

NUFLO™

Scanner 1140 RTU Hardware

User Manual



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Warranty

The Company warrants all products of its manufacture and bearing its nameplate for a period of one year after date of shipment from its factory to be free from defects in material and workmanship subject to the following:

The Company's liability under this warranty is limited, in the sole and absolute discretion of the Company, to refunding the purchase price, to repairing, or to replacing parts shown to the satisfaction of the Company to have been defective when shipped and then only if such defective parts are promptly delivered to its factory, transportation charges prepaid. This warranty is void if written notification is not given by Purchaser to Company within one year after said date of shipment.

This warranty applies only if the products have been installed, operated and maintained in accordance with the Company's recommendations and the products have not been misused, neglected, damaged by flood, fire or act of God, or modified or repaired, other than by the Company.

Where the Company has manufactured the products to a design of the purchaser, no liability is accepted by the Company for design errors, which remain the responsibility of the Purchaser.

This warranty is expressly in lieu of all other warranties, obligations, conditions or liabilities, expressed or implied by the Company or its representative. All statutory or implied warranties and conditions, other than title, are hereby expressly negated and excluded. The Company's liability as stated herein cannot be altered, enlarged or extended except in writing by an officer of the Company. The Company shall be under no liability in contract or otherwise for any loss, damage, death or injury arising directly or indirectly out of the supply, failure to supply, or use of the products.

Replacement parts will be invoiced in the regular way with invoices subject to adjustment after the parts claimed defective are examined at our factory. The Company reserves the right to make such changes in details of design, construction of product arrangement as shall, in its judgment, constitute any warranty of the Company's supplier of such products.

The Company and its representatives will furnish, upon request, data and engineering services relating to the application or use of its products. It will not be responsible and it does not assume any liability whatsoever for damages of any kind sustained either directly or indirectly by any person in the adoption or use of such data, any errors or omissions in such data, or engineering services in whole or in part.

Warranty Limitation

The Company manufactures products which satisfy the exact definition of Quality, that is, they meet the specifications as advertised or as stated by our customer. The products are intended to be used in accordance with the specification and applications described in this document.

A limited warranty applies to Products manufactured by Cameron's Measurement Systems Division. The Company will assume responsibilities for obligations, related to its products, which are specifically noted within the written warranty for a specific product. However, the Company will not be liable for any loss, damage, cost of repairs, incidental or consequential damages of any kind whether or not they are based upon expressed or implied warranty, contract, negligence, or strict liability arising in connection with the design, manufacture, sale use or repair of the products, if they are used outside the constraints of recommended usage as set forth herein.

Any use or application that deviates from the stated performance specification is not recommended and could render the instrument unsafe.

The Company should be advised of any apparent deviation or deficiency from specifications including safety related deficiencies. A return authorization will be issued, where applicable, for goods returned for inspection, calibration or repair, under warranty.

Product Warranty Statement

The warranty applicable to this product is stated at the beginning of this manual.

Should any problem arise after-delivery, please contact Cameron’s Measurement Systems Division **HelpDesk** at **1-877-805-7226** or the **Customer Service** department during normal business hours at **(403) 291-4814**.

Before installing the instrument, become familiar with the installation instructions presented in this document.

Also, be aware of the following important notices that appear throughout the manual:



WARNING notes indicate the presence of a hazard that **can cause** severe personal injury, death or substantial property damage if the warning is ignored.



CAUTION notes indicate the presence of a hazard, which will **or** can cause minor personal injury or property damage if the warning is ignored.

Please be aware that the above notices appear on the following pages:

- Page 11
- Page 16
- Page 28
- Page 39
- Page 68
- Page 71
- Page 74

Revisions

<i>Date</i>	<i>Description</i>	<i>By</i>
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Introduction

Overview of the Scanner 1140

The Scanner[®] 1140 is an economical, single stream measurement Remote Terminal Unit (RTU) with flow and pressure control capability. It offers a powerful alternative to chart recorders in gathering data for natural gas production and includes a full range of operator selectable mass, energy and volume algorithms.

Cameron's Barton DPE+ Multi-Variable Transducer (MVT) mounts directly to the Scanner 1140 to provide accurate, low cost measurement for both static and differential pressures in a single device. The 1140 can also use the MVX[®] or MVX[®]-II multi-variable transmitter to provide differential pressure, static pressure and temperature inputs to the Scanner. The Scanner 1140 also accepts inputs from low-power (1-5 Vdc) and 4-20 mA transmitters, RTDs, and pulse-producing devices such as the Barton and NuFlo turbine meters.

The Scanner 1140 is available in four different models (1140T, 1140C, 1140L and 1140G) to meet various customer needs.

An intelligent 6Vdc, Class I, Div.1 Intrinsically Safe power management system ensures that the Scanner 1140T consumes minimum power while collecting and processing data. It stores up to 60 days of flow history with an audit trail of all events, alarms and user changes. The memory for this information is secured against power failures with a separate replaceable lithium back-up battery.

A 12Vdc system is available for Class I, Div. 2 non-sparking applications (Scanner 1140C and 1140L).

Stored data can be downloaded on-site, or communicated to a central location. Standard communications and status/pulse inputs can easily be expanded.

The following features in the Scanner 1140 provide convenient and flexible operation:

Programmable Memory - A full set of menu-selectable calculation options are stored in the FLASH memory in each Scanner 1140. As new industry standards are adopted, new programs are easily loaded from a PC without EPROM chip changes. (See the ScanLoad, WinsLoad or ScanFLASH utility software.)

Security - Five security levels and selectable display options ensure convenient use while maintaining full protection of configuration and flow history.

Power Supplies - Choose from line power or various battery configurations with thermoelectric or solar charging options to minimize installation costs and meet site and intrinsic safety requirements.

Sampling Frequency - Select ideal end device sampling rates to optimize the Scanner 1140's ability to simultaneously measure and control while conserving power.

Calibration - A variety of methods are available for linearizing different end devices to maintain the highest accuracy. A detailed record of calibration information is stored automatically in the Scanner User Change Log and can be used to monitor and diagnose transmitter performance.

Controls - Various control options are easily configured using simple menus with input/output selections for both throttling and ON/OFF control. Four status input/outputs and an analog output make the Scanner 1140 ideal for:

- proportional integral control
- emergency shutdown
- run switching
- programmable logic status

Scanners 1140T, 1140C, 1140L, and 1140G

The Scanner **1140T**, often referred to as the standard Scanner 1140 unit, is a 6Vdc EFM rated for Class I, Div.1 Intrinsically Safe applications. The device has no integral communications. It is housed in a fiberglass-reinforced plastic enclosure. All Class I, Division 1 installations require an intrinsically safe barrier adapter (Part No. 9A-30058901) between the Scanner and the DPE+ transducer. The adapter is not required for Class I, Division 2 installations.

The Scanner **1140C** has the same main board as the Scanner 1140T model but with the following features:

- Class I, Div. 2 non-sparking certification
- a larger enclosure that can accommodate a communication device
- 12 Vdc battery/charger control (up to 55 amp-hours)
- a power supply for powering a communication device
- an optional lightning arrestor

The Scanner **1140L** has many of the features of the 1140C. However, it has a metal enclosure and its main board is mounted on an aluminum plate instead of in an aluminum extrusion. It is limited to a 32-amp-hour battery. The 1140L can be used with standard I/O with depluggable terminals or limited I/O with soldered terminals.

The Scanner **1140G** (shown below) is comprised of a standard Scanner 1140T main board, but has no integral enclosure with a battery. It is designed to be installed in another enclosure or panel mounted. It is intended to be a value-added product for integrators and E & C firms.



Scanner Software

A variety of software programs are available for configuring, monitoring, downloading, retrieving data, reading and creating reports from collected data:

- **ScanWin™** - ScanWin is a Windows™ based software program that is used to monitor, configure and download Scanner Measurement RTU data on-site. Such data is displayed graphically and in tables. Reports are printable from ScanWin. Monitor and download all firmware versions and configure version 4.x firmware.
- **ScanPC®** - ScanPC is a DOS / Windows™ 98 based software program for a PC that is used to monitor, configure, and download Scanner Measurement RTU data on-site. Scanner files can be printed in a universal report format or, outputted in either comma separated, or tab separated text formats. All report files are readily imported into spreadsheet and database software programs. Used with version 2.x and 3.x firmware.

Chapter 1: Installation



CAUTION

POWER TO THE SCANNER 1140 MUST BE TURNED OFF PRIOR TO THE REMOVAL OF ANY ELECTRONIC CIRCUIT BOARDS OR DAMAGE TO THE SCANNER MAY RESULT.

CIRCUIT BOARDS ARE SUBJECT TO DAMAGE IF EXPOSED TO STATIC ELECTRICITY.

HANDLING AND INSTALLING CIRCUIT BOARDS MUST BE PERFORMED IN AN ENVIRONMENT FREE OF STATIC ELECTRICITY AND THE OPERATOR MUST BE GROUNDED.

WHEN CIRCUIT BOARDS ARE REMOVED FROM THE SCANNER 1140, THEY MUST BE PLACED IN PROTECTIVE CONDUCTIVE ENVELOPES.

Note: Circuit boards returned to Cameron's Measurement Systems Division factory for repair must be properly packed for static protection or they will not be covered by the Cameron's warranty.

Quick Start

The following chart suggests a sequence for the installation of the Scanner 1140:

Step	Description	Reference Section
1	Unpack the Scanner	Page 12
2	Mounting the flow computer	Page 12
3	Connect to pipes	Page 12
4	Connect power supply	Page 16
5	Flash the Scanner (<i>if changing installed firmware</i>)	Page 21
6	Startup <ul style="list-style-type: none">• Superboot• Connect I/O• Configure the EFM/RTU	Page 28 Page 31 See Firmware/Software section of manual

Operating/Storage Limitations

Temperature: The instrument is not to be subjected to ambient or operating temperatures beyond the range listed in the specification section ([Page 85](#)).

Static Electricity: The circuit boards are not to be subjected to any source of external static electricity.

Unpacking

Cameron's Measurement Systems Division Scanners are carefully inspected during manufacturing and before shipment. However, an inspection should be performed at the time of unpacking to detect any damage that may have occurred during shipment. The following items should be included with each shipment:

- Scanner 1140 completely assembled
- Battery (optional)
- RTD (optional)
- Solar Panel (optional)

An IBM-compatible PC with ScanWin or ScanPC software is required to remotely configure and collect data from the Scanner 1140.

Mounting

The standard bracket for all, with the exception of the 1140G, is a universal 2" pipe mount/wall bracket. These models also offer an optional wall mount only bracket or a pipe ending bracket.

The 1140G is surface mounted by four user-supplied screws or by an optional DIN rail kit.

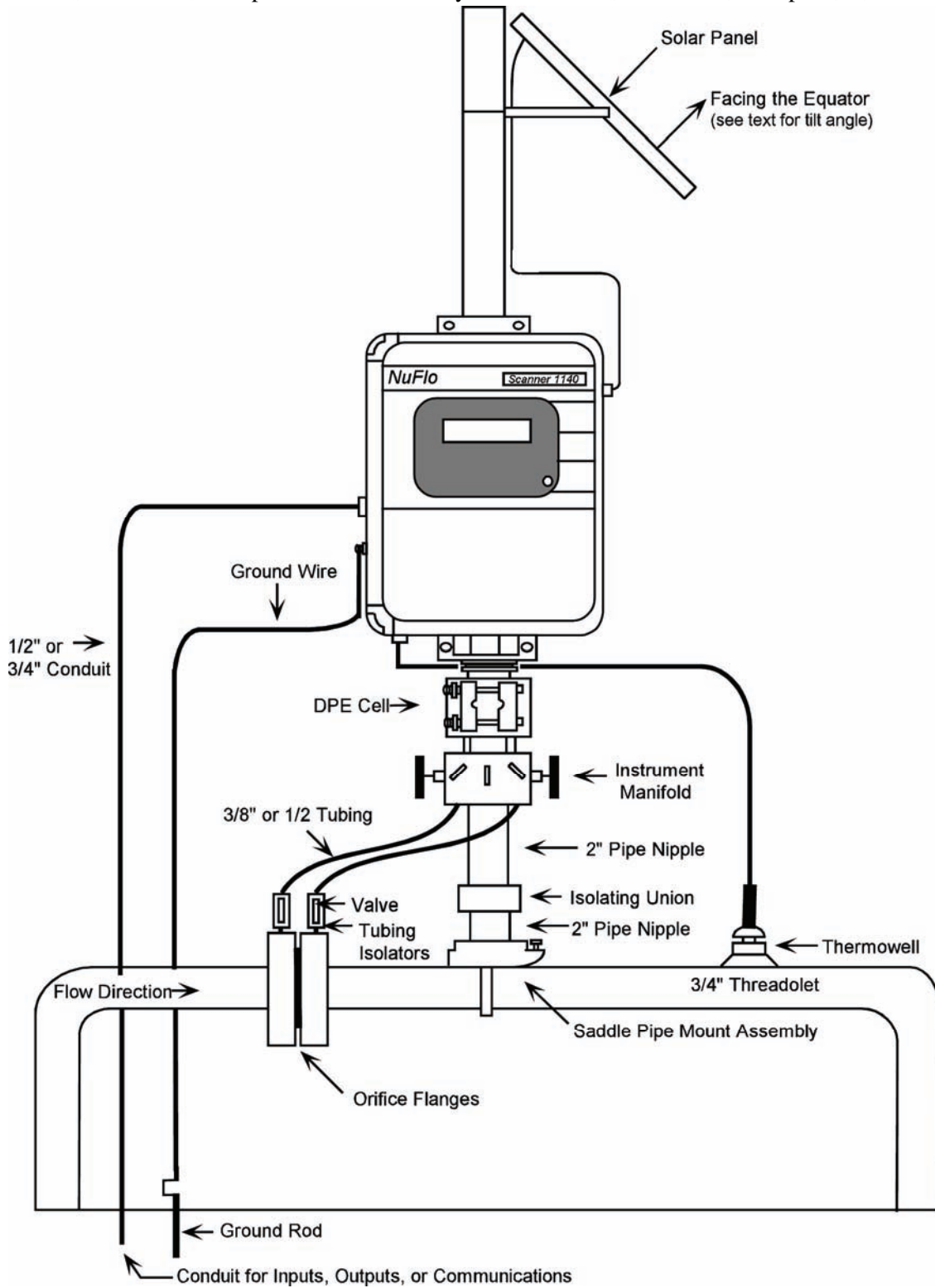
Refer to [Page 97 - Outline Dimensions](#) for size and location.

Piping

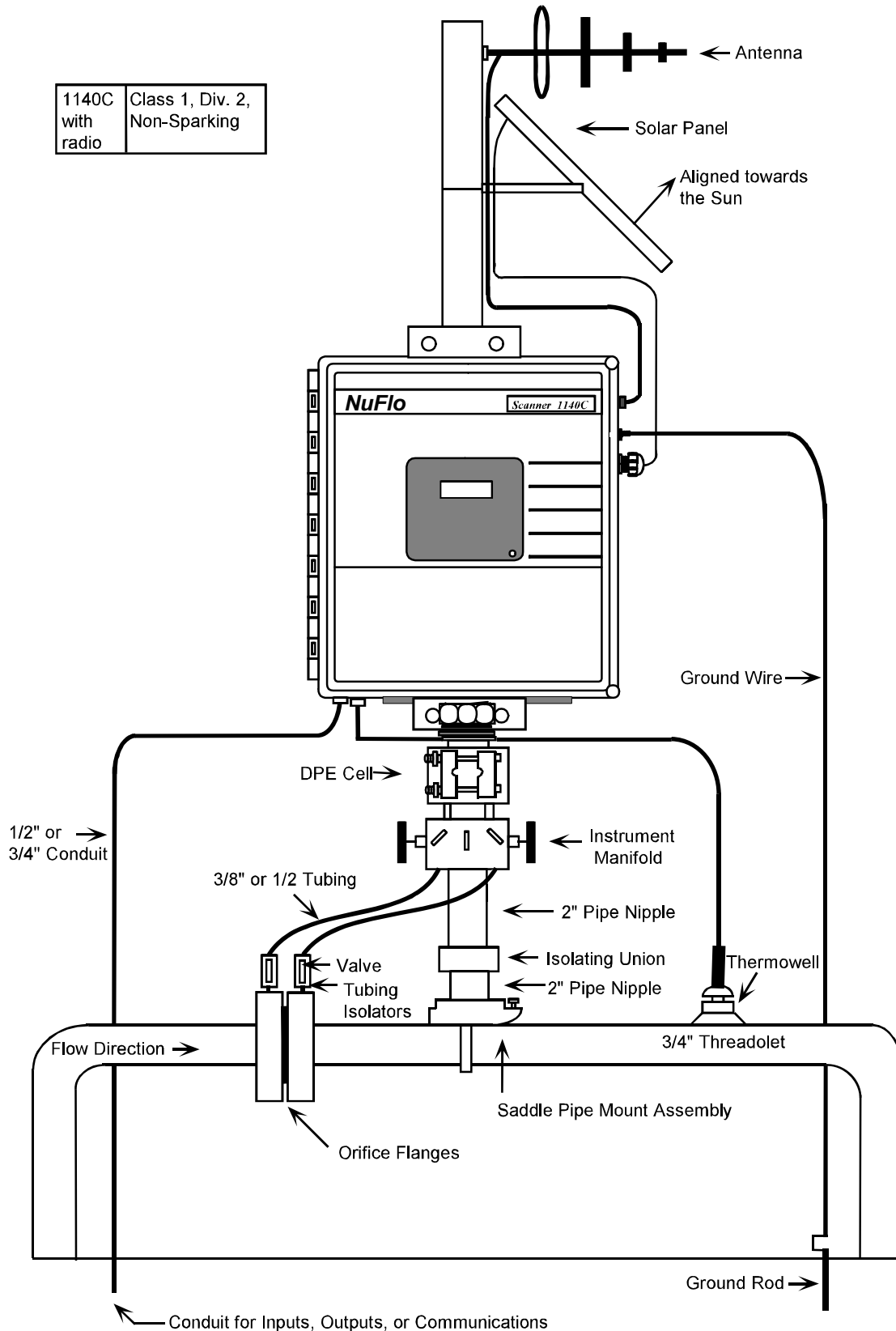
All piping connections are made in accordance with standard practices. For orifice meters, consult API chapter 14.3 Part 2 or AGA-3 Part 2 (1991) for additional information. For turbine meters, consult API chapter 5.3 or AGA-7.

Typical Installation of Scanner 1140T

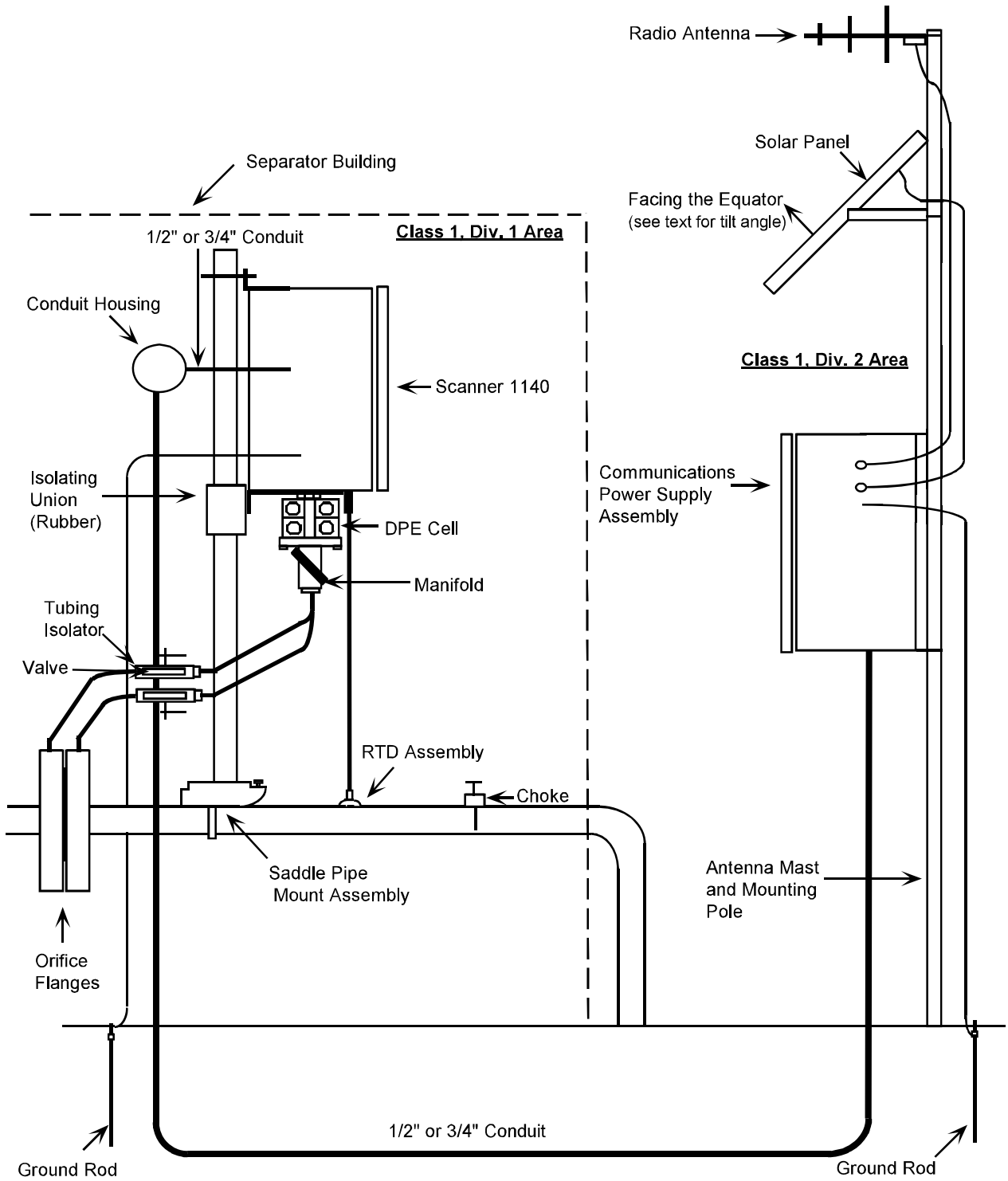
Class I, Division 1, Groups C & D Intrinsically safe or Class I, Division 2, Groups A, B, C & D non-sparking



Typical Installation - Scanner 1140C/L Integral Communications



Typical Installation (with Remote Communications)



Power Supply Connection

Conduit entry is provided on the right-hand side of the enclosure for the power supply/solar panel wires (refer to [Page 97 - Outline Dimensions](#) for size and location of conduit entry).



WARNING

ALL METALLIC CONDUIT CONNECTORS MUST BE GROUNDED TO THE INTERNAL GROUND WITH THE SHORTEST WIRE POSSIBLE.

Also, check [Page 31 – \(Main Board and Wiring\)](#) for additional wiring information. See [Appendix A: Installation Drawings](#) for information about installation in a **Hazardous Location**.

Power Supply



WARNING

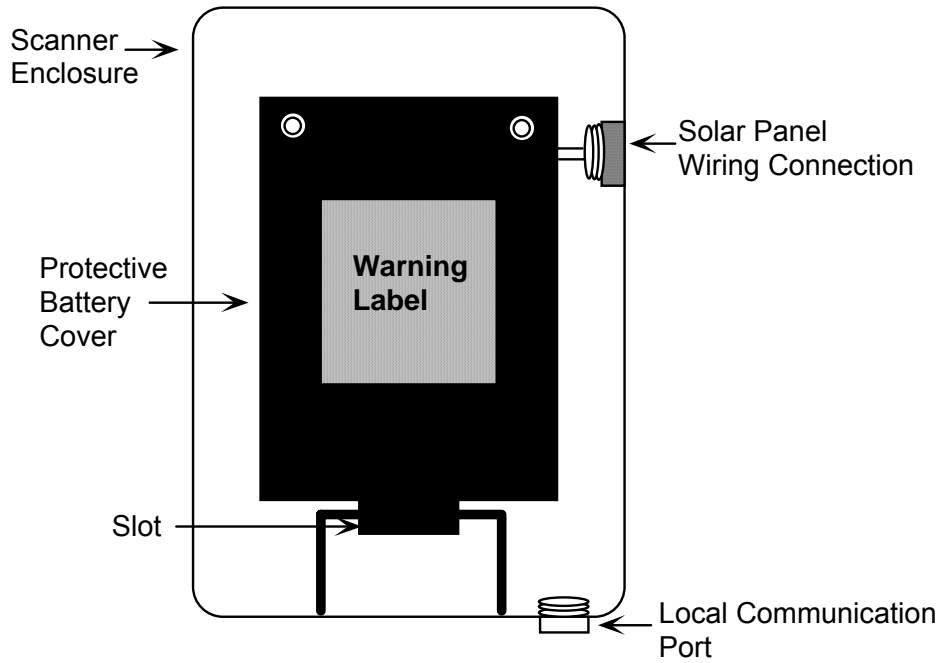
THE BATTERY IS USER-CHANGEABLE. HOWEVER, IT MUST BE REPLACED IN A *NON-HAZARDOUS* LOCATION.

6-Volt Battery Power Supply, Division 1 Controller

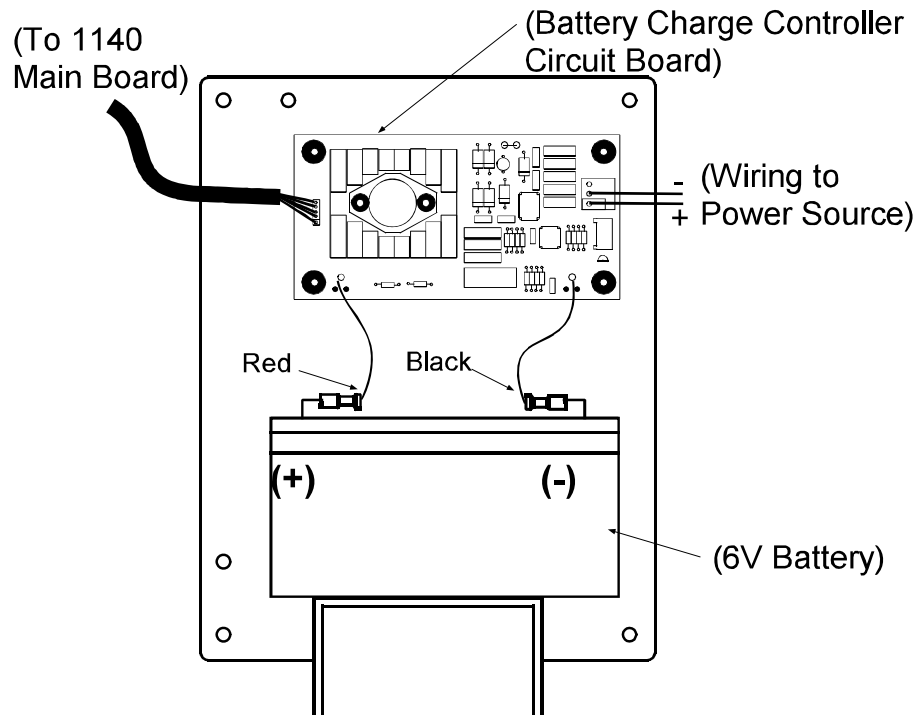
(Intrinsically Safe when installed as per [Appendix A: Installation Drawings 9A-1140-11002](#))

In a Scanner 1140T, the battery is located under a protective enclosure in the main body of the Scanner. To access it, open the enclosure and loosen and remove the nuts off the bolts on the battery cover. Lift and slide the cover out of the slot that the battery sits on.

The Scanner 1140C's battery is accessed by loosening the Velcro strap securing it.



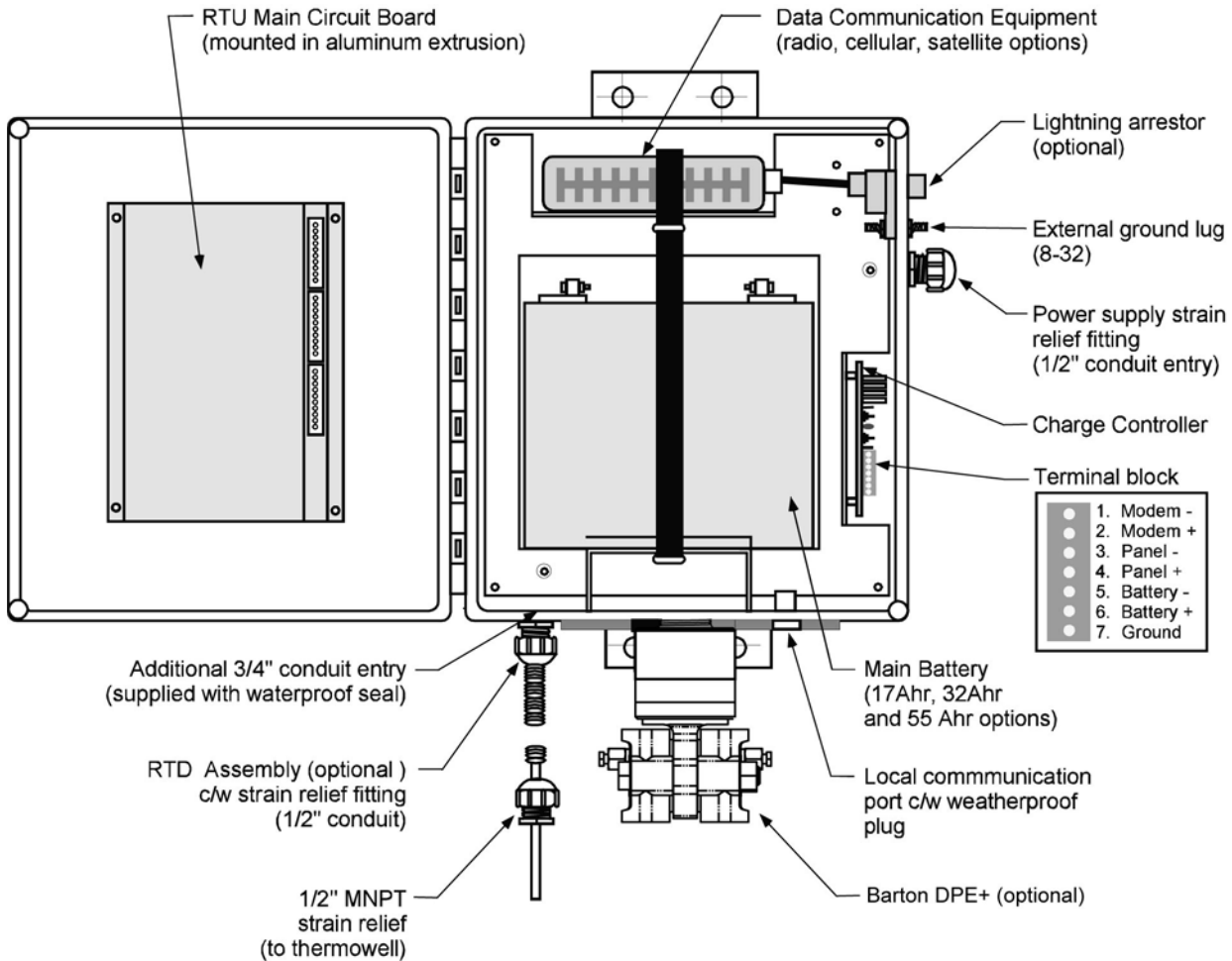
Scanner 1140T (With Battery Cover Removed)



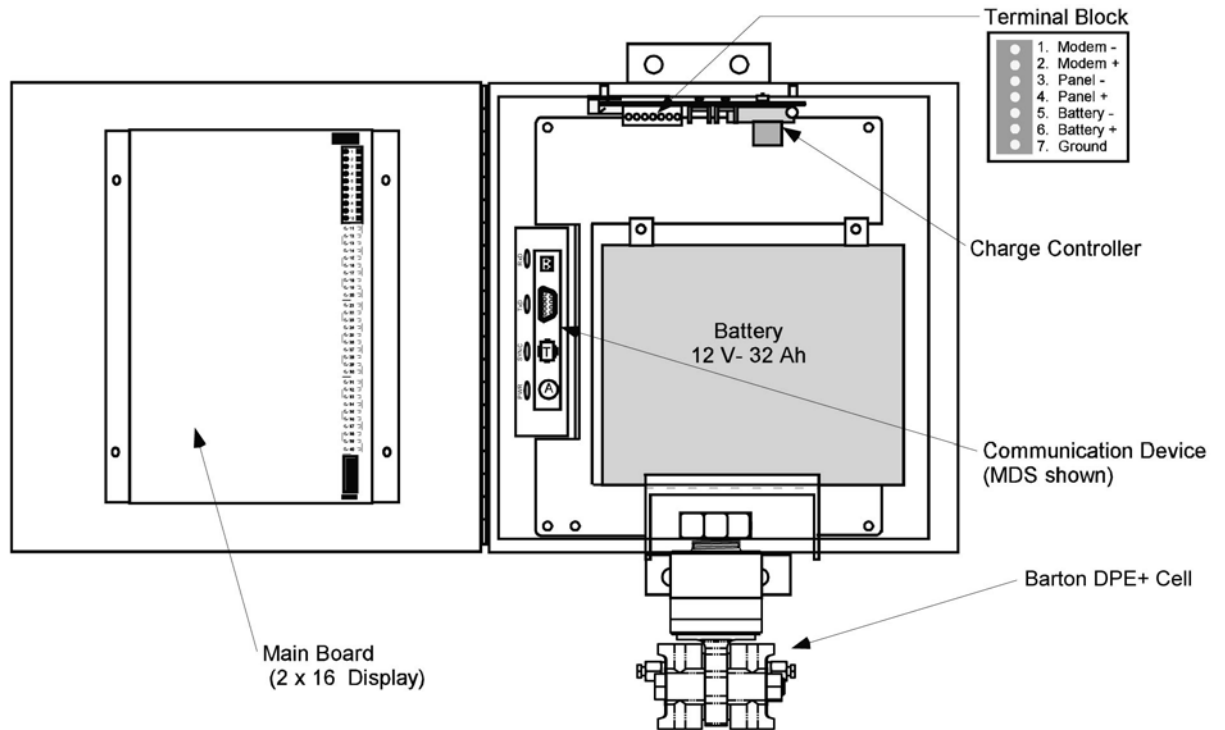
12-Volt Battery Power Supply, Division 2 Controller

The following configurations of the 1140 are suitable for Class I, Division 2 when installed as per [Appendix A: Installation Drawings 9A-1140-11012](#).

Scanner 1140C (Front View with Door Open)

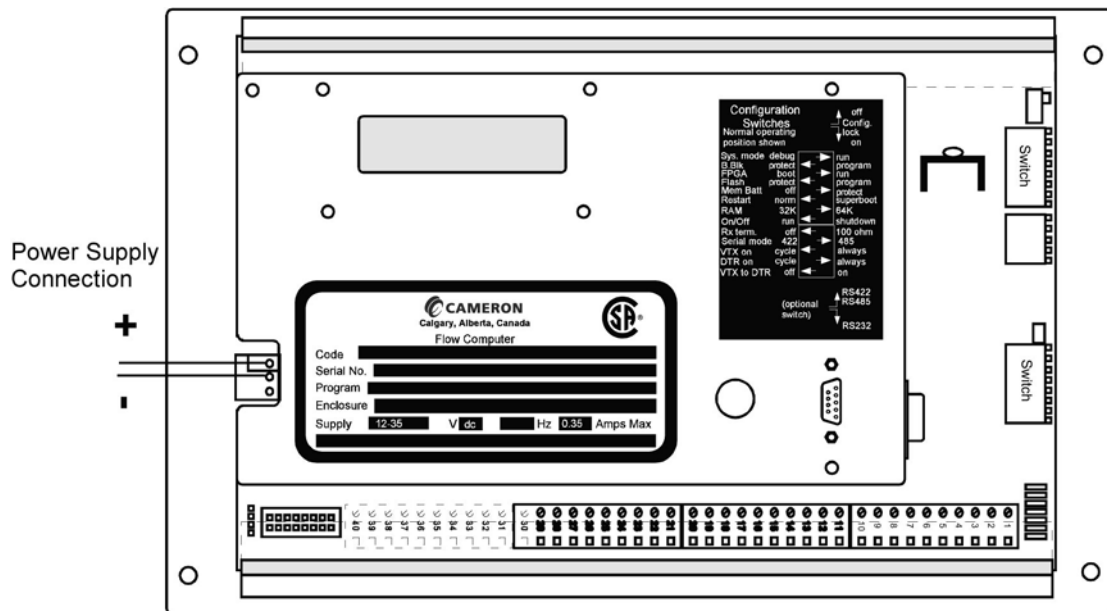


Scanner 1140L (Front View with Door Open)



2. Enclosure is 12" x 12" x 8" deep.
 Notes: 1. All dimensions in inches.

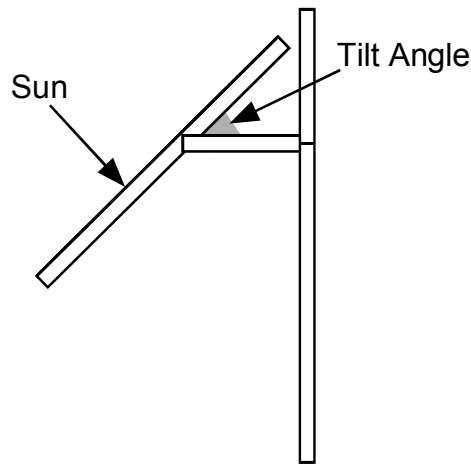
Scanner 1140G



Solar Panel Installation and Connection

Mount the solar panel on a post, or directly to an equator-facing (or, at the equator, upward-facing) flat surface – see chart below for tilt angles. The panel should be mounted high enough to prevent damage or tampering.

Site Latitude	Optimum Tilt Angle
0°	10°
5° - 20°	Latitude +5°
21° - 45°	Latitude +10°
46° - 65°	Latitude +15°
66° - 75°	80°



Note: Angles are marked on the bracket of the solar panel (0° - 90° tilt)

Connect the wires from the Power Supply Strain Relief to the Solar Panel Connection on the Battery Module Circuitry Board in the appropriate +, - terminals. Note that the strain relief must be ***TIGHT*** to ensure a weatherproof seal.

Refer to [Page 16 - Battery Power Supply](#) to access the Battery Module Circuitry Board.

Flashing the Scanner

“**Flashing**” is the term used to describe the procedure that installs a different version of firmware other than the one with which the Scanner was shipped. **If changing the firmware is *NOT* necessary**, the **Startup Procedure (Page 28)** may be initiated.

Reprogramming the flash memory of the Scanner 1140 RTU with a new version of firmware requires the use of a *loading program*. The **ScanFLASH** or WinsLoad program is used in a Windows 3.1, 95, 98, NT, 2000 or XP environment. While either loading program may be used with a Scanner, ScanFlash may be preferable for operators using laptops that support PC-COM ports up to 9 to work with USB to RS-232 converters that typically install at higher locations.

If a Windows operating system is not available, **ScanLoad** is a DOS program that should only be run in **DOS** (***NOT*** in a DOS shell from within Windows 3.1, 95, etc.). If you *must* use ScanLoad, go to **Page 26** for information about its installation and use.

A firmware upgrade is required for all instruments upgraded with a Barton[®] DPE+ transducer. The table below shows firmware versions required to support the DPE+ transducer.

