode.

4.3 PROGRAM RPM 1:

This selects the RPM pre-divide number equal to the pulses per revolution (PPR). The RPM signal can be from either a CD ignition shutdown lead or a magnetic pickup. The range is selectable from 0 to 361 PPR. A "0" PPR VALUE is used in applications where a speed input is not used. Use the **UP** and **DOWN** keys to select the proper pre-divide number and press the **ENTER** key to save.

4.4 PROGRAM RPM 2:

This selects the RPM overspeed value. The range is selectable from 1 to 2499 RPM. Use the **UP** and **DOWN** keys to select the overspeed value and press the **ENTER** key to save the selection. To disable the

overspeed function, enter 2500.

4.5 PROGRAM RPM 12*:

This selects the RPM underspeed value. The range is selectable from 0 to 2500 RPM. Use the **UP** and **DOWN** keys to select the underspeed value and press the **ENTER** key to save the selection. To disable the underspeed function, enter 2500.

4.6 PROGRAM PRE-LUBE P1*:

This selects the time delay in seconds for which the LUBE (**LUB**) output is actuated on start-up. The range is from 1 to 999 seconds. Use the **UP** and **DOWN** keys to select the desired pre-lube time (in seconds) and press the **ENTER** key to save the selection. Entering a value of zero (0) as the setpoint disables the pre-lube function.

4.7 PROGRAM POST-LUBE P2*:

This selects the time delay in seconds for which the LUBE (**LUB**) output is actuated following a manual STOP or SHUTDOWN. The range is from 1 to 999 seconds. Use the **UP** and **DOWN** keys to select the desired post-lube time (in seconds) and press the **ENTER** key to save the selection. Entering a value of zero (0) as the setpoint disables the post-lube function.

4.8 PROGRAM TIMER 2:

This selects the time delay in seconds for tripping SDI and OUTPUT 2 after a fault occurs. The range of the delay is from 1 to 60 seconds. Use the **UP** and **DOWN** keys to select the time and press the **ENTER** key to save the selection. In typical applications, SW1 is used to turn off the fuel and either SDI or SW2 is used to turn off the ignition.

4.9 PROGRAM SW1:

This selects the RUN state of output SW1, normally open (N.O.) or normally closed (N.C.). Use the **UP** and **DOWN** keys to select the state and press **ENTER** to save.

4.10 PROGRAM SW2:

This selects the RUN state of output SW2, normally open (N.O.) or normally closed (N.C.). Use the **UP** and **DOWN** keys to select the state and press **ENTER** to save.

4.11 PROGRAM SERIAL MODE:

This selects the type of communications used by the annunciator. Selections are provided for NONE (must be used for ignition powered applications), RS-232 ASCII (A 232), RS-232 Modbus RTU (232), RS-485 ASCII (A 485), or RS-485 Modbus RTU (485). Use the **UP** and **DOWN** keys to select the state and press **ENTER** to save.

4.12 PROGRAM BAUD RATE*:

This selects the baud rate for communications. Select either 9600 or 38.4k baud. Use the **UP** and **DOWN** keys to select the baud rate and press the **ENTER** key to save the selection. This applies only for serial communications and need not be programmed for non-serial applications.

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4.13 PROGRAM NODE NUMBER:

This selects the node number for the annunciator. The range of the node number is from 01 to 99. Use the **UP** and **DOWN** keys to select the node number and press the **ENTER** key to save the selection. This applies only for serial communications and need not be programmed for non-serial applications.

4.14 PROGRAM HOURS:

This selects the pre-programmed number of hours. The range is from 00000 to 65535 hours. Press the **UP** and **DOWN** arrow keys to modify the hours, then press the **ENTER** key to save.

4.15 PROGRAM TYPE:

This selects the type of Power Supply being used with the system; type.1 for 691200-1 (NTS mode) or type.3 for 691200-3 (NTV mode).

4.16 TIMER KEY:

This selects the B1 and B2 timer delays. The range is from 1 to 999 seconds. Pressing the **TIMER** key once displays the B1 timer, and pressing the **TIMER** key again displays the B2 timer. Use the **UP** and **DOWN** keys to change the respective B timer and press the **ENTER** key to save the selection.

4.17 DEFAULT SETTINGS:

As shipped from the factory, the device default settings are as follows:

MODE	1
RPM1 (PPR)	1
RPM2	200 RPM
RPM 12	2500 RPM
P1*	0
P2*	0
TIMER2	5 seconds
SW1	N.O.
SW2	N.O.
SERIAL MODE	None
BAUD RATE*	9600
NODE NUMBER	01
HOURS	00000
B1 TIMER	5 seconds
B2 TIMER	10 seconds
TYPE	3

NOTE: Unit must be properly configured for each application prior to use.

5.0 KEYPAD DESCRIPTION/FUNCTION

5.1 MENU:

This key allows the user to view/change the following:

- Mode selection
- Pulses per revolution
- Overspeed value
- Underspeed value*
- Pre-lube on-time*
- Post-lube on-time*
- Output switch 1
- Output switch 2
- Communications
- Baud rate*
- Output timer 2
- Node number
- Programmed hours
- Power Supply Type

5.2 UPARROW:

This key is used to increment/modify selections and allows the user to view the current RPM, the hourmeter reading, annunciator status, and all of the monitored electrical voltages* (back-up battery, external DC power, and CD ignition power).

5.3 DOWNARROW:

This key is used to decrement/modify selections and allows the user to view the current RPM, the hourmeter reading, annunciator status, and all of the monitored electrical voltages (back-up battery, external DC power, and CD ignition power).

5.4 ENTER:

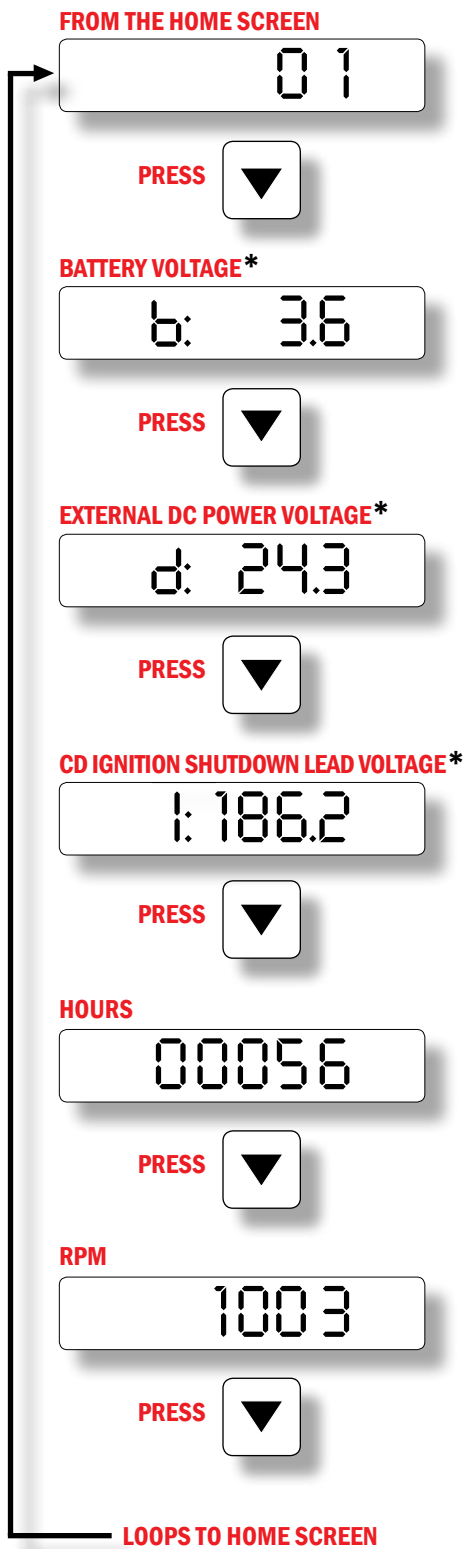
This key allows for selected items to be saved. When pre- or post-lubing, pressing the **ENTER** key will also cancel lubrication.

5.5 STOP:

This key initiates a shutdown condition and the unit will display a status of [60]. This has precedence over all other functions.

5.6 RESET:

This key clears any faults and resets the Class B1 and B2 timers. If the pre-lube function is active, **RESET** also actuates the **LUB** output.* The annunciator displays [00] if one or more points is not armed. Once all the channels are armed, the display reads [01]. The annunciator will power up in the **RESET** mode. The unit will not reset the outputs if any of the Class A points are faulted.



5.7 TEST:

This key provides for battery and operating voltage tests and also allows inputs to be tested (faulted) without causing a shutdown. The battery in the Power Supply may be checked when the machine is down and the display reads [00]; push and hold the **TEST** key – a reading of [80] indicates satisfactory battery voltage. The operating voltage may be checked when the machine is operating and the display reads [01]; push and hold the **TEST** key – a reading of [89] indicates the operating voltage is acceptable. To test the sensor input points, the annunciator must first be displaying [01] meaning all points are armed. Push and release the **TEST** key, and the display will read [09] indicating the Test Mode. Faulted points will be displayed but will not cause the outputs to trip. Testing an additional point requires the **TEST** key to be pressed again. The annunciator will remain in test mode for two minutes before reverting back to the running mode [01]. Any point not cleared in two minutes (either by pressing the **TEST** or **RESET** key) will cause the outputs to trip.

NOTE: Two fault occurrences will override the TEST mode: manual STOP function [60] and OVERSPEED [70].

5.8 TIMER:

This key allows the B1 and B2 delay timers to be viewed or modified.

5.9 KEYPAD SEQUENCE (PASSWORD) PROTECTION:

From the status screen, press and hold the **ENTER** key, then press the **MENU** key to allow values to be modified. Otherwise, the selected items may only be viewed. There is no keypad sequence protection for the **TIMER** key (Class B1 and B2 timers).

5.10 CANCEL TIMERS:

From the status screen, depress the **ENTER** key. While holding the **ENTER** key, also press the **DOWN ARROW** key.

6.0 OPERATION

See chart on next page.

6.1 OPERATING SEQUENCE

NOTE:

- a.) *TEST cannot be used until the start-up timer interval ends – [01] on the display.*
- b.) *A display reading of [09] means the system output will not activate unless the STOP button is pushed.*
- c.) *Do not leave a sensor number on the display after the last test; push the TEST button to get [09] on the display; then wait two minutes until [01] displays or select the CANCEL TIMERS feature.*
- d.) *For a complete system test, allow the test timer interval to expire – display changes from [09] to [01] – then cause one sensor to fault and allow the system output to activate. This will test the entire system for correct operation upon a fault with minimal downtime.*

MACHINE	DISPLAY	FUNCTION	DESCRIPTION
Down	[10-57]	Shutdown	Shutdown caused by the fault number indicated. Number will remain until fault is corrected and RESET button depressed.
	[60]	Shutdown	Shutdown caused by depressing STOP button.
	[70]	Shutdown	Shutdown caused by overspeed.
	[71]	Shutdown	Shutdown caused by loss of RPM signal.
	[72]*	Shutdown	Shutdown caused by underspeed. This is a Class C function which is armed when the setpoint is exceeded by 100 RPM.
	[80]	Shutdown	Push TEST button when down, indicates battery is OK.
	[00]	Reset	Before starting machine, momentarily push the RESET button. A display of [00] indicates all Class A sensors are ready for start-up. Any number 10-57 indicates a faulted sensor that must be cleared before start-up.
Running	[60]	Engine Purge	To purge engine prior to start, depress the STOP button, roll the engine to purge, then push the RESET button. Engine can then be started provided display reads [00].
	[61]	Shutdown	Shutdown caused by DE, a serial stop command.
	[00]	Start-up	Start-up timers have Class B1 and B2 points disarmed. All Class A points are being monitored. Pushing the RESET button re-cycles the start-up timers. To cancel the start-up timers, press the ENTER key, followed by the DOWN key while still depressing the ENTER key.
	[01]	Normal	All points are being monitored. The transition from [00] to [01] indicates the end of the last start-up timer interval.
	[89]	Test	From [01] display, press and hold TEST button; indicates adequate operating voltage.
	[09]	Test	Press and release TEST button – a timed test period is initiated for approximately two minutes. As a sensor is faulted, its number is latched on the display (but the output is not activated). To move to the next point, first clear the sensor, then push the TEST button again. The display reverts to [09] until the next sensor is faulted. After the last test, push the TEST button to get [09] on the display; wait two minutes until [01] displays.
	[01]	Normal	Test period has ended; all points are being monitored. DO NOT LEAVE MACHINE UNLESS DISPLAY READS [01].

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6.2 RPM/HOURMETER:

Press the **UP** and **DOWN** keys to view the RPM, hourmeter and voltages*. The RPM screen remains until the operator chooses another option. The **HOURS** display will revert to the status screen after two minutes. In either case, the annunciator will display the fault number when a shutdown occurs.

6.3 RPM OVERSPEED PROTECTION:

The DD-40NTV annunciator has a built in tachometer to monitor engine overspeed. When the detected RPM is greater than the RPM overspeed setpoint, the annunciator will trip the fuel and ignition outputs. When this occurs, the unit will display [70] and activate the **FAULT** indicator. **REFER TO FIGS. 7 – 20** for the further details.

6.4 RPM UNDERSPEED PROTECTION*:

The DD-40NTV annunciator has a built in tachometer to monitor engine underspeed. This point is armed when the underspeed setpoint is exceeded by 100 RPM. Once armed, should the monitored RPM fall below the setpoint, the annunciator will trip the fuel and ignition outputs. When this occurs, the unit will display [72] and activate the **FAULT** indicator. **REFER TO FIGS. 7 – 20** for further details.



WARNING:

THE DD-40NTV ANNUNCIATOR WILL NOT RECOGNIZE THE OUTPUT SIGNAL FROM AN ALTRONIC DTO-3200 OR OTHER OLDER OVERSPEED DEVICES (SEE LISTING ON PAGE 2). THESE DEVICES WILL NOT WORK FOR OVERSPEED PROTECTION IN CONJUNCTION WITH A DD-40NTV ANNUNCIATOR. FOR SUCH PROTECTION, USE THE OVERSPEED FEATURE BUILT INTO THE DD-40NTV ANNUNCIATOR.

6.5 BATTERY:

The Power Supply contains a special long-life lithium battery. When the monitored equipment is not operating, current draw from the battery is only microamps (millionths of amps). When the annunciator is powered, there is no drain from the battery. This allows for a battery life of up to 5 years in normal operation. The battery in the power supply is replaceable; use **ONLY** Altronic part no. 601952. Be sure to observe the proper polarity as marked in the Power Supply when replacing the battery.

7.0 FAULT OUTPUTS

- 7.1** Two digital outputs, SW1 and SW2 are in the Power Supply. These are rated 400 volts DC, 0.5 amp maximum.
- 7.2** Output SW1 will trip immediately upon a fault condition or if the **STOP** key is depressed.
- 7.3** Outputs SDI and SW2 will trip after a pre-programmed time delay (TIMER PROGM2) from either a fault condition or if the **STOP** key is depressed.
- 7.4** For Power Supplies 691200-1 and 691200-3, the maximum voltage is 400 volts from a negative ground C.D. ignition with a current drain of microamps. The maximum current rating is 50 mA when powered from a DC voltage source of 10 to 30 volts.

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8.0 PRE-LUBE/POST-LUBE OUTPUT*

8.1 One (1) digital output LUB is located in the power supply 691200-3*. It is rated 400 volts DC, 0.5 amp maximum.

8.2 Output LUB will be actuated under two operating conditions:

- Following a RESET (remote or manual), the LUB output will remain actuated until the pre-lube timer (P1) expires.
- Following a manual STOP or FAULT, the LUB output will remain actuated until the post-lube timer (P2) expires.

NOTE: The letter “L” will appear in the display when the LUB output has been actuated. To cancel the pre-lube or post-lube countdown timers, press the ENTER key. If pre-lubing, the annunciator will immediately initiate the Class B timer(s).

9.0 SERIAL COMMUNICATIONS

9.1 Serial communications may be selected as RS-232 or RS-485 using ASCII or Modbus RTU protocol.

9.2 MASTER/SLAVE OPERATION:

The RS-485 communication system in the annunciator is designed as a master/slave system; that is, each unit responds to its own unique address (node number) only after it is interrogated by the master (computer). A simple command/response protocol must be strictly observed.

9.3 NODE NUMBER:

The node number is used in the system to identify the desired slave unit being polled. The node number can be any numeric value from 1 to 99.

9.4 ASCII COMMUNICATION:

All communication to and from the annunciator is performed using ASCII characters. This allows the information to be processed with the “string” functions common to high level computer languages such as BASIC and C. For computers that support standard serial port interfaces, no special machine language software drivers are required. The use of the ASCII format also allows for the connection of these devices to an auto answer modem for long distance operation without the need for a local supervisory computer. The ASCII characters also make system debugging easy using standard terminal emulation software.

9.5 COMMUNICATIONS PARAMETERS:

- Baud Rate: 9600 or 38.4k*
- Data Bits: 8
- Stop Bits: 1
- Parity: None

9.6 COMMAND STRUCTURE:

The annunciator operates with a simple command/response protocol to monitor all functions. A command must be transmitted to the unit by the master (computer or PLC) before the slave can respond with useful data. A slave unit can never initiate a communications sequence.

Communication to the annunciator is performed with two character ASCII command codes. The general format used for the commands is illustrated below using the READ DATA command as an example. The hexadecimal values for the characters are shown only as a reference for those using low level (assembly language) decoding and will not appear on the communications terminal screen. All of the characters used in the communications protocol are standard ASCII characters and appear on the computer keyboard as shown with the exception of the “not acknowledge” (NAK) which is the industry standard “control U”.

	header	start	node	space	command	end
ASCII	>	(01	R	D)
HEX	3Eh	28h	30h 31h	20h	52h 44h	29h

Command Header “>” (3Eh):

Each command must begin with the command header sometimes referred to as a prompt character. The ASCII character used is the “>” which means that a command message will be sent from the master to the slave.

Start of Text “(” (28h):

The command header must be followed by the start of text indicator.

Node Number “01 -99” (30h 31h):

The node number or address of the device being contacted.

Space (20h):

Following the node number is an ASCII space character (not printable, value 20h) to act as a delimiter between the node number and the two character command word.

Command Word “RD” (52h, 44h):

The command words are standard two letter (upper case) commands sent by the master for gathering specific information about the status of a slave. The commands are listed under STANDARD COMMANDS below.

End of Text “)” (29h):

The end of text indicator says this is the end of the command.

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STANDARD COMMANDS

Information coming from serial command(s)	Command	Response	Notes
Annunciator status	>(01 RD)	<(01 XX)	(XX - Refer to section 6.0)
Read hourmeter	>(01 RH)	<(01 XXXXX)	(XXXXX = Hours)
Read current RPM	>(01 RP)	<(01 XXXX)	(XXXX = RPM)
Reset the annunciator	>(01 RR)	<(01 RR)	
Stop the annunciator	>(01 RS)	<(01 RS)	

Valid Response:

A command/response sequence is not complete until a valid response is received. When a slave unit receives a valid command, it interprets the command, performs the desired function and then communicates the response to the master within 20mS. The master may not initiate a new command until the response from a previous command is completed.

A valid response can occur in three ways:

- A normal response indicated by a “<” header and “()” beginning and end of text.
- An error response indicated by a “S” NAK (not acknowledged).
- A communications time-out error.

An NAK error response will be sent by the annunciator when it has received a command with an error in the message. All commands must be of the format above. The header, start-and-end of text characters, a valid node number and spaces must be sent and correct to receive an NAK; if not, no response will be sent.

9.7 RS-485 COMMUNICATIONS:

• HALF DUPLEX OPERATION:

The RS-485 system employed uses two wires for communication and cannot send and receive data at the same time over the same two wires making it a half duplex system. When the master is in the transmit mode, the slave is in the receive mode and visa-versa.

• ELECTRICAL OPERATING RANGE:

RS-485 is a communications standard to satisfy the need for multi-dropped systems that can operate at high speeds over long distances. RS-485 uses a balanced differential pair of wires switching from 0 to 5 volts to communicate data. RS-485 drivers can handle common mode voltages from -7 to +12 volts without loss of data, making them an excellent choice for industrial environments.

- **COMMUNICATIONS WIRING:**

The RS-485 wiring diagram illustrates the wiring required for multiple slave unit hookup. Note that every slave unit has a direct connection to the master. This allows any one slave unit to be removed from service without affecting the operation of the other units. Every unit must be programmed with a unique address or node number, but the addition of new units or nodes can be in any order. To minimize unwanted reflections on the transmission line, the bus should be arranged as a trunk line going from one module to the next. Random structures of the transmission line should be avoided. Special care must be taken with long busses (500 feet or more) to ensure error free operation. Long busses must be terminated with a 120 ohm resistor between the terminals marked RS-485 "A" and RS-485 "B" at the master only. The use of twisted pair shielded cable will enhance signal fidelity and is recommended. To prevent ground loops the shield should be connected to the shield terminal at the master only.

- **LOADING:**

RS-485 uses a balanced differential pair of wires switching from 0 to 5 volts to communicate data. In situations where many units (99 max.) are connected together on a long run, voltage drop on the communications leads becomes a major problem. Voltage drops on the RS-485 minus lead appear as a common mode voltage to the receivers. While the receivers are rated to a maximum voltage difference of ± 7 volts, $-7V$ to $+12V$, a practical system should not have a voltage difference exceeding ± 3 volts under normal conditions. The wire gauge used for the connections limits the maximum number of units or the maximum length of wire between units in each application. The following formula can be used as a guideline to select the appropriate wire gauge.

NOTE: The maximum number of units that can be connected in a system is 99.

For 18 AWG wire No. of annunciator units = $(4000)/(\text{ft of wire used})$

For 20 AWG wire No. of annunciator units = $(3600)/(\text{ft of wire used})$

For 22 AWG wire No. of annunciator units = $(2400)/(\text{ft of wire used})$

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9.8 RS-232 COMMUNICATIONS:

- For proper operation, the wire length should not exceed 50 feet.
- Use standard DB-9 connector and computer cable Altronic 693 116-x or equivalent.

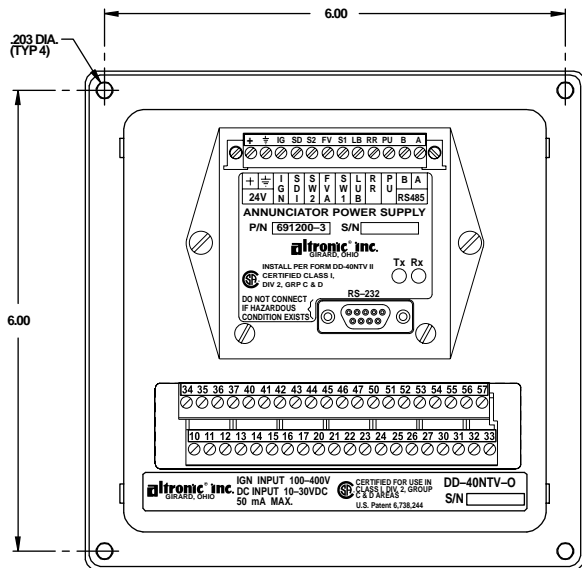
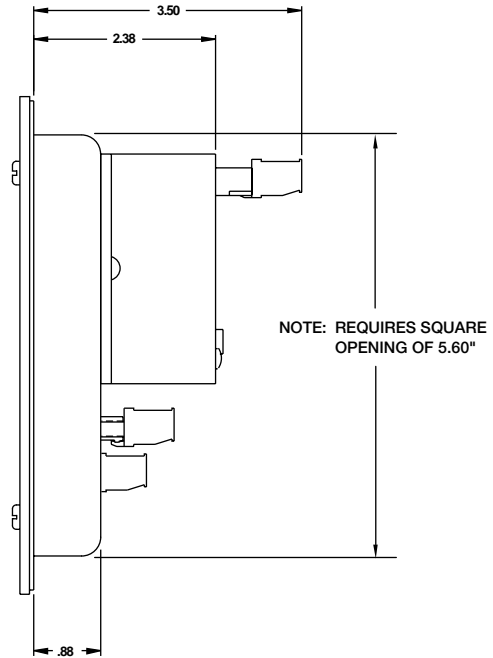
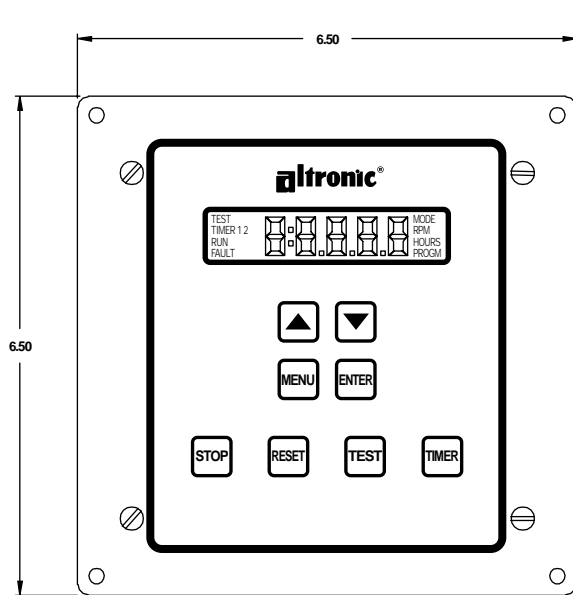
9.9 MODBUS STRUCTURE:

The annunciator can operate as a Modbus RTU slave. A command must be transmitted to the unit by the master (computer or PLC) before the slave can respond with useful data. A slave unit can never initiate a communications sequence.

Select the Modbus communications option. **SEE SECTION 4.11.** Communication to the annunciator can then be performed using standard Modbus RTU protocol. Multiple register reads are supported, specify number of registers.