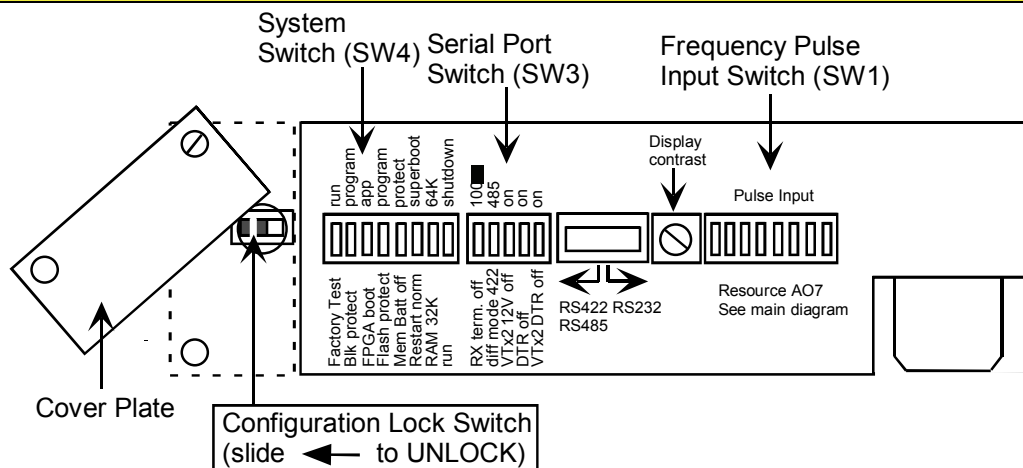
Selection Chart for Scanner Firmware

<i>If using this firmware</i>	<i>Install this firmware version (or later version)</i>	<i>Configure with this software</i>
NFlo version 4.x	NFlo 4.4.0F	ScanWin
NFlo version 3.x	NFlo 3.2.4F	ScanPC
NGas version 3.x	NGas 3.1.4F	ScanPC
NGas version 2.x	NGas 2.7.4F	ScanPC

Getting Ready to Flash

Important: Before starting, determine where the 8-switch bank of DIP switches, SW4 is located. SW4 can be found under the rubber plug, furthest from the hinge side, at the top of the Scanner 1140 main board. The main board is mounted inside the aluminum extrusion screwed to the inside of the enclosure’s door.

Note also that the *optional* Configuration Lock Switch **must** be in the **UNLOCK** position. If it is not, the flashing process cannot be done.



Configuration Lock Switch

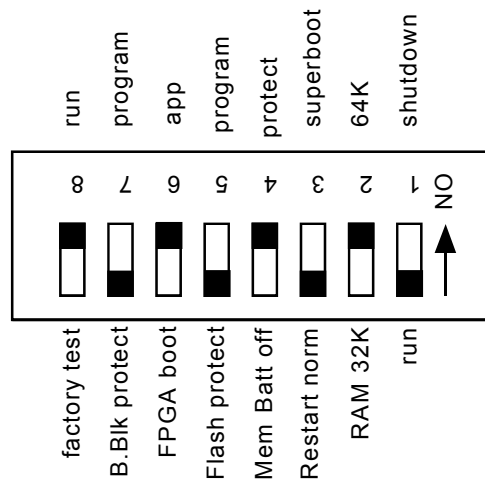
The optional Configuration Lock Switch may be legally required in some locations. When installed, it is located to the left of Switch SW4 (see above diagram). It consists of a cover plate that normally covers the switch. When it needs to be accessed the screw nearer the Scanner’s front cover is loosened and the further one is removed. The plate is then rotated until the locking switch is exposed as in the diagram above.

Sliding the switch to the LEFT (away from Switch SW4) allows the Scanner to be flashed, superbooted or configured.

When it is moved to the RIGHT (towards Switch SW4), change to the Scanner’s configuration is prevented. The cover plate is then rotated to cover the switch. The removed screw is then replaced and both screws are tightened. A wire is passed through the heads of the screws and a seal is placed on the ends of the wire.

Start Flashing

The “normal” running positions of the DIP switches in SW4 are as shown below:



(Note: Switch 2 position is application dependent. It may be in either position.)

IMPORTANT: Before the Scanner 1140 firmware can be upgraded, you must have the ScanFLASH or WinsLoad software loaded on your laptop in its own directory.

Whether you are intending to reprogram the Scanner with ScanFLASH, WinsLoad or ScanLoad, carry out the following **common** steps and then go on to the pertinent section.

1. Start ScanWin or ScanPC.

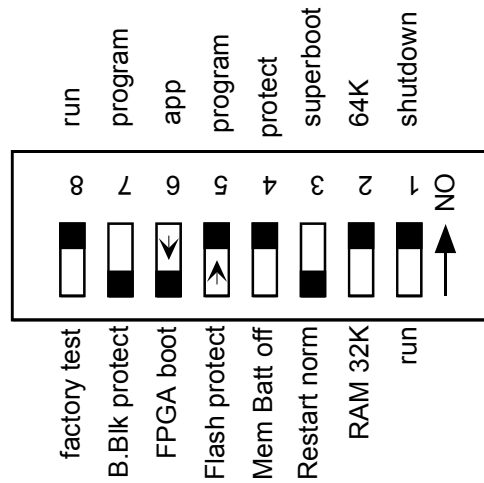
2. Download **all** History, Configuration and Calibration data. **(HIGHLY RECOMMENDED)**

3. Exit from ScanWin or ScanPC.

4. “Power down” the Scanner 1140 by moving Switch SW4-1 to the “shutdown” position (ON).

5. Make certain that the Configuration Lock Switch, if installed, is in an UNLOCKED state.

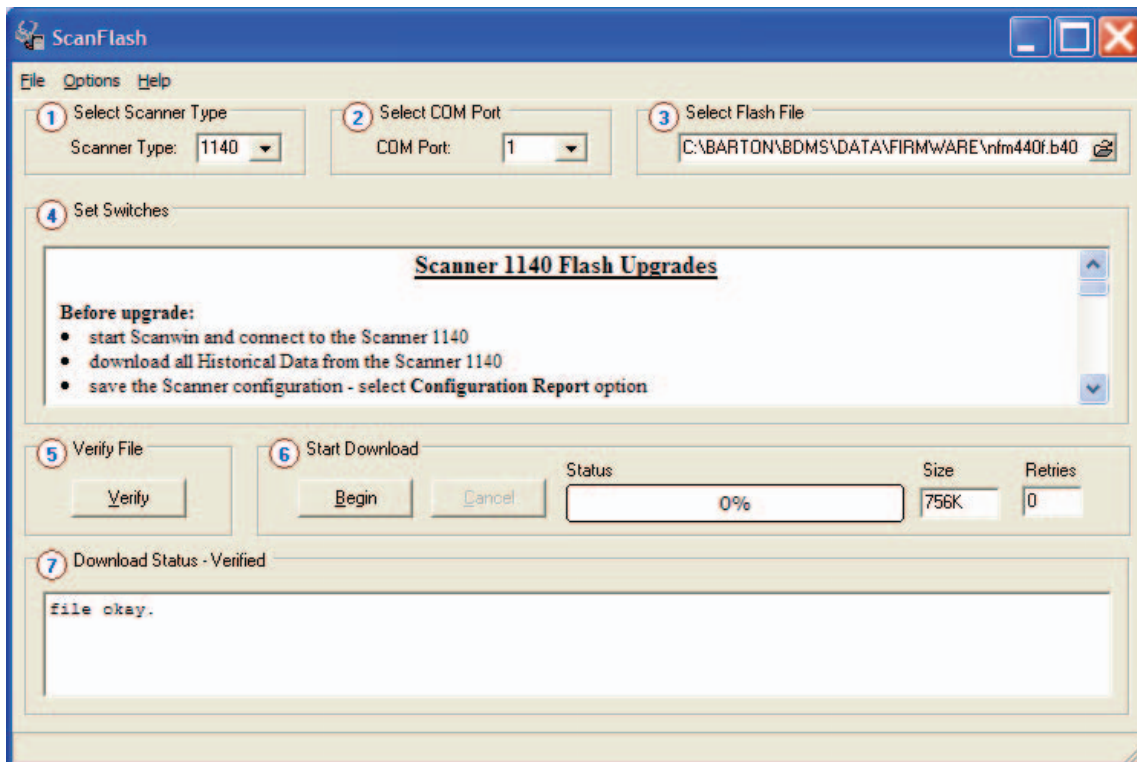
- Set Switches SW4-5 to the “**program**” position (ON) and SW4-6 to the “**FPGA boot**” position (OFF). SW4 should now look like this:



- Continue below *or* go to **Page 26** if you are using ScanLoad.

Flashing with ScanFlash

The ScanFlash utility is loaded on your ScanWin installation CD. Simply load the program into your computer and follow the on-screen instructions.



Flashing with WinsLoad (in Windows)

WinsLoad is used to flash the Scanner RTU using an MS Windows operating system.

If you *must* operate in a DOS environment, go to the section on **Flashing with ScanLoad (DOS)** – Page 26.

Installing WinsLoad

1. Obtain the **WINSLOAD.ZIP** file from Cameron’s Measurement Systems Division.
2. Open Windows Explorer and create a directory named WINSLOAD on the C: drive of your computer.
3. Unzip the contents of WINSLOAD.ZIP into C:\WINSLOAD. The ZIP contains five files including the WINSLOAD application, two batch files and two shortcut (PIF) files.

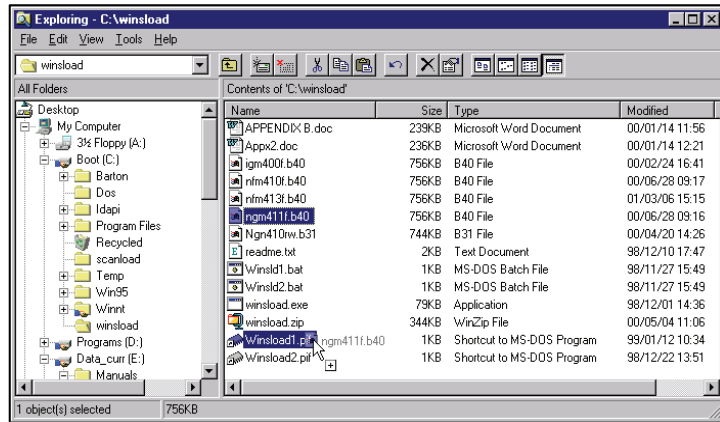
Note: The shortcuts assume c:\winsload as the default directory – edit their properties if you copy WINSLOAD and the two batch files elsewhere.

Using WinsLoad

The following steps is meant to serve as an example of using the WinsLoad utility:

1. Using Windows Explorer, drag the icon of the binary firmware file onto **WINSLOAD1.PIF**, **WINSLOAD2.BAT** or **WINSLOAD.EXE** if you are using the **COM1** communication port on your PC. The file may also be dragged and dropped onto **WINSLOAD2.PIF** or **WINSLOAD2.BAT** if your communication port is **COM2**.

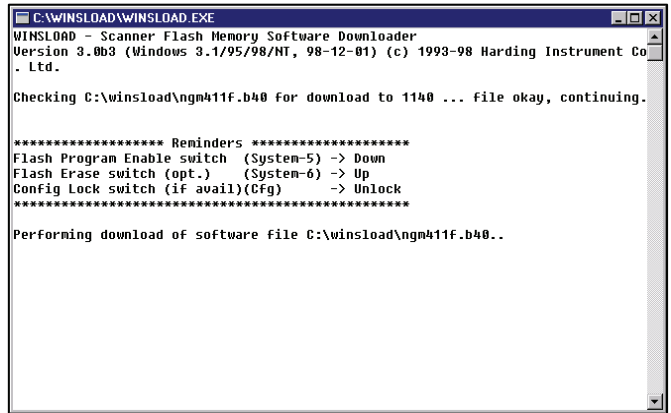
Alternatively, you can use the Win95/98/NT command line. For Windows 3.1, you must use the **Run** command in the Program Manager menu.



The binary firmware file name will be formatted as follows, depending on the version:

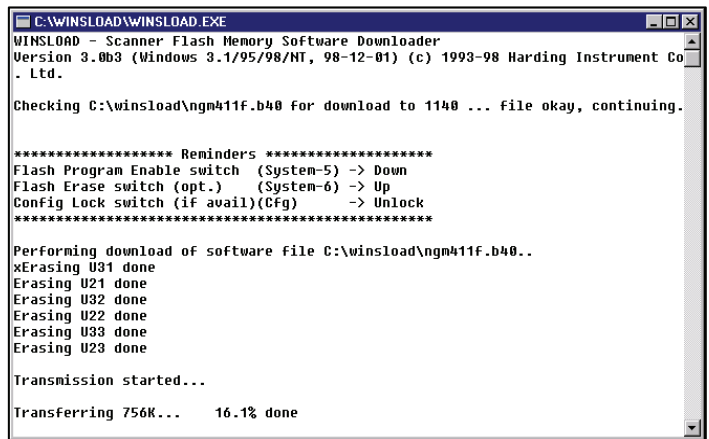
- NGXXXXXX.B40 for all Ngas versions for the Scanner 1140
- NFXXXXXX.B40 for all Nflo versions for the Scanner 1140
- IGXXXXXX.B40 for all Igas versions for the Scanner 1140
- OPXXXXXX.B40 for all OPSat versions for the Scanner 1140

2. An MS-DOS window is automatically opened. WinsLoad checks the validity of the binary file and if it is all right, it displays a window similar to this one.
3. Now, “**power up**” the Scanner by moving the SW4-1 switch *back* to the “**run**” position (OFF).

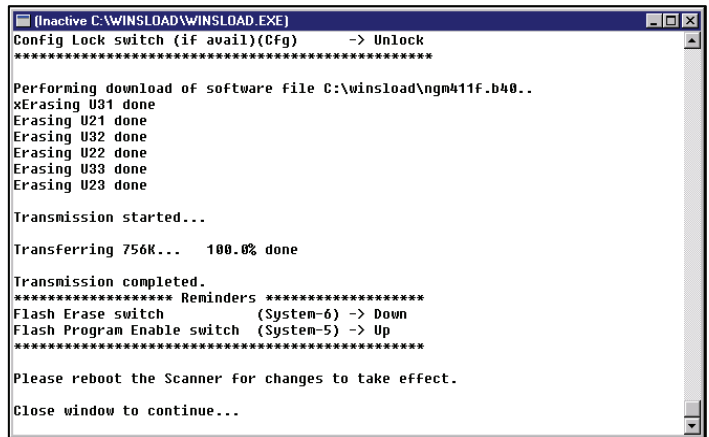


1. **Note:** In this example, note that NGM411F.b40 is being dragged and dropped onto the Winsload1 Shortcut.

4. WinsLoad begins to erase the ROM. When that is done, it then begins to upload the new firmware to the Scanner while displaying the percentage of the file that has been transferred...



5. ...until “*Transmission completed.*” Is reported. At this point, close the window.
6. Move Switch SW4-1 to the “**shutdown**” position (ON).
7. Move Switches SW4-5 to the “**Flash protect**” position (OFF) and SW4-6 to the “**app**” position (ON).
8. It is **HIGHLY RECOMMENDED** that the Scanner RTU be superbooted. To do this, refer to the [Startup Procedure – Page 28](#).



Flashing with ScanLoad (DOS)

The use of ScanLoad should take place **only** if you are running in a DOS environment (not from within a DOS “shell” when running Windows). Use WinsLoad if you are operating in an MS Windows operating system.

The **Getting Ready to Flash** section (Page 21) should be carried out before using ScanLoad.

Installing ScanLoad Version 2.2

Note: This procedure must be done in a “Safe Area.”

ScanLoad requires the Scanner software as a binary file with the extension B40. It is recommended that ScanLoad be installed onto the hard drive of the operator’s PC. Running ScanLoad from the hard drive speeds up the downloading process.

To install ScanLoad from disk onto the hard drive perform the following sequence:

1. Turn ON the PC and wait for the C:\ prompt to appear on the screen. If the operator is currently using a program, exit and return to C:\ prompt.
2. Make a ScanLoad directory by typing after the C:\ prompt:
md Scanload
3. Change the directory by typing after the C:\ prompt:
cd Scanload
4. The following prompt will appear:
C:\SCANLOAD>
5. Copy ScanLoad files EXE., TXT., and binary (*.B40) from the A drive to the hard drive by typing:
Copy a:*.*

(which will copy all the files that are on the disk, including the binary file) to the ScanLoad directory.

To copy **ONLY** the ScanLoad files, type the following after the C:\SCANLOAD> prompt:

Copy a: SCANLOAD.*

which will copy only the ScanLoad.EXE and TXT files from the disk.

The binary files must then be copied by typing:

Copy a: [binary name]

after the C:\SCANLOAD> prompt. (An example of a binary name is NGS260F.B40).

Using ScanLoad

Before starting ScanLoad, perform the steps outlined in the section, [Getting Ready to Flash \(Page 21\)](#).

The following steps is intended as an example of using the ScanLoad utility:

1. From the ScanLoad directory type: **SCANLOAD NGM411F.B40**, then press **enter**. (ScanLoad is the executable file to start the program and NGM411F.B40 is the binary file with the new firmware). **Note that a newer file would have a different name.**
2. ScanLoad checks that the binary file is OK and informs you it is ready to download the data.
3. “Power up” the Scanner 1140 by moving Switch SW4-1 to the “run” position...this will start the process of erasing the old firmware in the Scanner 1140.

```

C:\scanload>SCANLOAD NGM411F.B40
SCANLOAD - Scanner Flash Memory Software Downloader
Version 2.6 (98-08-21) (c) 1993-98 Harding Instrument Co. Ltd.

Checking NGM411F.B40 for download to 1140 ... file okay, continuing.

***** Reminders *****
Flash Program Enable switch (System-5) -> Down
Flash Erase switch (opt.) (System-6) -> Up
Config Lock switch (if avail) (Cfg) -> Unlock
*****

Performing download of software file NGM411F.B40..

```

4. ScanLoad will:
 - a) display a message indicating which ROM is being erased. If no message is being displayed at this point, see [page 27 – Troubleshooting the Flashing Procedure](#) section of this section.

```

C:\scanload>SCANLOAD NGM411F.B40
SCANLOAD - Scanner Flash Memory Software Downloader
Version 2.6 (98-08-21) (c) 1993-98 Harding Instrument Co. Ltd.

Checking NGM411F.B40 for download to 1140 ... file okay, continuing.

***** Reminders *****
Flash Program Enable switch (System-5) -> Down
Flash Erase switch (opt.) (System-6) -> Up
Config Lock switch (if avail) (Cfg) -> Unlock
*****

Performing download of software file NGM411F.B40..
Erasing U31 done
Erasing U21 done
Erasing U32 done
Erasing U22 done
Erasing U33 done
Erasing U23 done

Transmission started...
Transferring 756K... 51.7% done

```

- b) start the upload of the new firmware and display the percentage of the program that has been transmitted. If the percentage is displayed as -1% or, if any Retries occur, then see the [Troubleshooting the Flashing Procedure](#) section ([page 27](#)).

```

Command Prompt
Flash Erase switch (opt.) (System-6) -> Up
Config Lock switch (if avail) (Cfg) -> Unlock
*****

Performing download of software file NGM411F.B40..
Erasing U31 done
Erasing U21 done
Erasing U32 done
Erasing U22 done
Erasing U33 done
Erasing U23 done

Transmission started...
Transferring 756K... 100.0% done

Transmission completed.
***** Reminders *****
Flash Erase switch (System-6) -> Down
Flash Program Enable switch (System-5) -> Up
*****

Please reboot the Scanner for changes to take effect.
C:\scanload>

```

5. Once ScanLoad is done, close the window.
6. Move Switch SW4-1 to the “shutdown” position (ON).
7. Then, move Switches SW4-5 to the “Flash protect” position (OFF) and SW4-6 to the “app” position (ON).
8. Continue in Step 2 of the [Startup Procedure](#) section ([page 28](#)).

Troubleshooting the Flashing Procedure

- In ScanFLASH or WinsLoad, abort the flashing process by clicking on the **Close** button (X) (or, in ScanLoad, press both the **Ctrl** and **Break** keys).
- Power down the Scanner 1140 as described in Step 4 of the [Start Flashing](#) section ([Page 22](#)).
- Restart the loading program as explained in **Step 1** of [Using WinsLoad](#) or [Using ScanLoad](#).
- Power up the Scanner 1140 as in **Step 3** of either [Using WinsLoad](#) or [Using ScanLoad](#).

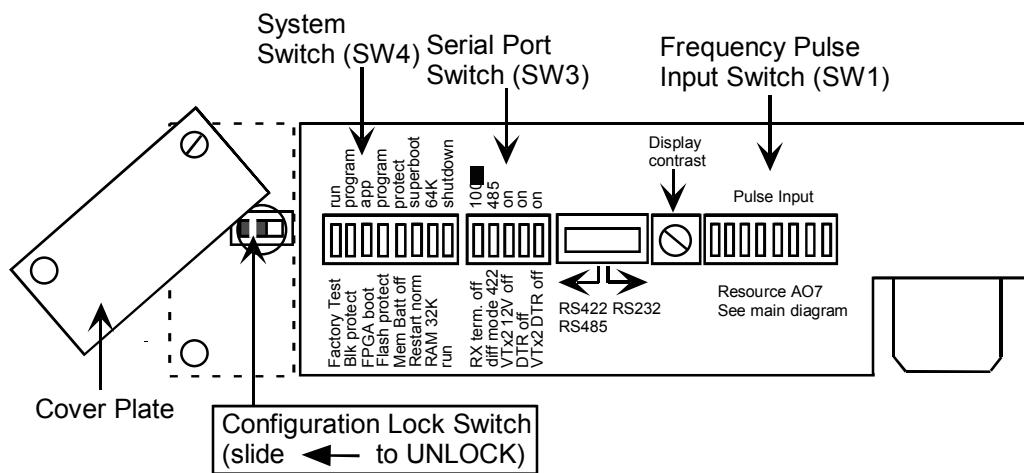
Startup Procedure

Note: If the Scanner has been **FLASHED** or is **NOT CONFIGURED**, perform a **Superboot**. If it is already configured, it is not necessary to perform a superboot. Also, note that if a previous configuration was saved, it is possible to restore a configuration after a Superboot is performed.

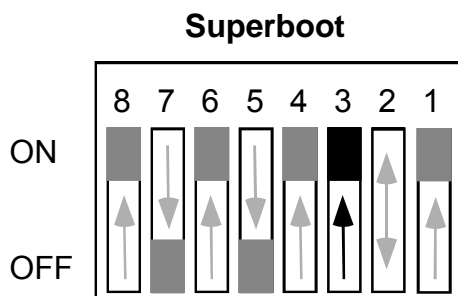
Superbooting the Scanner

Perform a **Superboot** as follows:

1. Connect the input power (solar panel to the Battery Charge Controller) and turn it ON. Refer to [Page 20 – Solar Panel Installation and Connection](#). Ensure that the power cable is connected to the connector on the Main board. If a Configuration Lock Switch is installed, make certain it is in the **UNLOCK** position.

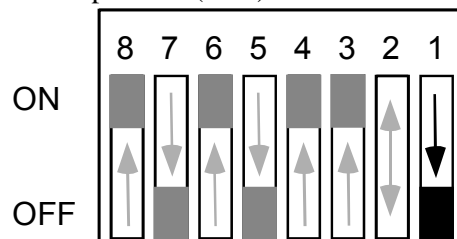


2. Set Switch SW4-3 to the “**superboot**” position (ON). You are now ready to superboot the Scanner. SW4 will look like this:

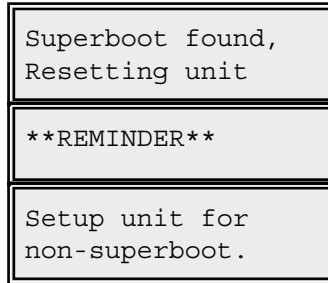


CAUTION:
Superboot causes a **LOSS** of Configuration and History data.
SAVE all Configuration and History data **BEFORE** superbooting the Scanner RTU.

3. Next, move Switch SW4-1 to the “**run**” position (OFF).

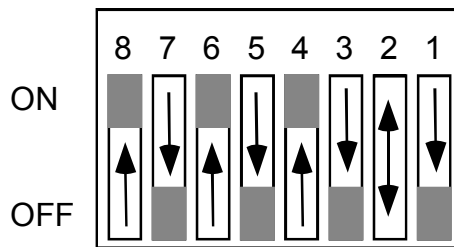


A series of messages appear on the local display as the Scanner 1140 performs its master reset sequence:




4. Start ScanWin or ScanPC and set the time and date at the prompt.
5. After setting the date and time, move Switch SW4-3 to the “Restart norm” position (OFF). The SW4 switches should now be in their “normal” running positions as follows:

Normal Operation

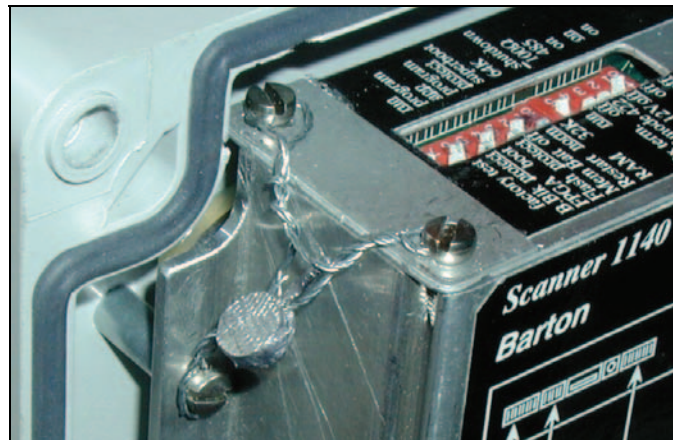
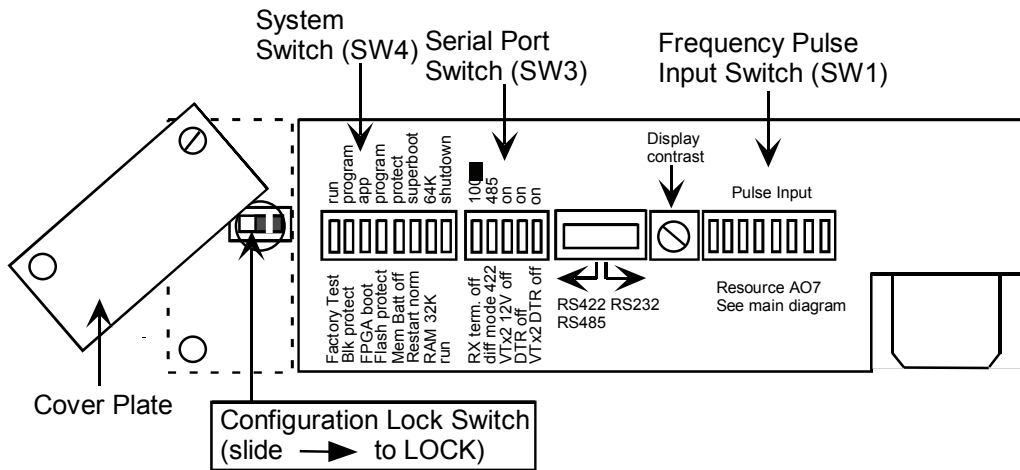


Note: Ensure that the **Superboot** Switch SW4-3 is shut OFF or configuration and history logs will be lost if power fail occurs or if the system is reset.

6. If it is necessary to add new hardware to the Scanner RTU, disconnect or switch off input power to the Scanner. Proceed to connect the transmitters, RTDs and any other end devices (refer to **Chapter 2: Main Board and Wiring**). If the end devices include turbine meters or other pulse-output meters, ensure that Switch SW4-2 is set to the appropriate mode. When you are finished, connect or turn on input power to the Scanner.
7. Configure the Scanner. Refer to the ScanWin manual (Chapter 2: ScanWin Basics (Overview of the Startup Procedure)) or Section 3.2 of the Scanner 1100 Configuration NGas/NFLo X.X.X manuals.

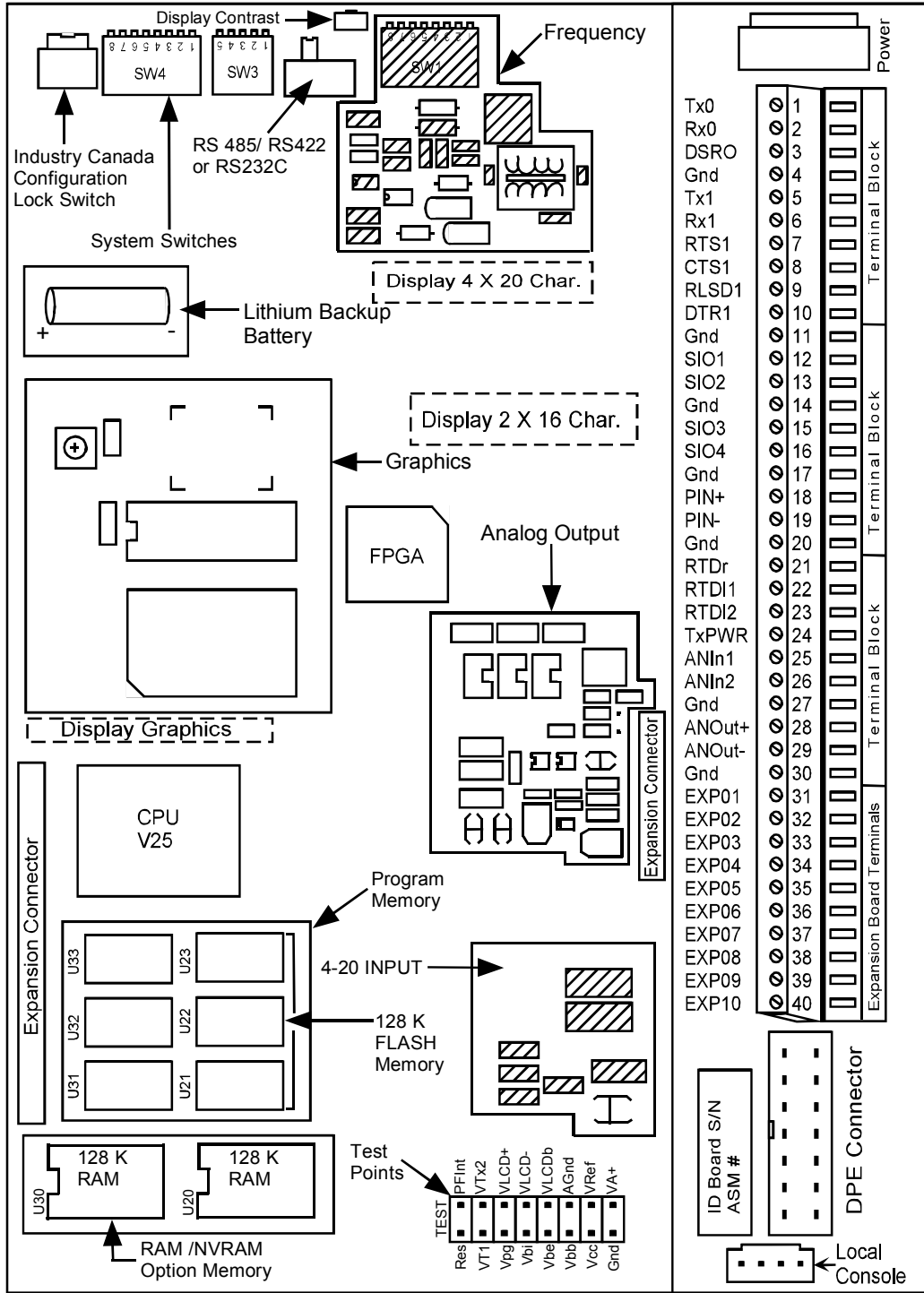
 It is **recommended** that the new Scanner configuration be rebuilt in its entirety. Undesired problems may result when a configuration file built in one firmware version is uploaded to another Scanner with a different firmware version.

8. Where legally required, the optionally installed **Configuration Lock** Switch may be enabled and the cover sealed.

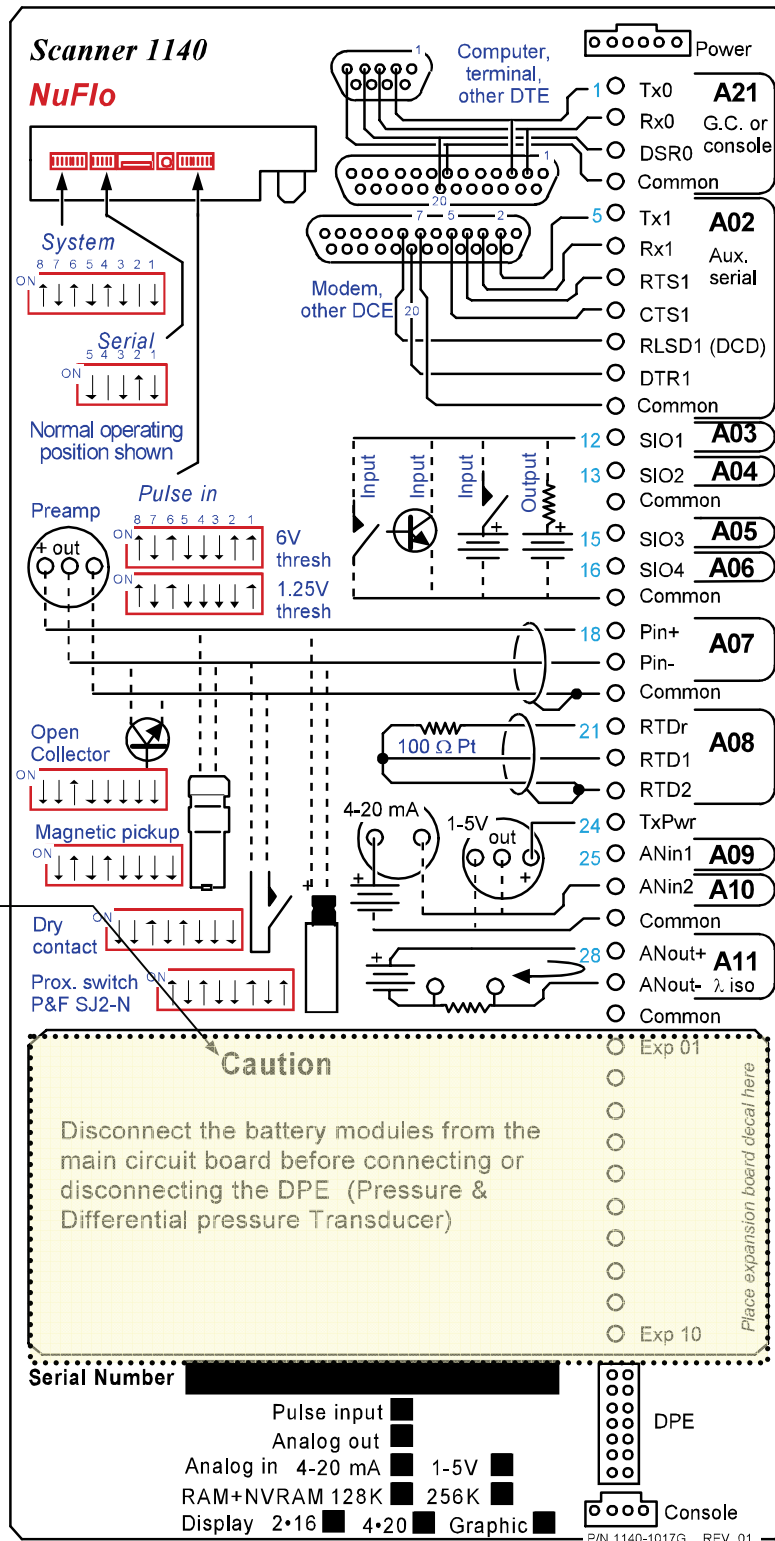


Chapter 2: Main Board and Wiring

Main Circuit Board Diagram (Major Components)



Main Board Wiring Diagram



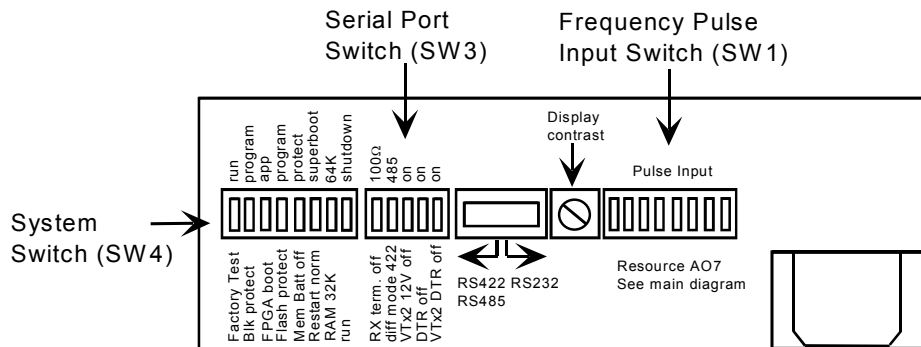
Field Termination

(6 Pin Input Connector – RS-232C setting)

Source	Terminal #	Description
A21 (Remote Console)	1	TxO – Gas chromatograph (secondary console) port transmit output
	2	RxO – Gas chromatograph (secondary console) port receive input
	3	DSRO – Remote console port DSR input
	4	COMMON – Signal common
A02 Auxiliary Serial (RS-232-C)	5	Tx1 – Auxiliary serial port transmit output
	6	Rx1 – Auxiliary serial port receive input
	7	RTS1 – Auxiliary serial port request to send (RTS) Output
	8	CTS1 – Auxiliary serial port clear to send (CTS) input
	9	RLSD1 (DCD) – Auxiliary serial port receive line signal detect (RLSD or DCD) input
	10	DTR1 – Auxiliary serial port data terminal ready (DTR) input
	11	COMMON – Signal common
A03	12	SIO1 – Status input/output #1
A04	13	SIO2 – Status input/output #2
	14	COMMON – Signal common
A05	15	SIO3 – Status input/output #3
A06	16	SIO4 – Status input/output #4
	17	COMMON – Signal common
A07	18	Pin + - Pulse input positive
	19	Pin- - Pulse input negative
	20	COMMON – Signal Common
A08	21	RTDr – RTD R
	22	RTD1 – RTD I1 (Signal Common)
	23	RTD2 – RTD I2 (Signal Common)
A09	24	TxPwr – Transmitter power output
	25	Anin1 – Analog input #1
A10	26	Anin2 – Analog input #2
	27	COMMON – Signal common
A11	28	Anout+ - Analog output positive
	29	Anout- - Analog output negative
	30	COMMON – Signal common

Source	Terminal #	Description
	31	EXP 01 - Expansion board terminal #1
	32	EXP 02 - Expansion board terminal #2
	33	EXP 03 - Expansion board terminal #3
	34	EXP 04 - Expansion board terminal #4
	35	EXP 05 - Expansion board terminal #5
	36	EXP 06 - Expansion board terminal #6
	37	EXP 07 - Expansion board terminal #7
	38	EXP 08 - Expansion board terminal #8
	39	EXP 09 - Expansion board terminal #9
	40	EXP 10 - Expansion board terminal #10

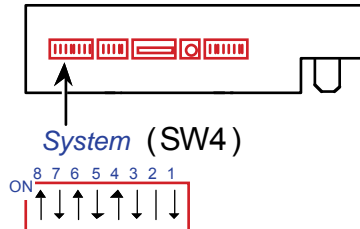
DIP Switch Summary



Memory Switches

Switch Control DIP Switch (SW4) Summary

The Switch SW4 located at the top left of the main board controls several important functions:

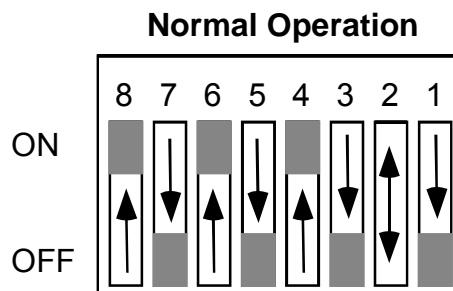


The following table summarizes SW4's functions and settings:

Switch #	Description	ON	OFF
SW4-1	System shutdown	Shutdown	(Running)
SW4-2	RAM size select (Firmware 4.3 and higher)	64K RAM (96K RAM)	32K RAM (64K RAM)
SW4-3	Restart type select	Superboot	(Normal)
SW4-4	Battery backup switch	(Enabled)	Disabled
SW4-5	FLASH memory program enable	Enabled	(Disabled)
SW4-6	Boot block FPGA version select	(Application Version)	Boot version
SW4-7	Boot block program enable	Enabled	(Disabled)
SW4-8	System mode select	(Normal Mode)	Debug Mode

Settings in parentheses () are for the normal operating mode.