REGISTER	MODBUS REGISTER VALUE
40001	RPM (0-2500)
40002	Hourmeter hours (0-65535)
40003	Class B1 timer left to expire (seconds)
40004	Annunciator Status (contains same status as display)
40005	Output Status (bit 0 = SW1, bit 1 = SW2, 1 = tripped, 0 = running)
40006	Input (chan. 10-27; bit 0 = 10, bit 8 = 20, bit 15 = 27)
40007	Input (chan. 30-47; bit 0 = 30, bit 8 = 40, bit 15 = 47)
40008	Input (chan. 50-57; bit 0 = 50, bit 7 = 57, bit 8 = ovrspd, bit 9 = loss of spd, bit 10 = underspeed) Input OK = 1, Input Fault = 0; 40006, 40007, 40008 all FF for running OK
40009*	Class B2 timer left to expire (seconds)
40010*	Test timer left to expire (max. 120 seconds); 0 = not in Test Mode
40011*	Time from Fuel Trip (seconds) before Ignition Shutdown
40012*	Pre-lube left to expire (seconds); 0 = prelube not being performed
40013*	Post-lube left to expire (seconds); 0 = postlube not being performed
40018*	Internal Battery Voltage (Example: 36 = 3.6 volts)
40019*	DC Power Voltage (Example: 246 = 24.6 volts)
40020*	Ignition Voltage (Example: 1847 = 184.7 volts)
40021*	B1 Setpoint (seconds)
40022*	B2 Setpoint (seconds)
40023*	Ignition Delay Setpoint (seconds)
40024*	Prelube Setpoint (seconds)
40025*	Postlube Setpoint (seconds)
40026*	DD-40NTV Configure Mode (SEE SECTION 4.2)
40082*	Overspeed Setpoint
40083*	Underspeed Setpoint

FIG. 1 SPECIFICATIONS AND DIMENSIONS, DD-40NTV-0



SPECIFICATIONS:

POWER REQUIRED: DC POWERED 12-24 VDC, 5 WATTS TYPICAL OR CD IGNITION SYSTEM 100 VOLTS MINIMUM.

INPUTS: RPM SIGNAL FROM CD IGNITION OR PICKUP.
40 DISCRETE SWITCH INPUTS NORMALLY OPEN.
4 SELECTABLE OPERATING MODES FOR NUMBER OF CLASS A, B (TWO TIMERS B1, B2) AND C SENSORS.

MODE	A	B1	B2	C
1	24	16	0	0
2	24	12	4	0
3	24	10	2	4
4	12	8	0	0

OUTPUTS: 3 DIGITAL OUTPUTS.
AUXILIARY TERMINALS FOR CD IGNITION SHUTDOWN AND FUEL VALVE TRIP, PROGRAMMABLE DELAY TIME ON OUTPUT SW2.

FEATURES: INTEGRATED UNDERSPEED, OVERSPEED TACHOMETER AND RUNTIME HOURMETER, PRE-LUBE/POST-LUBE.

DISPLAY CUSTOM 5-DIGIT LCD DISPLAY.

SCAN RATE: SCANS ALL 40 DISCRETE SWITCHES 5 TIMES/SECOND.

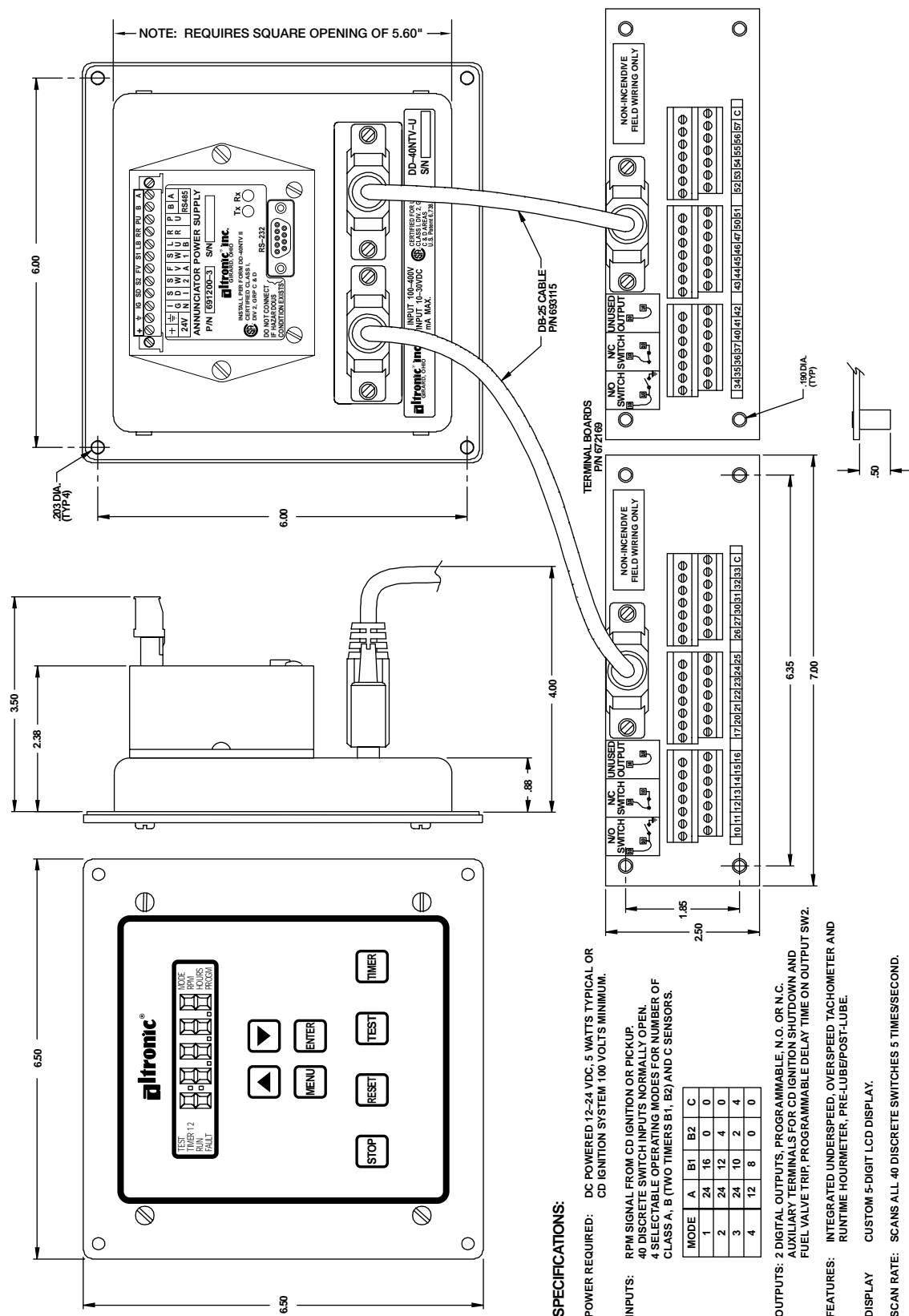
OPERATING TEMPERATURE RANGE: -40° C TO +80° C (-40° F TO 176° F)

COMMUNICATIONS: RS-232 OR RS-485, CONNECTION ON POWER SUPPLY (DC POWER REQUIRED)

HAZARDOUS AREA CLASSIFICATION: CLASS 1, DIV. 2, T4, GROUP C & D.

DD-40NTV DIGITAL ANNUNCIATOR

FIG. 2 SPECIFICATIONS AND DIMENSIONS, DD-40NTV-U



SPECIFICATIONS:

POWER REQUIRED: DC POWERED 12-24 VDC, 5 WATTS TYPICAL OR CD IGNITION SYSTEM 100 VOLTS MINIMUM.

INPUTS: RPM SIGNAL FROM CD IGNITION OR PICKUP.
40 DISCRETE SWITCH INPUTS NORMALLY OPEN.
4 SELECTABLE OPERATING MODES FOR NUMBER OF CLASS A, B (TWO TIMERS B1, B2) AND C SENSORS.

MODE	A	B1	B2	C
1	24	16	0	0
2	24	12	4	0
3	24	10	2	4
4	12	8	0	0

OUTPUTS: 2 DIGITAL OUTPUTS, PROGRAMMABLE, N.O. OR N.C. AUXILIARY TERMINALS FOR CD IGNITION SHUTDOWN AND FUEL VALVE TRIP, PROGRAMMABLE DELAY TIME ON OUTPUT SW2.

FEATURES: INTEGRATED UNDERSPEED, OVERSPEED TACHOMETER AND RUNTIME HOURMETER, PRE-LUBE/POST-LUBE.

DISPLAY: CUSTOM 5-DIGIT LCD DISPLAY.

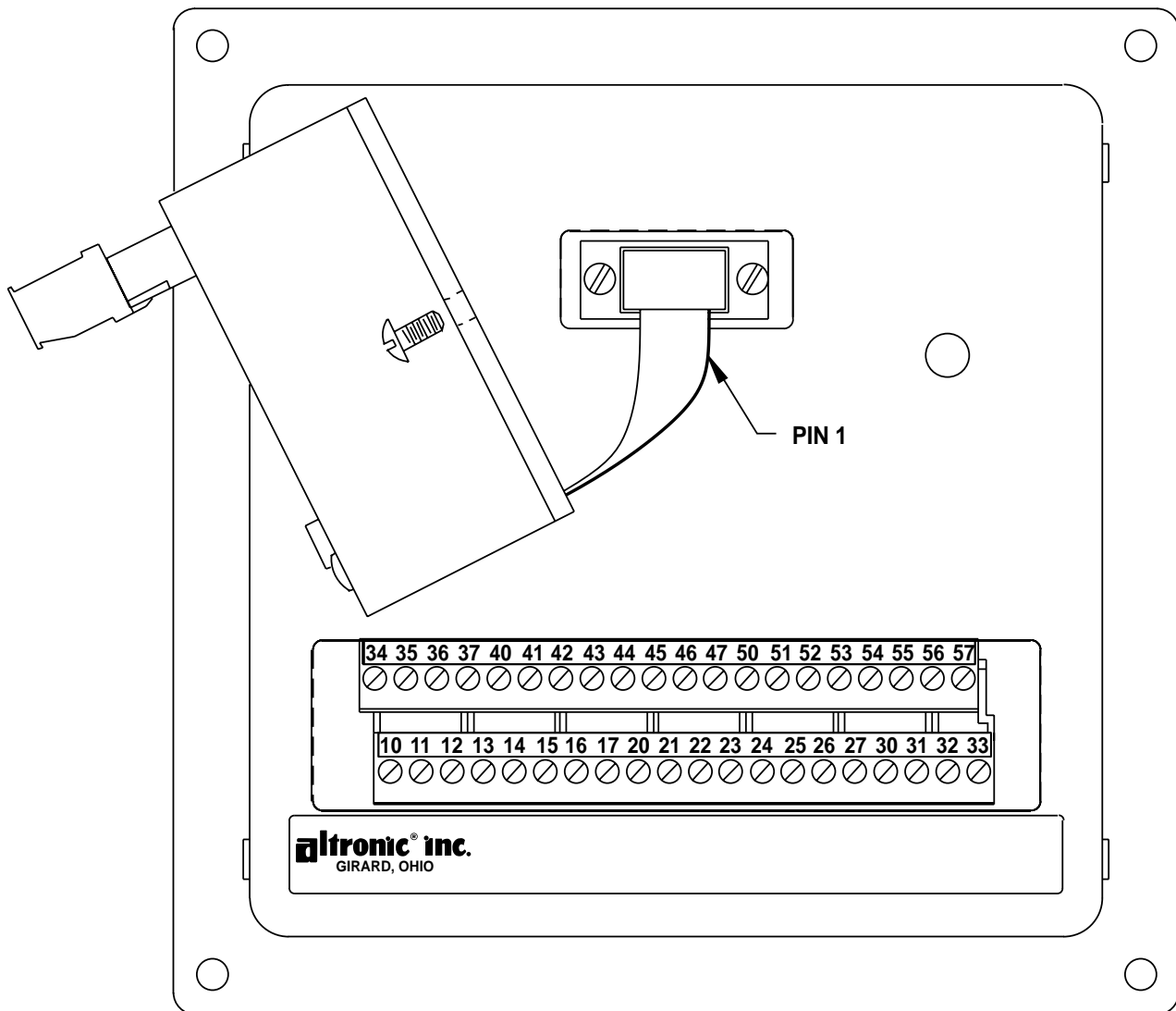
SCAN RATE: SCANS ALL 40 DISCRETE SWITCHES 5 TIMES/SECOND.

OPERATING TEMPERATURE RANGE: - 40° C TO + 80° C (- 40° F TO 176° F)

COMMUNICATIONS: RS-232 OR RS-485, CONNECTION ON POWER SUPPLY (DC POWER REQUIRED)

HAZARDOUS AREA CLASSIFICATION: CLASS 1, DIV. 2, T4, GROUP C & D.

FIG. 3 INSTALLATION DIAGRAM: DD-40NTV-X TO 691200-3 POWER SUPPLY



NOTES:

1. PLUG DB-9 CABLE FROM POWER SUPPLY INTO ANNUNCIATOR UNIT. SECURE WITH SCREWS.
2. SECURE POWER SUPPLY TO ANNUNCIATOR UNIT WITH 2 EA. B-32 X 5/16" SCREWS PROVIDED.

DD-40NTV DIGITAL ANNUNCIATOR

FIG. 4 GENERAL ELECTRICAL HOOK-UP, DD-40NTV-O WITH 691200-3 POWER SUPPLY

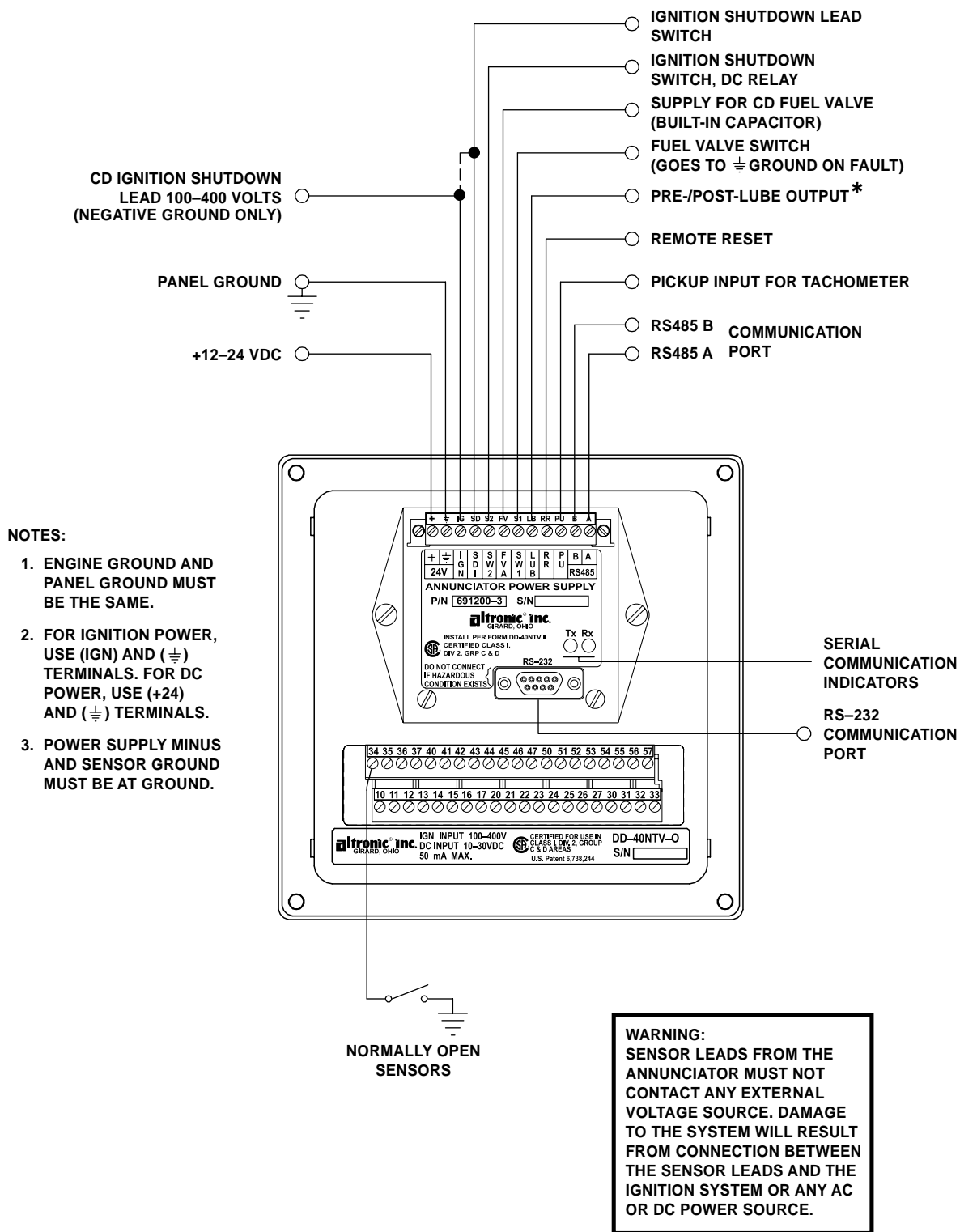
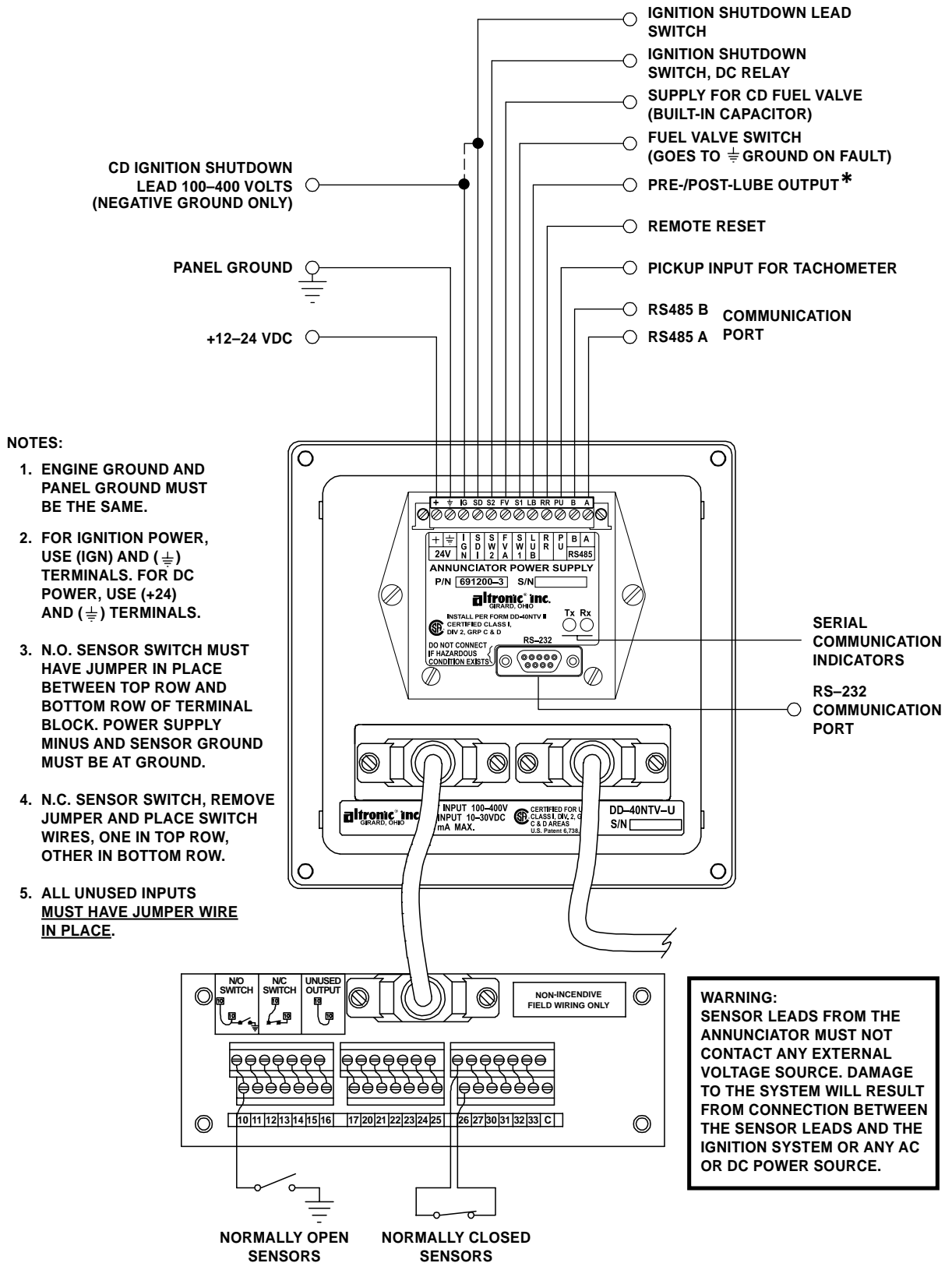