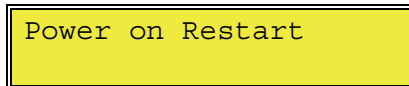
The following diagram illustrates SW4's settings for normal operation:



Below is a detailed description of the functions of each switch on the System Control Switch SW4:

SW4-1: This switch performs a properly supervised system shutdown. Rather than simply driving the system RESET line, SW4-1 generates a power fail interrupt to the CPU, and after a 10 ms delay (for the power fail code to run) shuts the power off to the entire system board. The current draw of the system board is reduced to below 50 mA when shut down.

Temporarily placing Switch SW4-1 in the ON position causes a Power On Restart. A Power On Restart interrupts the flow calculations but does not affect the configuration or historical flow data if the NVRAM lithium backup battery (see [Page 37](#)) is enabled. Power On resets are logged in the event log. The display will show:



Power on Restart

SW4-2: This switch determines how the system's base 128 Kbytes (or 256 Kbytes) of memory is partitioned. When ON, 64 Kbytes of RAM and 64 Kbytes of NVRAM are provided. When OFF, 32 Kbytes of RAM and 96 Kbytes of NVRAM are provided. Alternatively, the 256 Kbytes is partitioned as follows; when ON 64 Kbytes of RAM are provided, and 192 Kbytes of NVRAM; when OFF, 32 Kbytes of RAM is provided and 224 Kbytes of NVRAM are provided.

Note that the RAM values change to 96K (ON position) and 64K (OFF position) with Firmware 4.3x and higher.

SW4-3: This switch determines which type of system startup is performed. When ON, a "Superboot" occurs. When the Scanner 1140 is turned ON a superboot initializes all of the non-volatile memory. A Superboot is required for any changes made to any of the switch settings to become effective. When OFF, a normal restart occurs.

SW4-4: This switch enables and disables the lithium backup battery and should be left in the ON position when the Scanner is in operation. However, if the Scanner is stored for any period of time (a week or more), the switch should be shut OFF (refer to [Page 37 - Lithium Battery Switch](#)).

SW4-5: This switch enables programming of the FLASH memory array by connecting the +12V programming voltage to the VPP pin of each of the FLASH memory devices. Unless a new application code is being downloaded to the system, the switch should be left in the OFF position.

SW4-6: This switch determines the location from which the field programmable gate array (FPGA) is loaded. When SW4-6 is OFF, the array is loaded from the FLASH memory's protected "boot" block. The boot block is a special 8-Kbyte area of the FLASH memory array that can be independently erased and reprogrammed. When SW4-6 is ON, the array is loaded from the FLASH memory application area. This is the normal position of this switch.

SW4-7: This switch enables/disables programming of the FLASH memory "boot" block. This function can only be performed at the factory, so SW4-7 should be left in the OFF (disabled) position at all times.

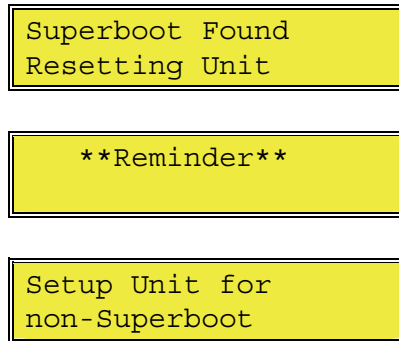
SW4-8 This switch is to select either normal operation (ON) or a specialized factory test mode (OFF). SW4-8 should therefore be left in the ON (normal) position at all times.

Superboot Switch

A “Superboot” erases all configuration and flow data when power is turned ON. A superboot is required when first commissioning the unit (after turning the NVRAM battery switch ON). A superboot is not required if the Scanner 1140 is already configured. However, it is possible to restore a configuration if a superboot is performed.

To perform a superboot:

1. On the System Control DIP switch SW4, place Switch SW4-1 in the normal operating position (OFF), and set Switch SW4-3 to the ON position.
2. Turn Switch SW4-1 ON and then OFF, or cycle the power OFF and then ON. The Scanner will begin its system reset. The display will show:

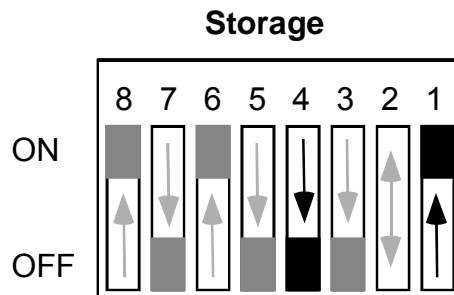


3. Set SW4-3 to the **OFF** position.

Lithium Battery Switch

Switch SW4-4 on the System Control Switch (SW4) enables backup power to the NVRAM. The Scanner 1140 is shipped with the battery switch in the OFF position. **The switch must be set ON before configuring the flow computer.** Loss of input power while Switch SW4-4 is OFF will scramble the entire contents of the NVRAM (including all configuration and flow data), and a “Superboot” will be necessary.

If the computer is stored without power for extended periods (i.e. a week or more), the NVRAM battery switch is set OFF to avoid draining the lithium battery. The reset switch is set ON as follows:



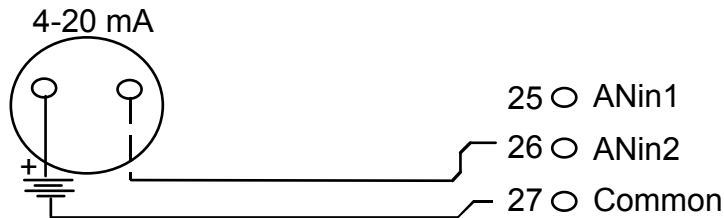
Note: Storage of the Scanner with the lithium battery switch in the ON position will drain the lithium battery. If the lithium battery is drained, it must be replaced.

Analog Transmitter Inputs (Resources A09 – A10)

Analog 4-20 mA Transmitter

(Intrinsically Safe only with barrier)

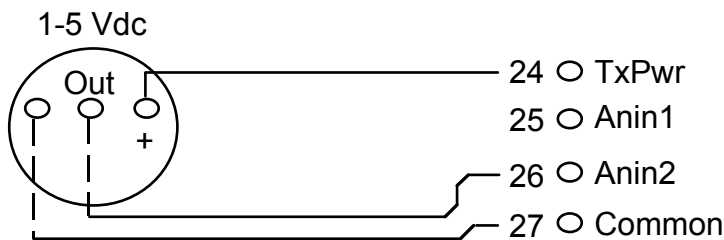
Use of conventional 4-20 mA transmitters requires the addition of precision load resistors on each analog channel. Power for the current loop is normally drawn from an external source.



Analog 1-5 Vdc Transmitter (TxPwr)

(Intrinsically Safe)

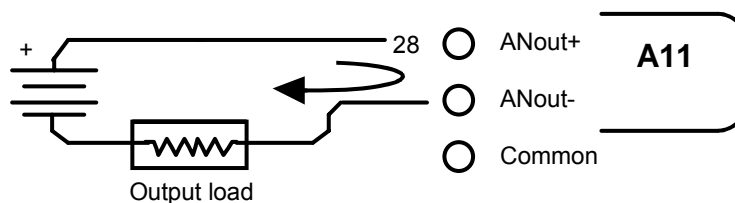
The use of conventional 1-5 Vdc transmitters requires no load resistors. Power for the circuit is normally obtained from the Scanner's internal power supply, but may also be drawn from an external source. The configuration is Intrinsically Safe when used with approved transmitter. Refer to [Appendix A: Installation Drawings](#).



Analog 4-20 mA Output (Optional)

An optional single 4-20 mA analog output is available. To determine if the analog output is installed, use the configuration software (**ScanWin** or **ScanPC**) to examine the hardware section. Alternatively, look at the analog output check box on the bottom of the wiring decal affixed to the extrusion. It is also possible to determine if this option is installed by inspecting the board or checking the ASM number with Cameron's Measurement Systems Division factory.

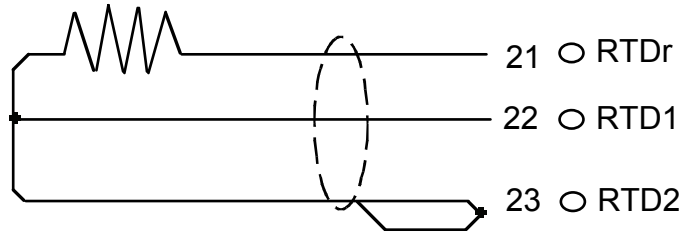
If it is not installed, an analog output can be obtained via the addition of an expansion board.



RTD Inputs (Resource A08)

(Intrinsically Safe when installed per [Appendix A: Installation Drawings](#))

Resource A08 is connected to 100 Ω 3-wire platinum RTD as shown. The RTD characteristic curve is software-selectable for temperature coefficients of either 0.003902 or 0.00385 ($\Omega/\Omega/^{\circ}\text{C}$) or by performing a loop calibration at three or more points (refer to the NGas/NFLo manuals (Section 2 - Analog and RTD Calibration) **or** to the ScanWin manual (Chapter 3 – Calibrate/Verify Devices)).



Platinum 2-wire RTDs can be used by jumping the lead-line compensation terminals together.



CAUTION:

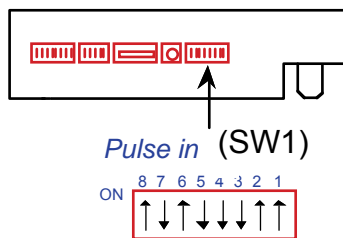
If a 4-wire RTD is used, apply heat shrink or electrical tape to the unused wire to prevent an electrical short.

Frequency Pulse Inputs (Resource A07)

The 1140 frequency inputs are designed to interface with a variety of pulse producing sources, including turbine magnetic pickups, preamplified turbine signals, as well as contact closures and Pepperl & Fuchs inductive proximity sensors.

Frequency Pulse Input DIP Switch (SW1) Summary

An eight position DIP switch (SW1) allows user configuration of the desired electrical interface. Switch 1 (SW1) is located at the top right of the main circuit board:



If SW1 is not present, **the pulse input option is not installed.**

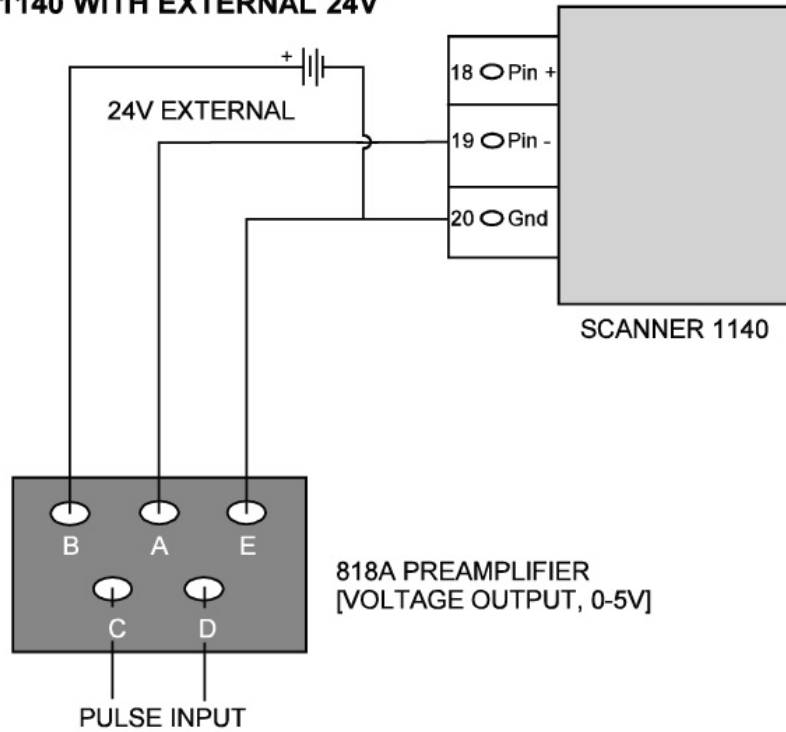
The following table summarizes the function of each switch on the Frequency Input Switch (SW1):

Switch #	ON	OFF
1	Connects +8 Vdc transmitter power supply (VTX2) to the PIN+ terminal (#18) for preamplified pulse and proximity sensor modes	N/A
2	5.68V comparator threshold	1.235V comparator threshold
3	Connects a 620Ω load resistor across the high level signal input to support 7-12 mA transmitters; e.g. used to convert the Pepperl & Fuchs proximity sensor current signal to a voltage for detection	Regular for voltage type preamplifiers or dry contacts
4	Debouncing - input sampling at 32 Hz allowing signals up to 16 Hz to be properly detected (higher frequency pulses generated by contact bounce will be rejected)	Normal - input is sampled at 32 kHz allowing signals up to 16 kHz to be detected
5	Connects the output of the flow computer's pulse preamplifier to signal comparator for low level signals such as turbine magnetic pickup coils	N/A
6	Connects the PIN- terminal (#19) to the signal comparator for high level inputs	N/A
7	Connects PIN+ terminal (#18) to the preamplifier's transformer coupled input for low level signals such as turbine magnetic pickup coils	Transformer not connected
8	Forces the +5V to +12V charge pumping circuit to be permanently active; must be ON to generate the +8V VTX2 supply	Should be left OFF if not in use to minimize power consumption

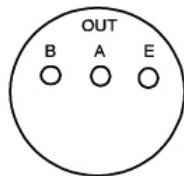
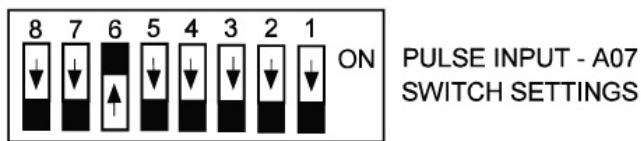
Three-Wire Preamplified Turbine (Barton 818) 0-5V Output

(Non-Intrinsically Safe) - This is suitable for use with the Barton 818A preamplifier configured for voltage output mode. This preamplifier provides a transmission of up to 30 m.

DIAGRAM FOR 818A [V.O.] CONNECTION TO SCANNER 1140 WITH EXTERNAL 24V SUPPLY



NOTE: 24V EXTERNAL SUPPLY SHOULD BE USED TO DRIVE THE 818A.
1140 VTX (APPROXIMATELY 8V) IS ENOUGH TO POWER THE PREAMPLIFIER.



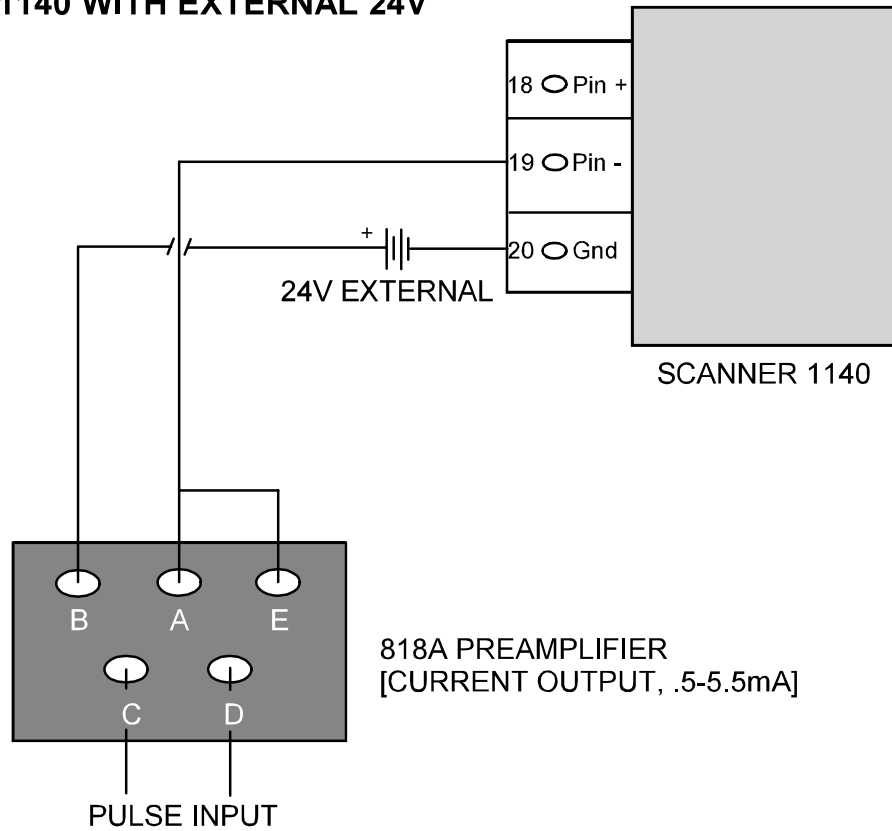
WHEN POWERING THE PREAMP INTERNALLY THE LOW THRESHOLD SWITCH SETTING WORKS BETTER.

NOVEMBER 28, 1966 REV 01

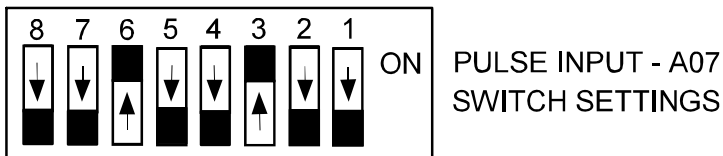
Two-Wire Preamplified Turbine (Barton 818) 0.5 - 5.5 mA Output

(Non-Intrinsically Safe) - This is suitable for use with the Barton 818A preamplifier configured for current-loop output mode. This preamplifier provides a transmission of up to 5 Km.

DIAGRAM FOR 818A [C.O.] CONNECTION TO SCANNER 1140 WITH EXTERNAL 24V SUPPLY



NOTE: 24V EXTERNAL SUPPLY SHOULD BE USED TO DRIVE THE 818A. 1140 VTX (APPROXIMATELY 8V) IS NOT ENOUGH TO POWER THE PREAMPLIFIER.

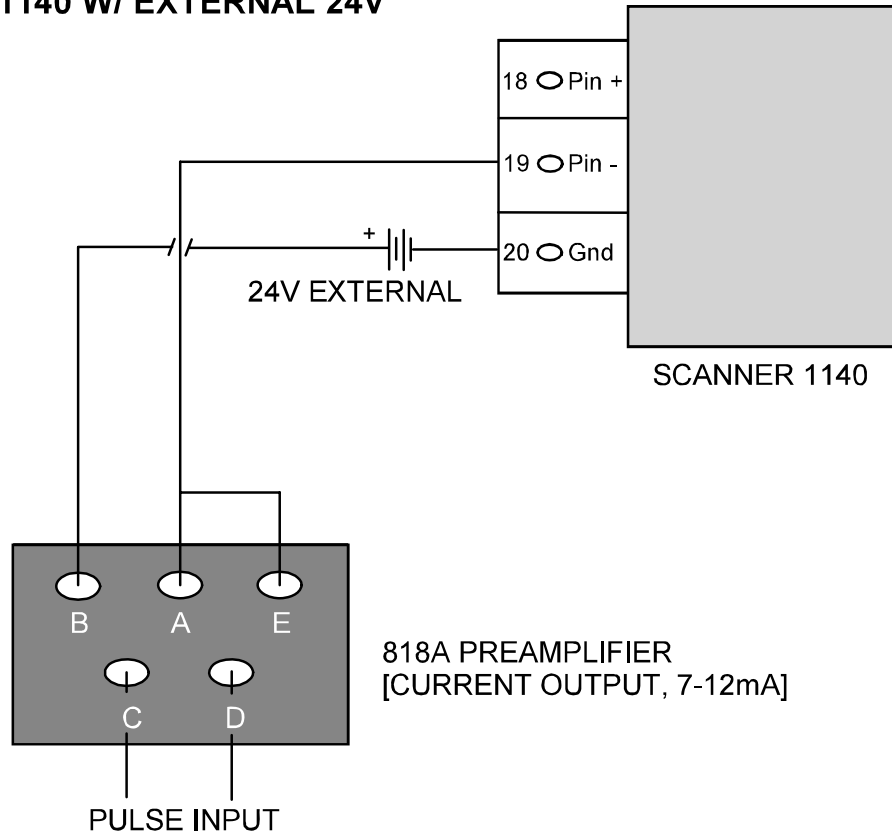


May 13, 1999 REV 02

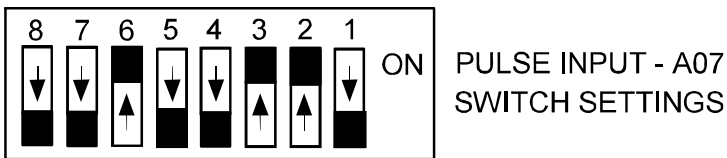
Two-Wire Preamplified Turbine (Barton 818) 7-12 mA Output

(Non-Intrinsically Safe) - This is suitable for use with the Barton 818A preamplifier configured for current-loop output mode. This preamplifier provides a transmission of up to 5 Km.

DIAGRAM FOR 818A [C.O.] CONNECTION TO SCANNER 1140 W/ EXTERNAL 24V SUPPLY



NOTE: 24V EXTERNAL SUPPLY SHOULD BE USED TO DRIVE THE 818A. 1140 VTX (APPROXIMATELY 8V) IS NOT ENOUGH TO POWER THE PREAMPLIFIER.

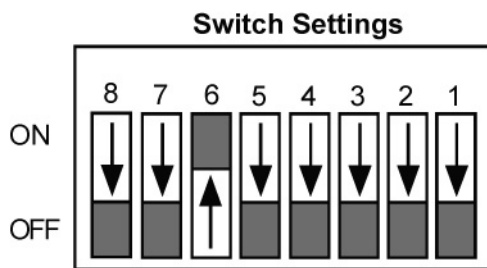
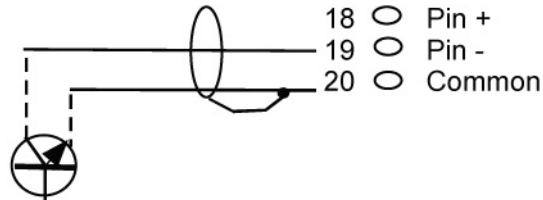


May 13, 1999 REV 02

Open Collector without “Bounce”

(Intrinsically Safe w/Barriers)

This mode provides a generic pulse input, which is compatible with a variety of pulsers and other end devices. A suitable end device is one that provides a bounce-free solid state output stage, such as an open collector transistor or open-drain MOSFET.



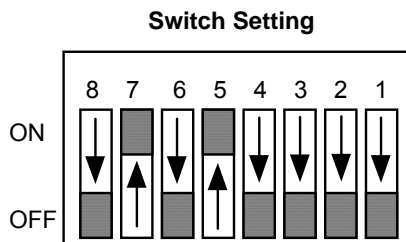
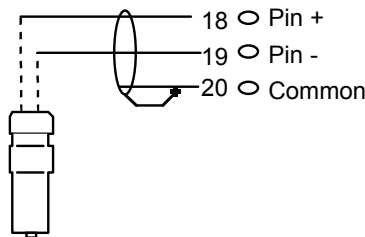
Input Specifications

Offstate Voltage:	+5V nominal
Offstate Leakage:	25 μ A maximum
Onstate Current:	50 μ A nominal
Frequency Range:	0 to 5 KHz

Magnetic Pickup Coil

(Intrinsically Safe)

In this mode, the pulse input is directly connected to a standard variable-reluctance pickup coil and is used on Barton 7400 series gas turbine meters and other meters of similar design. The input is transformer-coupled to ensure common-mode noise rejection, and incorporates a variable gain stage to increase the sensitivity to low frequency and low amplitude signals. Shielded cable (such as Belden 9322) is required.



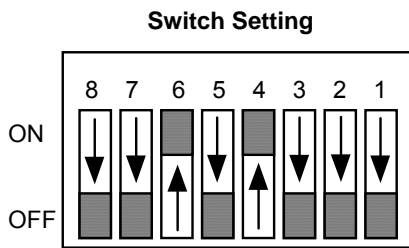
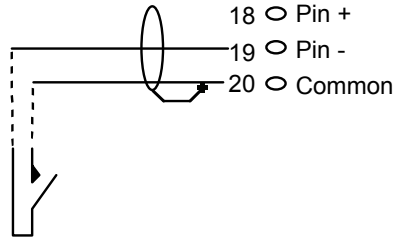
Input Specifications

Input Impedance:	10K Ω @ 1 KHz (signal < 1000 mV p-p)
Input Sensitivity:	20 mV p-p @ 20 Hz. 20 mV p-p @ 100 Hz. 200 mV p-p @ 1000 Hz. 400 mV p-p @ 2000 Hz. 1000 mV p-p @ 5000 Hz.

Dry Contact

(Intrinsically Safe when installed as per [Appendix A: Installation Drawings](#))

In this mode, the pulse input is connected to any device that provides a passive contact closure, such as a reed relay or microswitch. Excitation is provided by the Scanner 1140. Debouncing circuitry limits the input frequency to 15 Hz maximum.



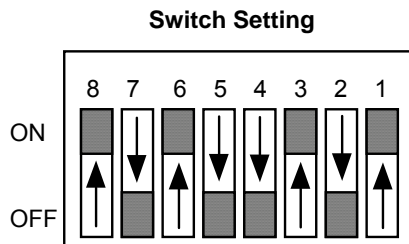
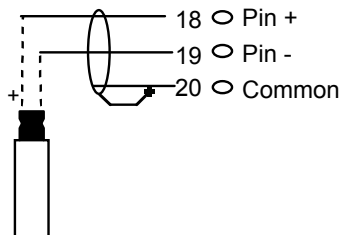
Input Specifications

Offstate Voltage:	+5 V nominal
Offstate Leakage:	25 μ A maximum
Onstate Current:	50 μ A nominal
Frequency Range:	0 to 15 Hz @ 50 duty cycle
Maximum Contact Bounce:	15 msec.

Pepperl & Fuchs Inductive Proximity Sensor

(Intrinsically Safe when installed as per [Appendix A: Installation Drawings](#))

In this mode, the pulse input is compatible with the BSR (Rockwell) slot sensor or other pulsers that provide a current output that is signal compatible with the Pepperl & Fuchs #SJ2-N proximity sensor.



Input Specifications

Maximum Low Level:	1.0 mA
Minimum High Level:	3.0 mA
Frequency Range:	0 to 5 KHz

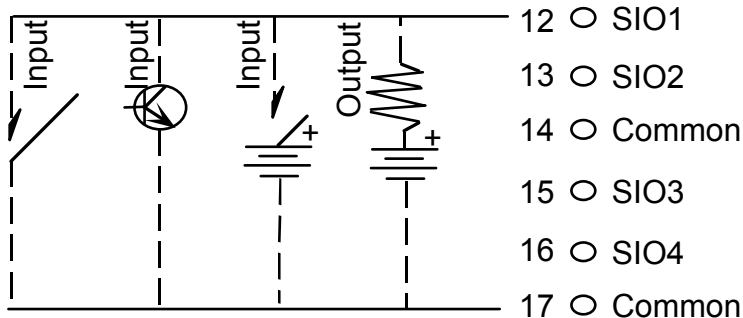
Status Inputs and Outputs (Resources A03, A04, A05 and A06)

(Intrinsically Safe w/Barriers)

Status inputs are used to read the state of an external device, which can be either passive (e.g. contact closures) or active where excitation is from an external source. The type of input is selected by software. When a passive input is selected, an internal power source attempts to drive a 50-microampere current through the circuit. The voltage through this circuit is limited to 3.2 Vdc. When an active input is selected, the user is provided software selectable voltage thresholds of 2, 7 or 10 Volts. Below the threshold, the input will be false (off); above the threshold, true (on).

Outputs are used for status (e.g. alarms) or pulse train (e.g. accumulated volume) and are selected by software. The circuits are suitable for a variety of end devices including small inductive loads such as electromechanical counters. The output circuits have limited protection against inductive “kickback” from such devices, but an additional safety factor is gained by strapping a diode across the load. Current requirements in excess of 100 mA require the use of interposing relays. The transmitter power supply terminals marked “Vtx” (refer to [Page 32 - Main Board Wiring Diagram](#)) should not be used for excitation since the computer can switch OFF the power to these terminals under software control. Excitation should instead be drawn from an external source.

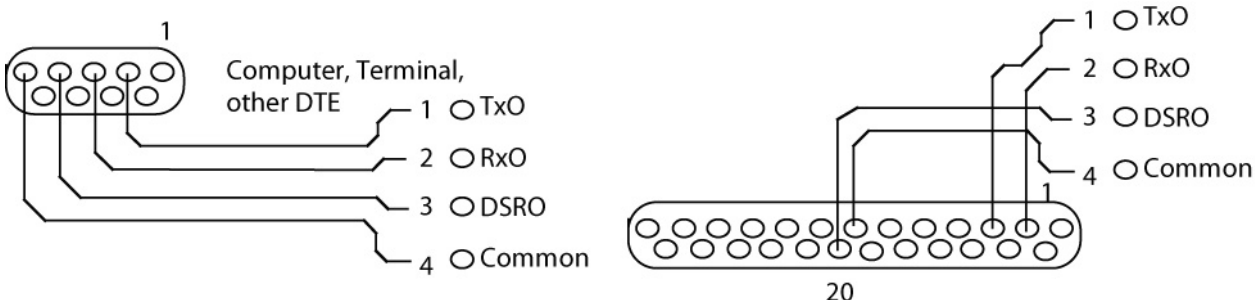
On the Scanner 1140, SIO1, SIO2, SIO3 and SIO4 are capable of both status inputs and outputs.



Console Serial Port (Resource A21)

(Intrinsically Safe only when using an HT-88A Handheld)

The console port is accessed through the bottom socket on the main terminal block of the instrument. This port is used with a console device, such a PC or a gas chromatograph.



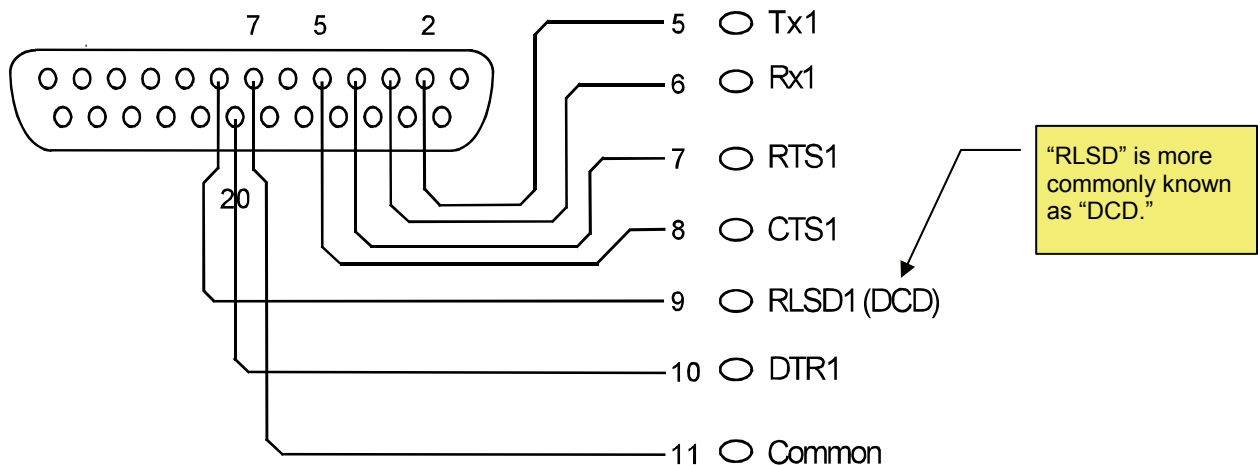
Auxiliary Serial Port (Resource A02)

(Intrinsically Safe w/Barriers)

The auxiliary serial port supports full RS-232C hardware handshaking signals and is used with a modem to provide remote communication or to connect peripheral devices such as the NuFlo MVX[®] or MVX[®]-II multivariable transmitters, Daniel gas chromatographs and ultrasonic meters to provide additional inputs via serial ports. (For more information, refer to the NGas/NFlo manuals, Section 3 - Network Settings or to the ScanWin manual, Chapter 5 – About the System).

The auxiliary serial port can also be configured as a second console port for remote console, network port, or printer port etc. (refer to the NGas/NFlo manuals, Section 3 - System Settings or to the ScanWin manual, Chapter 5). The RS-232C interface allows the output signals (TX, RTS & DTR) to be “powered-down” under software control to reduce power consumption when the serial port is inactive. Optionally, the DTR output can also be left on exclusive of TX & RTS to provide power for line powered modems. The receivers remain active even when the transmitters are powered-down, allowing transitions on these inputs to “wake-up” the serial port. The second port option can either be RS-422 or R485, both are user configurable and switch selectable (refer to [Page 48 - Auxiliary Serial Port Optional DIP Switch \(SW3\)](#)).

RS-232C



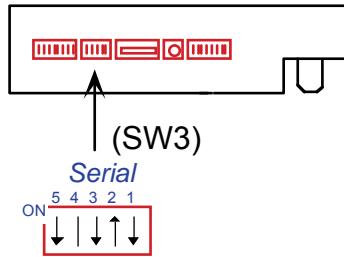
Terminal	RS-232C	RS-422	RS-485
5	Tx	Rx+	Sig+
6	Rx	Rx-	Sig-
7	RTS	Tx+	N.C.*
8	CTS	Tx-	N.C.*
9	DCD	N.C.*	N.C.*
10	DTR	N.C.*	N.C.*
11	Signal Ground	Signal Ground	Signal Ground

* N.C. means Not Connected.

Auxiliary Serial Port Optional DIP Switch (SW3)

Note: If Switch (SW3) is not present, the default is RS-232. If SW3 Serial DIP Switch option has been installed, then RS-232/RS-422/RS-485 is switch selectable.

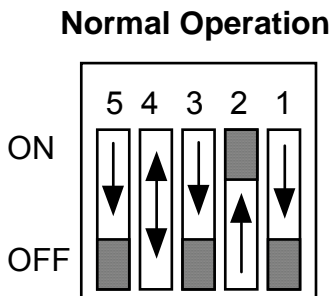
The Auxiliary Serial Port Switch is located on the very top of the circuit board beside the System Control Switch (SW4):



The following table summarizes SW3's functions and settings:

Switch #	Description	ON	OFF
SW3-1	VTX2 output to DTR	Selected	Deselected
SW3-2	RS-232 output DTR	Selected	Deselected
SW3-3	+12V charge pump switch ¹	ON	Software Controlled
SW3-4	Differential mode select	RS-485 mode	RS-422 mode
SW3-5	Receiver termination select	100Ω termination	No termination

The following diagram depicts the Serial Port Switch in its normal operating position:



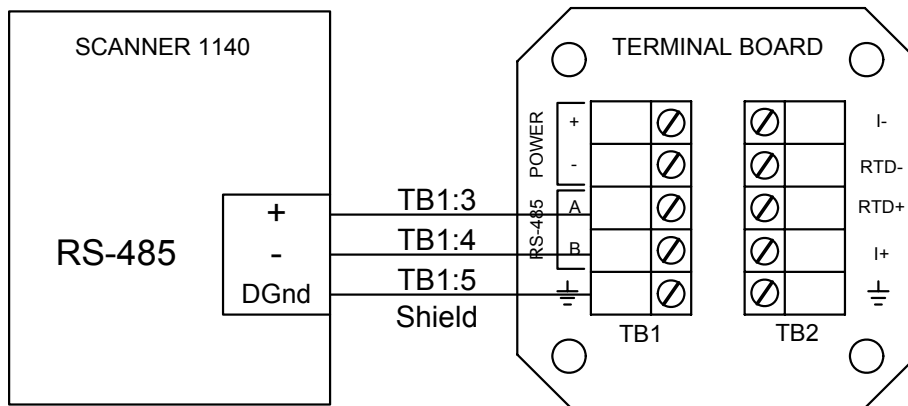
The following is a detailed description of the functions for each switch of the Serial Port Switch (SW3):

SW3-1 & SW3-2: These switches select the signal applied to the auxiliary serial port DTE terminal. With SW3-1 ON (SW3-2 must be OFF), the 8.0V VTX2 transmitter supply is connected to the DTR terminal. With SW3-2 ON (SW3-1 must be OFF), the normal RS-232C signal is connected.

¹ This switch must be ON when SW3-1 is ON to ensure a stable VTX2 output.

- SW3-3:** This switch forces the +5V to +12V charge pumping circuit to be permanently active and must be ON to generate the +8V VTX2 supply. When VTX2 is not in use SW3 should be left OFF to minimize power consumption.
- SW3-4:** This switch is used to select the differential mode of the auxiliary serial port. When ON, it selects RS-485 mode and when OFF, selects RS-422 mode. When slide switch SW3-2 is in the RS-232C position (ON), SW3-4 can be in either position.
- SW3-5:** This switch connects a 120Ω termination resistance across the RS-485 transceiver (RS-422 receiver). The switch should be ON in the RS-422 mode, or if the flow computer is at the end of a multi-drop line RS-485 mode.

MVX-II Wiring (RS-485 Communications)



Chapter 3: Optional Board and Wiring

MIO1 Expansion Board

The Scanner 1140 MIO1 expansion board is a multi-purpose I/O expansion card that provides an RS-232C/RS-485/RS-422 serial port, a 1-5V/4-20 mA analog output and a multi-interface pulse input. Each of the interface types for these circuits is switch selectable. In addition, the board provides a second RS-232C (only) serial port and four ports that can be individually (software) configured for operation as a status input, status output, or pulse output. Because of terminal limitations (ten total), the board does not allow all of the I/O circuitry to be installed at once.

The MIO1 installs in the Scanner 1140's expansion slot, and is shipped with a ten-point terminal block plug to enable field-wiring termination. The configuration switches for the serial port, analog output, and pulse input are located at the bottom of the card.

Specification

General

Operating Temperature	40°C to +60°C
Classification	CSA certified for Class I, Div. 1, Groups C & D
Relative Humidity	10% to 95% non-condensing

Serial Port

Quantity	1 (optional)
Port 1 Electrical Interface	RS-232C c/w TX, RX, RTS, and CTS ² or RS-422RS-422, or RS-485 (user configurable)
Useable ³ Baud Rates	110, 150, 300, 600, 1200, 2400, and 4800 baud, software selectable
Parity	Even, odd, or none, software selectable
Stop bits	1 or 2, software selectable

² CTS is not provided on some assembly versions due to terminal allocation limitations.

³ Higher baud rates may be selected, however, received characters may be lost due to interrupt processing limitations, especially in packet oriented protocols.

Analog Output

Quantity	1 (optional)
Isolation	Optically isolated to 500 VAC, externally powered
Type	Switch selectable as either 1-5V or 4-20 mA
Accuracy	±0.1% of FS max. error @ 25°C (after software calibration)
Temperature Effect	±1% of FS max. error over temperature
Minimum Operating Voltage	6.5 Vdc (4-20 mA), 9.5 Vdc (1-5V)
Maximum Voltage	±40 Vdc
Minimum load (1-5V mode)	10KΩ
D/A Resolution	12 bits
Calibration	Zero and Full-scale software calibration
Settling Time	<100 msec. to ±0.1% of span for a full-scale step change

Status In/Status Out/Pulse Outputs

The MIO1 board provides four (maximum) digital I/O channels that can be individually ‘software’ configured as status inputs, status outputs or pulse outputs. Each of the four channels is identical, and is implemented using a comparator for detecting the state of an (status) input, and an n-channel MOSFET to provide an open drain status output driver. Pulse outputs are provided by simply driving the status output on and off at the required pulse output rate in an interrupt driven software routine. The channels on the MIO1 board are identical to those on the main board. Refer to pages 46 and 88.

Pulse Inputs

Quantity	1 (optional)
Pulse Signal Types	Pre-amplified square wave, open collector, contact closures, Pepperl & Fuchs inductive proximity sensor or turbine magnetic pickup coil configured via on board DIP switch.

Pulse Signal Levels

Pulse Type	Maximum Low Level Signal	Minimum High Level Signal	Frequency Range	Input Impedance
Square Wave	4.5V	7.5V	0 - 10 kHz.	> 10 KΩ
Square Wave	1.0V	1.5V	0 - 10 kHz.	> 10 KΩ
Open Collector	2 KΩ	200 KΩ	0 - 10 kHz.	N.A.
Contact Closure	2 KΩ	200 KΩ	0 - 10 Hz.	N.A.
Inductive Proximity Sensor	1 mA	3 mA	0 - 5 kHz.	N.A.
	Minimum Signal Levels			Impedance
Magnetic Pickup Coil	20 mV p-p @ 20 Hz.			10 KΩ @ 1 kHz.
	20 mV p-p @ 100 Hz.			
	200 mV p-p @ 1000 Hz.			
	400 mV p-p @ 2000 Hz.			
	1000 mV p-p @ 5000 Hz.			

Over-voltage Protection ±40 VDC

I/O Termination

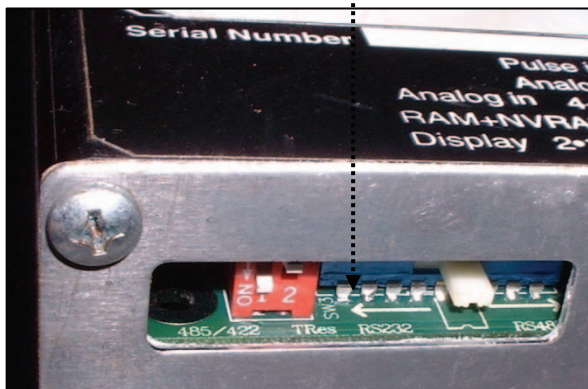
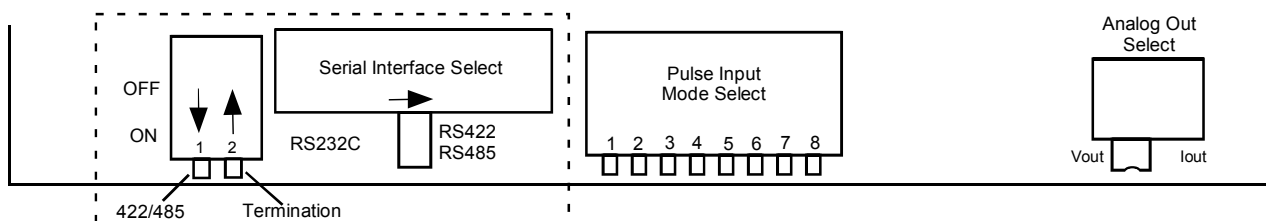
Because Scanner 1140 expansion boards are limited to 10 points of I/O termination, not all of the I/O functionality available on the board can be accessed at the same time. The design therefore provides some interconnection flexibility between the terminal connections and the I/O circuitry so that a variety of configurations may be supported. The part number of the expansion board is 9A-1140-0210B-code. The table below documents the valid combinations for RS-232 mode:

Assembly Description	Terminals									
	31	32	33	34	35	36	37	38	39	40
Code 05 - 1 pulse input + 1 analog out + 2 status I/O		PIN+	PIN-	GND	SIO1	SIO2	GND	ANO+	VOUT	ANO-
Code 06 - pulse input + 4 status I/O		PIN+	PIN-	GND	SIO1	SIO2	GND	SIO3	SIO4	GND
Code 10 - 1 serial port	TX	RX	RTS	CTS	GND		GND			
Code 11 - 1 serial port + 4 status I/O	TX	RX	RTS	GND	SIO1	SIO2	GND	SIO3	SIO4	GND
Code 12 - 1 serial port + 1 pulse input + 1 analog out	TX	RX	RTS	GND	PIN+	PIN-	GND	ANO+	VOUT	ANO-
Code 13 - 1 serial port + 1 pulse input + 2 status I/O	TX	RX	RTS	GND	SIO1	SIO2	GND	PIN+	PIN-	GND
Code 14 - 1 serial port + 1 analog out + 2 status I/O	TX	RX	RTS	GND	SIO1	SIO2	GND	ANO+	VOUT	ANO-

Any of the assemblies that include a serial port c/w signal Cts may also provide a switchable interface to afford RS-232C/RS-485/RS-422RS-422 support. Any assembly that provides a serial port without signal Cts may also provide a switchable interface to afford RS-232C/RS-485 support. The table below documents the signals provided for each of the three interface types.

Interface Type	Terminals #				
	31	32	33	34	35
RS-232-C	TX	RX	RTS	CTS	GND
RS-422RS-422	Rx+	RX-	Tx+	Tx-	GND
RS-485	Data+	Data-	N.A.	N.A.	GND

The following diagram illustrates the position and orientation of this connector as well as the serial port, pulse input, and analog output configuration switches.



- Switch 1 ON is RS-485
- Switch 1 OFF is RS-422RS-422
- Switch 2 OFF, 100 ohm termination is OFF

Configuration Switches

As illustrated above, the board provides configuration switches for serial port, the pulse input and the analog output. A brief description of each of the switches is given below:

Status Input/Output and Pulse Output Circuits

All settings are software selected. Hence, there are no switches to set.

Serial Port Switches

The serial port's configuration is controlled by both a 2-bit 'DIP' switch and a multi-pole slide switch (see dotted area or above diagram). The slide switch selects between an RS-232-c interface (left-hand position) and an RS-422/RS-485 interface (right hand position).

DIP switch #1 selects between RS-422 (**open - OFF**) and RS-485 (**closed - ON**) interfaces (the slide switch must be in the RS-422/RS-485 position). DIP switch #2 connects a 100 Ω termination and should be closed (**ON**) for an RS-422 interface or if the MIO1 board is the last device on a multi-drop RS-485 network.

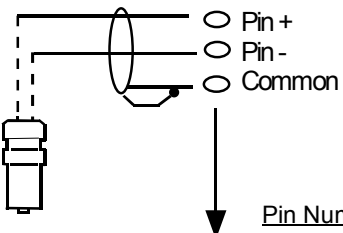
Pulse Input Switches

The eight-position 'DIP' switch is used to configure the pulse input circuitry to interface with a variety of pulse-producing devices. A description of the function of each of the switches is given below; a detailed description of the switch settings required for each interface is given in the Pulse Input section.

- Switch #1:** This switch connects the system board's Vtx2 (+8.0V) supply to the Pin+ terminal and can be used to power external pulse producer's such as the Pepperl & Fuchs inductive proximity sensor.
- Switch #2:** This switch determines the threshold of the comparator section when measuring high level signals. When closed, the high level threshold (~5.8V) is selected, and when open the low-level threshold (~1.2V) is selected.
- Switch #3:** This switch connects a 620 Ω load resistor into the high level circuit and is used to terminate current mode devices such as the Barton 818 (7-12 mA mode) preamplifier, and the Pepperl & Fuchs inductive proximity sensor (1-3 mA). This termination produces voltage levels compatible with the high and low level voltage thresholds respectively.
- Switch #4:** This switch enables (closed) or disables (open) the interface circuit's debouncing logic. Debouncing is typically enabled when interfacing to contact closures.
- Switch #5:** This switch connects the interface circuits pre-amplifier output to the comparator section input, and is closed when using magnetic pickup coils.
- Switch #6:** This switch connects the Pin- terminal to the comparator section and is closed when measuring high level signals such as the output of a Barton 818 preamplifier.
- Switch #7:** This switch connects the Pin+ terminal to the pre-amplifier section and is closed when using magnetic pickup coils.
- Switch #8:** This switch connects the system board's Vtx1 (+10V) supply to the Pin+ terminal.

Pulse Input Mode Select Switch Settings

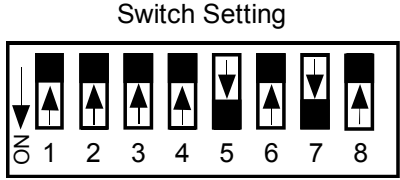
Magnetic Pickup Coil



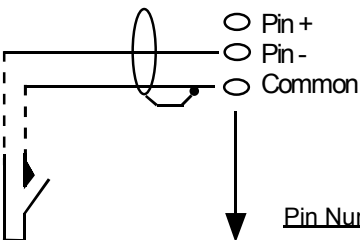
Pin Numbers on MIO1 Boards

Pin	Code 05	Code 12	Code 13
Pin +	32	35	38
Pin -	33	36	39
Common	34	37	40

Switch Setting



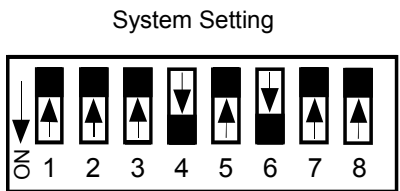
Dry Contact



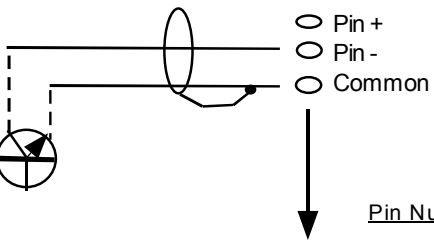
Pin Numbers on MIO1 Boards

Pin	Code 05	Code 12	Code 13
Pin +	32	35	38
Pin -	33	36	39
Common	34	37	40

System Setting



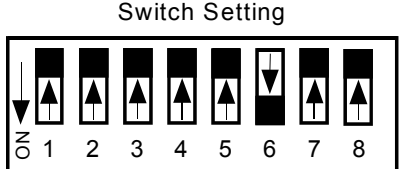
Open Collector without "Bounce"



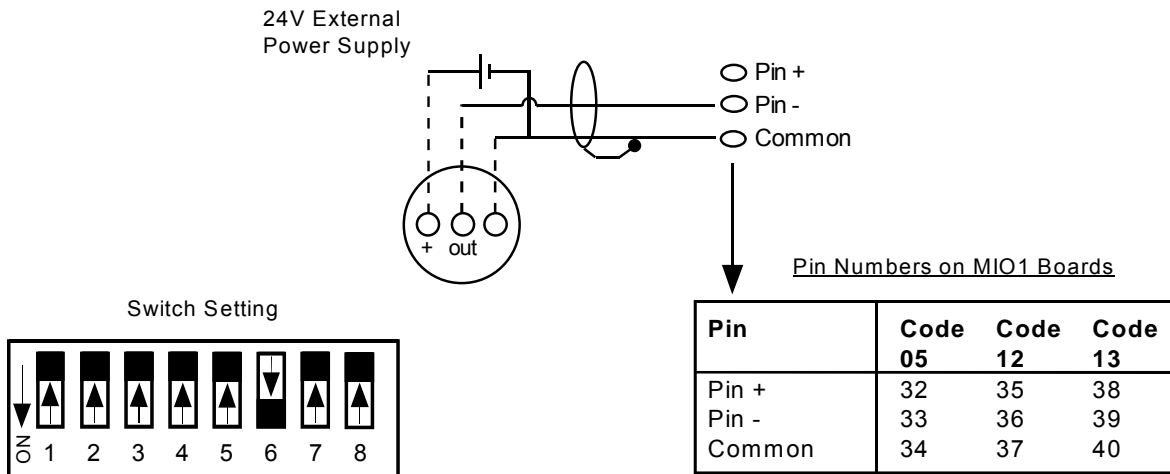
Pin Numbers on MIO1 Boards

Pin	Code 05	Code 12	Code 13
Pin +	32	35	38
Pin -	33	36	39
Common	34	37	40

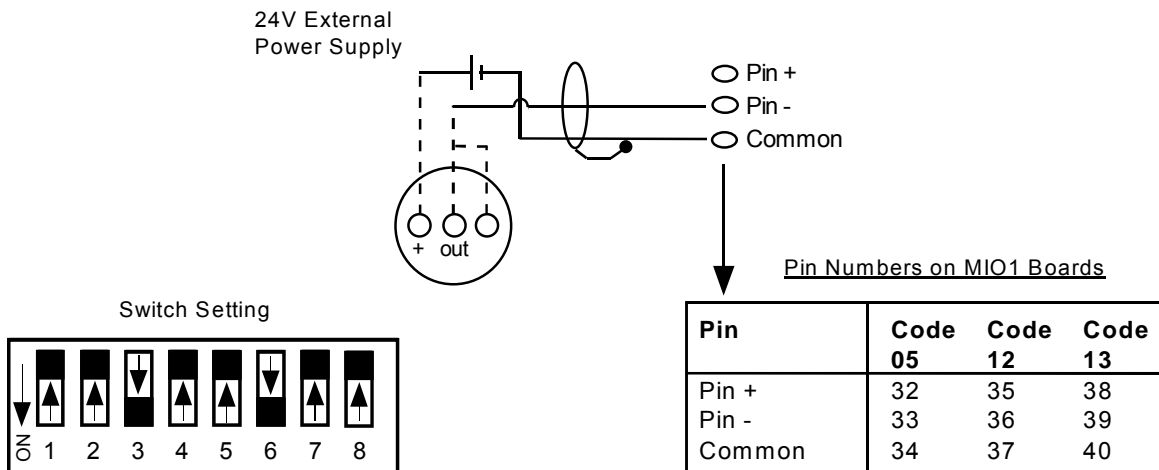
Switch Setting



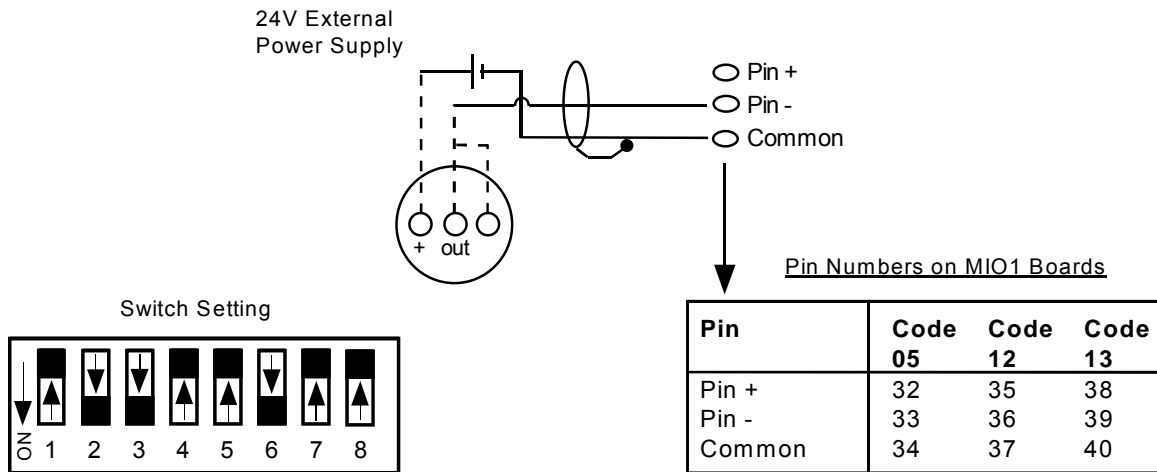
Three-Wire Pre-Amplified Turbine (0-5V Output)



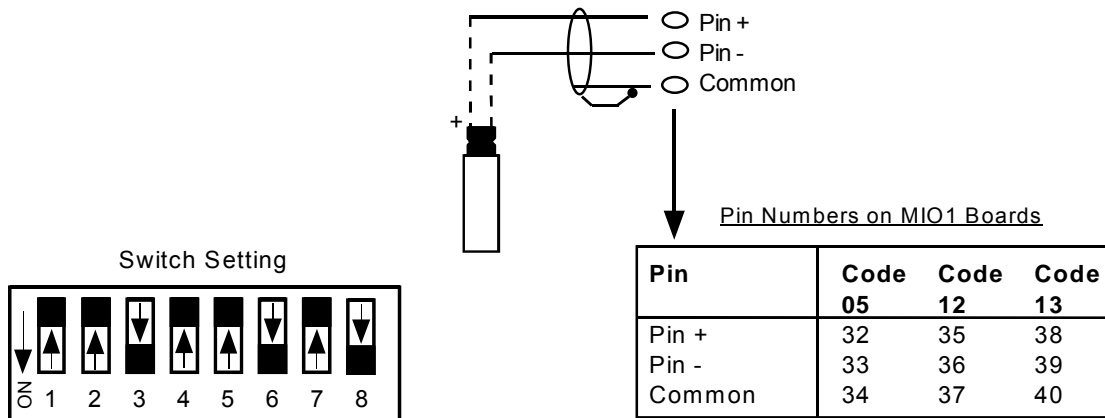
Two-Wire Pre-Amplified Turbine (.5-5.5 mA Output)



Two-Wire Pre-Amplified Turbine (7-12 mA Output)



Pepperl & Fuchs Inductive Proximity Sensor



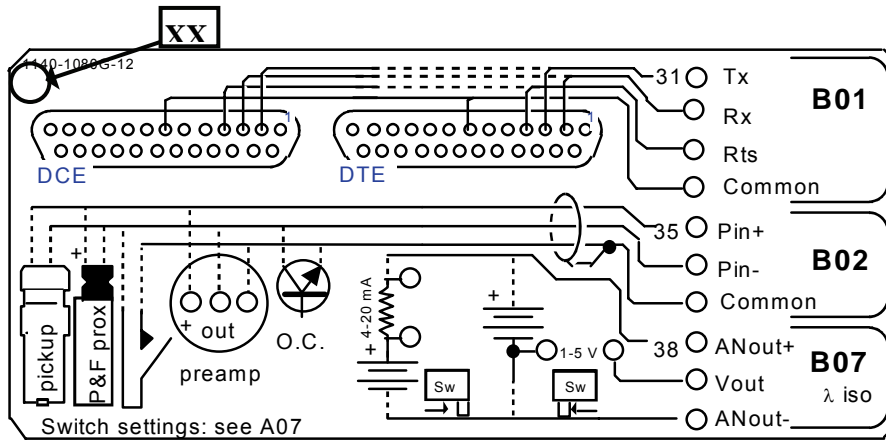
Analog Output Switch

The analog output slide switch selects between 1-5V mode (left hand position) and 4-20 mA mode (right hand position). In voltage mode, power is applied between the An_o+ and An_o- terminals with the 1-5V output signal on terminal V_{out} (relative to An_o-). In current mode, the circuit operates as a two-wire device that controls the current flowing from An_o+ to An_o-. In this case, V_{out} is not used.

Circuit Board Wiring Diagrams

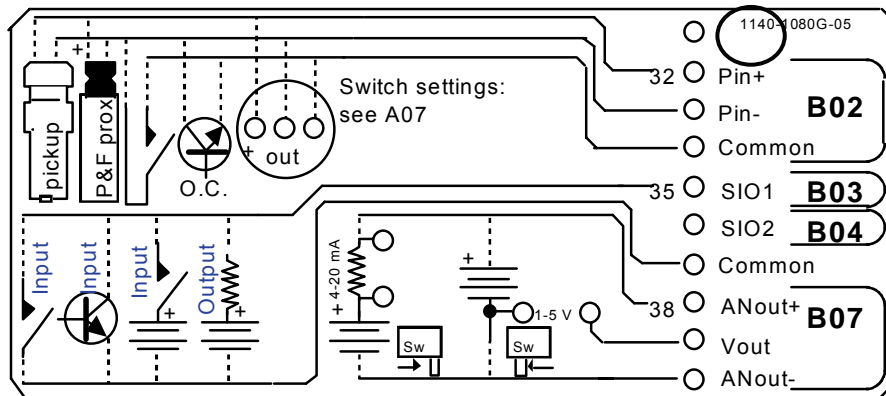
The MIO1 expansion board is available in any one of seven options. The part number of the board is 9A-1140-0210B-XX where XX is a code that identifies the option built into that board.

Located on the extrusion behind the cover (in the space below the main board wiring diagram - refer to [Main Board Wiring Diagram, Page 32](#)) is a label like the one below. The **last two digits** of the number on *this label* (this is **not** the expansion board part number) identify the option that is built into the installed expansion board.



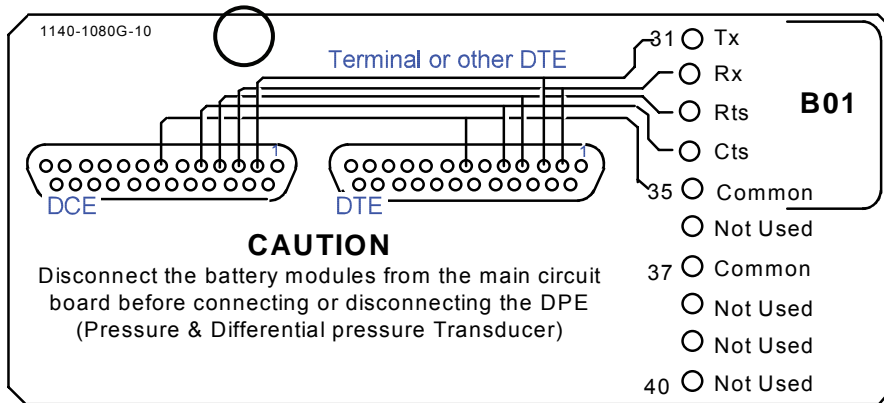
Code 05

This board is equipped with one pulse input, 1 analog output and 2 digital input/outputs.



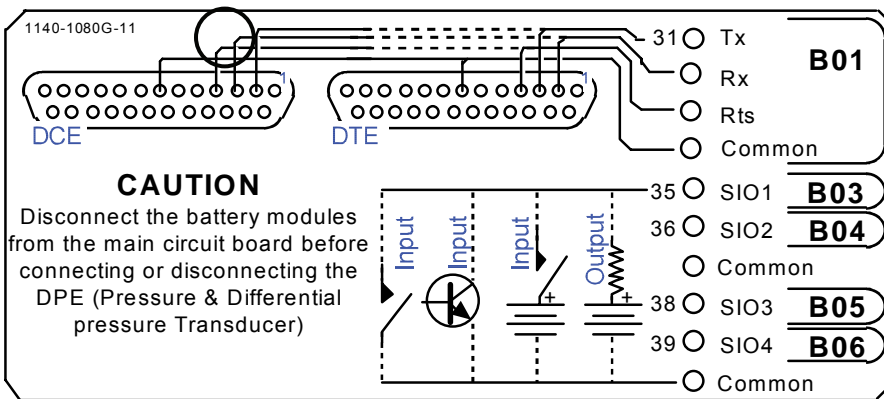
Code 10

A code 10 board has a serial port alone.



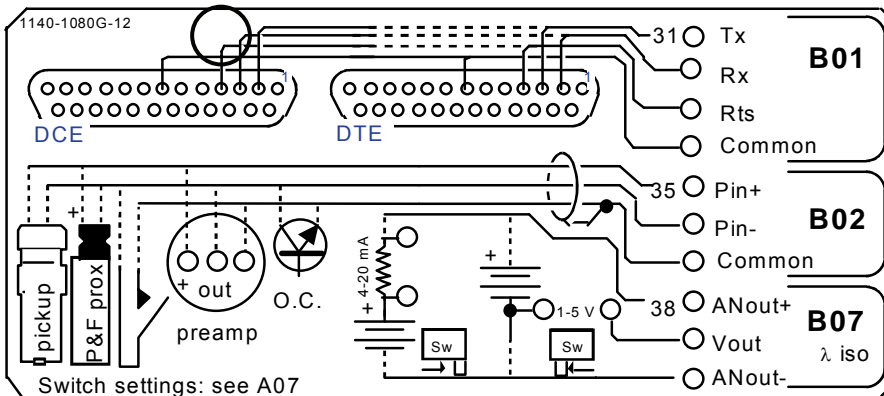
Code 11

A code 11 board has a serial port and four digital input/outputs.



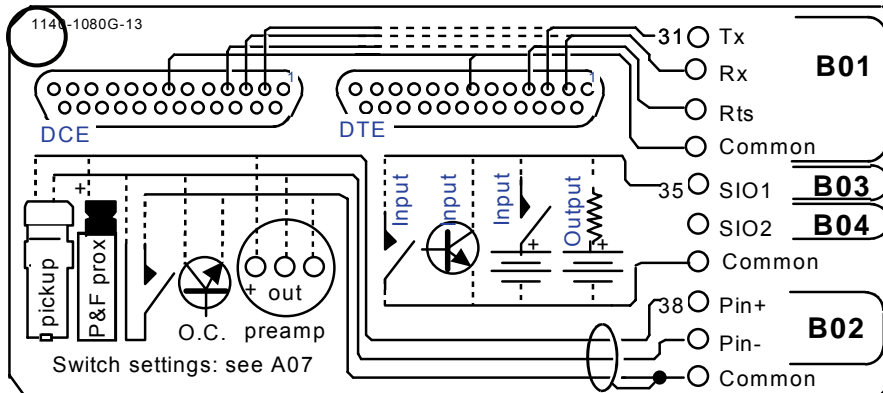
Code 12

A code 12 board has a serial port, a pulse input and an analog output.



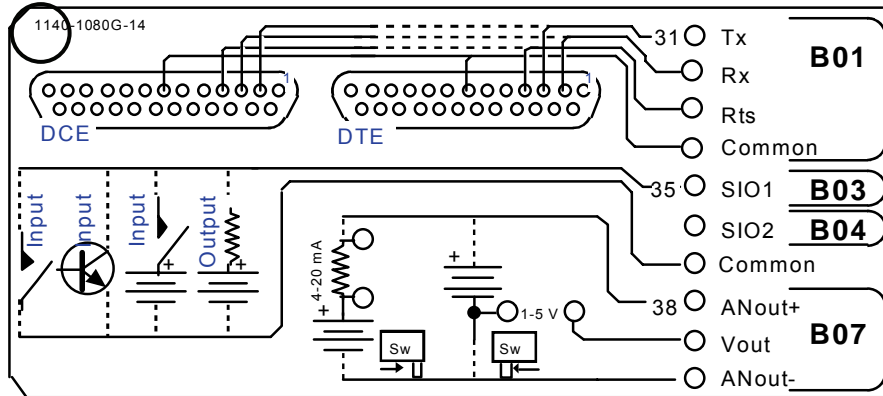
Code 13

A code 13 board is equipped with a serial port, a pulse input and 2 digital input/outputs.



Code 14

A board that is coded 14 has a serial port, an analog output and two digital input/outputs.



MIO1 Installation Procedure

The following procedure should only be performed by a trained technician in a **SAFE** area.

1. Use ScanWin or ScanPC to download all configuration, calibration and historical data from the Scanner RTU.
2. Turn off the Scanner 1140 RTU by moving Switch SW4-1 to the “**shutdown**” position (check second diagram in the **Start Flashing** section, **Page 22**).
3. Disconnect the power supply to the Scanner.
Steps 4 thru 12 and 14 thru 16 apply if the 1140 main board is in an aluminum extrusion
4. Unplug the DPE / DPE+ and communication connectors.
5. Also unplug all field wiring connectors (if any) from the main board.
6. Disconnect the ground wiring from the stud on the 1140 extrusion.
7. Remove the Scanner 1140 extrusion by removing the four screws anchoring it to the door.⁴
8. Remove the light pipe.⁴
9. Carefully remove the display by squeezing the plastic standoffs with needle nose pliers, while maintaining a gentle, outward pressure.⁴
10. Remove the top and bottom plates from the extrusion by taking out the Phillips head screws from each end and one screw from the display side of the extrusion.

Note: The 1140G has no end plate but requires that the cover holding the display, push button and communications port be removed.

11. Slowly slide the Scanner 1140 main board from the top of the extrusion while applying a slight pressure to open the extrusion to lessen the grip of the optional rubber sealing strip.
12. While exerting a little pressure to open the extrusion (in order not to buckle the rubber-sealing strip), carefully insert the main board into the extrusion by aligning the circuit boards to the grooves in the extrusion.
13. Remove the MIO1 board from the anti-static bag and install it on the connectors to the main board.
14. For all models except the 1140G, replace the end plates (note that, where required, the MIO1 has a special bottom plate).

Note: For the 1140G, no endplate is used when a MIO1 board is installed. Reassemble in reverse order. Proceed to Step 18.

15. Stick the decal with the wiring connections for the accessory board to the appropriate space on the existing wiring decal (see the **Note** on **Page 32**).
16. Replace the LCD display and light pipe, making sure that the light pipe is centered over the photodiode.
17. With the four screws, attach the extrusion to the door. Then connect the ground wires, DPE+, Communications connector, field wiring connectors and any new wiring to resources on the accessory board.
18. Reconnect the power supply board to the Scanner 1140.
19. If the firmware is pre-NgasX3.1.0FbF, re-flash the unit with this version or later (for test purposes only). If re-flashed, superboot the unit; otherwise, soft boot the Scanner.
20. Go to the Scanner Hardware page and verify that the resources are all recognized.
21. Configure any new features and test.

⁴ Not applicable to the Scanner 1140G

Chapter 4: Troubleshooting

This section defines a basic procedure for locating Scanner 1140 Hardware operating problems. It is not intended to solve all problems for all users. Instead, it is an attempt to assist users in the field with the most commonly encountered problems. If a problem not covered by this guide is encountered, further assistance may be had by contacting “Scanner Help Desk” at 1-(877) 805-7226 or the Customer Service department at (403) 291-4814.

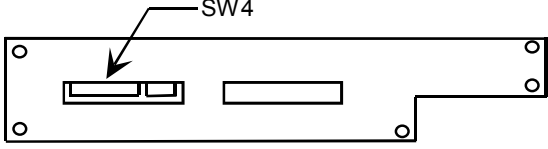
Tools Required

As a minimum requirement, the following tools should be available to the user:

- Laptop PC and ScanWin or ScanPC software
- ScanPC cable
- Digital multimeter that can measure 0.0-25.0 Vdc and 0.0-2,000.0 mA
- Large slotted screwdriver
- Instrument size slotted screwdriver
- Phillips #2 screwdriver

Problems and Solutions

Problem	Possible Solutions																												
<p>A) The Scanner does not seem to be operating at all.</p> <div style="border: 1px solid black; background-color: yellow; padding: 5px; width: fit-content; margin-top: 10px;"> <p>Refer to Page 67 - Transmitter Voltage for more information.</p> </div>	<ol style="list-style-type: none"> 1. Place your finger over the photodiode in the lower right corner of the Scanner’s faceplate for about a second. The display should power up within 2 seconds. 2. Try plugging the console port cable into the local console port, and running ScanWin or ScanPC on your Laptop to communicate to the Scanner 1140. 3. Check battery voltage on the Scanner 1140’s main battery located behind the cover in the rear of the enclosure. The battery voltage must be: <ul style="list-style-type: none"> • above 6 Vdc for 6 volt systems • above 11.2 Vdc for 12 volt systems 4. Check the power input terminals. The input must be: <ul style="list-style-type: none"> • above 10 Vdc for 6 volt systems • above 16 Vdc for 12 volt systems 5. Check the power cable that runs from the power supply board to the Scanner 1140 main board. It terminates with a 6-pin connector at the top of the terminal block. Ensure that it is properly seated in the receptacle and that the strain relief catch is fully latched. Also, ensure that each pin in the connector is fully seated. The voltage readings on each pin with reference to the ground pin are as follows: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-decoration: underline;">Color</th> <th style="text-decoration: underline;">Label</th> <th style="text-decoration: underline;">Function</th> <th style="text-decoration: underline;">Acceptable Range</th> </tr> </thead> <tbody> <tr> <td>Black</td> <td>Gnd</td> <td>Common</td> <td>N/A</td> </tr> <tr> <td>White</td> <td>ILck</td> <td>Hardware Interlock</td> <td>N/A</td> </tr> <tr> <td>Blue</td> <td>VBat</td> <td>Scanner Battery Voltage</td> <td>0.54-0.64V</td> </tr> <tr> <td>Green</td> <td>VChg</td> <td>Charge in Voltage</td> <td>0.63-2.00V</td> </tr> <tr> <td>Brown</td> <td>PFail</td> <td>Power fail indicator</td> <td>over 3.2V*</td> </tr> <tr> <td>Red</td> <td>Vout</td> <td>Voltage to Scanner</td> <td>6.00-7.00V</td> </tr> </tbody> </table> <p>*Cable must be connected to Scanner 1140 to read this voltage.</p>	Color	Label	Function	Acceptable Range	Black	Gnd	Common	N/A	White	ILck	Hardware Interlock	N/A	Blue	VBat	Scanner Battery Voltage	0.54-0.64V	Green	VChg	Charge in Voltage	0.63-2.00V	Brown	PFail	Power fail indicator	over 3.2V*	Red	Vout	Voltage to Scanner	6.00-7.00V
Color	Label	Function	Acceptable Range																										
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Blue	VBat	Scanner Battery Voltage	0.54-0.64V																										
Green	VChg	Charge in Voltage	0.63-2.00V																										
Brown	PFail	Power fail indicator	over 3.2V*																										
Red	Vout	Voltage to Scanner	6.00-7.00V																										

Problem	Possible Solutions
<p>A) The Scanner does not seem to be operating at all (cont'd).</p>	<p>6. Perform a software restart from the DIP switches found under the rubber plug furthest from the hinge side at the top of the Scanner 1140 main board (mounted inside the black, aluminum extrusion screwed to the inside of the enclosure's door).</p>  <p>Set switch 1 of SW4 to the ON position, and then turn it OFF again. The Scanner 1140 should then display the message "Power on restart"</p>
<p>B) The Scanner display will not "power up".</p>	<ol style="list-style-type: none"> 1. Try holding your finger over the photodiode on the front of the unit for a longer period of time (perhaps 5 seconds) before removing it to turn display on. 2. Shine a pen flashlight at the light sensor for a couple of seconds to turn the display on. This may help in areas of low ambient light. 3. Try adjusting the "Display Contrast" potentiometer found under the rubber plug closest to the hinge side on the top of the main board. With a small slotted screwdriver, a clockwise rotation should increase the contrast to the point where all of the display pixels are blackened out. If this works, turn the contrast back to the desired setting. 4. See previous problem "The Scanner does not seem to be operating at all." 5. Power down the Scanner 1140, remove the aluminum extrusion from the door of the enclosure that houses the main board and replace the display.
<p>C) The Scanner will not talk to ScanPC / ScanWin.</p>	<ol style="list-style-type: none"> 1. Check to ensure that the Console port cable is plugged into the Scanner 1140, and the correct COM Port on your laptop. 2. Check communications settings to ensure that they match the Scanner 1140. If unsure of the Scanner's settings, do a software reset by turning switch 1 on SW4 on and then off again. When the Scanner 1140 boots up, the display will reveal the firmware version (e.g. NGas M2.7.0F or NFlo M3.2.2F, version 2 and 3 firmware respectively) followed by the local console port settings (e.g. 4800, 8, N, 1). In the example given, assuming the console port cable is plugged into COM Port 1 of the PC, the default values for communication are as follows: <ol style="list-style-type: none"> 2a. ScanPC is used for version 2 and 3 firmware, communication settings are found in the off-line menu under Configuration...Communications <ul style="list-style-type: none"> • PC Port> 1 • Baud Rate> 4800 • Data Bits> 8 • Parity> None • Stop Bits> 1

Problem	Possible Solutions
<p>C) The Scanner will not talk to ScanPC / ScanWin (cont'd).</p>	<p>2b. ScanWin is used for version 4 firmware (e.g. NFlo M4.1.0F), local console communication settings are found in the main menu tools>communication setup. Family and Scanner name are <code>_DIRECT_</code>, with default settings as follows:</p> <ul style="list-style-type: none"> • Port group is DIRECT • Baud Rate is 9600 • Stop Bits is 1 • Parity is none <p>Ports Tab default settings are Port is COM1, status is enabled, Port Group Name and Device setup name are DIRECT.</p> <p>3. Check to ensure that the cable inside the Scanner 1140 enclosure that runs from the local console connector to the bottom of the main board terminal block is properly connected at both ends.</p>
<p>D) The Scanner battery does not hold a charge.</p> <div data-bbox="207 1346 456 1465" style="border: 1px solid black; background-color: #ffffcc; padding: 5px; margin-top: 10px;"> <p>For instructions on replacing the battery, see Page 69.</p> </div>	<ol style="list-style-type: none"> 1. Check the charging voltage coming into the terminals on the right side of the charge control board in the rear of the Scanner 1140 enclosure. If a 12-volt solar panel is being used, it should be 13-18 Vdc. If a 24 Vdc and I.S. barrier combination is being used, it should be 16-20 Vdc. If a 12 Vdc and I.S. barrier combination is being used, it should be 7-9 Vdc. 2. Although the voltage seems sufficient, there may not be enough current to sustain the Scanner's operation over a long period of time. If this is suspected, remove one of the input power leads coming from the charging device (e.g. solar panel). Using a current meter, measure the amount of current being supplied to the Scanner 1140 battery. A fully charged Scanner 1140 will only draw 10-20 mA. A low battery will draw as much as the solar panel will produce, up to the 300 mA limit imposed by the 6-volt charge control board. <ul style="list-style-type: none"> Typical Solar Panel Max Current • 5 watt- 290 mA (0.29 A) • 10 watt- 580 mA (0.58 A) • 30 watt- 1,750 mA (1.75 A) 3. The Scanner 1140 battery may have been damaged due to a series of excessively deep discharge cycles (e.g. less than 5 Vdc for the 6-volt system). This might be symptomatic of a large number of low battery alarms on the Scanner 1140 only at night when there is no sun, despite the fact that the system has seen a consistent amount of sunshine during the daylight hours. Some of the battery's capacity may be restored by fully charging the battery and then discharging it to 5.5 Vdc repeatedly in the shop. If not, the battery should be replaced.