FIG. 5 GENERAL ELECTRICAL HOOK-UP, DD-40NTV-U WITH 691200-3 POWER SUPPLY



DD-40NTV DIGITAL ANNUNCIATOR

FIG. 6A FLOWCHART WITH 691200-3 POWER SUPPLY

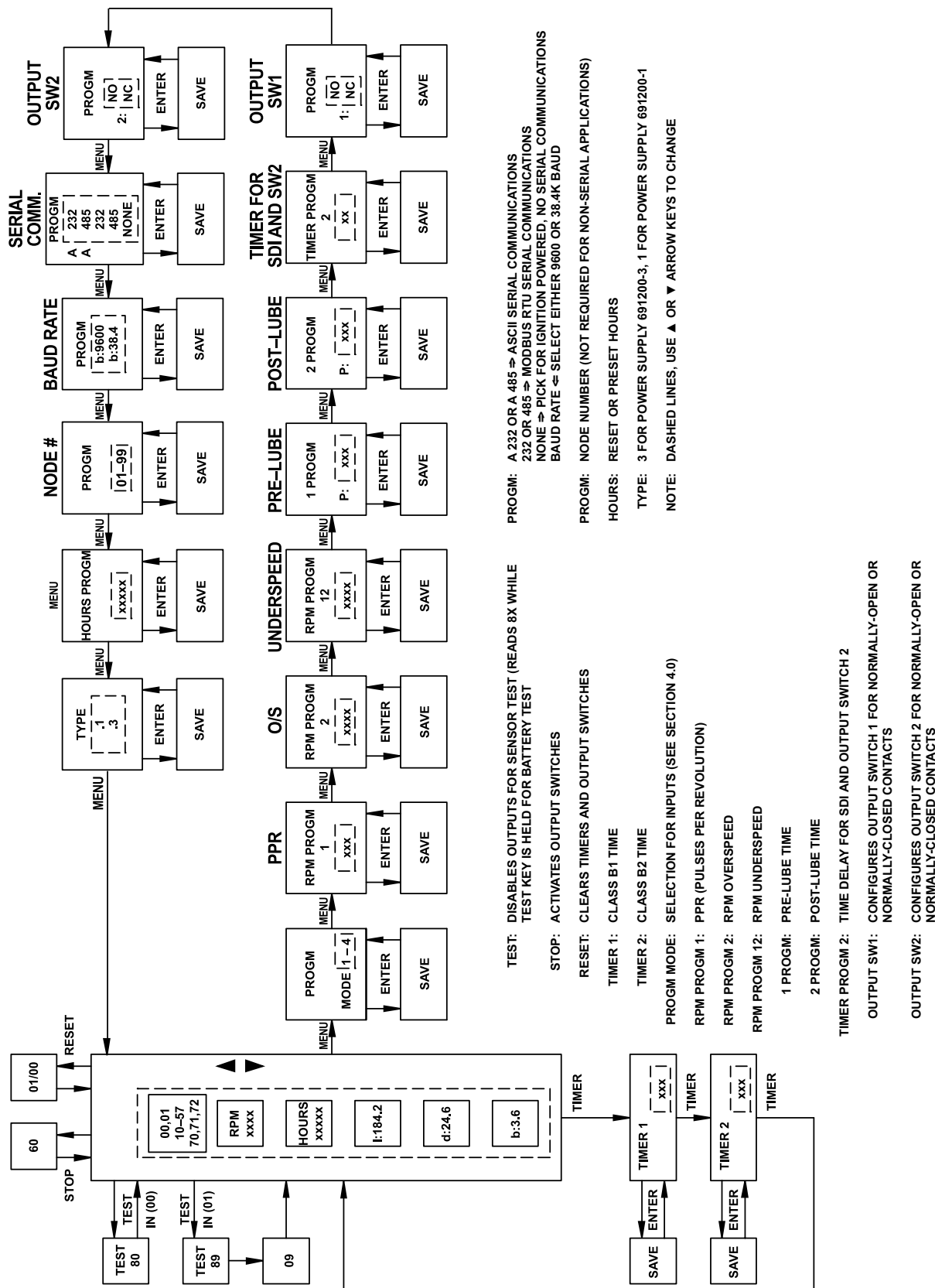
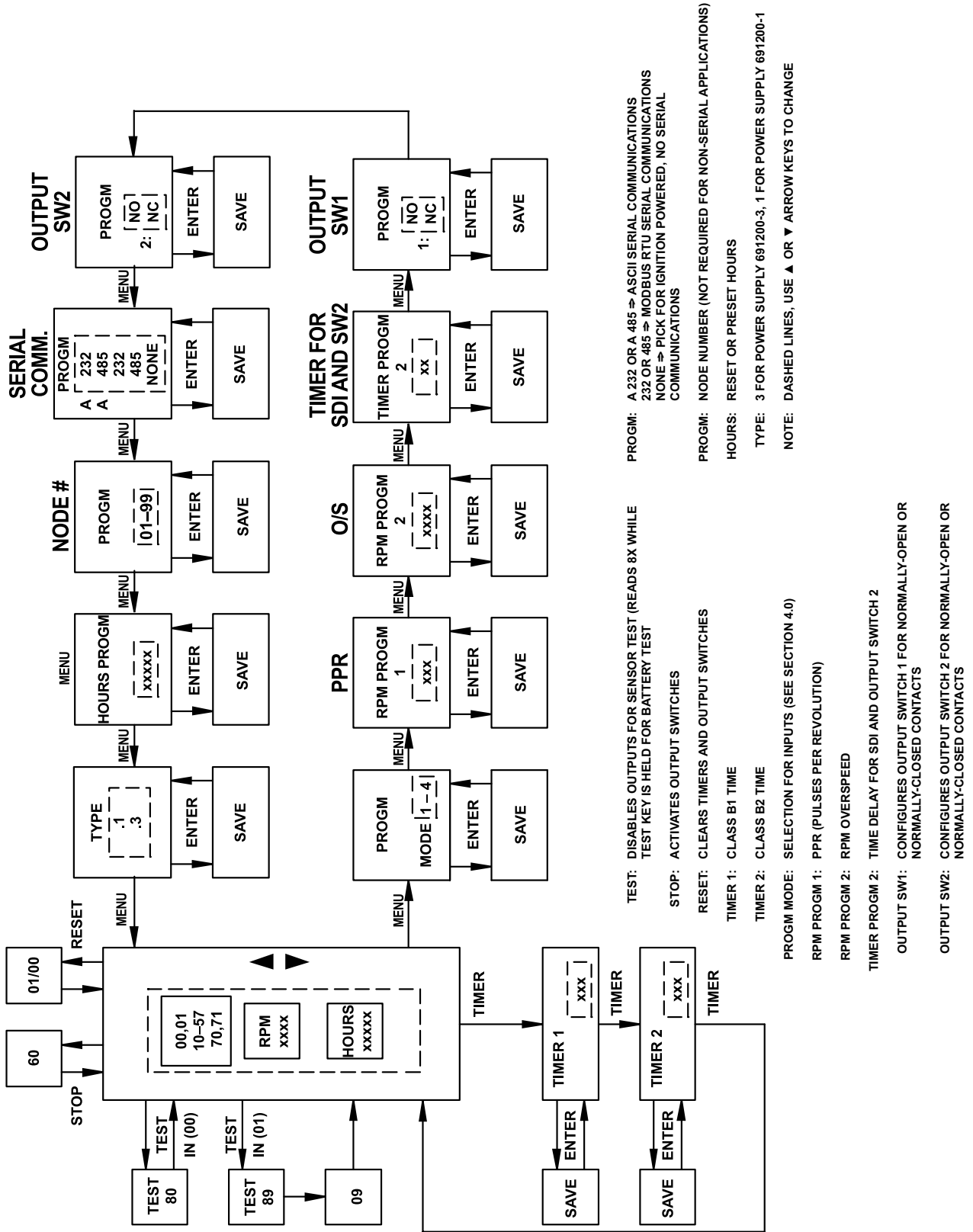
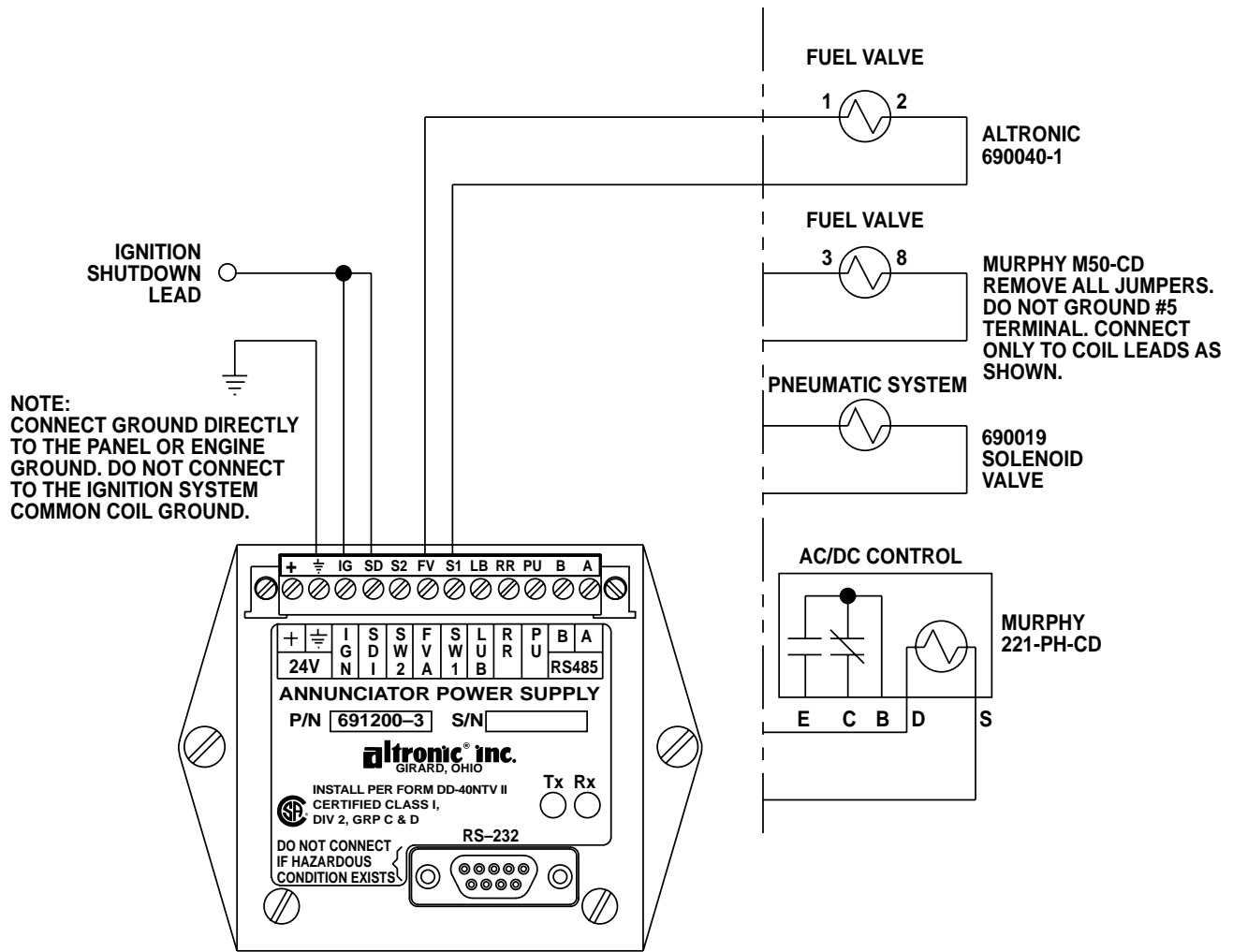


FIG. 6B FLOWCHART WITH 691200-1 POWER SUPPLY



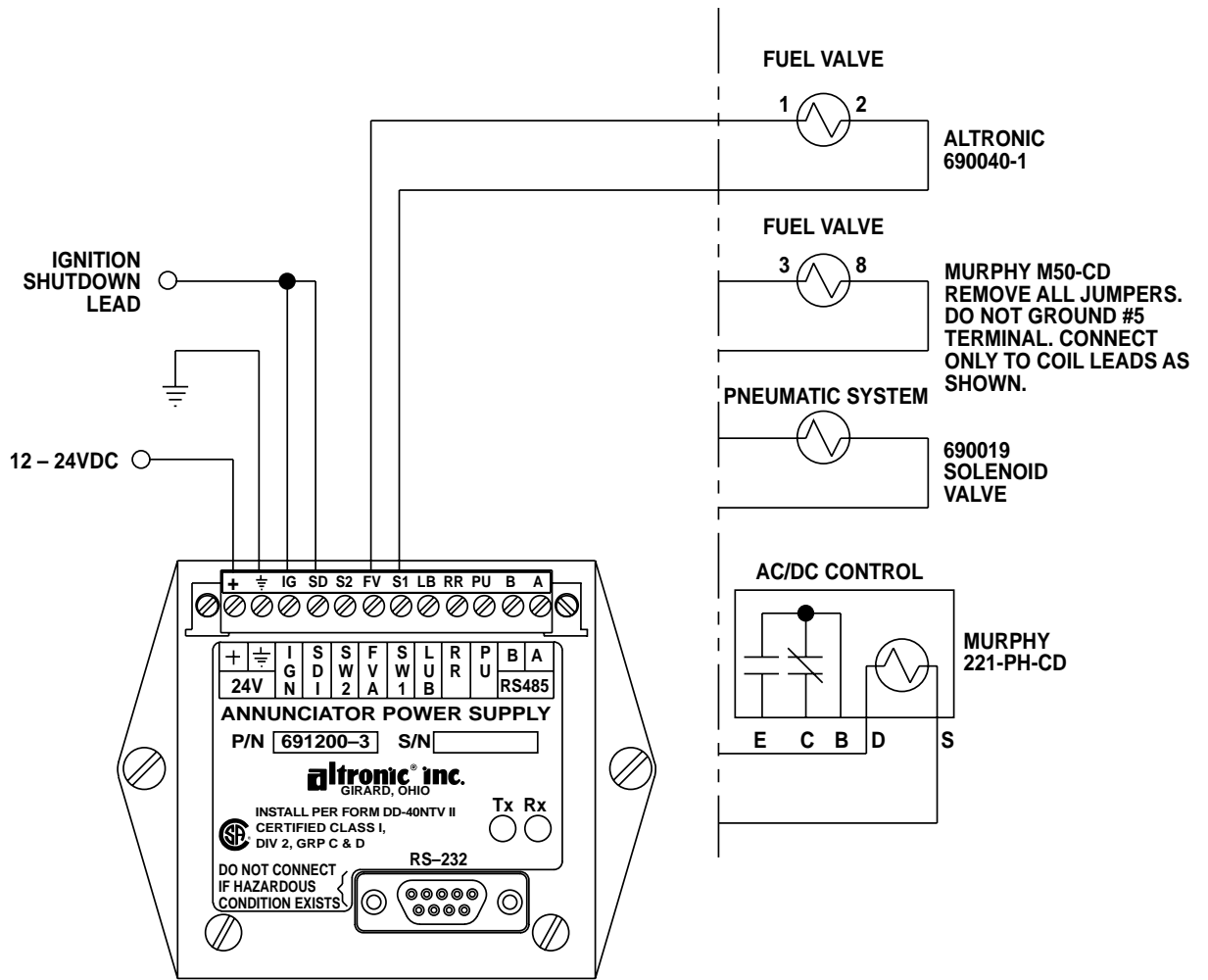
DD-40NTV DIGITAL ANNUNCIATOR

FIG. 7 WIRING DIAGRAM: CD IGNITION AND CD FUEL VALVE



CAUTION: LUB TERMINAL (8TH FROM LEFT) REPLACES RPM TERMINAL ON THE 691200-1 POWER SUPPLY. IF REPLACING A 691200-1 POWER SUPPLY WITH 691200-3, REMOVE THE JUMPER BETWEEN THE 3RD AND 8TH (FROM LEFT) TERMINALS AND DISCARD. REFER TO INSTRUCTIONS DD-NTS II 5-02 FOR WIRING DETAILS USING A 691200-1 POWER SUPPLY.

FIG. 8 WIRING DIAGRAM: DC-POWERED AND CD FUEL VALVE



NOTE: WHEN 24V IS USED TO POWER ANNUNCIATOR SUPPLY, THE SHUTDOWN LEAD MUST BE TIED TO THE "IGN" TERMINAL TO CHARGE THE TRIP CAPACITOR

NOTE: CONNECT GROUND DIRECTLY TO THE PANEL OR ENGINE. DO NOT CONNECT TO THE IGNITION SYSTEM COMMON COIL GROUND



CAUTION: LUB TERMINAL (8TH FROM LEFT) REPLACES RPM TERMINAL ON THE 691200-1 POWER SUPPLY. IF REPLACING A 691200-1 POWER SUPPLY WITH 691200-3, REMOVE THE JUMPER BETWEEN THE 3RD AND 8TH (FROM LEFT) TERMINALS AND DISCARD. REFER TO INSTRUCTIONS DD-NTS II 5-02 FOR WIRING DETAILS USING A 691200-1 POWER SUPPLY.

DD-40NTV DIGITAL ANNUNCIATOR

FIG. 9 WIRING DIAGRAM: DC-POWERED FUEL VALVE (M50-B)

HOOK-UP DRAWING TO TRIP A DC-POWERED (ENERGIZED TO CLOSE) FUEL VALVE MURPHY P/N M50-B AND DISCONNECT THE 12-24VDC TO THE FUEL VALVE DURING SHUTDOWN.