Problem	Possible Solutions
<p>E) The Network Port is not functioning.</p>	<ol style="list-style-type: none"> 1. Check to ensure that the network has been enabled and the network port communications settings are correct for your application. <ol style="list-style-type: none"> 1a. This can be found using ScanPC and in the on-line menu, going to Configuration... Accessories... Network Settings...ScanCom 3.4 Status... It should say Network enabled>Yes. If not, use the SELECT key and change it. Using ScanPC, the Scanner EFM/RTU serial port settings are in the on-line menu under Configuration... Accessories... Network Settings... Serial port... Slot>A Res>02... <ol style="list-style-type: none"> 1b. Using ScanWin Using ScanWin network port settings are found on the System > Network tab. Status of network should be a green check mark to indicate the network is enabled. The Scanner EFM/RTU serial port settings can be viewed by clicking on serial port Details button. While on the network screen, also check to ensure that the network port has not locked up. Typically, Network connected will say “no” unless the host system is polling it at that instant. Seldom will the network remain active for more than a minute or two at a time. If it says Network connected=yes for longer than this period, disable the network and re-enable it. 2. Check that the network port has been wired properly for your application. In the example above, resource A02 would require, at a minimum, transmit on terminal 5, receive on terminal 6, and ground on any of the commons (e.g. terminal 4 or 11). The other serial connections will depend on your specific application. Refer to the Scanner Support Group for further assistance. 3. Check that the serial port is operational by performing a loopback test. Refer to Section 3.7.8 - Serial Ports in the Scanner 1140 Manual for further details. 4. Normally, the serial port will be powered down so that there is no voltage between either transmit or receive and ground. After it has been “woken up”, the receive line (terminal 6) should be at -8 Vdc with reference to ground except when data is being received, when it should toggle up and down briefly between +8V and -8V. If this is not the case, it might indicate a hardware problem.
<p>F) The DPE/DPE+ cell is not providing process signals to the flowrun.</p>	<ol style="list-style-type: none"> 1. Check to ensure that the DPE/DPE+ hardware resource has been allocated to the flowrun. This can be found using ScanPC and in the on-line menu, going to Configuration... Flow Measurement... View Flow Runs... Run#?:Run?... Qvtot... Fextn... Pf... Press. Then hit the DETAILS key and go down to Get From>DPE-SP. This tells you that the static pressure signal for this flowrun is coming from a DPE/DPE+ resource - but you must PAGE DOWN from this location to see which resource, if any, has been assigned. This keystroke action should reveal the display “Slot>A Res>17”. If not, refer to Output to Analog Channels in the NGas Manual (Section 3) for a detailed description on how to assign a resource. 2. Check to see if the zero and full-scale values for the DPE/DPE+ have been read into the Scanner 1140 correctly. This can be found using ScanPC and in the on-line menu, going to Configuration... Hardware... SlotA:MAIN... A17:DPE-SP... If the zero and full-scale values are reading “Invalid”, then perform a software reset and return to the same display. If they still read “Invalid”, power down the Scanner 1140 and replace the DPE/DPE+ cell.

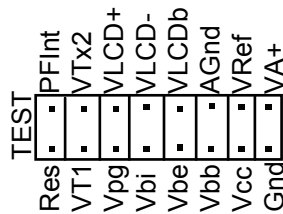
Transmitter Voltage

When the shutdown switch (SW4-1) is ON the entire system is shutdown. A time delay (~10 ms) is provided to allow the system to execute its power fail code before power is lost and the system is reset.

The following table documents the voltage supplies generated in the Battery Module Circuitry Board:

Supply	Voltage	Current	Description
VCC	+5V \pm 5%	333 mA	Power computer & interface circuitry.
VBB	+5V \pm 5%	30 mA	Powers NVRAM and real time clock
VPG	+12V \pm 5%	30 mA	Programming supply for FLASH memory.
VTx1	+10V \pm 10%	8 mA	Low-power transmitters supply (switched).
VTx2	+10V \pm 10%	8 mA	Powers external turbine preamplifier.
VLCD +	+5V \pm 5%	6 mA	Powers character & graphics LCD (switched)
VLCD -	-15V \pm 3.3%	4 mA	Negative supply for graphics LCD (switched)
VLCDB	-7.0V to -1.0V -12.5V to -9.5V	< 1 mA < 1 mA	Character LCD (-25°C to +60°C linear profile) Graphics LCD (-10°C to +60°C linear profile)

The following illustrates the transmitter test points located on the main board (see [Page 31](#)):



Check “Vtx” on the main circuit board terminals (refer to [Page 38 - Analog Transmitter Inputs](#)). Check that the switches are correctly positioned (refer to [Page 35 - Memory Switches](#)).

Main Battery Voltage

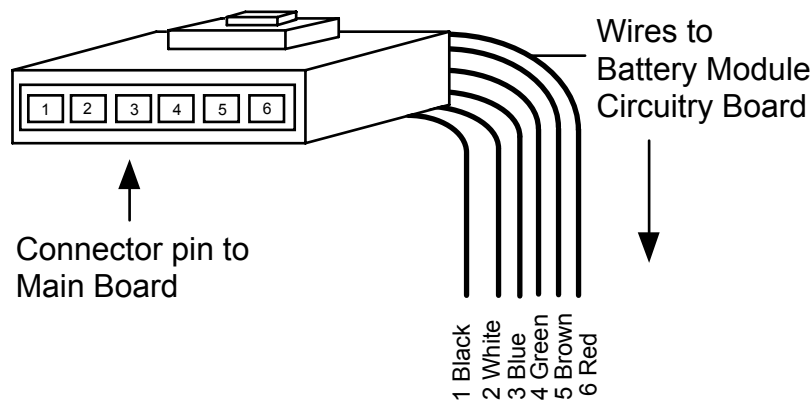


CAUTION

LOSS OF CONFIGURATION AND DATA MAY RESULT IF THE BATTERY CONNECTOR IS DISCONNECTED BEFORE PERFORMING THE BATTERY REPLACEMENT PROCEDURE. ENSURE THAT LITHIUM BACK-UP BATTERY (SW4-4) IS TURNED ON.

(Refer to NGas/NFLo manuals, **Section 3 – Utilities** *or* the ScanWin manual, **Chapter 5 – System Status**)

Replace the battery and/or check battery voltage. To check the battery voltage, unplug the battery power cable from the main circuit board and check voltages (see below). Battery voltage is displayed on the local display as part of the autoscroll loop.



Wire #	Color	Description	Acceptable Range
1	Black	Ground	N.A
2	White	Current Lock	N.A.
3	Blue	Battery Voltage	0.54 - 0.64V, 6V battery 1.08 – 1.28V, 12V battery
4	Green	Charging Voltage	0.63 – 2.0V
5	Brown	Power Fail	> 3.2V ⁵
6	Red	Voltage Out	6.0 – 7.0V

The voltage values are approximate (i.e. if the 6V battery reads 6.5 Vdc the battery is fine). Ensure that the battery power is always greater than 6.0V. The average current will be 21 mA in low-power mode and 80 mA in full power mode with a communication port active. The shut off voltage is 5.9V for a 6V battery and 10.8V for a 12V battery. Replace battery if voltages are low or zero. Recharge suspect battery and recheck its connector voltages.

⁵ Cable must be connected to Scanner 1140 to read this voltage.

NVRAM Lithium Battery Voltage

The NVRAM Lithium battery must register above 2.0 Vdc when using ScanWin version 2.2.3 and higher with Firmware version 4.1.4 and above OR ScanPC with Firmware 2.x and 3.x.

When measuring the NVRAM battery voltage with a voltmeter (this measurement can be performed with the battery in the holder while the Scanner is operating), the voltage will be 0.3 to 0.7 volts higher than when it is measured by the firmware. The value read by the Scanner firmware is the actual (backup) voltage applied to the NVRAM and PIC (for operation as an RTC) and includes the voltage drops from the Schottky diodes that are part of the intrinsic safe circuit.

Note that with lithium batteries, the voltage drops off dramatically so there is never much “low voltage” warning. The NVRAM battery voltage above 2.0 Vdc indicates the configuration is still backed up; a voltage of zero means that the battery is dead, not installed, or the jumper is missing.

NVRAM Battery Change Procedure

The following steps outline the procedure for changing the ½ AA NVRAM / Lithium backup battery in the NuFlo Scanner 1140 Measurement RTU when the main board is in an aluminum extrusion. In some configurations where the 1140 main boards is not installed in an extrusion the NVRAM . Lithium battery is soldered to the main board. Please note that this battery will last between 7 and 10 years of normal usage.

1. Use ScanWin or ScanPC to download all configuration, calibration and historical data from the Scanner RTU.
2. Turn off the Scanner 1140 RTU by moving Switch SW4-1 to the “shutdown” position (check diagram on [Page 22](#)).
3. Disconnect the power supply to the Scanner.
4. Unplug the DPE+ and communication connectors.
5. Also unplug all field wiring connectors (if any) from the main board.
6. Disconnect the ground wiring from the stud on the 1140 extrusion.
7. Remove the Scanner 1140 extrusion by removing the four screws anchoring it to the door.⁶
8. Remove the light pipe.⁶
9. Carefully remove the display by squeezing the plastic standoffs with needle nose pliers, while maintaining a gentle, outward pressure.⁶
10. Remove the end cap from the top and bottom sides of the extrusion.

Note: On the Scanner 1140G, also remove the single screw on the display side of the Scanner (located on the bottom of the unit).

11. Slowly slide the Scanner 1140 main board from the top of the extrusion while applying a slight pressure to open the extrusion to lessen the grip of the rubber sealing strip.
12. The lithium backup battery is located in the upper left-hand corner of the board. Remove the retainer (plastic cover) by gently prying out the ends and them lifting off. The battery can now be removed.
13. Replace with 3.6 volt 1/2 AA size lithium cell noting the correct polarity.
14. While exerting a little pressure to open the extrusion (in order not to buckle the optional rubber-sealing strip), carefully insert the main board into the extrusion by aligning the circuit boards to the grooves in the extrusion.
15. Replace the top and bottom sides of the extrusion.

Note: For the 1140G, reassemble and proceed to Step 17.

16. Replace the LCD display and light pipe, making sure that the light pipe is centered over the photodiode.

⁶ Not applicable to the Scanner 1140G.

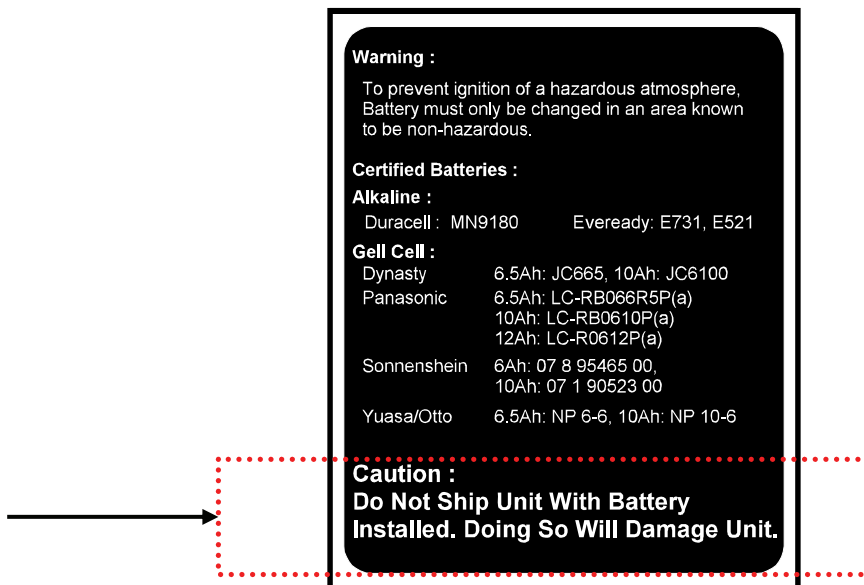
17. With the four screws, attach the extrusion to the door. Then connect the ground wires, DPE+, Communications connector, field wiring connectors and any new wiring to resources on the accessory board.
18. After ensuring that all connections have been made, restore power to the unit following the master reset procedure ([Page 28- Startup Procedure](#)).
19. Restore the configuration to the unit. Be sure to remember to TURN ON ALL FLOWRUNS AND ACCESSORIES upon completion.
20. Check the voltage of the new lithium battery through ScanPC's on-line terminal window - Configuration...Hardware...SlotA=MAIN...A18=NV Battery...
21. The value displayed should be close to 3.6 volts.

Returning the Scanner

If the Scanner 1140 Measurement RTU must be returned to Cameron's Measurement Systems Division, ship it as a complete unit **OR** ship just the extrusion with the circuit board inside it.

If this is not possible and only the main circuit board is to be returned, refer to the Steps 1 to 11 of the [NVRAM Battery Change Procedure](#) above.

Also, please take note of the instructions on the battery cover's warning label (see [Page 17](#) for location).



Chapter 5: DPE+ Installation

DPE+ Installation

Replacing a DPE with a DPE+ Transducer

This section provides step-by-step instructions for replacing a Scanner 1140 DPE with a DPE+ transducer. If the Scanner is to be used in a Class I, Div. 1 intrinsically safe installation, the upgrade requires the installation of a barrier adapter.

New Scanner firmware is also required to support communications with the DPE+ transducer. See the table on page 21 for Scanner firmware versions that support the DPE+ transducer.



Explosion Hazard. Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.



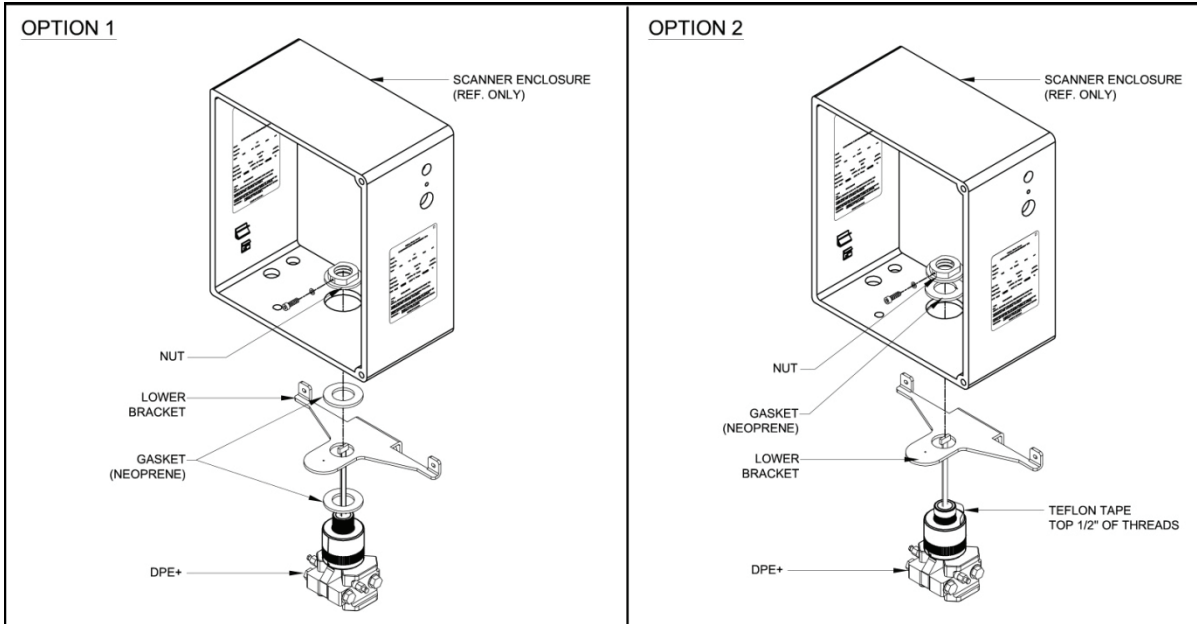
Static electricity can damage the DPE+ transducer. Use proper anti-static techniques to establish an earth ground (such as wearing anti-static wrist strap or touching metal) prior to removing the DPE+ from the anti-static bag.

1. Power down the Scanner.
2. Remove the tubing or manifold from the DPE.
3. Attach a static ground strap to your wrist and a Scanner ground.
4. Remove the ground screw from the DPE nut inside the enclosure.
5. Loosen the DPE nut on the outside of the enclosure.
6. Remove the DPE nut inside the enclosure using a 1 ¹¹/₁₆-in. or adjustable wrench. It may be necessary to place a wrench on the DPE neck or body for leverage.
7. Unplug the DPE cable from the Scanner board.
8. Remove the DPE from the enclosure.
9. Examine the gaskets and replace as necessary to maintain a weatherproof enclosure. Two gaskets are supplied with each DPE+.

Gasket Options

For metal enclosures, the gasket is installed between the DPE+ and the enclosure.

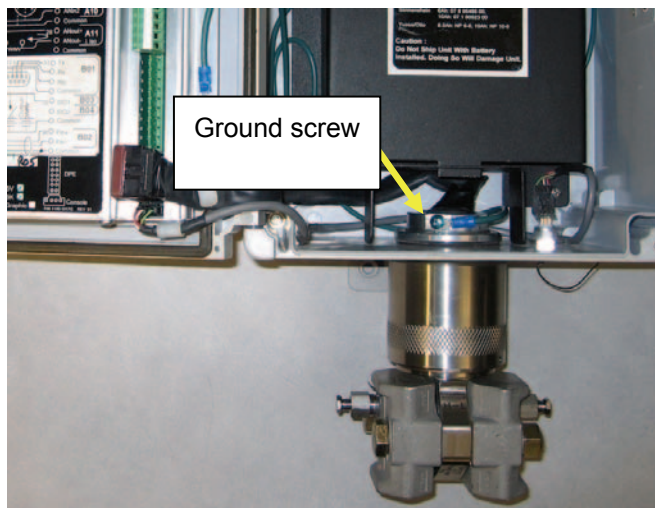
For fiber-reinforced plastic (FRP) enclosures, see options shown below.



Install a gasket between the enclosure and the bottom bracket, and another gasket between the bottom bracket and the DPE+ adapter.

Put 3 wraps of Teflon tape around the top 1/2 in. of neck threads of the DPE+ adapter. Install the gasket between the inside of the enclosure and the DPE nut.

10. Insert the top of the DPE+ transducer through the opening in the Scanner enclosure and secure, using the DPE nut from inside the enclosure. Make sure the ground screw is facing the front of the Scanner. The external nut from the original DPE installation is no longer needed and may be discarded.
11. Reconnect the ground wire to the internal DPE nut.

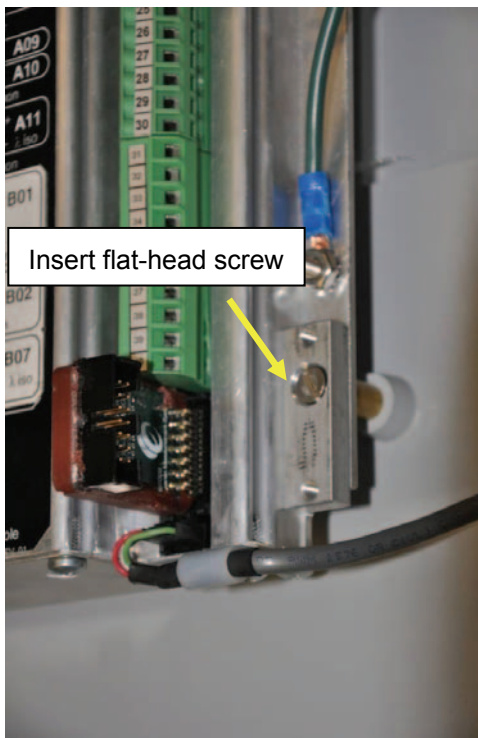


Proper positioning of the DPE+ transducer

12. Install the DPE+ cable clamping kit, if provided (recommended for use with the 1140T and 1140C).
 - a. Remove the round-head screw from the lower right corner of the extrusion and discard.



- b. Connect the cable holder bracket to the extrusion, using the flat-head screw to secure the bracket and extrusion to the standoff connector in the enclosure door.



The black plastic cap will fit over the cable, after it is connected to the scanner board (step 12), and is secured to the holder bracket with two pan-head screws provided with the kit.

13. With the Scanner power turned off, connect the ribbon cable from the DPE+ transducer to the Scanner. If the transducer is being installed while flashing new firmware to the Scanner and the Scanner power is on, wait until the Scanner is powered down to connect the DPE+ ribbon cable to the Scanner.
14. Lay the DPE+ ribbon cable across the cable holder bracket and place the black plastic cap over the cable. Secure it in place with the two pan-head screws provided.



15. Reconnect the tubing or manifold to the DPE+ transducer.

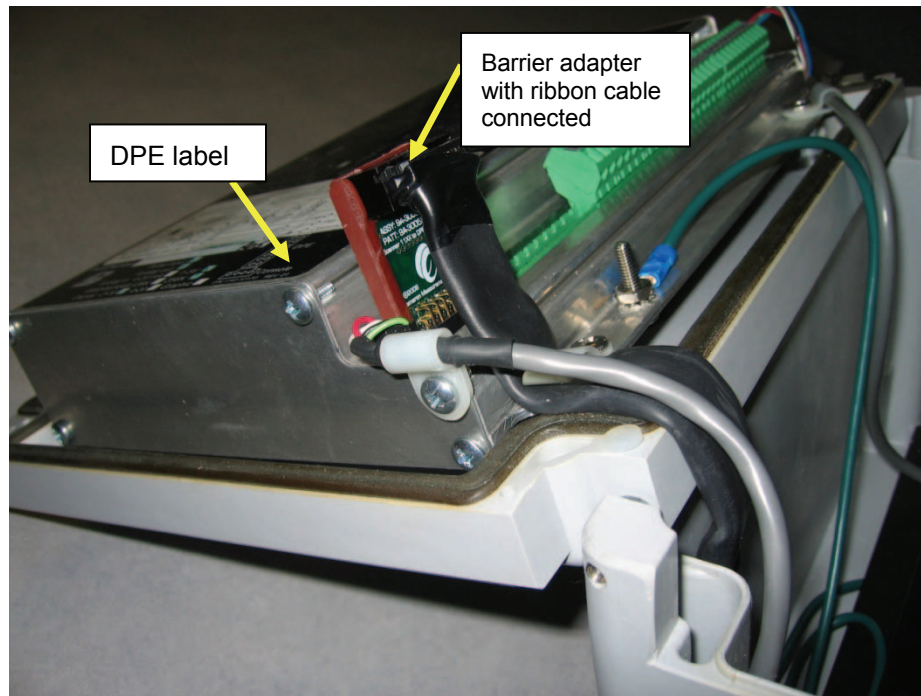
Installing the Barrier Adapter (for Class I, Div. 1 installations only)



For Class I, Division 1 installations, an intrinsically safe barrier adapter must be installed between the Scanner and the DPE+ transducer. Barrier adapter Part No. 9A-30058901 is suitable for such installations.

To install the barrier adapter, follow the steps below.

1. Ensure power to the Scanner is turned off.
2. Remove the barrier adapter from the packaging.
3. Locate the DPE connector in the bottom right corner of the main board. The “DPE” label on the black decal on the extrusion that covers the main board inside the enclosure shows the correct positioning.
4. Plug the female end of the barrier adapter into the connector on the Scanner main board.
5. Plug the ribbon cable from the DPE+ transducer into the connector near the top of the barrier adapter.



Chapter 6: Principles of Operation

Application Software

The Scanner 1140 executes the current NGas, NFLo, and IGas, as well as any future software developed for the Scanner 1100 series measurement RTUs. Gas calculations meet both North American (NGas and NFLo) and International measurement standards (IGas).

NFLo supports a variety of primary elements including orifice / cone meters, turbine and other linear pulse-output volumetric devices, coriolis meters, averaging pitot tubes, and inverted venturis. Secondary devices include pressure, temperature, and differential pressure analog transmitters, RTDs, analog or frequency-type densitometers, and gas chromatographs. Gas composition values can be automatically updated either through gas chromatograph interface using the RS-232/485 communications port, or can be manually entered.

The International standard (IGas) include ISO-5167, which supports a variety of differential pressure meters, venturi and flow nozzles. ISO-T30SC1088 is supported for turbine meter measurement.

NGas solves Manual of Petroleum Measurement Standards (MPMS), and American Gas Association (AGA) (Reports 3 (1985, 1992), 5, and 7) calculations including volume, mass and energy. The calculation speeds meet or exceed API standards for flow computers. The Supercompressibility calculations (refer to Section 3 - (Super) Compressibility Factor) performed include:

- AGA-8 (1985), (1992)
- NX-19
- Redlich-Kwong
- Standing Katz
- An interpolation method
- GERG Virial Equation for Field Use
- Standard GERG Virial Equation

NFLo is a combined gas and liquid measurement program. It is based on the NGas gas flow program and Liquid properties calculations based on the API Manual of Petroleum Measurement Standards (MPMS) chapters 11.2.1, 11.2.2, 11.2.3 and API 2540.

All calculations are performed in SI units, with automatic conversion of other units performed by the Unit Manager as required. NFLo bases all calculations on mass flow, volume or energy flow are always calculated from mass flow. Even turbine metering is handled this way. This consistent treatment simplifies the calculations, and allows flowruns to be handled the same way regardless of what primary devices are used.

Audit Trail

The Scanner 1140 maintains a detailed audit history of all configuration records, user changes and system alarms. It also maintains a history of events including hourly and daily flow history. The Event log operates as a circular buffer that contains 100 typical events. Each new event added to the log causes the oldest event to be discarded. The User Change log will not accept any further changes or inputs until the user has downloaded the log if the log is full. This feature ensures that the audit trail is continuous (refer to Section 2 (NGas, NFLo, IGas)- Event Log and User Change Log). Up to 60 days of history records can be maintained in memory that is backed-up with its own battery which is separate from memory used for operating systems and application software.

Central Processing Unit (CPU)

The system board utilizes a microcomputer, which provides an 8086 machine code compatible core, an interrupt controller, a clock generator, and a demultiplexed data and address bus. In addition, it contains two serial ports, an 8-bit comparator port and digital control lines that can be utilized for interfacing with various types of digital I/O. Clock control, as well as halt and stop methods allow the CPU to minimize system power.

Memory

There are three types of memory in the Scanner 1140: program FLASH memory, random access memory (RAM) and non-volatile random access memory (NVRAM).

Programs are stored in FLASH memory. FLASH memory enables the user to load new firmware from an MS Windows compatible PC into the Scanner using ScanFLASH or WinsLoad. With a DOS compatible PC ScanLoad is used (refer to Appendix B - ScanLoad for information on loading new firmware).

RAM is used as a temporary storage during normal program execution. RAM is volatile; any data held in RAM is lost if a power failure occurs.

NVRAM is the system's long-term storage memory for large blocks of vital data (e.g. configuration data, logs, etc.) that must be protected if there is a power failure. NVRAM power is backed by a small replaceable on-board lithium battery. If a loss of voltage is detected, the system immediately saves all necessary data in the NVRAM. When power is restored, the computer resumes exactly where it stopped when the power failed.

FPGA

A Field Programmable Gate Array (FPGA) is used to provide support logic for the CPU as well as provide a number of additional I/O ports. It is a RAM-based program that is loaded from FLASH memory at system startup. This allows the logic to be modified and updated along with the application code, adding a great deal of flexibility to the system.

The FPGA generates the entire read and write information for the memory, I/O spaces, as well as chip select outputs for all the memory devices.

In addition, the FPGA contains logic for:

- controlling interrupts
- a programmable counter for generating
- the system "heartbeat interrupt"
- a debounce circuit
- a counter for the pulse input
- automatic dispensing of pulses
- to the pulse output ports
- interfacing to the serial ports
- simple output for controlling the A/D system
- analog outputs
- transmitter supplies
- the Watchdog Timer

Hardware Write Protection

The NVRAM is guarded against changes. NVRAM is only written when there is a configuration change, a power failure, or if a system restart is performed. This restriction protects vital configuration and measurement data from being lost if there is an electrical transient or an uncontrolled program.

Clocks

The **CPU Clock** provides 7.37 MHz to run the microprocessor. In power-save mode, the CPU clock is automatically shutdown when the processor is inactive.

The **Real Time Clock** is a combined clock and calendar with leap years. It provides all timing functions to the flow computer including the generation of the “heartbeat interrupt” (see **Power Management** below) which runs the real-time kernel. The real-time clock provides the accurate time base for volume integration, estimation, history and data logging, and all other timing functions. The real-time clock runs continuously; during power outages it draws power from the memory backup battery.

The Watchdog Timer

The **Watchdog Timer** prevents the microprocessor from becoming hung-up in a loop (e.g., the processor waits for an input signal that never arrives). If a loop occurs, the Watchdog Timer resets the program to the initial start point and normal operation continues. Watchdog Timer resets are logged in the event log.

Power Management

The Scanner 1140 uses a sophisticated power management system to optimize measurement and control operations while minimizing power use. A single power input is required; all other supplies are generated from the main board.

The display is “powered-down” under software control when it is not in use to conserve energy. A front panel sensor (photodiode), activated by lighting changes, “wakes-up” the display. An operator can pause on any displayed item by covering the sensor. This design eliminates the need for a keypad and makes operation extremely easy.

A “heartbeat interrupt” pulse triggers the processor periodically for internal process operations. When the power-saver mode is ON, the Real Time Clock provides a “heartbeat interrupt” signal that turns the CPU ON every 1/32 of a second. During this momentary ON period, the CPU performs any pending tasks. If no tasks are pending, the CPU shuts itself OFF.

Power is further conserved through cycling and duty-cycling the end device’s sampling and calculation frequencies. The RS-232C interface is software controlled and manages power supplied to a radio or modem for minimum power consumption.

Battery Power Options

Two integral battery power options, complete with current limiting circuitry, are available for the Scanner 1140 for remote hazardous locations. The rechargeable battery module uses a solar panel with an Intrinsically Safe barrier and contains a temperature compensated charge controller and a 6 volt sealed, air transportable, gelled lead acid battery. The alternative module is a primary 6-volt alkaline battery. For Class I, Division 2 applications a 12 Volt sealed air transportable lead acid battery configuration is available.

Transmitter Supplies

The Scanner 1140 provides two separate transmitter supplies. The first (VTX1) is used to power low-power transmitters, and is current limited and switched under software to minimize power consumption by the end devices. The second supply (VTX2) is used to power a turbine preamplifier, as well as provide power to the auxiliary serial port DTR line for powering “line powered” modems.

Communications

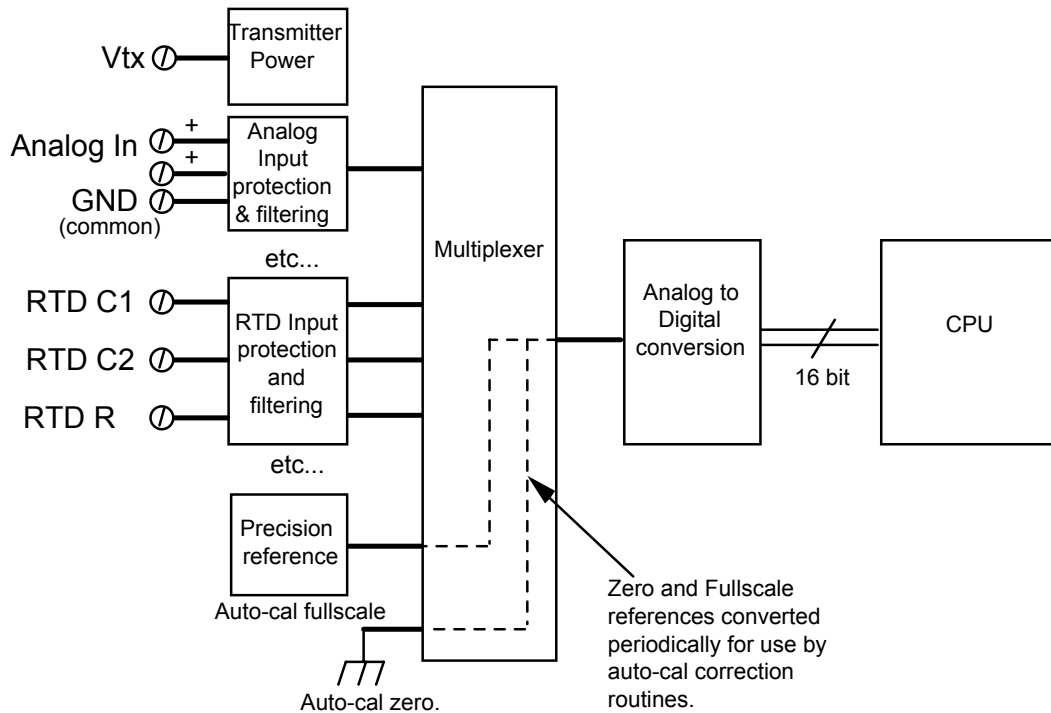
The Scanner 1140 communicates with local gas chromatographs and remote communications. ScanCom, Modbus and other custom protocols can be supported. For remote communications, the Scanner 1140 supports radio, modem, phone, and satellite access. Remote data is collected using the Barton ScanPol software, which is based on the ScanCom protocol.

Analog Inputs

The analog input circuits are designed to read voltages from 0 to 5 Vdc. Input devices having 1-5V outputs are connected to analog inputs and scaled from 0-100% by software. If 4-20 mA devices are used, optional precision load resistors can be installed at the factory. Each input signal is connected to an input port on the analog (MUX) which routes each signal sequentially to the input port of the A/D converter. The sampling interval is software controlled.

One of the MUX input ports is connected to a precision voltage reference and another port is connected to ground. This forms the basis for autocalibration. The CPU uses the readings from these ports to establish internal correction factors for the transmitter signals. Autocalibration corrects the following: drift in the analog circuitry due to component age, temperature induced gain variations, cross-channel leakage in the MUX, assorted component leakage, and other errors. Further corrections determined from the loop calibration data are applied to account for the end device characteristics including static offset, linearity and hysteresis. Various checks ensure that the corrections are “reasonable.”

All analog inputs are single-ended (common ground). This means that some method of isolation may be required to share an analog signal with another device.



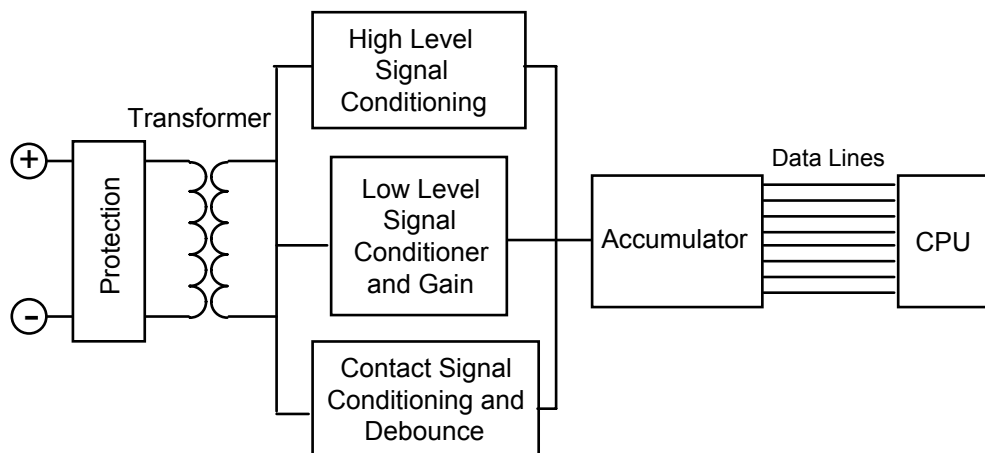
RTD Inputs

RTD inputs use a precision current source to measure the resistance of the RTD. Lead length compensation of the 3-wire RTD is done by measuring the line resistance between terminals C1 and C2. The multiplexer, A/D converter and autocal are the same as the analog inputs.

Pulse Inputs

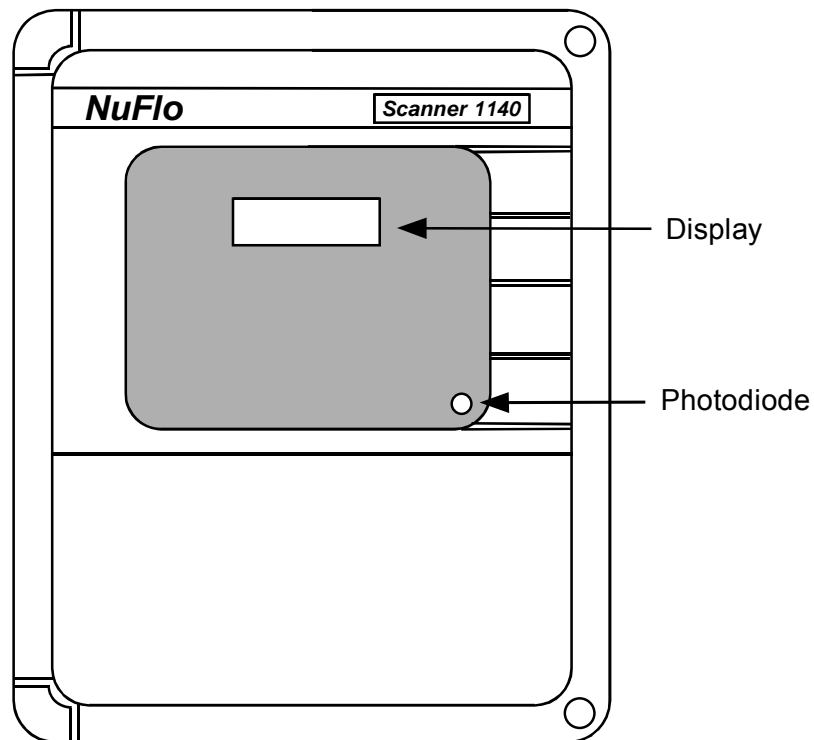
The Scanner 1140 optional pulse inputs are designed to interface with a wide variety of devices including variable-reluctance magnetic pick-up coils, signals from turbine preamplifiers (both voltage and current types), and simple contact closures. DIP switches select the type of signal for each pulse input.

In all modes, the pulses are accumulated in a hardware register that is periodically read by the microprocessor. The pulse count is used directly in volume calculations. The frequency (used to determine flowrate) is calculated using the time interval between successive pulses. See the diagram on the next page.



Front Panel

Standard Display



The standard display on the Scanner 1140 is a 2 line x 16 character Liquid Crystal Display (LCD). Information is organized into “pages” of data, which are displayed on the local display screen or terminal.

Autoscroll

The Scanner 1140's front panel is equipped with a small disk shaped photodiode that is located in the bottom right-hand corner of the front panel. The location of the photodiode allows the user's thumb to be placed over the photodiode to activate the autoscroll display. The photodiode is activated by lighting changes. When the diode sensor is covered it "wakes-up" the display and the menu "autoscrolls" through a user-definable list of items. Each item is held on the display for a user-configurable time and then replaced by the next item in the list. The operator can pause on any displayed item by covering the diode sensor and then uncovering it for one second. The same covering and uncovering process resumes the autoscroll.

Note: The Scanner **1140G** (page 102) is equipped with a push-button instead of the photodiode described above. Each push/release of the button is equivalent to the covering/uncovering of the diode.

The following is a sample of an autoscroll screen:

```
Run 1 Pf On
492.00000 PSI
```

While in autoscroll, the following unit status screen is displayed once every loop through the list is completed:

```
Time= 09:00 ML
Date= Jan 01/95
```

The display will shut itself off after a configurable amount of time (usually about 30 seconds). To "wake-up" the display, cover the diode for one second.

Barton DPE+ Cell

The DPE+ cell provides both static pressure (SP) and differential pressure (DP) measurements. One DPE+ cell is connected to the Scanner 1140 with a 14-pin keyed connector. When the Scanner is configured with a DPE+ cell, the entire instrument is verified over the entire range of temperature, pressure and differential pressure to ensure that the linearity of the system meets published specifications. Local installation effects such as instrument positioning, tubing and site elevation require local calibration of both the differential pressure and the static pressure in order to obtain custody transfer quality accuracy. It is recommended that the DP and SP be verified upon installation and calibrated if required.

Chapter 7: System Specifications

General Specifications

Environmental

Operating Temperature	-40°C to +60°C (-40°F to +140°F)
Enclosure	Weatherproof, CSA enclosure 3 or 4 (NEMA 3 or 4)
Classification	
6V Battery System	
1140T	CSA certified for Class I, Div. 1, Groups C & D Intrinsically safe barrier module required for DPE+ in Class I, Div. 1, installations
12V Battery System	
1140C	CSA certified for Class I, Div. 2, Groups A, B, C & D
1140L	CSA certified for Class I, Div. 2, Groups A, B, C & D
No Battery	
1140G	CSA certified for Class I, Div. 2, Groups A, B, C & D
DPE+ Transducer	ANSI 12.27 Single Seal certified for pressure ranges up to and including 3000 psi
Dielectric Strength	>500 VAC between circuitry and enclosure
Relative Humidity	0% to 95% Non-condensing

Enclosure

Dimensions (1140T)	6 3/8" deep x 9 3/16" wide x 11 3/16" high, FRP, NEMA 4
Dimensions (1140C)	8 1/3" deep x 14 1/2" wide x 16 1/2" high, FRP, NEMA 4

The fiberglass reinforced plastic (FRP) enclosure is designed for an integral battery system. The electronics are encased in an aluminum extrusion. All electronic circuitry is protected and segregated from the field wiring terminations so the enclosure can be opened in damp weather conditions. The same field terminations are compatible with Cameron's Measurement System Division automated test equipment, which is used to factory test each Scanner under a wide range of operating conditions before installation.