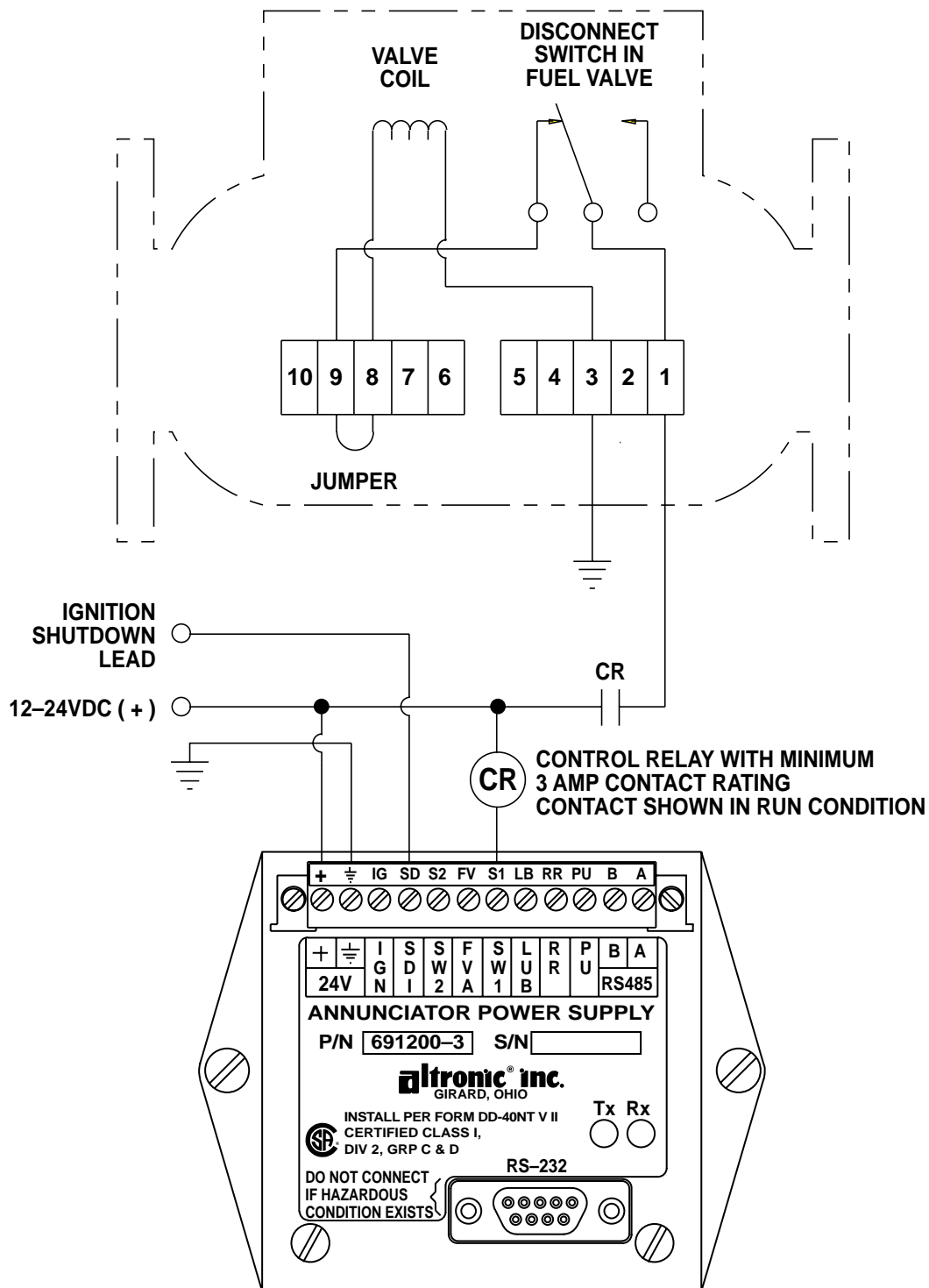
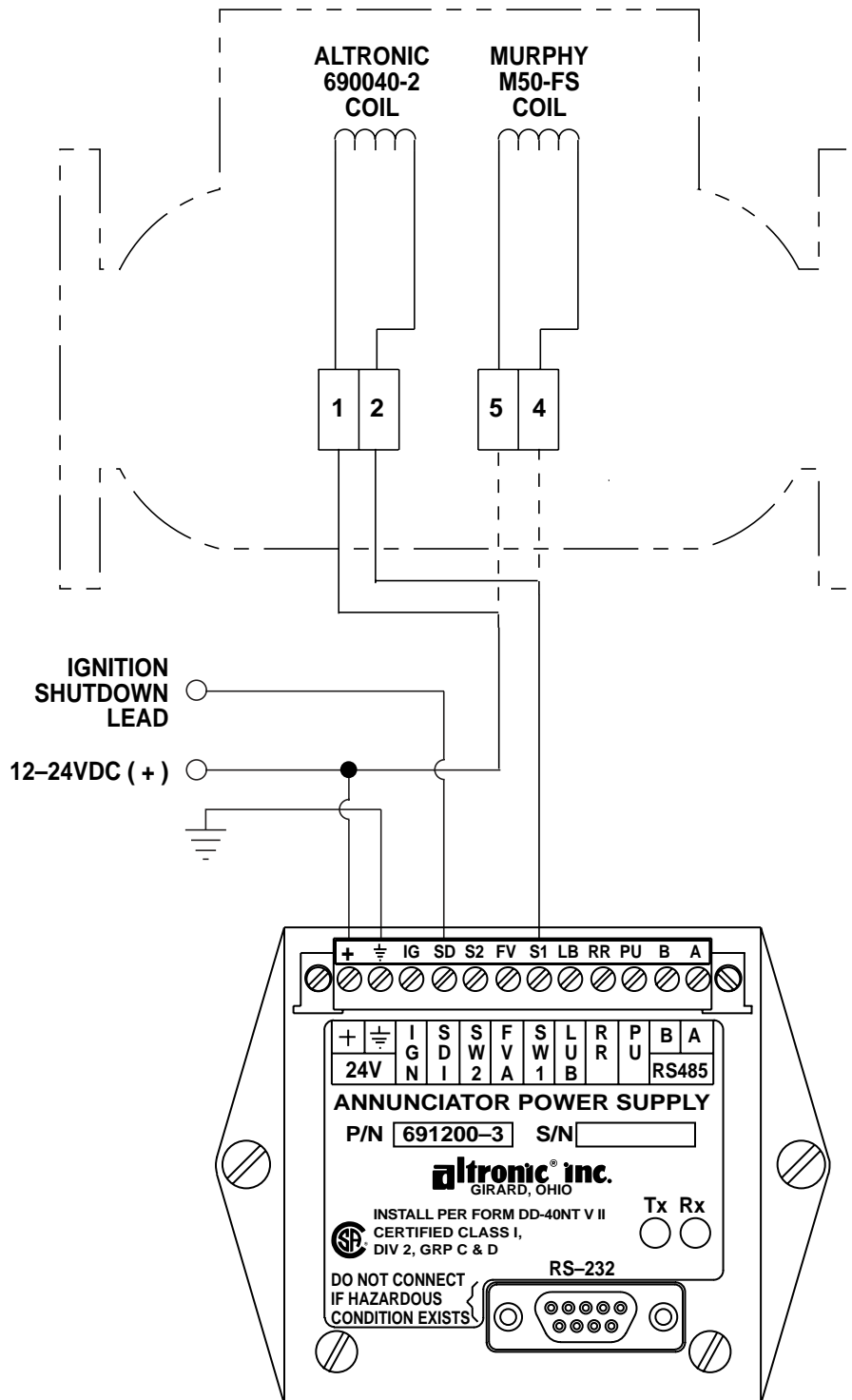


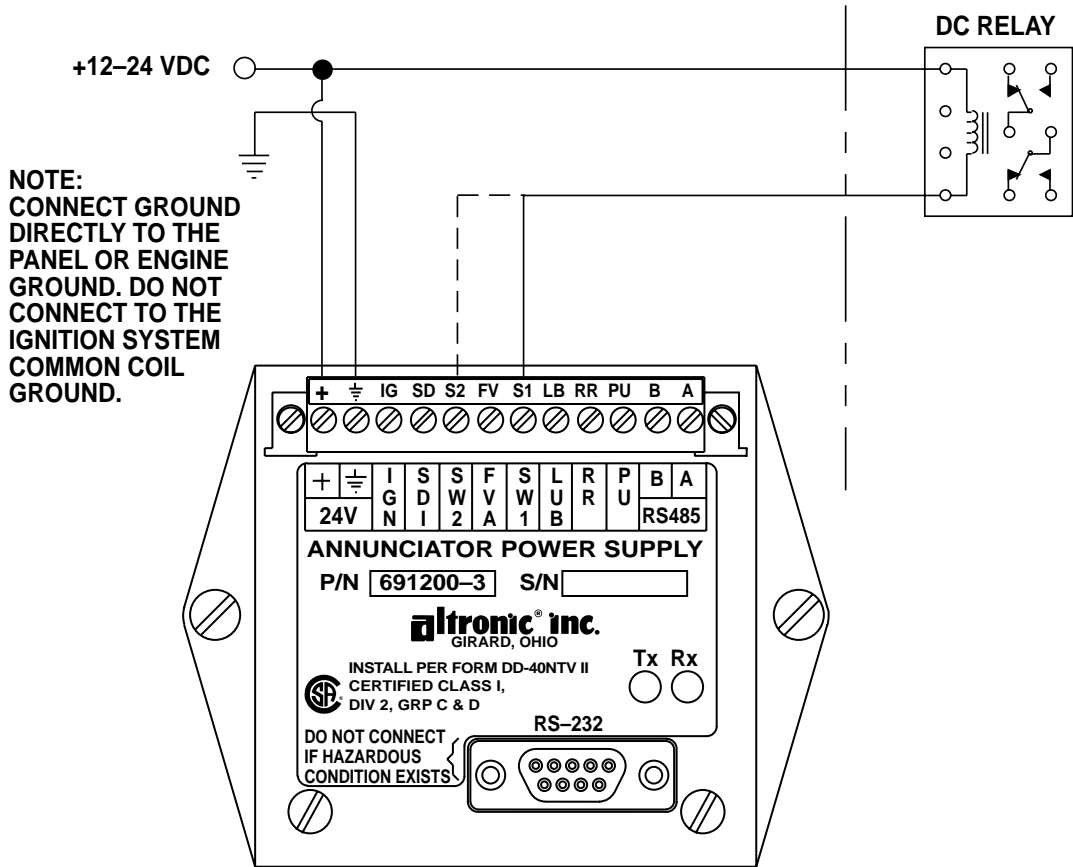
FIG. 10 WIRING DIAGRAM: DC-POWERED FUEL VALVE

HOOK-UP DRAWING TO TRIP A DC-POWERED (ENERGIZED TO RUN) FUEL VALVE BY OPENING SW1(THE FUEL VALVE SWITCH) DURING SHUTDOWN.



DD-40NTV DIGITAL ANNUNCIATOR

FIG. 11 WIRING DIAGRAM: DC-RELAY



NOTES:

1. SWITCHES (SW1) AND (SW2) ARE SOLID-STATE OPEN DRAIN RATED 400 VDC, 0.50 A. MAX. THAT CLOSE TO GROUND (⊕) ON A FAULT.
2. SW1 IS FOR FUEL VALVE SHUTDOWN. SW2 IS FOR IGNITION SHUTDOWN.