Dimensions (1140L)	8" deep x 12" wide x 12" high, metal, enclosure 3R (NEMA 3)
Dimensions (1140G)	3 1/2" deep x 7 1/2" wide x 10" high (Non-rated aluminum chassis)

Components

The system board contains the central processing unit, FLASH EPROM memory, RAM, NVRAM, interface circuitry for the display and two serial ports. This board provides analog I/O and status/pulse I/O to support a single AGA 7 or AGA 3 flowrun with proportional/integral control.

Computer

CPU: 8088 compatible microprocessor
 Clock: Real Time Clock: Battery backed time clock /calendar
 Accuracy @ 25C is +/- 1 minute/month
 Memory: Program Memory: Up to 768 Kbytes FLASH memory

New application software can be loaded using any IBM compatible PC. The Scanner automatically determines how much RAM (available for operating system and intermediate calculations) and NVRAM (stores configuration, flow history, alarm, event logs and concurrent operations) is installed.

The system's use of RAM and NVRAM memory is selected at the time of manufacture. Switch #2 on the System Control Switch (SW4) allows for RAM to be set at either 32 / 64 Kbytes (with firmware 4.2.0 and below) or 64 / 96 Kbytes (with firmware 4.3.0 and above). NVRAM is what remains of the memory after RAM is selected. (Refer to [page 35 – Switch Control DIP Switch \(SW4\) Summary](#) for more details).

Memory Options	SW4-2	RAM	NVRAM
128 Kbytes (no longer available)	OFF	32 Kbytes	96 Kbytes
	ON	64 Kbytes	64 Kbytes
256 Kbytes	OFF	32 Kbytes	224 Kbytes
	ON	64 Kbytes	192 Kbytes
256 Kbytes	OFF	64 Kbytes	192 Kbytes
	ON	96 Kbytes	160 Kbytes

}

Firmware 4.2.0 and below

}

Firmware 4.3.0 and above

Memory Backup Battery: A user-replaceable N Size (1/2 AA) lithium battery powers the clock and maintains the contents of the NVRAM during power outages for at least 2 years.

CPU Voltage +5.0V

System Board I/O Summary

Display	1	LCD (optional)
Communications Ports	2	1 RS-232C (console/gas chromatograph) 1 RS-232/RS-485/ RS-422 (auxiliary)
Pulse Input	1	For volume accumulation (optional)
Status Input/Status or Pulse Out	4	Software selectable threshold in; MOSFET outputs
Analog Inputs	2	1-5V (4-20 mA optional)
Analog Output	1	Optically isolated (optional)
RTD	1	2 or 3 wire 100Ω RTD
Barton DPE/DPE+ Interface	1	Static and differential pressure transducer in a single unit. (Optional at initial time of order)
Terminations	30	De-pluggable termination blocks with protection for the circuitry.

Expansion Board Interface

The Scanner 1140 is built with an added expansion board location. The I/O for this board can be assigned based on planned use of the board.

Display

Type	LCD, 2 line x 16, alphanumeric character LCD, 4 line x 20, alphanumeric character
Function	“Autoscroll” display of user-assignable data items, software controlled shut-off and display duration, single key “wake-up” and pause.
Character Size	2.95 x 5.55mm (2x16 and 4x20)
Character Format	5 x 8 dots (2x16 and 4x20 display)
Operating Temperature	-30°C to +65°C (2x16 and 4x20 display)
Storage Temperature	-40°C to +85°C (2x16 and 4x20 display)
Activate Display	A light sensitive photodiode activates the autoscroll display. Manual adjustment and temperature compensation circuitry are factory set to optimize the display contrast.

Keypad (optional)

Type	28 sealed keypad with positive tactile feedback
Function	Numbers 0-9 , +/- , . , Page Up , Page Down , Line Up , Line Down , Yes , No , Select , Exp. , Mode , Pause , Enter , Detail and four programmable buttons. Keys allow all operations and changes (password protected) with the exception of alphabetic functions, which are associated with user-defined names
Hardware Required	I/O “13” and a 4x20 display

Communications Port

Quantity	2 serial ports
Types	First: RS-232C c/w TX, RX, and DSR Resource A01 and A21 Automatically switch between console and gas chromatograph with DSR input. Second: RS232C c/w TX, RX, RTS, CTS, DTR and RLSD Options for Second Port; RS-422 or RS-485 user-configurable and switchable
Baud Rates	Software selectable from 110, 150, 300, 600, 1200, 2400, 4800, or 9600
Bits per Character	7 or 8
Stop Bits	Software selectable 1 or 2
Parity	Software selectable from even, odd, or none
RTS Delay	Manually entered in milliseconds
Flow Control	Software or Hardware
DCD/CTS	OFF/ON

Status In, Status Out, Pulse Out

Quantity	4 assignable/selectable
Type	Status in, status out, pulse out
Maximum Voltage	± 40 Vdc
Status/Pulse Out	Max. on-state current 100 mA
Maximum Pulse Output Rates	5 counts/second @ 50% duty cycle

Status Input Threshold: The following values are the guaranteed limits that the input will be detected as having a changed state. For example, with a 2 volt selection, the input will be detected as false (off) when the input is less than 0.5V and on when it is more than 3.5V. In typical operation, the trip transition points are within 0.5 volts of the nominal threshold.

Nominal Threshold	Maximum Low Level Signal	Minimum High Level Signal
2.0V	0.5V	3.5V
7.0V	5.0V	9.0V
10.0V	8.0V	12.0V
Contact In	2 KΩ	200 KΩ

Function User assignable for signaling alarms, controlling valves, interface to counters

RTD

Quantity	1
Type	100Ω 2-wire or 3-wire lead compensation
Range	(Default) -45°C to +120°C (-50°F to +250°F) (User-enterable) up to +210°C (410°F), if lead compensation is less than 1Ω
Accuracy	± 0.25°C @ 25°C (77°F) ambient including RTD linearization
Temperature Effect	± 1.0°C over entire Scanner operating range

Analog Inputs

Quantity	2
Type	1-5V or 4-20 mA with 250Ω load resistor
Accuracy	± 0.050% of span max. error @ 25°C (77°F)
Average Temperature Effect	± 0.005% of span/°C max. (average temperature equals (max. minus min.) / operating temperature range as % span)
Impedance	>10 KΩ (1-5V input) >250Ω (4-20 mA input)
Over Voltage Protection	± 40 Vdc
A/D Resolution	16 Bit
Linearity Error	± 0.020% Max.; ± 0.010% typical

Pulse Input Board (Optional)

Quantity	1 configured using DIP switch settings
Status Signal Types	1.25V threshold, or 6.0V threshold, or open collector, or contact closure, or inductive proximity sensor configured via on board DIP switch.
Pulse Signal Types	Preamplified square wave, or open collector, or contact closure, or inductive proximity sensor, or turbine magnetic pickup coil configured via on board DIP switch.

Pulse Signal Levels:

Pulse Type	Maximum Low Level Signal	Minimum High Level Signal	Frequency Range	Input Impedance
Square Wave	4.5V	7.5V	0-8 kHz	>100 kΩ
Square Wave	1.0V	1.5V	0-8 kHz	>100 KΩ
Open Collector	2 kΩ	200 kΩ	0-10 kHz	N.A.
Contact Closure	2 kΩ	200 kΩ	0-10 Hz	N.A.
Inductive Proximity Sensor	1 mA	3 mA	0-5 kHz	N.A.
	Min. Signal Levels			Impedance
Magnetic Pick-up	20 mV p-p @ 20 Hz. 20 mV p-p @ 100 Hz. 200 mV p-p @ 1000 Hz. 400 mV p-p @ 2000 Hz. 10000 mV p-p @ 5000 Hz.			10 KΩ @ 1 kHz.

Analog Output Board (Optional)

Quantity	One
Type	4-20 mA, Optically isolated, externally powered
Accuracy	± 0.1% of span max. error @ 25°C (77°F) (after calibration)
Temperature Effect	± 1% of span max. error over temperature
Output Load	$R \text{ (ohms)} = \{\text{Supply (volts)} - 5.5\} / 0.02$
Maximum Voltage	± 40 Vdc
D/A Resolution	12 Bits
Calibration	Zero and full-scale via software
Settling Time	<100 msec. to 0.1% of full-scale for a 10% step change
Function	User-assignable to any rate function (flow rate, temperature, control etc.)

DPE+ Multi-Variable Transducer

Differential Pressure Accuracy	Stability: Long-term drift is less than $\pm 0.05\%$ of upper range limit (URL) per year over a 5-year period Accuracy (30 In. H2O) $\pm 0.10\%$ for spans $\geq 10\%$ of the sensor URL $\pm(0.010)$ (URL+SPAN) for spans $< 10\%$ of the sensor URL Accuracy (200 to 840 In. H2O) $\pm 0.05\%$ for spans $\geq 10\%$ of the sensor URL $\pm(0.005)$ (URL+SPAN) for spans $< 10\%$ of the sensor URL				
Effect on Differential Pressure for a 100-psi Change in Static Pressure	SP/SWP (PSIA)	DP (IN H2O)	Max. Overrange Pressure (PSIA)	Zero Shift	Span Shift
	100	30	150	$\pm 0.05\%$ of URL	$\pm 0.01\%$ of reading
	300	200	450	$\pm 0.007\%$ of URL	$\pm 0.01\%$ of reading
	300	840		$\pm 0.002\%$ of URL	$\pm 0.01\%$ of reading
	500	200	750	$\pm 0.010\%$ of URL	$\pm 0.01\%$ of reading
	1500	200	2250	$\pm 0.010\%$ of URL	$\pm 0.01\%$ of reading
	1500	300		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	1500	400		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	1500	840		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	3000	200	4500	$\pm 0.010\%$ of URL	$\pm 0.01\%$ of reading
	300	300		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	3000	400		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	3000	840		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	5300	200	7420	$\pm 0.010\%$ of URL	$\pm 0.01\%$ of reading
	5300	300		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	5300	400		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
	5300	840		$\pm 0.004\%$ of URL	$\pm 0.01\%$ of reading
Static Pressure Accuracy	Accuracy (500 psia) $\pm 0.05\%$ for spans $\geq 5\%$ of the sensor URL $\pm(0.0025)$ (URL+SPAN) for spans $< 5\%$ of the sensor URL Accuracy (300, 1500, 3000 and 5300 psia) $\pm 0.05\%$ for spans $\geq 10\%$ of the sensor URL $\pm(0.0025)$ (URL+SPAN) for spans $< 10\%$ of the sensor URL				
Temperature Performance	$\pm 0.25\%$ of full scale over full operating temperature range				

DPE+ Pressure Limits and Bolt Specifications

SP/SWP (PSIA)	DP (IN H2O)	Max. Overrange Pressure (PSIA)	Standard Bolts	Limited NACE Bolts (not for offshore) ^a	Full NACE Bolts
100	30	150	B7 or 316 SS (with SS vent plug)	B7M (no vent plug)	B7M (with Hastelloy vent plug)
300	200	450	B7 or 316 SS (with SS vent plug)	B7M (no vent plug)	B7M (with Hastelloy vent plug)
300	840				
500	200	750	B7 or 316 SS (with SS vent plug)	B7M (no vent plug)	B7M (with Hastelloy vent plug)
1500	200	2250	B7 or 316 SS (with SS vent plug)	B7M (no vent plug)	B7M (with Hastelloy vent plug)
1500	300				
1500	400				
1500	840				
3000	200	4500	B7 or 17-4 SS (with SS vent plug)	Inconel (no vent plug)	Inconel (with Hastelloy vent plug)
3000	300				
3000	400				
3000	840				
5300	200	7420	B7 ^b (with SS vent plug)	Inconel ^b (no vent plug)	Inconel ^b (with Hastelloy vent plug)
5300	300				
5300	400				
5300	840				

^a A regular stainless steel plug is substituted for the vent plug in limited NACE units.

^b Not available with Canadian CRN or ANSI 12.27 Single Seal certification.

Transmitter Power Supply

Quantity	One
Function	Software-controlled supply for low-power transmitters
Output Voltage	9-11V
Rated Output Current	8.0 mA
Current Limit	15 mA nominal

Power Supply Options

General: The power supplies are designed to allow the user to input a single variable voltage. The power supply provides the various regulated voltages required by the RTU. In applications where a lead acid battery is integral, the power supply recharges that battery. This function can continue whether the RTU is switched on or not. As applicable, all power supplies report the input voltage and the battery voltage to the main board. This information is available for remote monitoring.

6 Volt Rechargeable Battery

Where Used	Optional on Scanner 1140T
Part Number	9A-1140-0300C, ASM 3658300-XX or ASM 3658301-XX
Description	6 Volt sealed lead acid battery with temperature compensated charge controller for charging from a solar panel or other sources <ol style="list-style-type: none">1. Input Voltage 7-27.5 Vdc maximum2. Input Current Limit: 500 mA nominal3. Charger Output Adjustable from 6.6V to 7.4V (nominal) @ 25°C (77°F) Factory set to 7.0V @ 25°C (77°F) Linear temperature coefficient of -11.8 mV/°C 300 mA maximum (less depending on the charge level of the battery and input voltage)4. Battery Management Scanner shuts down at 5.9V, restarts at 6.2 (nominal)
Standard Solar Panel	5 Watt, 12 Volt
Optional Solar Panel	10 Watt, 12 Volt

Alkaline Battery

Where Used	Optional on Scanner 1140T
Part Number	9A-1140-0301C, ASM 3658201-XX
Description	Non-chargeable 6V alkaline lantern or 6V lithium batteries. Intrinsicly safe current limiting and switching regulator boosts the battery to the required system board supply voltage. <ol style="list-style-type: none">1. Input Voltage: 3.5 to 7.0 Vdc2. Battery Management: Scanner shuts down at 3.47V3. Short Circuit Current Limit: 2A

DC Input

Where Used	Standard on Scanner 1140G. Optional on Scanner 1140T.
Part Number	9A-1140-0304C, ASM 3658302-XX
Description	Designed to accept power from an external DC power source. Does not provide a recharging capacity. <ol style="list-style-type: none">1. Input Voltage: 10.5 to 27.5 Vdc2. Input Current Limit 500 mA nominal3. Management Scanner shuts down at 9.5V

12 Volt Rechargeable Battery

Where Used	Optional on Scanner 1140C
Part Number	9A-1140-0302C, PC06586-XX
Description	<p>12 Volt sealed lead acid battery with temperature compensated charge controller for charging from a 5 to 50 Watt solar panel or other power sources.</p> <p>1. Input Voltage: 12.0 to 27.5 Vdc Transient protection on input Voltage drop of 3 Vdc nominal</p> <p>2. Input Current Limit: 2.5 A nominal, maximum 50W, 12V solar panel</p> <p>3. Charger Output: Adjustable from 13.5V to 14.5V (nominal) @ 25°C (77°F). Factory set to 14.0 Vdc @ 25°C (77°F). Linear temperature coefficient of -23.6 mV/°C 15.5 Vdc @ -40°C 13.2 Vdc @ 60°C</p> <p>4. Communications Output: 11.2 to 14.5 Vdc 1.4 A to 2.2 A</p> <p>Switched output for communications equipment or other accessories. Switching turns the power off to conserve power. On periods are software-, user-controlled.</p> <p>5. Battery Management: Communications output shuts down at 11.3V, restarts at 12.5V (nominal) Scanner shuts down at 10.8V, restarts at 11V (nominal).</p>

Software

The Scanner 1140 supports all of the standard Scanner 1100 Series software for turbine and orifice measurements. Although designed for single stream measurements, the system can be configured to perform AGA-3 calculations for one orifice meter using DPE/DPE+ and RTD inputs, and an additional liquid stream based on pulse inputs.

Order Code

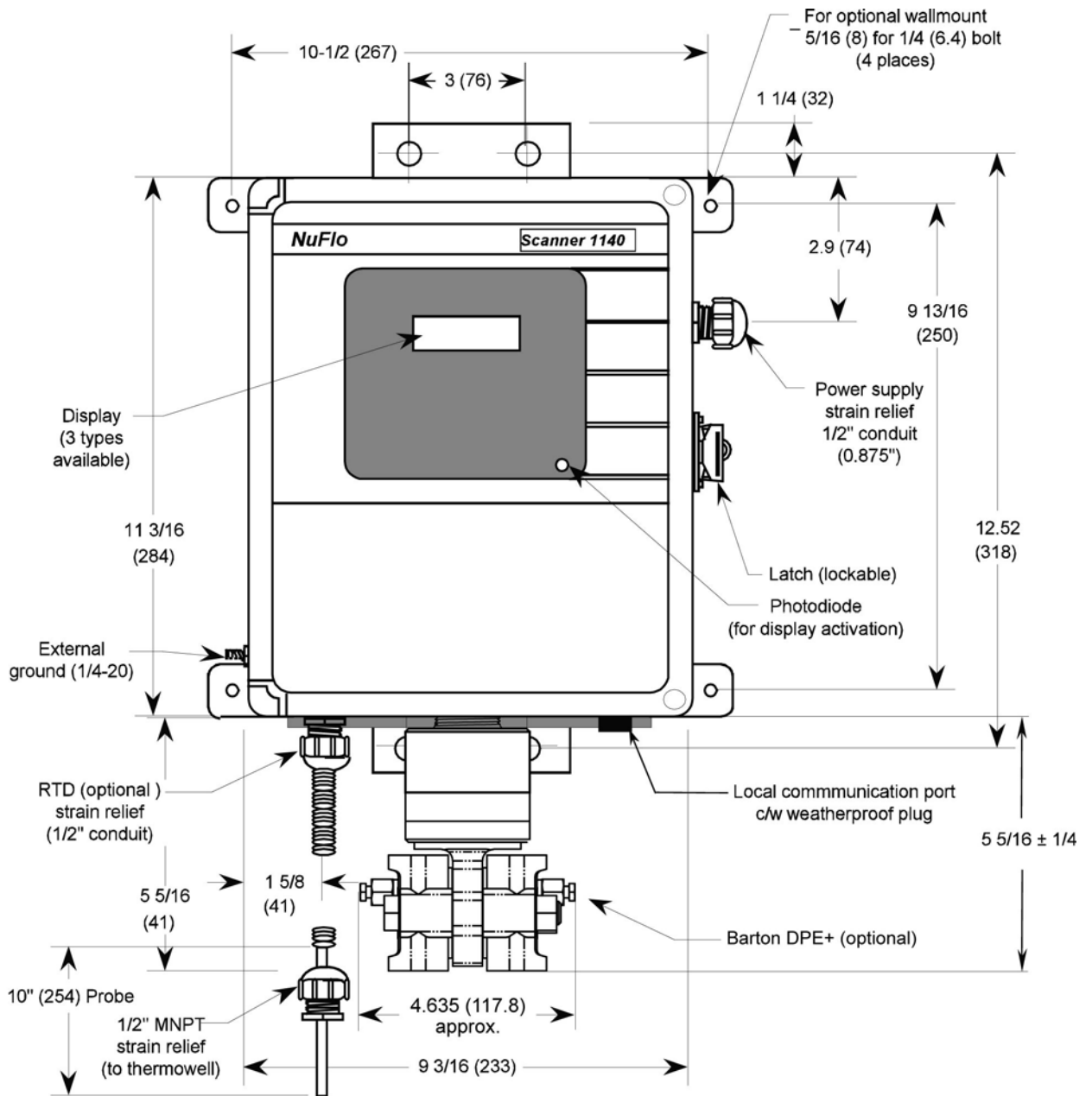
BASE UNIT		1 DPE input,1 RTD input, 2 Analog (1-5 vdc) Inputs,													
INCLUDES:		2 or more Status inputs/outputs, 2 RS-232 serial ports and 256K Ram/NVram													
Shaded selections indicate stocked items															
		1140 Code Example: 1140		T	02	IM	00	06	J	10	13	02	05	83	2C
1	ENCLOSURE	Communication Connector													
	[Traditional] NEMA 4 FRP Enclosure	External Fischer	T												
	[With Communications] NEMA 4 FRP	External Fischer	C												
	[OEM] Surface Mount Chassis	DB9	G												
	[Low Cost] NEMA 3 Steel Enclosure	External Fischer	L												
	Note: NEMA 4X only with SS Mounting														
2	CERTIFICATION	None													
	CSA Intrinsically Safe, Class I, Div 1, Groups C & D		00												
	CSA non-incendive, Class I, Div 2, Groups A,B,C & D		02												
	CSA IS, Class I, Div 1, Grps C & D - MC Lock (1)		C2												
	CSA NI, Class I, Div 2, Groups A,B,C & D - MC Lock (1)		12												
	(1) includes Configuration Lock Seal for Measurement Canada (MC)		M2												
3	TRANSDUCER	No Transducer													
	Integral Mounted DPE+ Transducer (Specify as a separate line item)		00												
	Integral Mounted Pressure Transmitter, 100PSIG (1)		IM												
	Integral Mounted Pressure Transmitter, 200PSIG (1)		P1												
	Integral Mounted Pressure Transmitter, 300PSIG (1)		P2												
	Integral Mounted Pressure Transmitter, 500PSIG (1)		P3												
	Integral Mounted Pressure Transmitter, 1000PSIG (1)		P5												
	Integral Mounted Pressure Transmitter, 1500PSI (sealed gauge) (1)		P6												
	Integral Mounted Pressure Transmitter, 3000PSI (sealed gauge) (1)		P7												
	Integral Mounted Pressure Transmitter, 5000PSI (sealed gauge) (1)		P8												
	NOTE: 3a. Option codes IM or P1-P9 are not available for the 1140G		P9												
4	TRANSDUCER2	No Transducer													
	Integral Mounted Pressure Transmitter, 100PSIG (1)		00												
	Integral Mounted Pressure Transmitter, 200PSIG (1)		P1												
	Integral Mounted Pressure Transmitter, 300PSIG (1)		P2												
	Integral Mounted Pressure Transmitter, 500PSIG (1)		P3												
	Integral Mounted Pressure Transmitter, 1000PSIG (1)		P5												
	Integral Mounted Pressure Transmitter, 1500PSI (sealed gauge) (1)		P6												
	Integral Mounted Pressure Transmitter, 3000PSI (sealed gauge) (1)		P7												
	Integral Mounted Pressure Transmitter, 5000PSI (sealed gauge) (1)		P8												
	NOTE: 4a. Option codes P1-P9 are not available for the 1140G		P9												
5	POWER SUPPLY	Div1 or Div2, 12-28Vdc /6V Charge control [1140T, 1140C, 1140L]													
	Div2, 12-28Vdc /12V Charge control [1140C, 1140L]		06												
	Div 2, 24 Vdc (applicable to all enclosure models)		10												
			DC												
6	BATTERY	None													
	6 VDC, 12 Ah (requires Power Supply '06')		X												
	12 VDC, 32 Ah (requires 1140C with Power Supply '10')		J												
	12 VDC, 55 Ah (requires 1140C with Power Supply '10')		M												
			N												

1140 Code Example: 1140											T	02	IM	00	06	J	10	13	02	05	83	2C																																
7 SOLAR PANEL																																																						
<table border="1"> <thead> <tr> <th>Watts</th> <th>Bracket</th> <th>Cable</th> <th>Approval</th> </tr> </thead> <tbody> <tr> <td>None</td> <td>None</td> <td>None</td> <td>n/a</td> </tr> <tr> <td>10</td> <td>Adj.</td> <td>10'</td> <td>Div 1</td> </tr> <tr> <td>20</td> <td>Adj.</td> <td>10'</td> <td>Div2</td> </tr> <tr> <td>30</td> <td>Adj.</td> <td>10'</td> <td>Div 2</td> </tr> <tr> <td>50</td> <td>Vertical</td> <td>None</td> <td>Div 2</td> </tr> </tbody> </table>												Watts	Bracket	Cable	Approval	None	None	None	n/a	10	Adj.	10'	Div 1	20	Adj.	10'	Div2	30	Adj.	10'	Div 2	50	Vertical	None	Div 2																			
Watts	Bracket	Cable	Approval																																																			
None	None	None	n/a																																																			
10	Adj.	10'	Div 1																																																			
20	Adj.	10'	Div2																																																			
30	Adj.	10'	Div 2																																																			
50	Vertical	None	Div 2																																																			
<p>NOTES: 7a. All brackets are for 2" pipe</p> <p>7b. For non standard solar panels please consult factory</p>																																																						
8 INPUT OPTIONS (MAIN BOARD)																																																						
<table border="1"> <thead> <tr> <th>Status I/O</th> <th>Frequency Input</th> <th>Analog Output 4 - 20 mA</th> <th>Communications 2nd serial port</th> </tr> </thead> <tbody> <tr> <td>Quantity</td> <td>Quantity</td> <td>Quantity</td> <td></td> </tr> <tr> <td>4</td> <td>0</td> <td>0</td> <td>RS-232C</td> </tr> <tr> <td>4</td> <td>1</td> <td>1</td> <td>RS-232C</td> </tr> <tr> <td>4</td> <td>1</td> <td>1</td> <td>RS232C / 422 / 485</td> </tr> <tr> <td>2</td> <td>0</td> <td>0</td> <td>RS232C</td> </tr> </tbody> </table>												Status I/O	Frequency Input	Analog Output 4 - 20 mA	Communications 2nd serial port	Quantity	Quantity	Quantity		4	0	0	RS-232C	4	1	1	RS-232C	4	1	1	RS232C / 422 / 485	2	0	0	RS232C																			
Status I/O	Frequency Input	Analog Output 4 - 20 mA	Communications 2nd serial port																																																			
Quantity	Quantity	Quantity																																																				
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4	1	1	RS-232C																																																			
4	1	1	RS232C / 422 / 485																																																			
2	0	0	RS232C																																																			
<p>NOTE: 8a. L1 Features fixed terminal blocks and soldered in place lithium back-up battery</p> <p>8b. * Option 13 not available for 1140G, if required please consult factory</p> <p>8c. Standard options 00, 03, 13 - depluggable terminals</p>																																																						
9 DISPLAY																																																						
None [applicable to all models]																																																						
2 lines X 16 character LCD Display [all models]																																																						
4 lines X 20 character LCD Display c/w Keypad [1140T, 1140C]																																																						
NOTE: 9a. Option 04 only available with Input Option code 13 (field 8 above)																																																						
1140 Code Example: 1140T											02	IM	00	06	J	10	13	02	05	83	2C	R	00	S																														
10 EXPANSION BOARD MIO1, Multiple Input / Output Board																																																						
None																																																						
<table border="1"> <thead> <tr> <th>Serial Port</th> <th>Pulse In</th> <th>Analog Out</th> <th>Digital I/O</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>1</td> <td>2</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>4</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>1</td> <td>0</td> <td>0</td> <td>4</td> </tr> <tr> <td>1</td> <td>1</td> <td>1</td> <td>0</td> </tr> <tr> <td>1</td> <td>1</td> <td>0</td> <td>2</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>2</td> </tr> </tbody> </table>												Serial Port	Pulse In	Analog Out	Digital I/O	0	1	1	2	0	1	0	4	1	0	0	0	1	0	0	4	1	1	1	0	1	1	0	2	1	0	1	2											
Serial Port	Pulse In	Analog Out	Digital I/O																																																			
0	1	1	2																																																			
0	1	0	4																																																			
1	0	0	0																																																			
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11 PROGRAM																																																						
<table border="1"> <thead> <tr> <th>ScanCom</th> <th>Modbus</th> <th>BSAP</th> <th>PLC</th> </tr> </thead> <tbody> <tr> <td>18</td> <td>19</td> <td>-</td> <td></td> </tr> <tr> <td>38</td> <td>39</td> <td>L3</td> <td></td> </tr> <tr> <td>note 11a</td> <td>33</td> <td>tba</td> <td></td> </tr> <tr> <td>58</td> <td>59</td> <td>-</td> <td></td> </tr> <tr> <td>78</td> <td>79</td> <td>-</td> <td></td> </tr> <tr> <td>88</td> <td>89</td> <td>-</td> <td></td> </tr> <tr> <td>note 11a</td> <td>83</td> <td>L4</td> <td>P4</td> </tr> </tbody> </table>												ScanCom	Modbus	BSAP	PLC	18	19	-		38	39	L3		note 11a	33	tba		58	59	-		78	79	-		88	89	-		note 11a	83	L4	P4											
ScanCom	Modbus	BSAP	PLC																																																			
18	19	-																																																				
38	39	L3																																																				
note 11a	33	tba																																																				
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78	79	-																																																				
88	89	-																																																				
note 11a	83	L4	P4																																																			
<p>NOTES:</p> <p>11a. Please use applicable Modbus program code, since all "4" series firmware versions are provided with ScanCom and Modbus communication protocols</p> <p>11b. For other available programs please consult Barton document 1100-1002B</p> <p>11c. Scan PLC (IEC61131 programming module) only available with NFlo 4 firmware, ScanCom / Modbus Protocol</p>																																																						

1140 Code Example: 1140T										02	IM	00	06	J	10	13	02	05	83	2C	R	00	S
12 MOUNTING																							
None										[1140G]										00			
2" Pipe Mount Universal (CS)										[1140T, 1140C, 1140L]										2C			
2" Pipe Mount Universal (SS)										[1140T, 1140C]										2S			
2" Pipe Mount (CS), with End Cap										[1140T, 1140C]										EC			
2" Pipe Mount (SS), with End Cap										[1140T, 1140C]										ES			
Wall Mount										[1140T, 1140C, 1140L]										WL			
NOTE: 12a. Pipe Mount Brackets are not applicable to the 1140G																							
13 RTD (Armored 3 wire 100 Ohm Platinum)																							
None																				A			
10 foot																				R			
30 foot																				S			
NOTE: 13a. For non-standard lengths, please consult factory																							
14 NOTE: THIS FIELD [10] IS ONLY APPLICABLE TO MODELS 1140C & 1140L FOR ALL OTHER ENCLOSURE STYLES PLEASE SELECT CODE 00																							
COMMUNICATIONS INTERFACE																							
Order codes in this table are used to specify a "DCE Ready" Scanner only																							
Comm Device to Serial Port										Comm Device to Antenna													
None	0	None	0							00													
None	0	Type N	N							0N													
None	0	TNC	T							0T													
None	0	SMA	S							0S													
None	0	UHF	U							0U													
DB25M Connector	5	None	0							50													
DB25M Connector	5	Type N	N							5N													
DB25M Connector	5	TNC	T							5T													
DB25M Connector	5	SMA	S							5S													
DB25M Connector	5	UHF	U							5U													
DB9M Connector	9	None	0							90													
DB9M Connector	9	Type N	N							9N													
DB9M Connector	9	TNC	T							9T													
DB9M Connector	9	SMA	S							9S													
DB9M Connector	9	UHF	U							9U													
Flying Leads	L	None	0							L0													
Flying Leads	L	Type N	N							LN													
Flying Leads	L	TNC	T							LT													
Flying Leads	L	SMA	S							LS													
Flying Leads	L	UHF	U							LU													
Special, specify as a separate line item																							
DCE DEVICE																							
MDS 4710B (DB25M Serial, Type N Antenna)																							
Free Wave Radio Modem																							
Modem, Div. 2 (Flying Leads, Serial, No Antenna)																							
NOTES:																							
14a. Includes pre-wired DCE communication cable, lightning surge protector, and internal co-ax service loop. For non-standard antenna / cabling options, please consult factory.																							
14b. For communication interfaces not listed, please consult factory.																							
14c. Please see list of standard options for antenna and external co-ax and specify as a separate option.																							
15 SOFTWARE and DOCUMENTATION																							
None																				X			
ScanWin Lite Software and Maintenance Manuals																				S			

Outline Dimensions

Scanner 1140T (Front View)

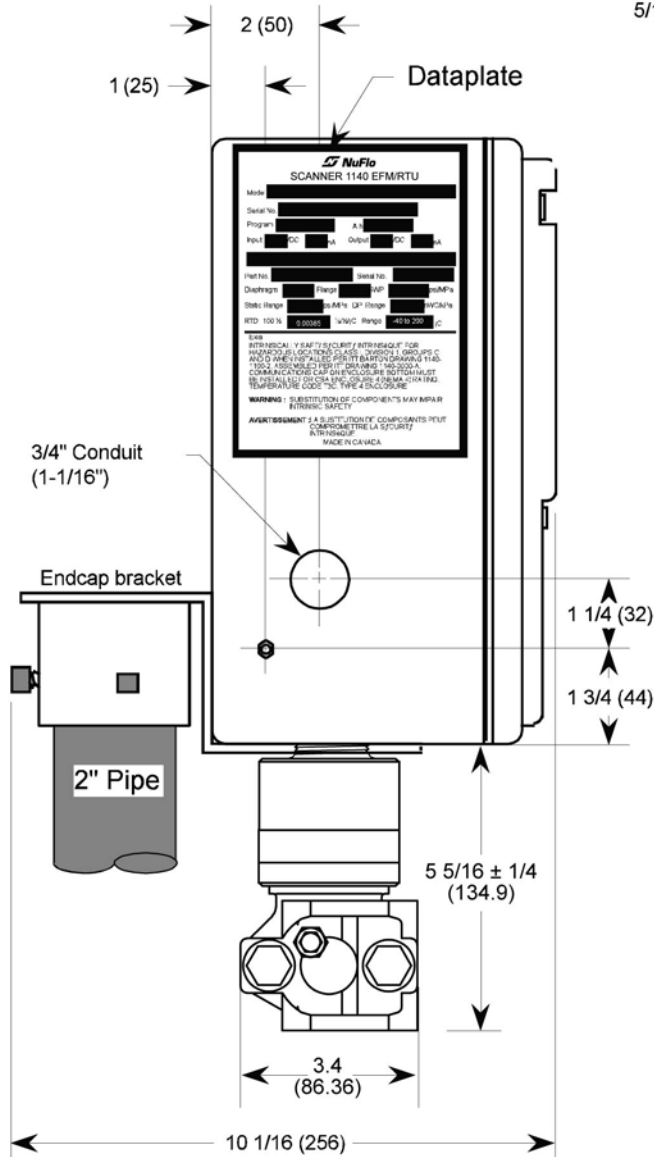


2. Available mounting options: 2" Pipe Mount, 2" U-bolt mount and wall mount

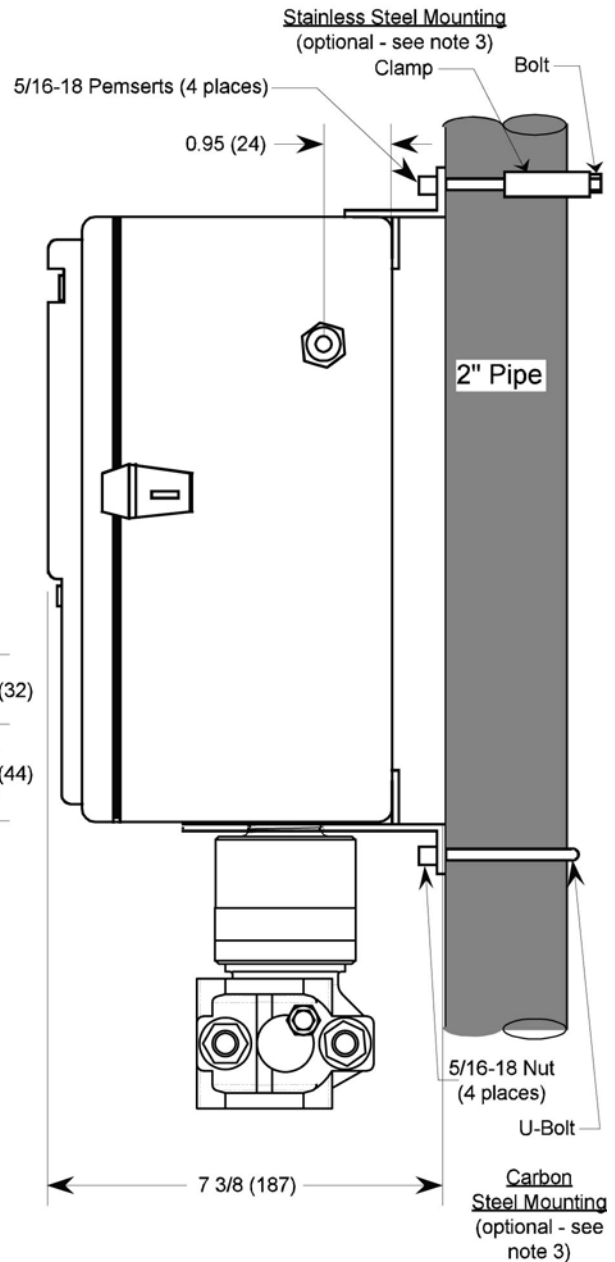
Notes: 1. All dimensions in inches. (Soft metric conversion) Tolerances ± 1/8" .

Scanner 1140T (Side Views)

Endcap Mount



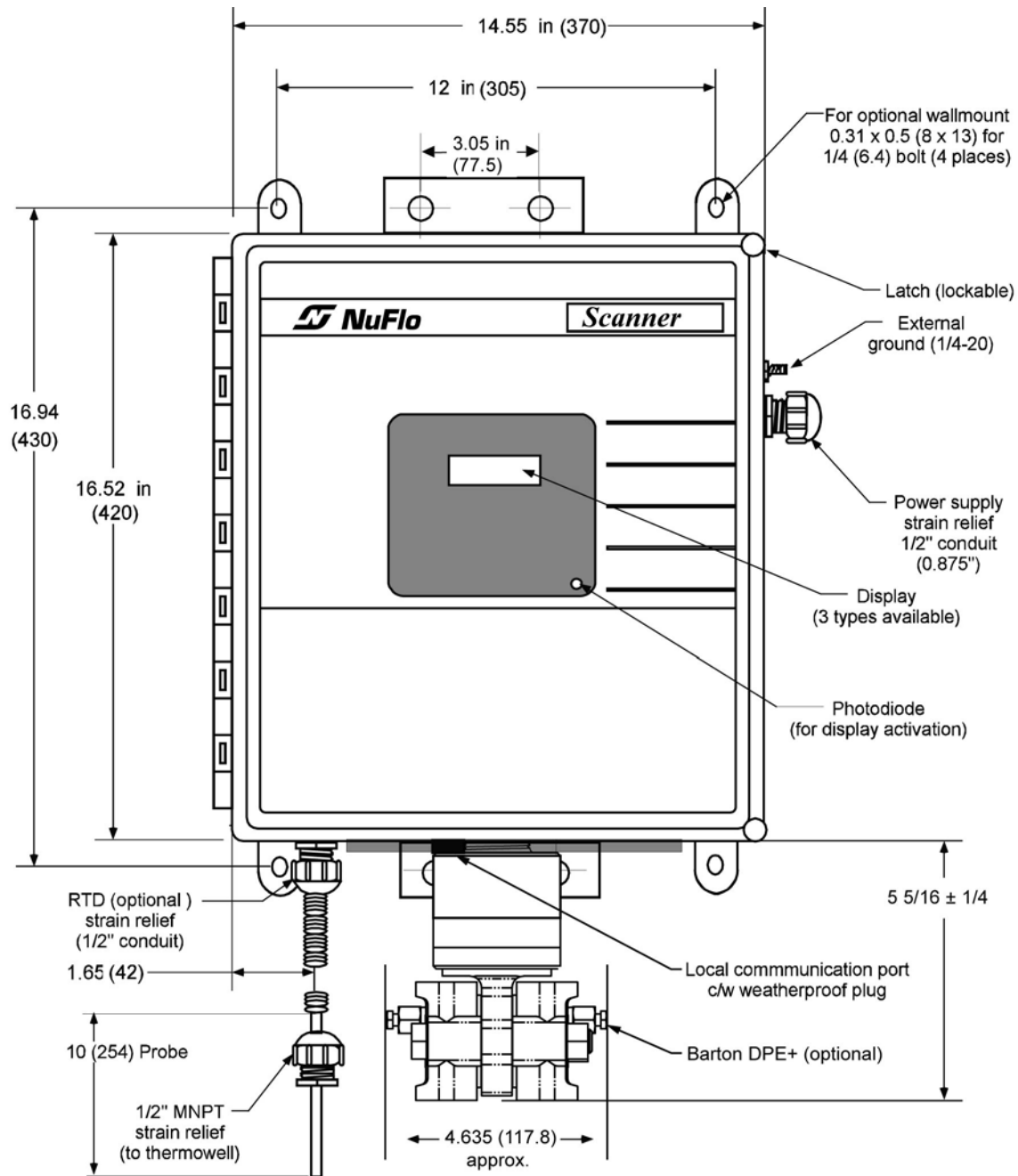
Universal Pipemount



3. Both types of mountings are shown as examples only.
2. DPE mounting standard 2-1/8 spacing 1/4" NPT process connections.

Notes: 1. All dimensions in inches (Soft metric conversion). Tolerances $\pm 1/8"$.

Scanner 1140C (Front View)

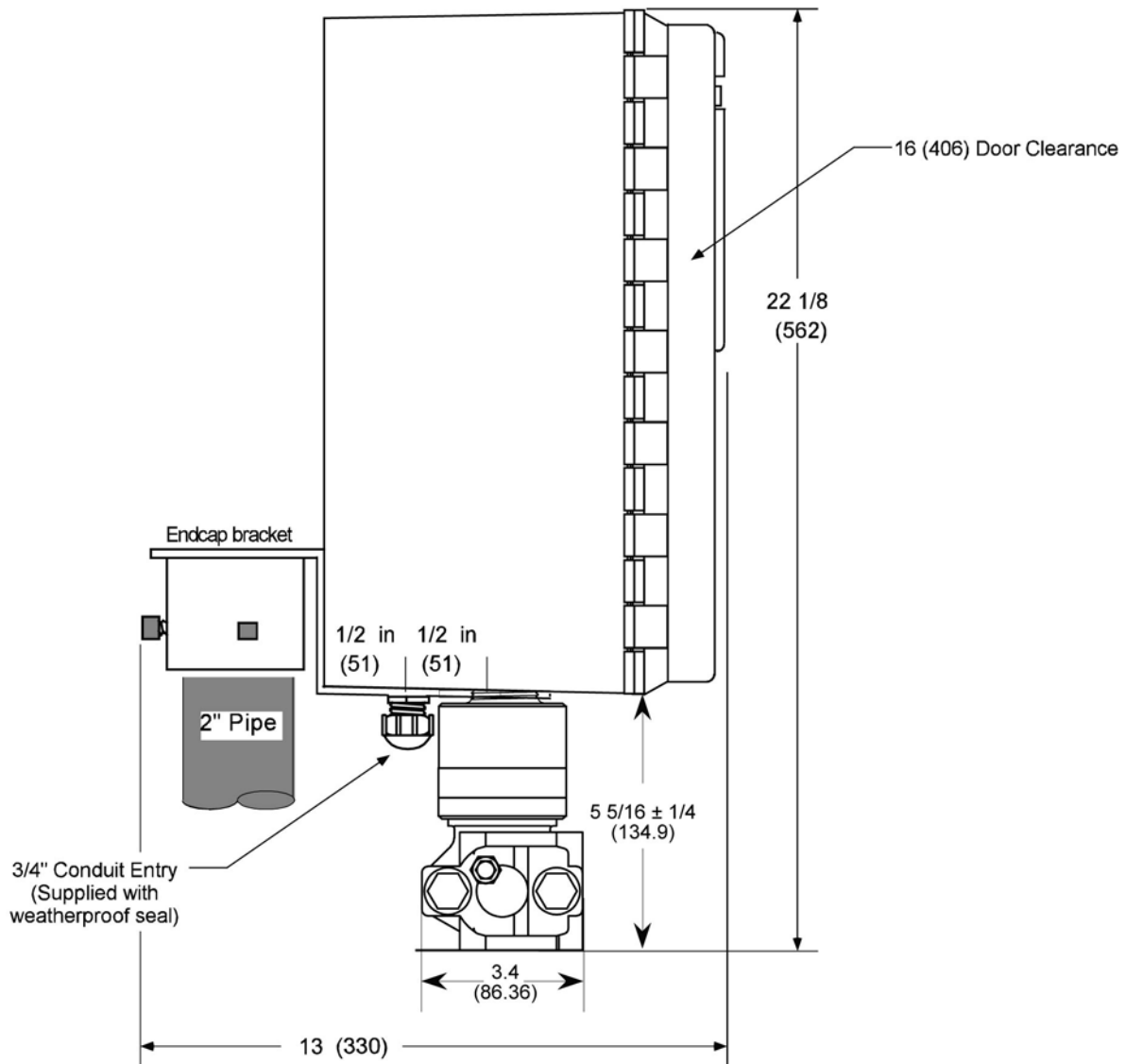


2. Available mounting options: 2" Pipe Mount, 2" U-bolt mount and wall mount

Notes: 1. All dimensions in inches. (Soft metric conversion) Tolerances: ± 1/8" (3.2mm)

Scanner 1140C (Endcap Mount Side View)

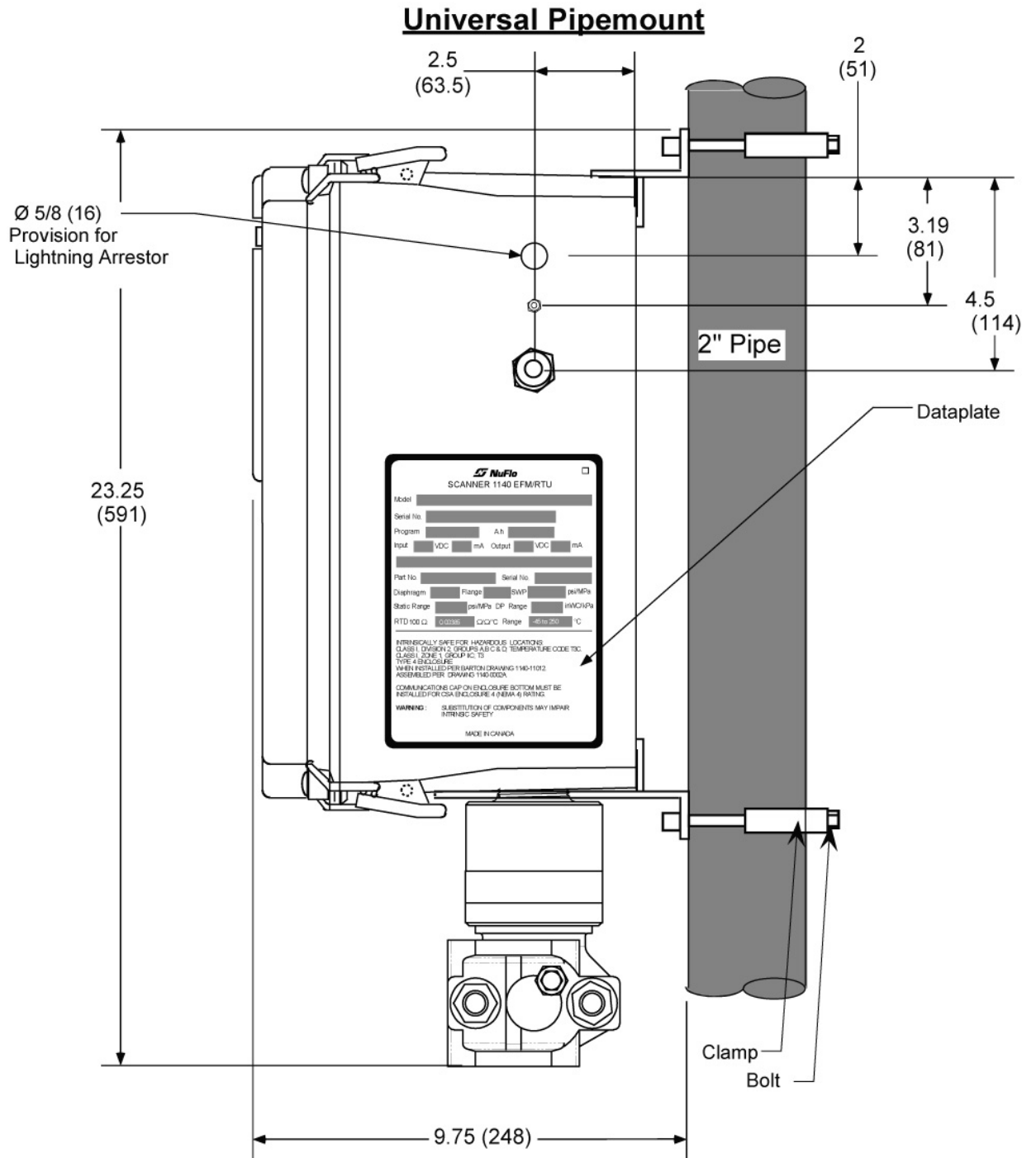
Endcap Mount



2. DPE mounting standard 2-1/8 spacing 1/4" NPT process connections.

Notes: 1. All dimensions in inches fraction ± 1/32", 0.XX ± 0.01", 0.XXX ± 0.005"

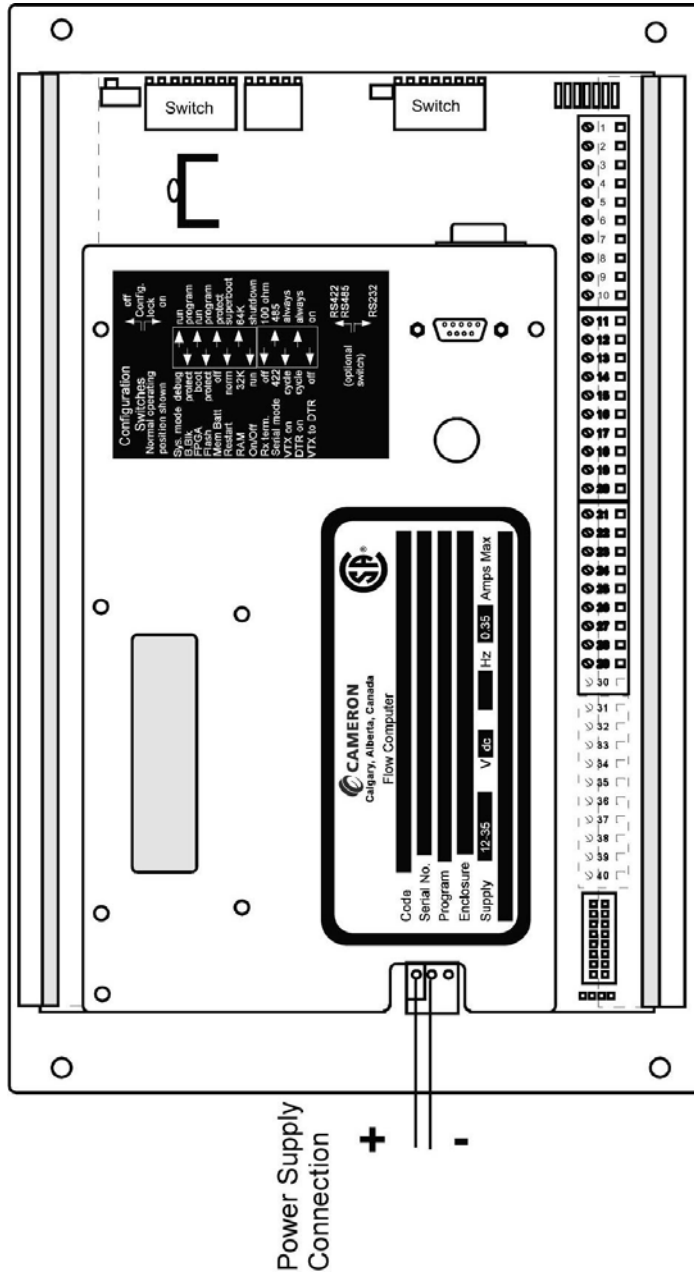
Scanner 1140C (Universal Mount Side View)



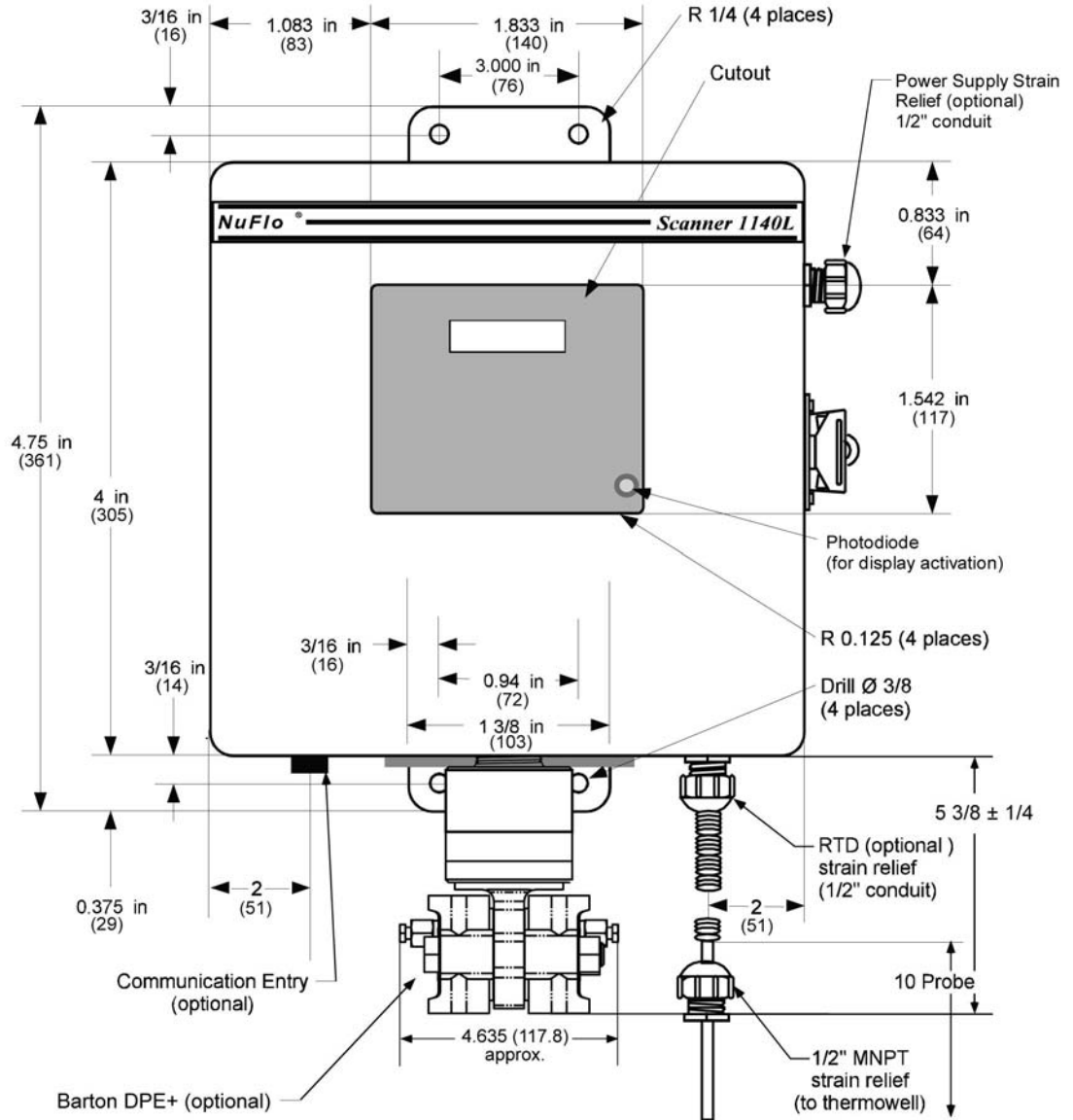
2. DPE mounting standard 2-1/8 spacing 1/4" NPT process connections.

Notes: 1. All dimensions in inches fraction ± 1/32", 0.XX ± 0.01", 0.XXX ± 0.005"

Scanner 1140G (Top View)



Scanner 1140L (Front View)

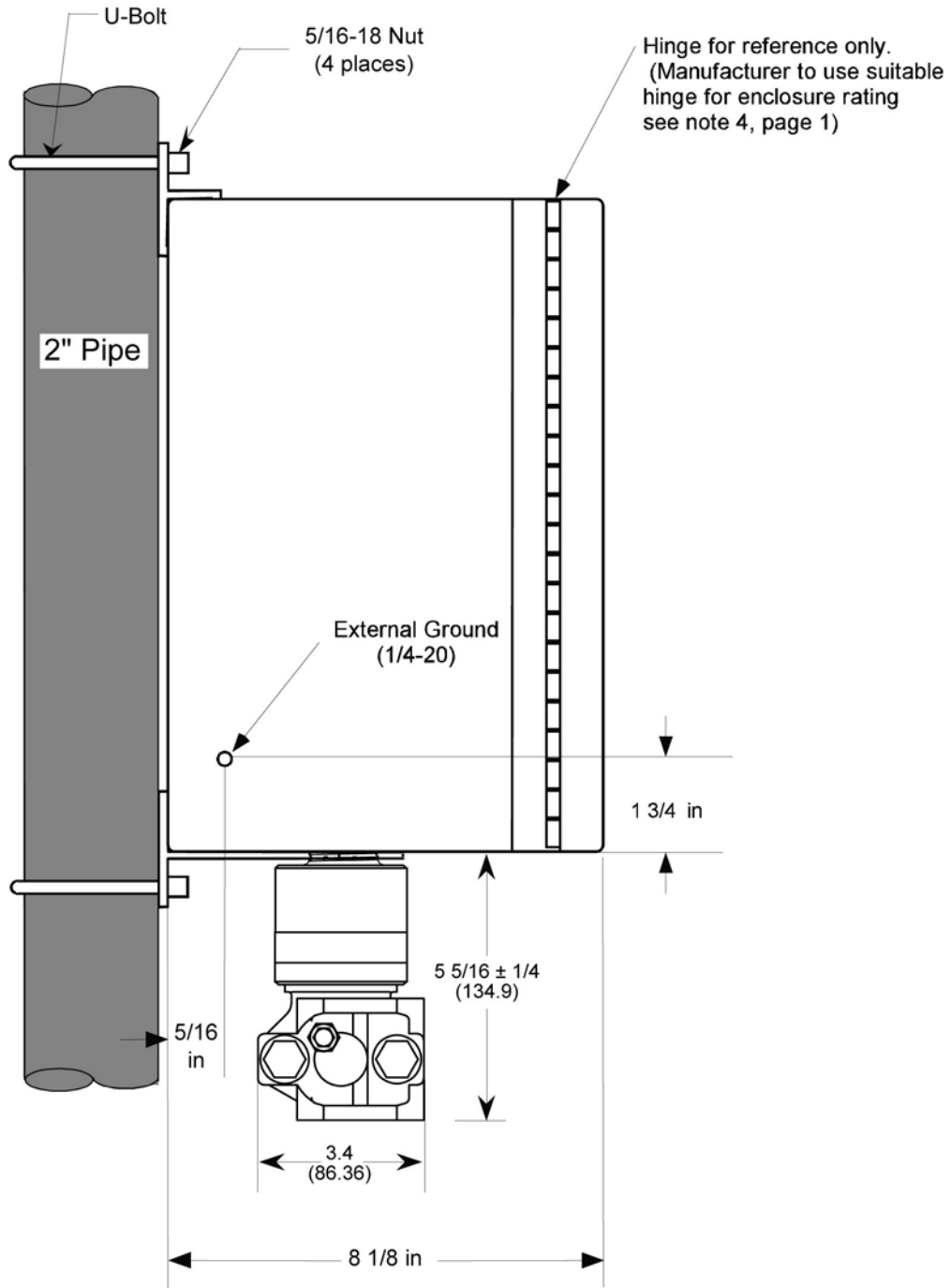


3. Mounting Tab thickness to be 12 Gage.

2. Radius all corners 1/32 unless other wise specified. Deburr all holes, Break all sharp edges.

Notes: 1. All dimensions in inches (mm). Tolerances: Fraction $\pm 1/32"$, Decimals $0.XX \pm 0.01"$, $0.XXX \pm 0.005"$

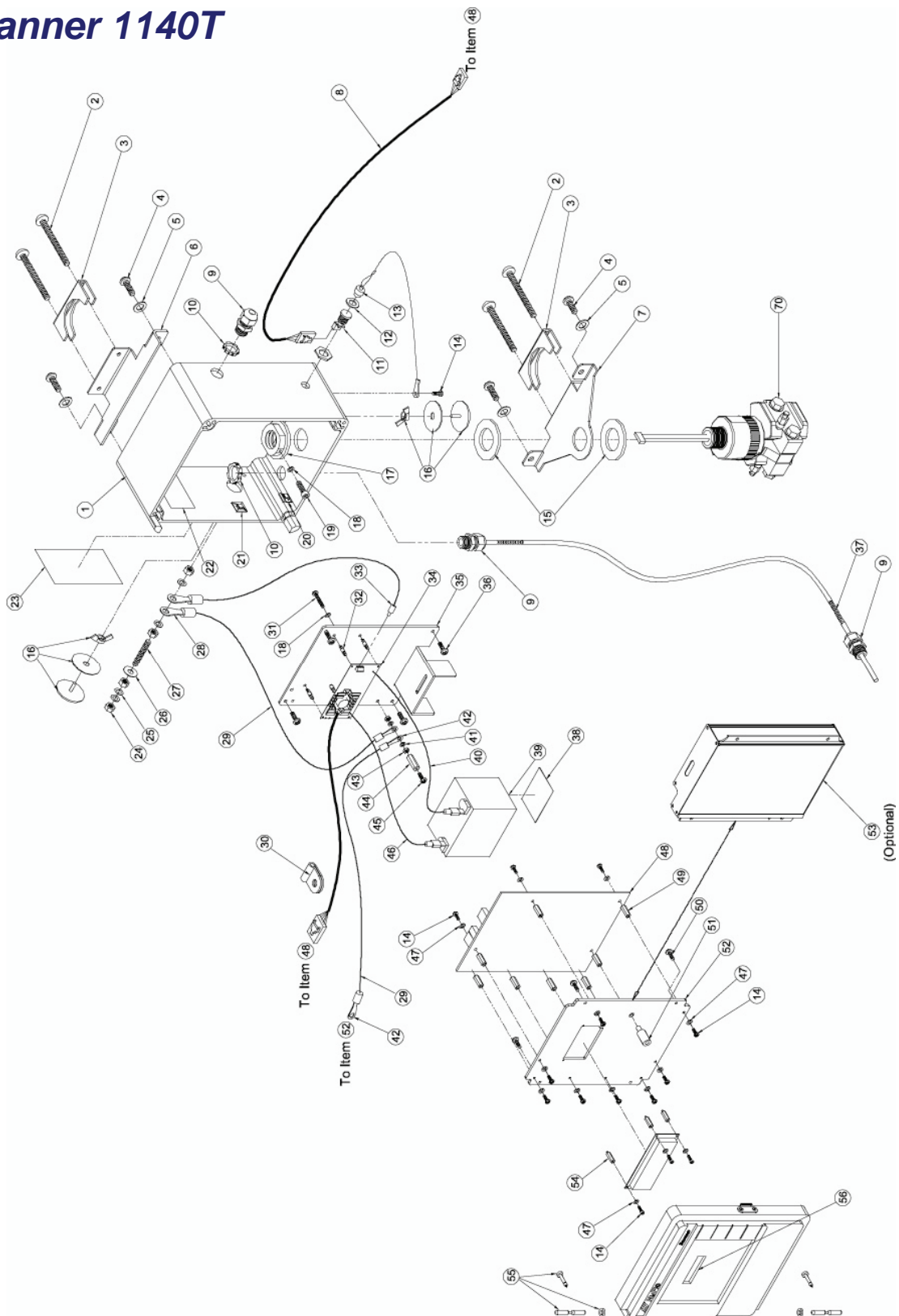
Scanner 1140L (Side View of Enclosure)



Notes: 1. All dimensions in inches. Tolerances: Fraction $\pm 1/32$ ", Decimals $0.XX \pm 0.01$ ", $0.XXX \pm 0.005$ "

Chapter 8: Parts List

Scanner 1140T



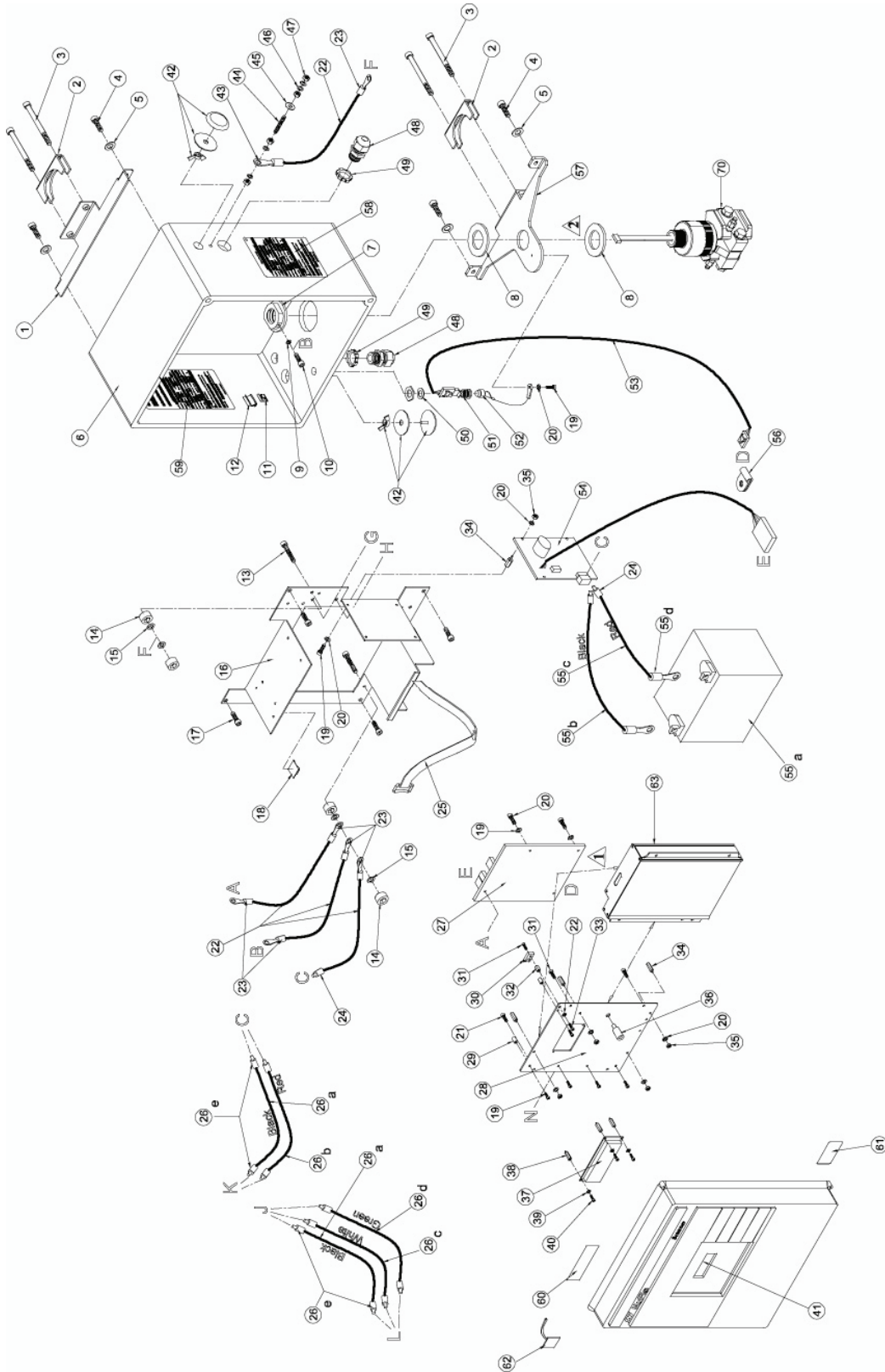
Scanner 1140 Hardware User Manual

ITEM	PART NUMBER	DESCRIPTION	QTY
1		ENCLOSURE, SCANNER 1140	1
	9A-1140-1040B-11	ENCLOSURE, SCANNER 1140, 2x16	
	9A-1140-1040B-21	ENCLOSURE, SCANNER 1140, 4x20	
2	9A-0210-9004J	SCREW, HEX CAP HD 5/16-18 X 3-1/2 SS	4
3	9A-0142-9002C	SADDLE, MOUNTING - 304 STNL ST	2
4	9A-0210-9005J	SCREW, HEX CAP HD 5/16-18 X 1/2 18-8 SS	4
5	9A-0003-0083K	WASHER, SPLIT LOCK, 5/16, SST	4
6	9A-1140-1051C-03	BRACKET, 2" UNIVERSAL 316 SS, TOP, 1140	1
7	9A-1140-1022C-03	BRACKET, 2" UNIV., 316 SS, BOTTOM 1140	1
8	9A-1140-1053B-11	CONNECTOR CABLE ASSEMBLY, WIRE - STD	1
9	9A-0091-9000T	STRAIN RELIEF, 1/2"NPT	3
10	9A-1140-1028J	LOCKWASHER AND GASKET, NEMA 4 - 1/2"NPT	3
11	9A-0090-9001T	CAP, SEALING - FISCHER RECEPTACLE	1
12	9A-1140-1031R	GASKET, FISCHER CONNECTOR - SILICONE	1
13	9A-1140-1054B	CONNECTOR ASSEMBLY, HHT INTERFACE	1
14	9A-0119-1013J	SCREW, PAN PHILLIPS HEAD, 6-32 X1/4, SS	4
15	9A-1140-1026R	GASKET, DPE MOUNTING - NEOPRENE	2
16	9A-0192-9006T	HOLE SEAL, 1/2 & 3/4" , NEMA 4X , FRP	2
17	9A-1140-1023C	NUT, SEAL - CAPSULE STEM, GROUND SCREW	1
18	9A-0003-9004K	LOCKWASHER, EXTERNAL TOOTH - #8, SS	7
19	9A-99002019	SCW,SET,#8-32NCX3/16,CUP PORT,HEX SOC,SS	1
20	9A-0062-9001T	CLIP, CABLE Ø 3/16" CAPACITY NYLON	1
21	9A-0062-9009T	BASE, TIE WRAP MOUNTING - 3/4"	1
22	9A-1140-1019G	DECAL, SWITCH IDENTIFICATION - M1140	1
23	9A-1140-1049G-01	DATAPLATE,SCANNER, DIV 1,CSA	1
24	9A-0500-0046J	NUT, HEX, 1/4-20, 18-8 SST	4
25	9A-0003-1110K	WASHER, LOCK, IT, 1/4, SST	4
26	9A-0003-9008K	WASHER, SEAL, 1/4", CS, BONDED NEOPRENE	1
27	9A-0007-9007T	STUD, 1/4-20 X 1-1/2 SS	1
28	9A-0109-9015T	TERMINAL CRIMP,RING TONGUE 1/4(14-16AWG)	2
29	9A-0012-9002T-11	WIRE, STRANDED 14 AWG - GREEN	as required
30	9A-0062-9002T	CLIP, CABLE- 'P' Ø 3/16" CAPACITY NYLON	2
31	9A-0119-9002J	SCREW, PAN PH HD 8-32 X 3/4 18-8 STNL ST	1
32	9A-0152-9010T	STAND-OFF, MXM .156X.375" SNAPIN NYLON	4
33	9A-1130-4666T	WIRE TIP FERRULE, BLUE H2.5/14	1
34	9A-1140-0300C	CHARGE CONTROL BOARD, 1140, 6V	1
34	9A-1140-0304C	CHARGE CONTROL BOARD, 1140, NO BATTERY, DIV 2, CSA	1
35	9A-1140-1036C	PLATE, BATTERY MOUNTING - SCANNER 1140	1
36	9A-0111-0086J	SCREW, PAN HD,PHLPS, 10-32 X 1/4 18-8	4
37	9A-1100-1010C-xx	RTD PROBE/ARMOURED ASSY.	xx-length
38	9A-0022-9004T	VELCRO, ADHESIVE BACKED, HOOK/LOOP, 2"	1
39	9A-0130-9011T	BATTERY, LEAD ACID, 6V, 12 AHR	1
40	9A-0012-9002V-03	WIRE, STRANDED 14 AWG - BLACK	as required
41	9A-0003-0066K	LOCKWASHER, INTERNAL TOOTH - #8 STNL ST	4
42	9A-0109-9014T	TERMINAL CRIMP,RING TONGUE #8 (14-16AWG)	5
43	9A-0500-0047J	NUT, MACHINE SCREW 8-32 18-8 STNL ST	2
44	9A-0152-9002T	STAND-OFF, FFX 8-32 X 3/4" (3/8"HEX-AL)	1
45	9A-0119-9004J	SCREW, PH BD HD 8-32 X 1/4 - GREEN HEAD	1
46	9A-0012-9002V-09	WIRE, STRANDED 14 AWG - RED	as required

ITEM	PART NUMBER	DESCRIPTION	QTY
47	9A-0003-0070K	WASHER, LOCK, IT, #6, SST	12
48		1140 MAIN BOARD, 1 DPE+, 1 RTD, 2 AI, 4 SI/O	1
	9A-1140-25002018C	STD	—
	9A-1140-25012018C	STD + 4-20 MA OUTPUT	—
	9A-1140-25032018C	STD + 4-20 MA OUTPUT + FREQUENCY INPUT	—
	9A-1140-25132019K	STD + 4-20 MA OUTPUT + FREQUENCY INPUT + SELECTABLE 232/485 SERIAL PORT	—
49	9A-0152-9014T	STAND-OFF, FXF 6-32 X 11/16", AL	8
50	9A-0119-9001J	SCREW, BD PH HD 8-32 X 3/8 18-8 STNL ST	4
51	9A-1140-1009B	PIPE ASSEMBLY, LIGHT	1
52	9A-CS08-595-120	MOUNTING PLATE, MAIN BOARD, 1140T	1
53	9A-1140-1000D	EXTRUSION, SCANNER 1140	1
54	9A-1140-1015T	STAND-OFF, M6-32 SNAPON X 3/16" PLASTIC	3
55	9A-1140-1061W	KIT, HINGE - SCANNER 1140	1
56	9A-1140-1033T	LENS, BLANK - SCANNER 1140	3
57*	9A-1140-1012R	GASKET, EXTRUSION - 3/8" W X 3/8"T	0.8 FT.
58*	9A-1140-1013J	SCREW, PH PAN HD 8-32 X 3/8 ZP SELF-TAP	8
59*	9A-0022-9003T-03	TIE, CABLE, MINIATURE (3.9) INCH	4
60*	9A-1140-1017G	LABEL, WIRING CONNECTIONS - SCANNER 1140	1
61*	9A-0500-0021J	NUT, MACHINE SCREW 6-32 STNL ST	1
62*	9A-0119-9001J	SCREW, BD PH HD 8-32 X 3/8 18-8 STNL ST	1
63*	9A-0081-9001T	GROMMET, HOLE - 9/16" I.D. - BLACK VINYL	2
64	9A-1140-1037C	COVER, BATTERY MOUNT	1
65*	9A-1140-1072G	LABEL, APPROVED BATTERIES - 1140C	1
70	(see page Error! Bookmark not defined.)	DPE+	1
NOT SHOWN IN ASSEMBLY DRAWING			
		EXPANSION BOARD, MIO1	1 (optional)
—	9A-1140-0210B-05	0 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210B-06	0 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210B-10	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210B-11	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210B-12	1 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210B-13	1 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210B-14	1 SERIAL, 0 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
		KIT, EXTRUSION & MAIN BOARD REPLACEMENT, 1 DPE+, 1 RTD, 2 AI, 4 SI/O	1 (optional)
—	9A-1140-1097B-00	STD	—
—	9A-1140-1097B-01	STD + 4-20 MA OUTPUT	—
—	9A-1140-1097B-03	STD + 4-20 MA OUTPUT + FREQUENCY INPUT	—
—	9A-1140-1097B-13	STD + 4-20 MA OUTPUT + FREQUENCY INPUT + SELECTABLE 232/485 SERIAL PORT	—

ITEM	PART NUMBER	DESCRIPTION	QTY
		KIT, EXPANSION BOARD, MIO1 (INCLUDES EXPANSION BOARD, TERMINAL, END PLATE AND WIRING DECAL)	1 (optional)
—	9A-1140-0210W-05	0 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210W-06	0 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210W-10	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210W-11	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210W-12	1 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210W-13	1 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210W-14	1 SERIAL, 0 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—