FIG. 12 WIRING DIAGRAM: TACH INPUT, NEG GROUND CD IGN SHUTDOWN LEAD INPUT

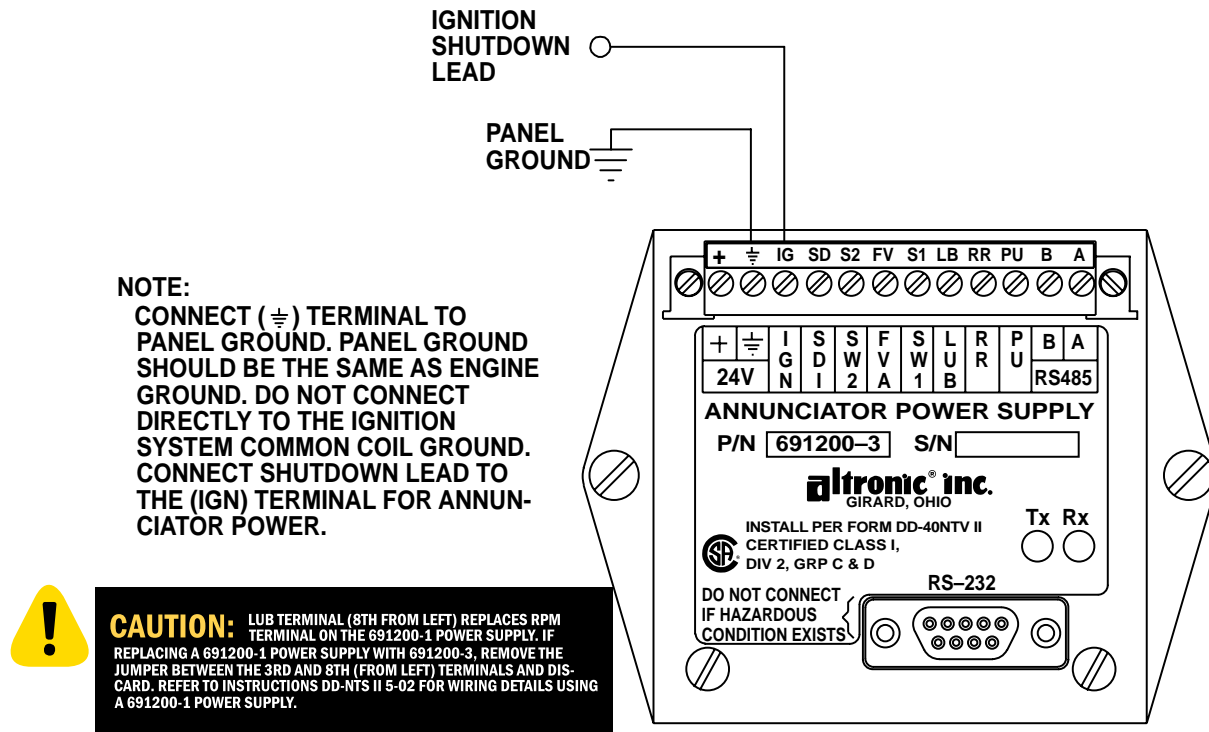
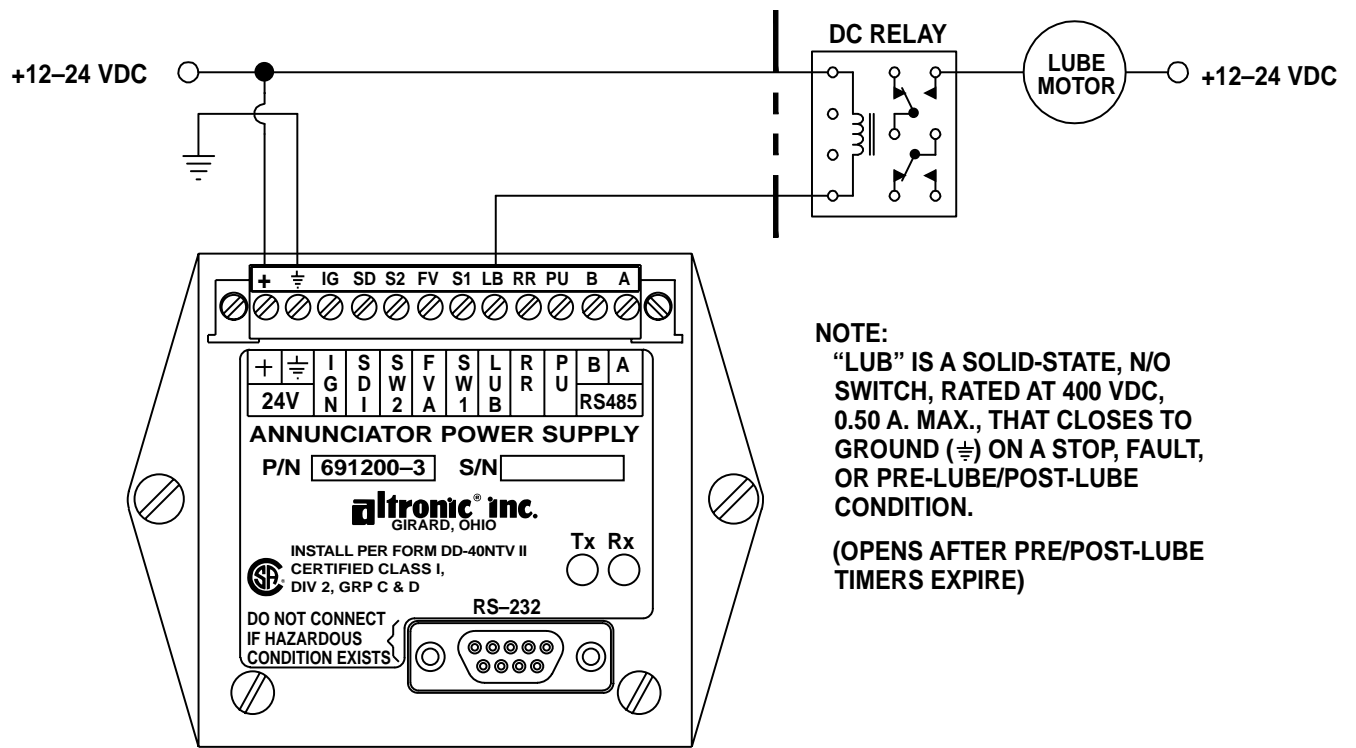


FIG. 13 WIRING DIAGRAM: PRE-/POST-LUBE MOTOR*



DD-40NTV DIGITAL ANNUNCIATOR

FIG. 14 WIRING DIAGRAM: MAGNETIC PICKUP TACHOMETER INPUT

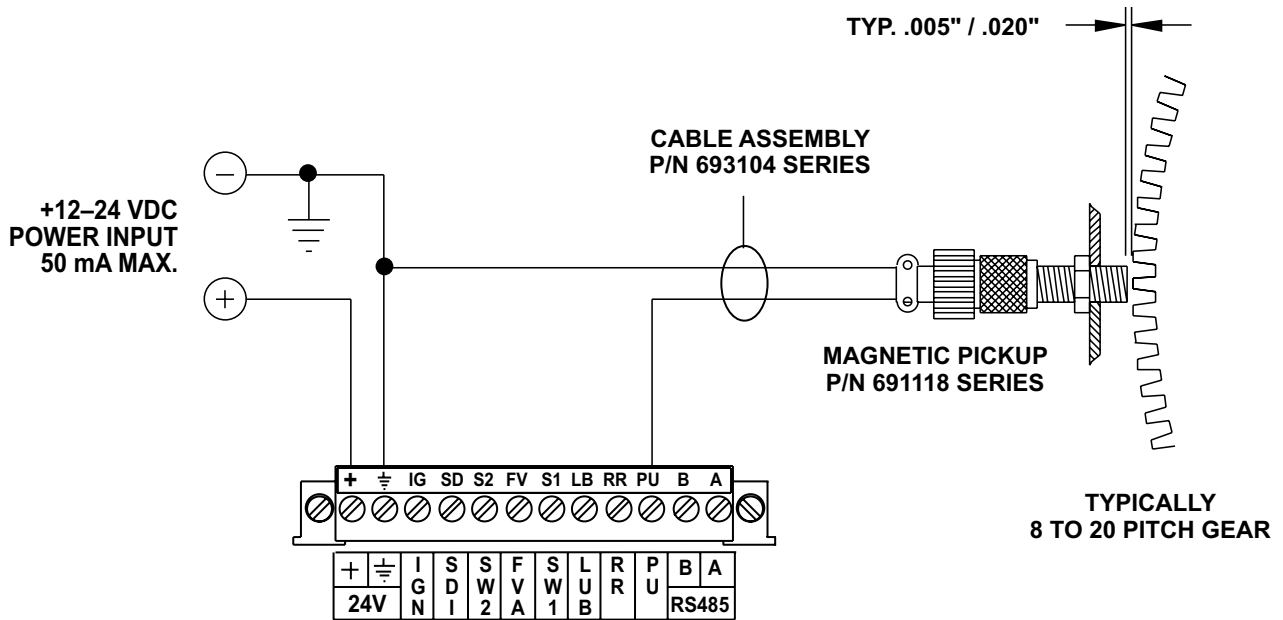


FIG. 15 WIRING DIAGRAM: HALL-EFFECT PICKUP TACHOMETER INPUT

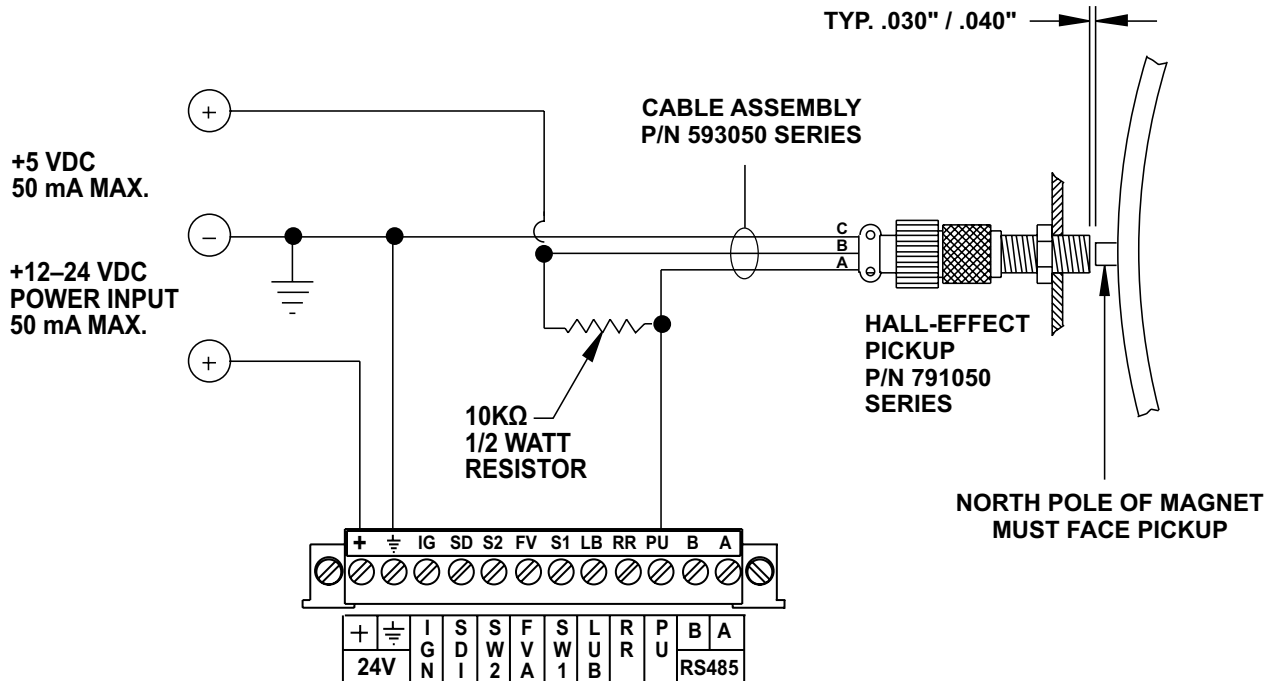
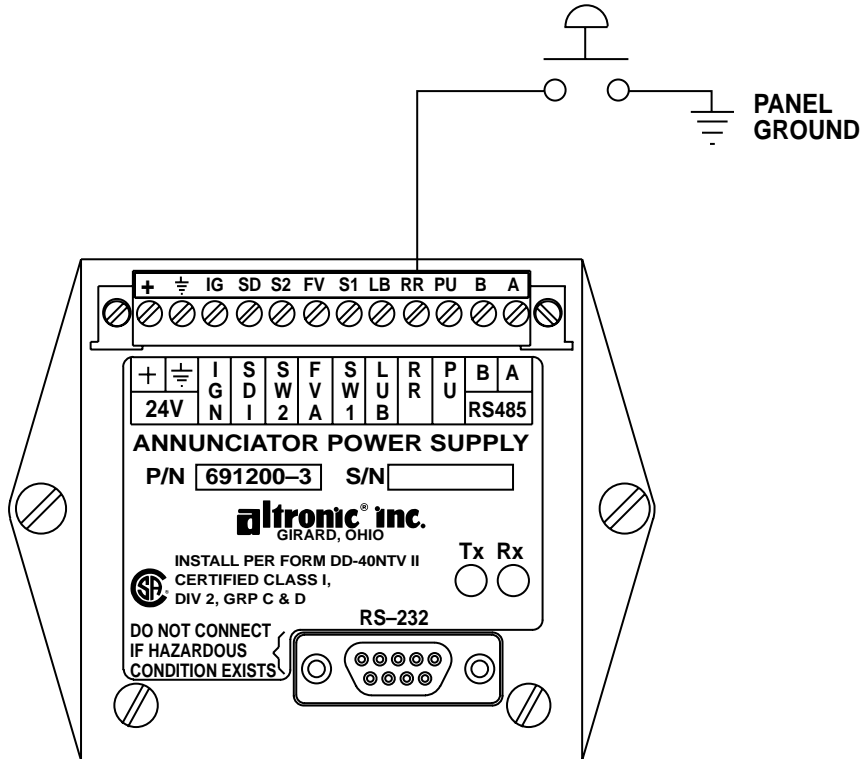


FIG. 16 WIRING DIAGRAM: REMOTE RESET

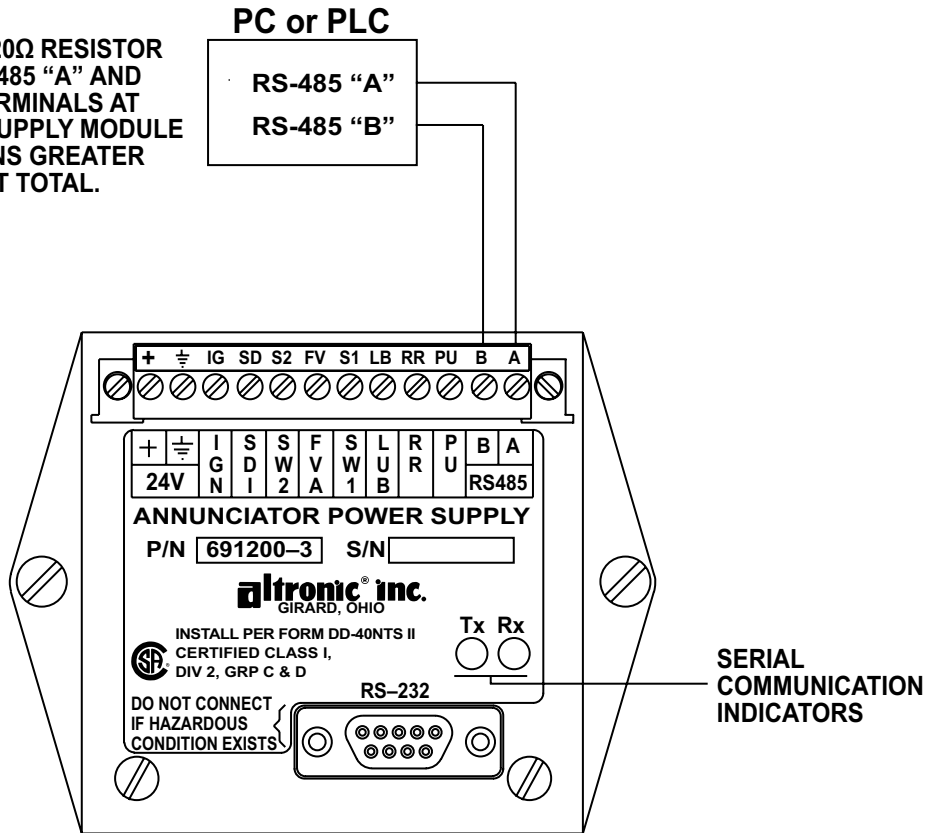


NOTE:
 USE A MOMENTARY PUSH-BUTTON OR RELAY
 FOR REMOTE RESET. MAKE SURE REMOTE
 RESET IS OPEN DURING ENGINE OPERATION.

DD-40NTV DIGITAL ANNUNCIATOR

FIG. 17 WIRING DIAGRAM: RS-485 COMMUNICATIONS

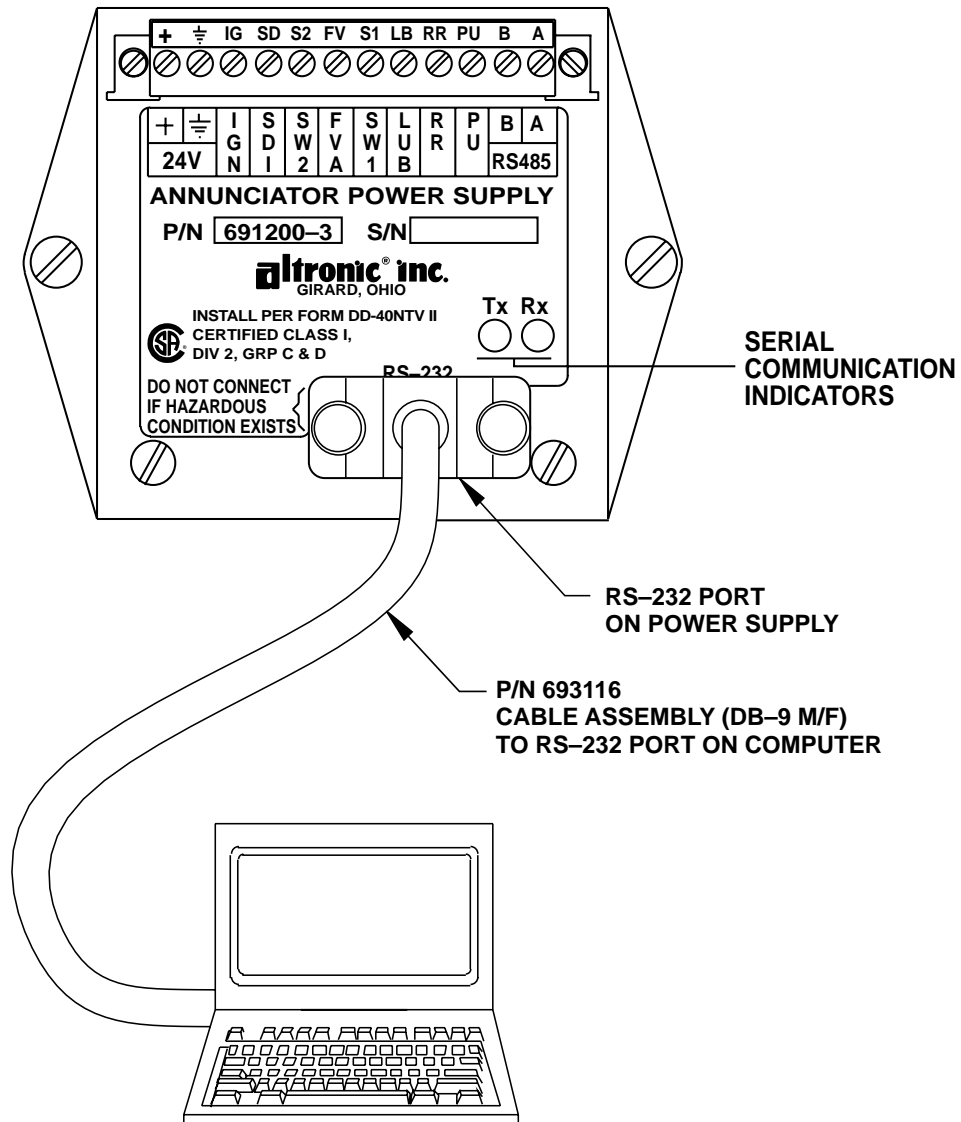
NOTE: CONNECT A 120Ω RESISTOR BETWEEN RS-485 "A" AND RS-485 "B" TERMINALS AT THE POWER SUPPLY MODULE FOR WIRE RUNS GREATER THAN 500 FEET TOTAL.



NOTES:

1. USE SHIELDED CABLE FOR RS-485 CONNECTIONS. CONNECT SHIELD AT PC OR PLC ONLY.
2. EACH UNIT MUST HAVE A UNIQUE NODE NUMBER. MAXIMUM 32 NODES.
3. TO MINIMIZE UNWANTED REFLECTIONS ON THE RS-485 LINE, THE WIRES SHOULD BE HOOKED-UP FROM ONE INSTRUMENT TO THE NEXT IN A DAISYCHAIN FORMAT.

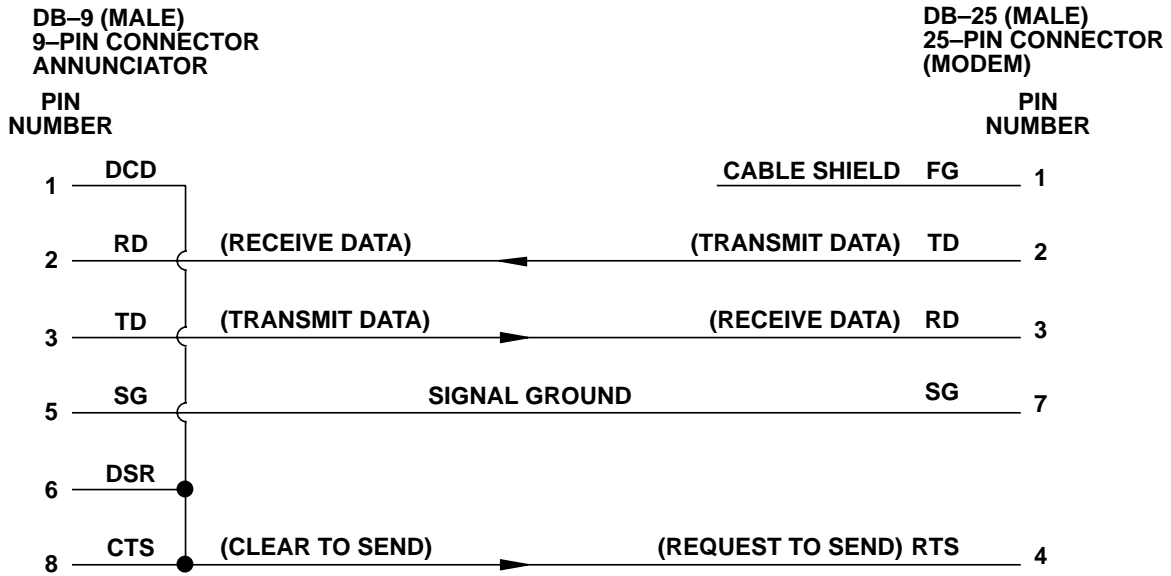
FIG. 18 WIRING DIAGRAM: RS-232 COMMUNICATIONS



DD-40NTV DIGITAL ANNUNCIATOR

FIG. 19 WIRING DIAGRAM: NULL MODEM CABLE

RS-232 NULL MODEM CABLE. USE TO CONNECT THE DD-40NTV-O ANNUNCIATOR SYSTEM TO AN EXTERNAL MODEM. CONNECTION IN THIS MANNER ELIMINATES THE NEED FOR A NULL MODEM ADAPTER.



PINS NOT LISTED ARE NOT USED FOR THIS APPLICATION AND ARE LEFT OPEN.

ACCEPTABLE CABLES FOR RS-232 APPLICATIONS:

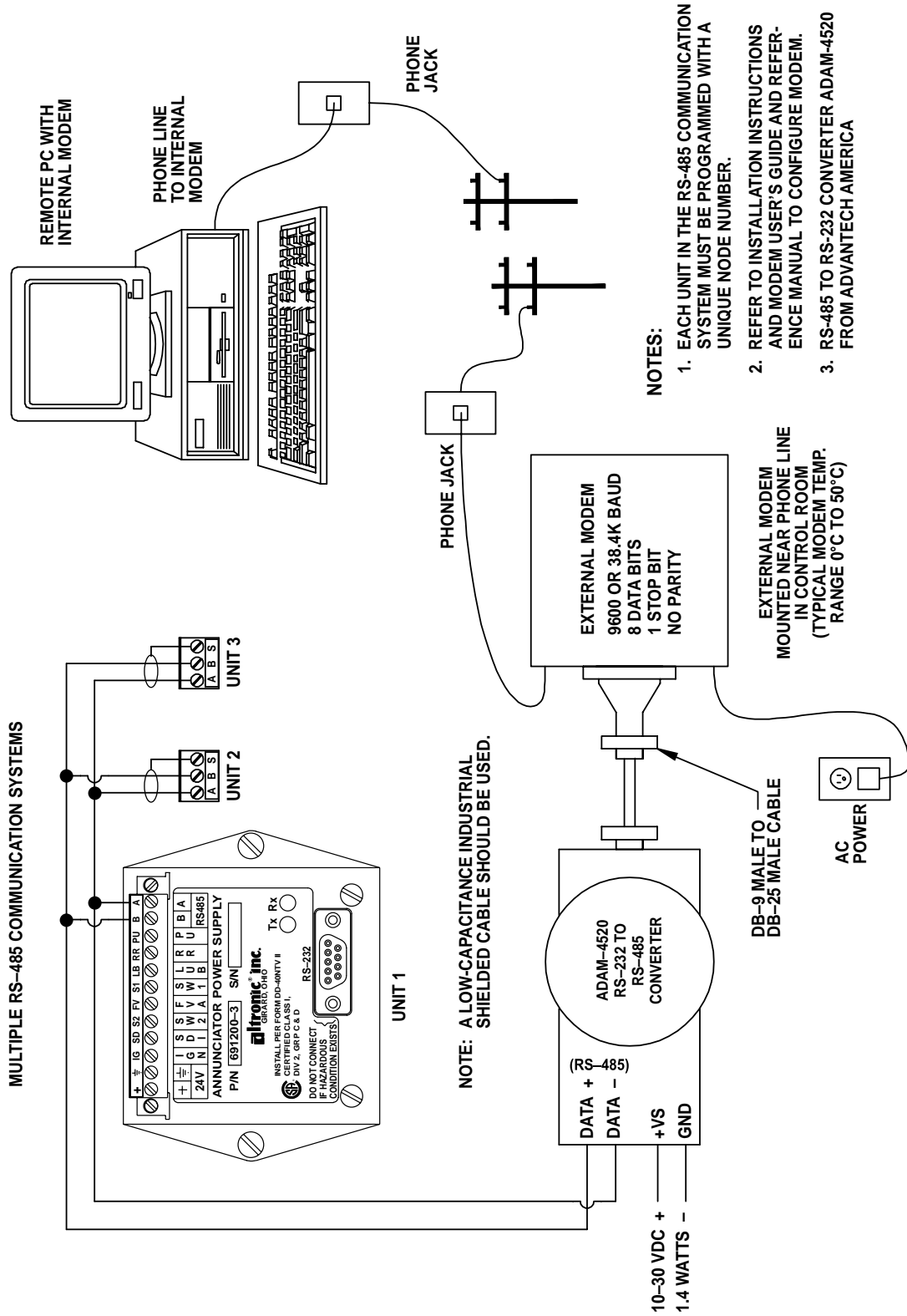
9534, 9536, BELDEN 4 OR 6 CONDUCTOR

9609, 9611 BELDEN 4 OR 6 CONDUCTOR (LOW CAPACITANCE)

9927, 9931 BELDEN 4 OR 6 CONDUCTOR (LOW CAPACITANCE)

FOR OTHER ACCEPTABLE CABLES SEE BELDEN OR OTHER MANUFACTURER'S CATALOGS.

FIG. 20 WIRING DIAGRAM: RS-485 COMMUNICATIONS TO EXTERNAL MODEM



DD-40NTV DIGITAL ANNUNCIATOR

FIG. 21 WIRING DIAGRAM: RS-232 COMMUNICATIONS TO EXTERNAL MODEM