Scanner 1140C



Scanner 1140 Hardware User Manual

ITEM	PART NUMBER	DESCRIPTION	QTY
1	9A-1140-1057C-01	BRACKET, 2" UNIVERSAL , CS, TOP 1140C	1
2	9A-0142-9001T	CLAMP, PIPE - 2 1/2" NOMINAL SADDLE	2
3	9A-0210-9003J	SCREW, HEX CAP HD, 5/16-18 X 3-1/2, CS	4
4	9A-0116-0005J	SCREW, HEX HD 10-32 X 5/8 ST CP	4
5	9A-0003-0047K	WASHER, FLAT, #10, SST	4
6	9A-1140-1041C	ENCLOSURE, SCANNER 1140C	1
7	9A-1140-1023C	NUT, SEAL - CAPSULE STEM, GROUND SCREW	1
8	9A-1140-1026R	GASKET, DPE MOUNTING - NEOPRENE (DPE+ included)	2
9	9A-0003-9004K	LOCKWASHER, EXTERNAL TOOTH - #8, SS	1
10	9A-99002019	SCW,SET,#8-32NCX3/16,CUP PORT,HEX SOC,SS	1
11	9A-0062-9001T	CLIP, CABLE Ø 3/16" CAPACITY NYLON	1
12	9A-0062-9003T	CLIP, CABLE, RIBBON	1
13	9A-0119-9002J	SCREW, PAN PH HD 8-32 X 3/4 18-8 STNL ST	2
14	9A-0500-0047J	NUT, MACHINE SCREW 8-32 18-8 STNL ST	4
15	9A-0003-9004K	LOCKWASHER, EXTERNAL TOOTH - #8, SS	4
16	9A-1140-1027C	PLATE, MOUNTING - SCANNER 1140C	1
17	9A-0111-0057J	SCREW 10-32X 3/8 SLOT HEAD	4
18	9A-CS08-412-106	CLIP, CABLE Ø 3/8" CAPACITY NYLON	2
19	9A-0119-1013J	SCREW, PAN PHILLIPS HEAD, 6-32 X1/4, SS	16
20	9A-0003-0070K	WASHER, LOCK, IT, #6, SST	19
21	9A-0119-9001J	SCREW, BD PH HD 8-32 X 3/8 18-8 STNL ST	2
22	9A-0012-9002T-11	WIRE, STRANDED 14 AWG - GREEN	as required
23	9A-0109-9014T	TERMINAL CRIMP,RING TONGUE #8 (14-16AWG)	6
24	9A-1130-4666T	WIRE TIP FERRULE, BLUE H2.5/14	3
25	9A-0022-9001T-10	STRAP, VELCRO - 100 CM LENGTH BLACK	1
26a	9A-0012-9001T-03	WIRE, STRANDED 18 AWG - BLACK	as required
26b	9A-0012-9001T-09	WIRE, STRANDED 18 AWG - RED	as required
26c	9A-0012-9001T-01	WIRE, STRANDED 18 AWG - WHITE	as required
26d	9A-0012-9001T-11	WIRE, STRANDED 18 AWG - GREEN	as required
26e	9A-1130-4665T	WIRE TIP FERRULE, YELLOW H1.5/14	12
27		1140 MAIN BOARD, 1 DPE+, 1 RTD, 2 AI, 4 S/I/O	1
	9A-1140-25002018C	STD	
	9A-1140-25012018C	STD + 4-20 MA OUTPUT	
	9A-1140-25032018C	STD + 4-20 MA OUTPUT + FREQUENCY INPUT	
	9A-1140-25132019K	STD + 4-20 MA OUTPUT + FREQUENCY INPUT + SELECTABLE 232/485 SERIAL PORT	
28	9A-1140-1217C	MOUNTING PLATE, DISPLAY, SCANNER 1140L	1 (optional)
29	9A-0152-1134T	STAND-OFF, FXF 6-32 X 1/4"- PHENOLIC	5
30	9A-1140-1227C	MEASUREMENT CANADA SWITCH, SEALING CAP	1
31	9A-0114-9003J	SCREW, FILLISTER HD, 8-32X3/8" CROSS	2
32	9A-0152-9017T	STAND-OFF, FXF 8-32 X 7/16" , HEX, ALUM	1
33	9A-0111-0062J	SCREW, RD PH HD 8-32 X 1/4 SS	1
34	9A-0152-1136T	STAND-OFF, MXF 6-32 X 1/4" - ALUMINUM	8
35	9A-0500-0021J	NUT, MACHINE SCREW 6-32 STNL ST	8
36	9A-1140-1009B	PIPE ASSEMBLY, LIGHT	1
37		DISPLAY, LCD	1
37a	9A-1140-0404C	DISPLAY 2 X 16, FOR 1140 IN AN EXTRUSION	—
37b	9A-1140-0405C	DISPLAY 2 X 16, FOR 1140 NO EXTRUSION	—
37c	9A-1140-0403C	DISPLAY, BACKLIT LCD 20 X 4 - 1140	—

ITEM	PART NUMBER	DESCRIPTION	QTY
38	9A-0152-1147T	STAND-OFF, MXF 2-56 X 1/4" - ALUMINUM	3
39	9A-0003-1092K	WASHER, FLAT, #2, TEFLON	3
40	9A-0119-1002J	SCREW, BD SL HD 2-56 X 1/4 18-8 SS	3
41	9A-1140-1033T	LENS, BLANK - SCANNER 1140	1
42	9A-0192-1029T	SEAL, CONDUIT HOLE, 3/4" NPT, CS GREY	2
43	9A-0109-9015T	TERMINAL CRIMP,RING TONGUE 1/4(14-16AWG)	1
44	9A-0007-9007T	STUD, 1/4-20 X 1-1/2 SS	1
45	9A-0003-9008K	WASHER, SEAL, 1/4", CS, BONDED NEOPRENE	1
46	9A-0003-1110K	WASHER, LOCK, IT, 1/4, SST	4
47	9A-0500-0046J	NUT, HEX, 1/4-20, 18-8 SST	4
48	9A-0091-9000T	STRAIN RELIEF, 1/2"NPT	2
49	9A-1140-1028J	LOCKWASHER AND GASKET, NEMA 4 - 1/2"NPT	2
50	9A-1140-1031R	GASKET, FISCHER CONNECTOR - SILICONE	1
51	9A-1140-1054B	CONNECTOR ASSEMBLY, HHT INTERFACE	1
52	9A-0090-9001T	CAP, SEALING - FISCHER RECEPTACLE	1
53	9A-1140-1053B-11	CONNECTOR CABLE ASSEMBLY, WIRE - STD	1
54	9A-1140-03003C	CHARGE CONTROL BOARD, 1140C, 12VDC	1
55a		BATTERY, LEAD ACID, 12V	1
	9A-0130-9022T	BATTERY, LEAD ACID, 12V 32/35AH	
	9A-0130-9024T	BATTERY, LEAD ACID, 12V 55AH	
55b	9A-0012-9002V-03	WIRE, STRANDED 14 AWG - BLACK	as required
55c	9A-0012-9002V-09	WIRE, STRANDED 14 AWG - RED	as required
55d	9A-0109-9006T	TERMINAL, RING-TYPE - SIZE 16 BLUE	2
56	9A-0062-9002T	CLIP, CABLE- 'P' Ø 3/16" CAPACITY NYLON	1
57	9A-1140-1056C-03	BRACKET, 2" UNIV, 316 SS, BOTTOM 1140C	1
58	9A-1141-1012G-01	DATAPLATE,SCANNER 1100, CSA DIV. 2	1
59	9A-1140-1017G	LABEL, WIRING CONNECTIONS - SCANNER 1140	1
60	9A-1140-1019G	DECAL, SWITCH IDENTIFICATION - M1140	1
61	9A-1140-1072G	LABEL, APPROVED BATTERIES - 1140C	1
62	9A-0062-9009T	BASE, TIE WRAP MOUNTING - 3/4"	1
63	9A-1140-1000D	EXTRUSION, SCANNER 1140	1 (optional)
70	(see page Error! Bookmark not defined.)	DPE+	1
NOT SHOWN IN ASSEMBLY DRAWING			
		EXPANSION BOARD, MIO1	1 (optional)
—	9A-1140-0210B-05	0 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210B-06	0 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210B-10	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210B-11	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210B-12	1 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210B-13	1 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210B-14	1 SERIAL, 0 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
		KIT, EXTRUSION & MAIN BOARD REPLACEMENT, 1 DPE+, 1 RTD, 2 AI, 4 SI/O	1 (optional)
—	9A-1140-1097B-00	STD	—
—	9A-1140-1097B-01	STD + 4-20 MA OUTPUT	—
—	9A-1140-1097B-03	STD + 4-20 MA OUTPUT + FREQUENCY INPUT	—
—	9A-1140-1097B-13	STD + 4-20 MA OUTPUT + FREQUENCY INPUT + SELECTABLE 232/485 SERIAL PORT	—

ITEM	PART NUMBER	DESCRIPTION	QTY
		KIT, EXPANSION BOARD, MIO1 (INCLUDES EXPANSION BOARD, TERMINAL, END PLATE AND WIRING DECAL)	1 (optional)
—	9A-1140-0210W-05	0 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210W-06	0 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210W-10	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210W-11	1 SERIAL, 0 FREQ. IN, 0 ANALOG OUT, 4 DIG I/O	—
—	9A-1140-0210W-12	1 SERIAL, 1 FREQ. IN, 1 ANALOG OUT, 0 DIG I/O	—
—	9A-1140-0210W-13	1 SERIAL, 1 FREQ. IN, 0 ANALOG OUT, 2 DIG I/O	—
—	9A-1140-0210W-14	1 SERIAL, 0 FREQ. IN, 1 ANALOG OUT, 2 DIG I/O	—

BARTON DPE+ MULTI-VARIABLE TRANSDUCER		
DPE+ Ranges:	Standard - 316SS Body / B7 Bolts	Stainless Steel Bolting
	Part number	Part number
100 PSIA, 30 IN H2O	9A-30058041	9A-30058097
300 PSIA, 200 IN H2O	9A-30058042	9A-30058098
300 PSIA, 840 IN H2O	9A-30058075	9A-30058099
500 PSIA, 200 IN H2O	9A-30058076	9A-30058100
1500 PSIA, 200 IN H2O	9A-30058043	9A-30058101
1500 PSIA, 300 IN H2O	9A-30058077	9A-30058102
1500 PSIA, 400 IN H2O	9A-30058078	9A-30058103
1500 PSIA, 840 IN H2O	9A-30058079	9A-30058104
3000 PSIA, 200 IN H2O	9A-30058044	9A-30058105
3000 PSIA, 300 IN H2O	9A-30058080	9A-30058106
3000 PSIA, 400 IN H2O	9A-30058081	9A-30058107
3000 PSIA, 840 IN H2O	9A-30058082	9A-30058108
5300 PSIA, 200 IN H2O *	9A-30058045	not available
5300 PSIA, 300 IN H2O *	9A-30058083	not available
5300 PSIA, 400 IN H2O *	9A-30058084	not available
5300 PSIA, 840 IN H2O *	9A-30058085	not available
DPE+ Ranges:	Limited NACE - B7M Bolts	NACE - B7M Bolts / Hast Vent Plug
	Part number	Part number
100 PSIA, 30 IN H2O	9A-30058641	9A-30058046
300 PSIA, 200 IN H2O	9A-30058642	9A-30058047
300 PSIA, 840 IN H2O	9A-30058675	9A-30058086
500 PSIA, 200 IN H2O	9A-30058676	9A-30058087
1500 PSIA, 200 IN H2O	9A-30058643	9A-30058048
1500 PSIA, 300 IN H2O	9A-30058677	9A-30058088
1500 PSIA, 400 IN H2O	9A-30058678	9A-30058089
1500 PSIA, 840 IN H2O	9A-30058679	9A-30058090
	Limited NACE - Inconel Bolts	NACE - Inconel Bolts / Hast Vent Plug
3000 PSIA, 200 IN H2O	9A-30058644	9A-30058049
3000 PSIA, 300 IN H2O	9A-30058680	9A-30058091
3000 PSIA, 400 IN H2O	9A-30058681	9A-30058092
3000 PSIA, 840 IN H2O	9A-30058682	9A-30058093
5300 PSIA, 200 IN H2O *	9A-30058645	9A-30058050
5300 PSIA, 300 IN H2O *	9A-30058683	9A-30058094
5300 PSIA, 400 IN H2O *	9A-30058684	9A-30058095
5300 PSIA, 840 IN H2O *	9A-30058685	9A-30058096

* Shaded area - Not available with Canadian CRN or ANSI 12.27 Single Seal certification

NOTE : Limited NACE - Change bolts of Standard IMV25 to **B7M** or **Inconel** Bolts,

Consult with customer for use of steel (B7 or B7M) Bolts for offshore use. Inconel bolts are rust proof, ideal for offshore use

ADDITIONAL ITEMS - ORDER AS SEPARATE LINE ITEMS	
Certification:	
None	
CSA-certified Class I, Div. 2, Groups A, B, C, D (non incendive)	
CSA-certified Class I, Div. 1, Groups C and D, Intrinsically Safe Module Required, Part No. 9A-30058901	
PIC microController version 3.5, Part No. 9A-1131-0103T, Required to upgrade existing Scanner 1131 installations	
ScanWin Lite CD	
Includes DPE+ manual, ScanFLASH & Scanner Firmware NGas M2.7.4x, NGas M 3.1.4x, NFlO M3.2.4x, & NFlO M4.4.0x. where x is R for Scanner 1131 and x is F for Scanner 1140. Part No. 9A-SP-SWL-B300W-NC	
Product Tag: <input checked="" type="checkbox"/> None <input type="checkbox"/> Paper <input type="checkbox"/> Stainless Steel	
DPE+ Cable Clamping Kit:	
For Scanner 1140s with extrusions, Part No. 9A-1140-1244B	

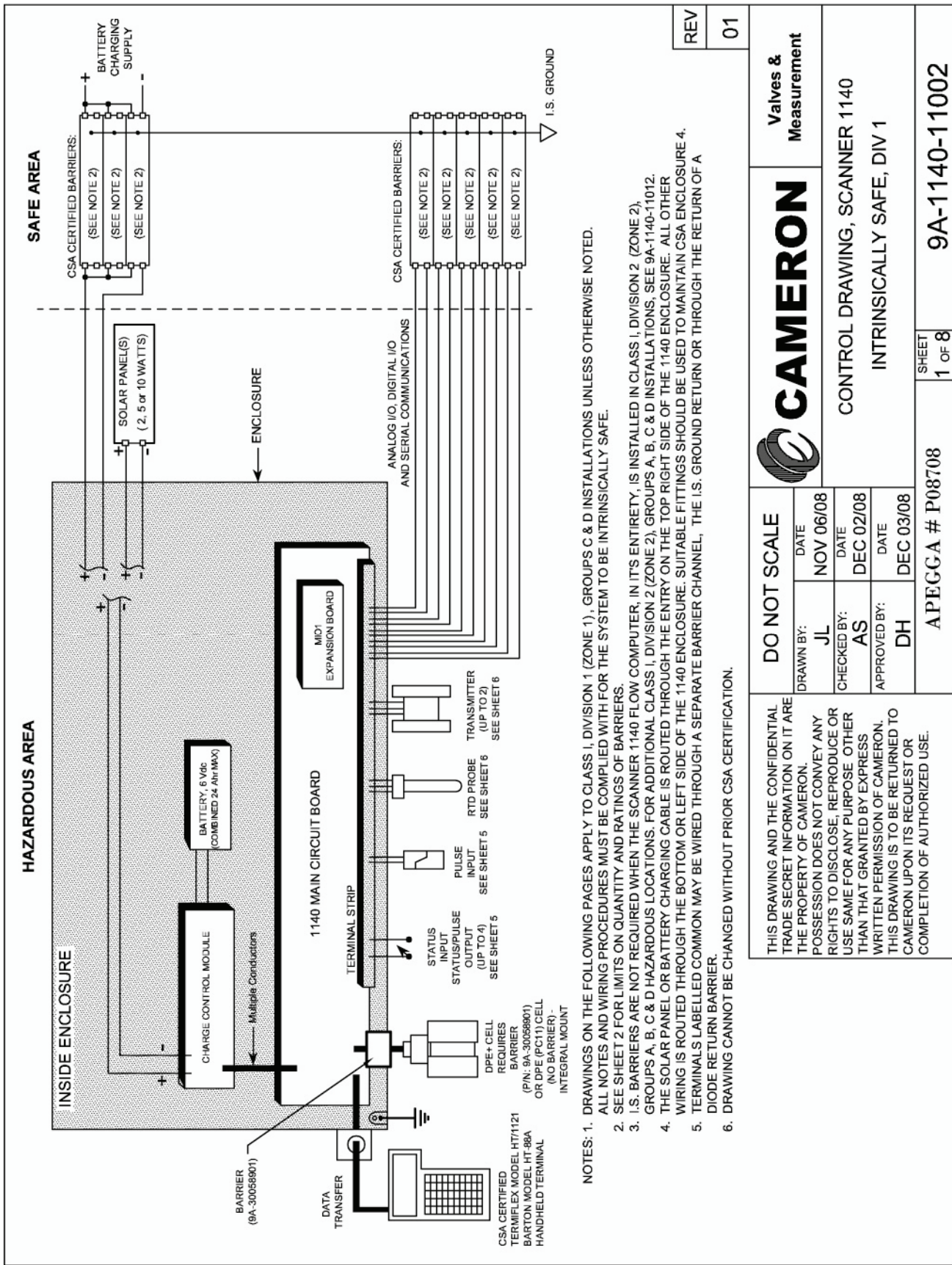
Appendix A: Installation Drawings

SCANNERS 1140T/1140C/1140G/1140L

Drawing 9A-1140-11002: Installation, Scanner 1140T Division 1

Drawing 9A-1140-11012: Installation, Scanner 1140T/1140C/1140L Division 2

Locations	Drawings	Page
Div. 1	1: Installation	116
	2: Barrier Ratings	117
	3: Power Supply	118
	4: Communications (RS-232C Serial Ports)	119
	5: Status & Pulse Inputs/Outputs	120
	6: RTD Inputs & Analog Input/Outputs	121
	7: Analog Outputs	122
	8: MVX Inputs	123
Div. 2	9: Installation	124
	10: Power Supply	125
	11: Communications (Serial Ports)	126
	12: Status & Pulse Inputs/Outputs	127
	13: RTD Inputs & Analog Inputs/Outputs	128
	14: Analog Outputs	129
	15: MVX Inputs	130



- NOTES: 1. DRAWINGS ON THE FOLLOWING PAGES APPLY TO CLASS I, DIVISION 1 (ZONE 1), GROUPS C & D INSTALLATIONS UNLESS OTHERWISE NOTED.
 2. ALL NOTES AND WIRING PROCEDURES MUST BE COMPLIED WITH FOR THE SYSTEM TO BE INTRINSICALLY SAFE.
 3. SEE SHEET 2 FOR LIMITS ON QUANTITY AND RATINGS OF BARRIERS.
 4. GROUPS A, B, C & D HAZARDOUS LOCATIONS. FOR ADDITIONAL CLASS I, DIVISION 2 (ZONE 2), GROUPS A, B, C & D INSTALLATIONS, SEE 9A-1140-11012.
 5. THE SOLAR PANEL OR BATTERY CHARGING CABLE IS ROUTED THROUGH THE ENTRY ON THE TOP RIGHT SIDE OF THE 1140 ENCLOSURE. ALL OTHER WIRING IS ROUTED THROUGH THE BOTTOM OR LEFT SIDE OF THE 1140 ENCLOSURE. SUITABLE FITTINGS SHOULD BE USED TO MAINTAIN CSA ENCLOSURE 4.
 6. TERMINALS LABELLED COMMON MAY BE WIRED THROUGH A SEPARATE BARRIER CHANNEL, THE I.S. GROUND RETURN OR THROUGH THE RETURN OF A DIODE RETURN BARRIER.
 7. DRAWING CANNOT BE CHANGED WITHOUT PRIOR CSA CERTIFICATION.

Drawing 1: Installation (Div. 1)


BARRIER RATINGS		CLASS I, DIVISION 1, GROUPS C & D CONFIGURATIONS											
VOLTS (MAX.)	Ω (MIN.)	A	B	C	D	E	F	G	H	I	J	K	L
+28.5 Vdc	200												2
+28.5 Vdc	300	4	3	2	1		2	1	2	3	1	2	1
+22 Vdc	200		2	3	5	7		2			3	2	
+16 Vdc	100	6	5	5	4	2	5	6	10	8	7	7	6
+12 Vdc	800	8	8	8	8	8	8	8	8	8	8	8	8
±12 Vac	100						1	1					
±12 Vac	1000	6	8	9	9	9	4	2	8	8	9	9	6

BARRIER RATINGS		CLASS I, DIVISION 1, GROUP D CONFIGURATIONS											
VOLTS (MAX.)	Ω (MIN.)	M	N	O	P	Q	R	S	T	U	V	W	X
+28.5 Vdc	200												2
+28.5 Vdc	300	5	4	3	2	1	2	1	4	-	3	4	2
+22 Vdc	200		2	4	6	8		2		-	3	2	0
+16 Vdc	100	10	8	6	4	3			12	-	8	8	8
+12 Vdc	800	10	8	8	8	8	8	8	8	-	8	8	8
±12 Vac	100						7	2		-			
±12 Vac	1000	9	9	9	9	9	9	7	9	-	9	9	9

NOTES:

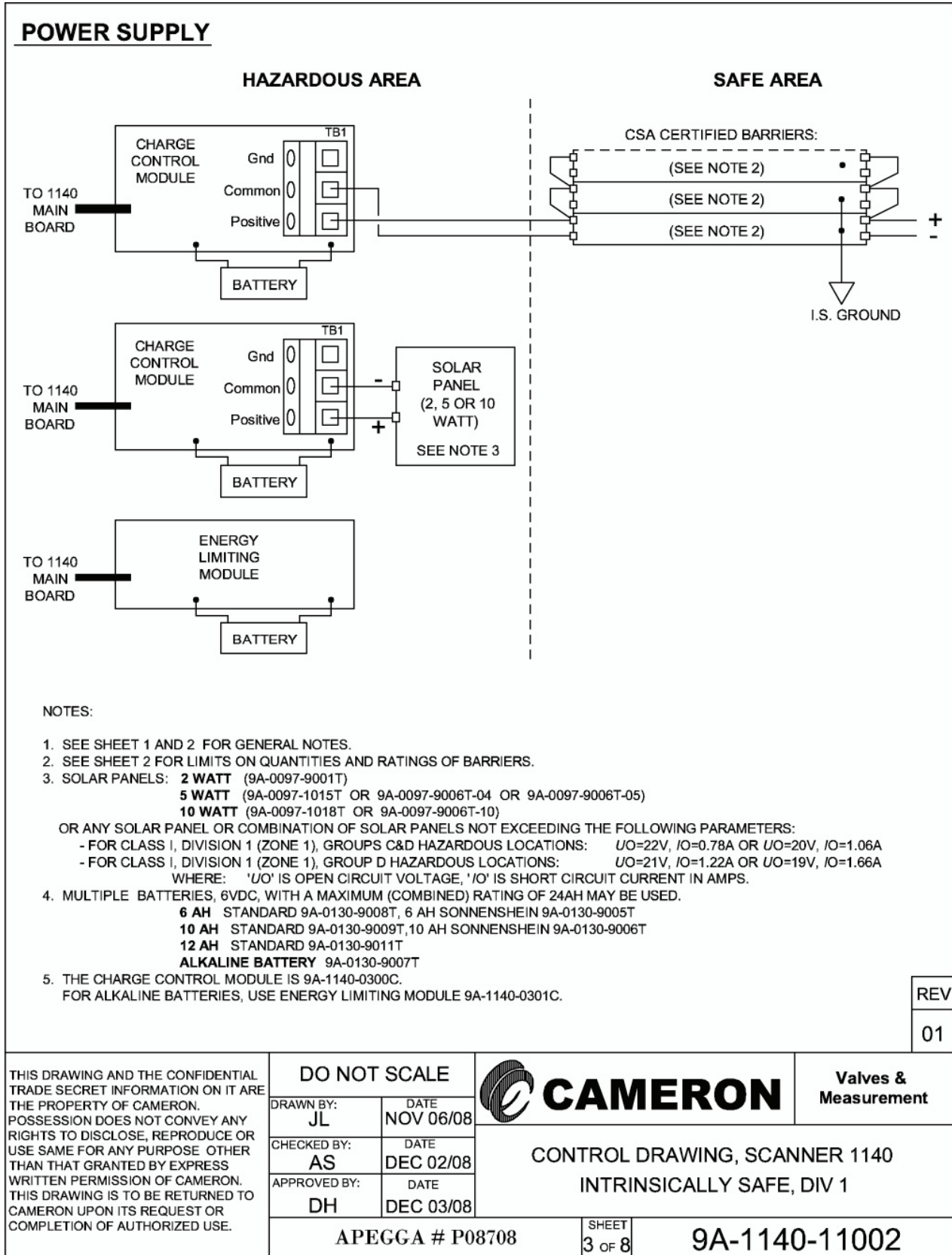
1. EACH SCANNER 1140 INSTALLATION MUST COMPLY TO ONE OF THE CONFIGURATIONS SHOWN. PARTIAL INSTALLATIONS OF A PARTICULAR CONFIGURATION CAN BE CONSIDERED INTRINSICALLY SAFE.
2. SINGLE BARRIERS MAY BE SUBSTITUTED FOR MULTIPLE BARRIERS OF THE SAME VOLTAGE RATING PROVIDED THE NET RESISTANCES ARE IN COMPLIANCE WITH THE TABLE.
EXAMPLE: TWO 28.5 V/150 Ω BARRIERS CAN BE SUBSTITUTED FOR FOUR 28.5 V/300 Ω BARRIERS.
3. DIODE RETURN BARRIERS MAY BE SUBSTITUTED FOR SINGLE BARRIERS.
4. ANY BARRIERS MEETING THE RATINGS SHOWN ON THIS PAGE MAY BE SUBSTITUTED FOR THE RECOMMENDED BARRIERS SHOWN ON PAGES 3 THROUGH 6.

REV
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	CHECKED BY: AS	DATE DEC 02/08					
	APPROVED BY: DH	DATE DEC 03/08					
APEGGA # P08708			SHEET 2 OF 8	9A-1140-11002			

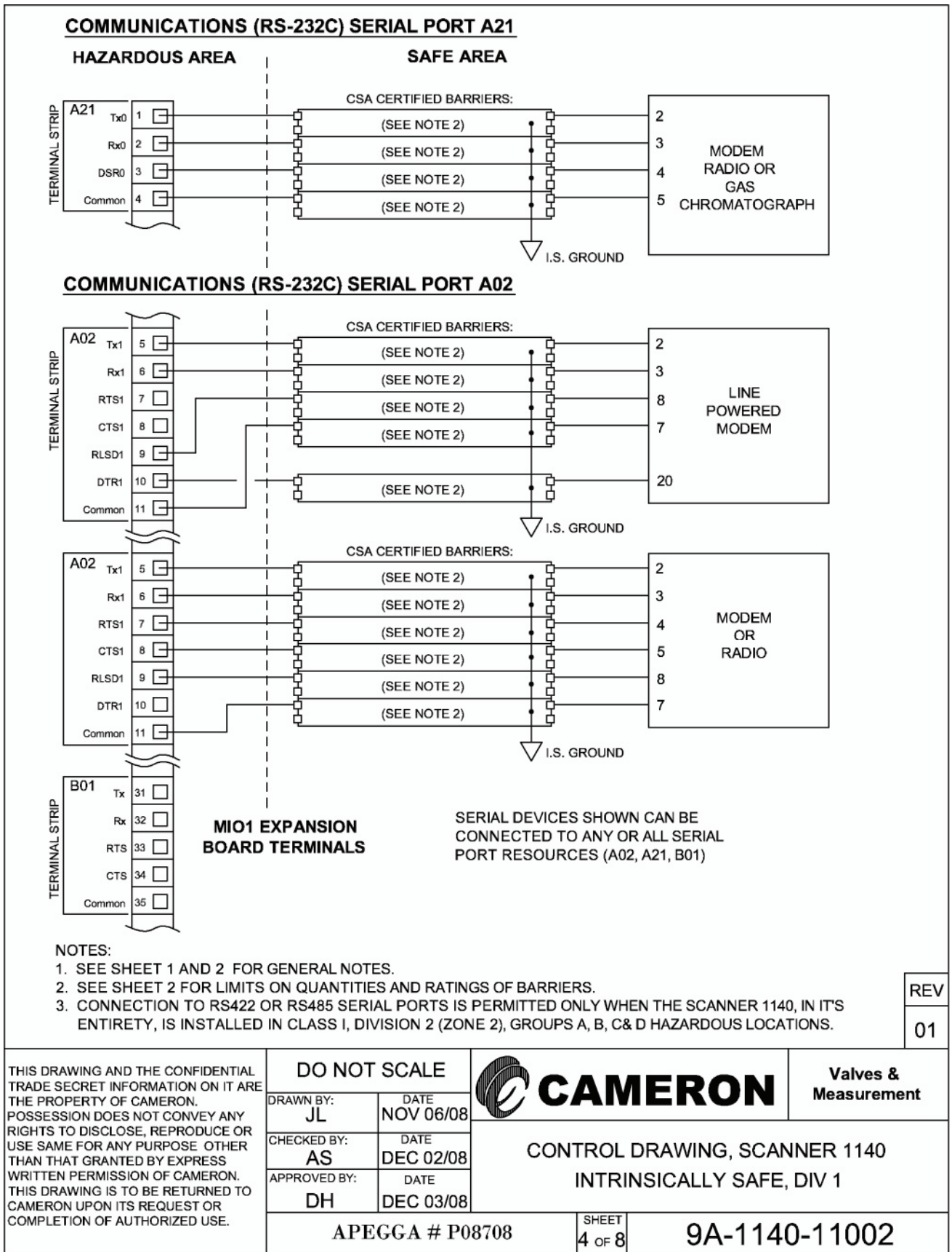
Drawing 2: Barrier Ratings (Div. 1)

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Drawing 3: Power Supply (Div. 1)

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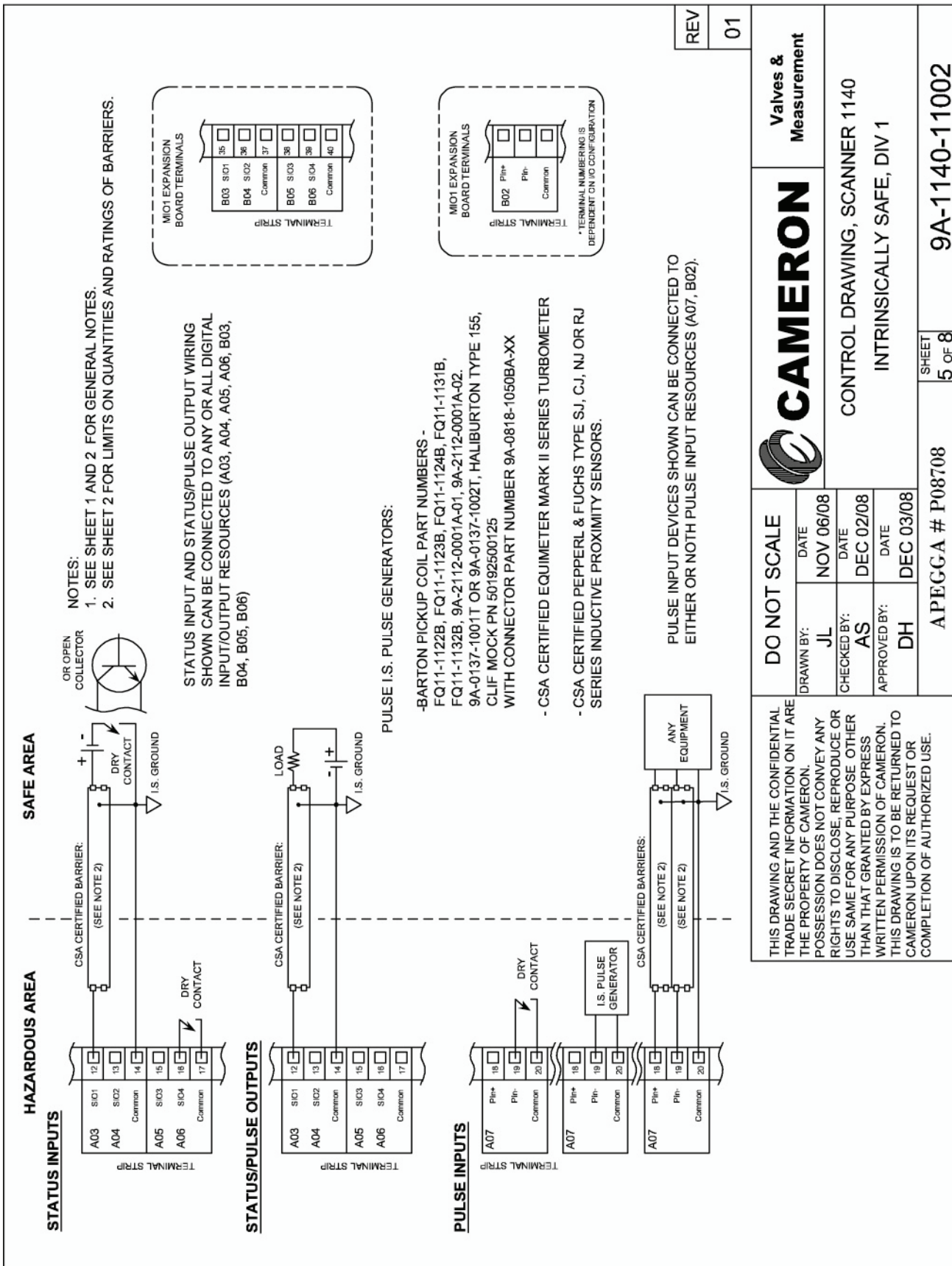
Valves & Measurement

**CONTROL DRAWING, SCANNER 1140
INTRINSICALLY SAFE, DIV 1**

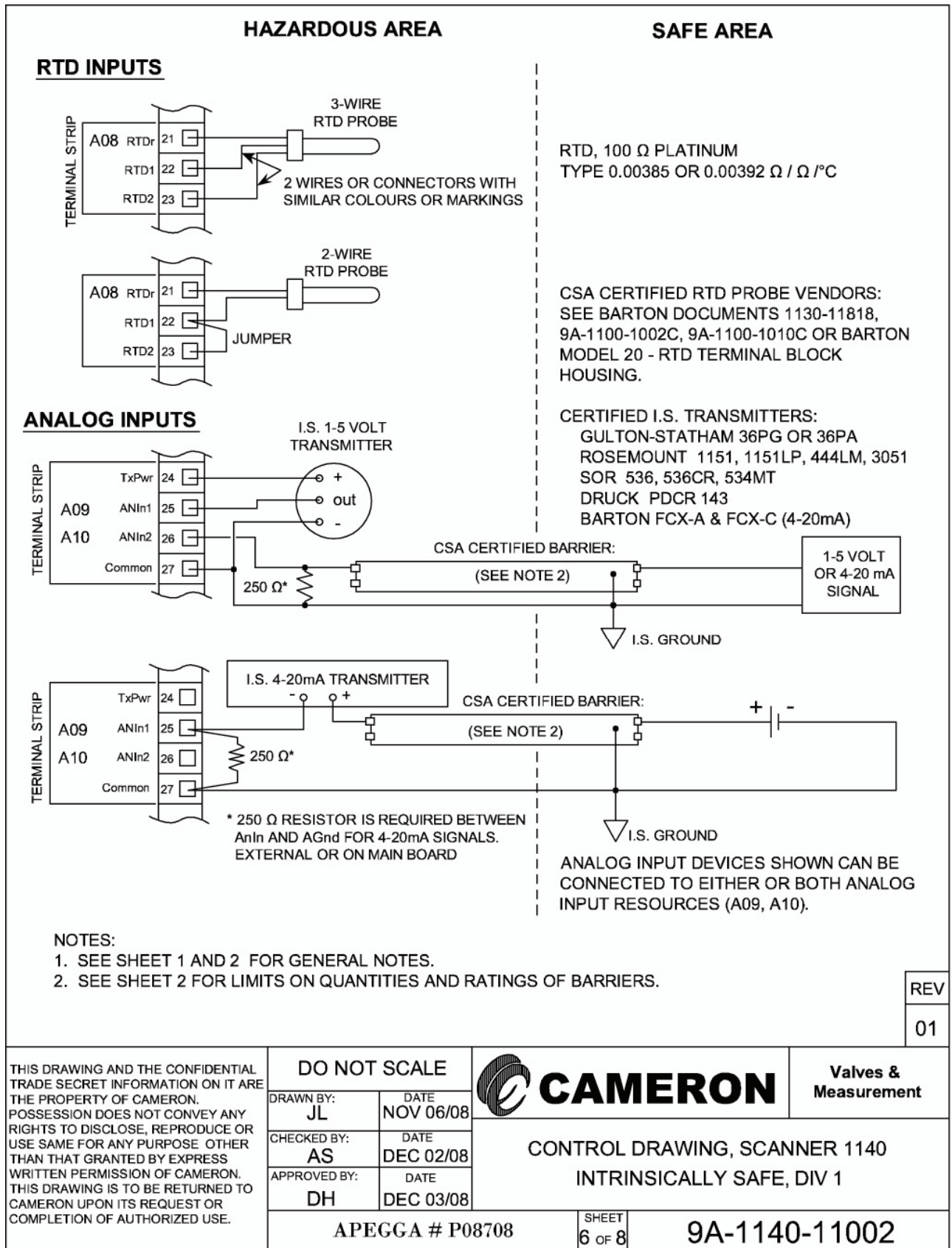
APEGGA # P08708	SHEET 4 OF 8	9A-1140-11002
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Drawing 4: Communications - RS-232C Serial Ports (Div. 1)

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Drawing 5: Status & Pulse Inputs/Outputs (Div. 1)

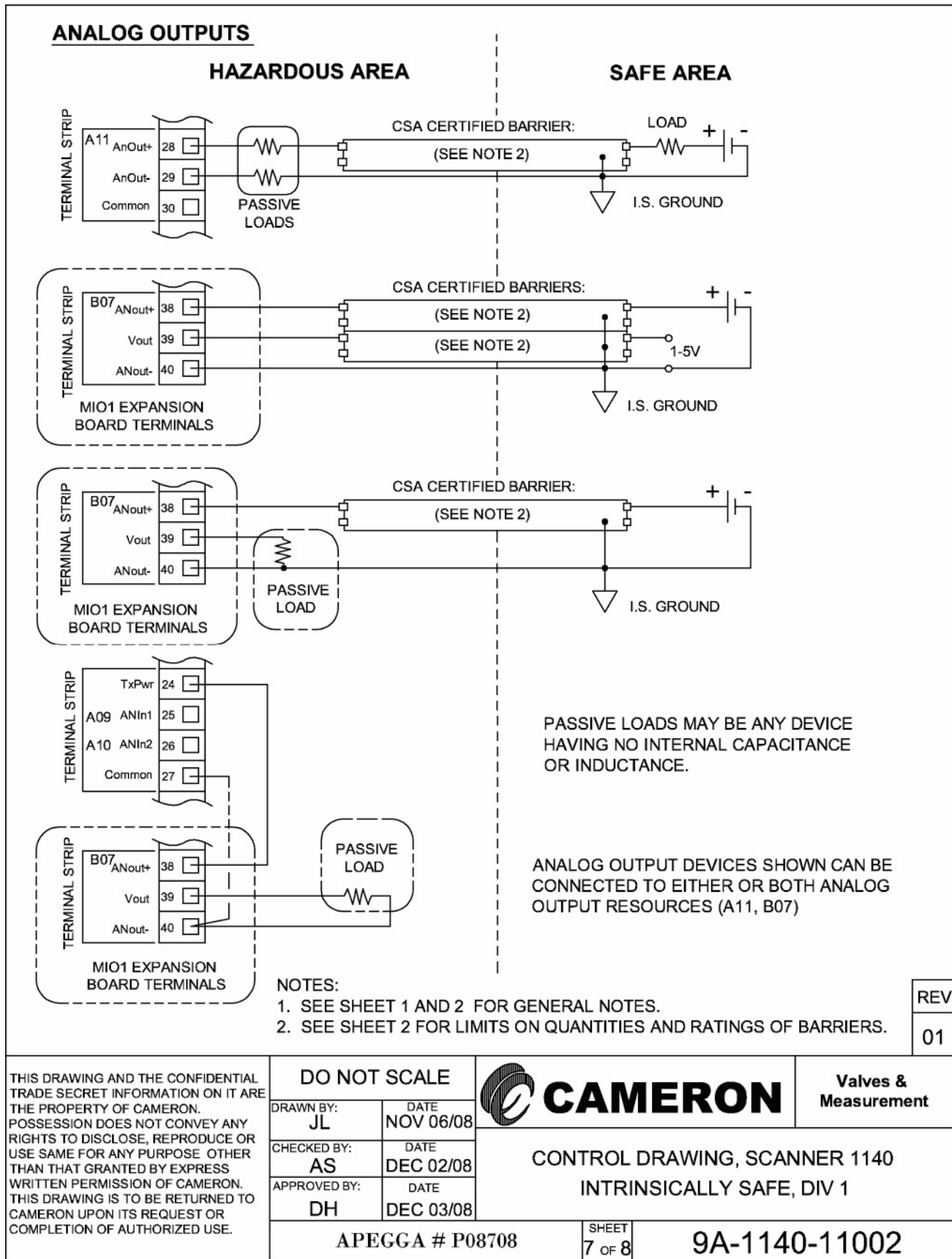


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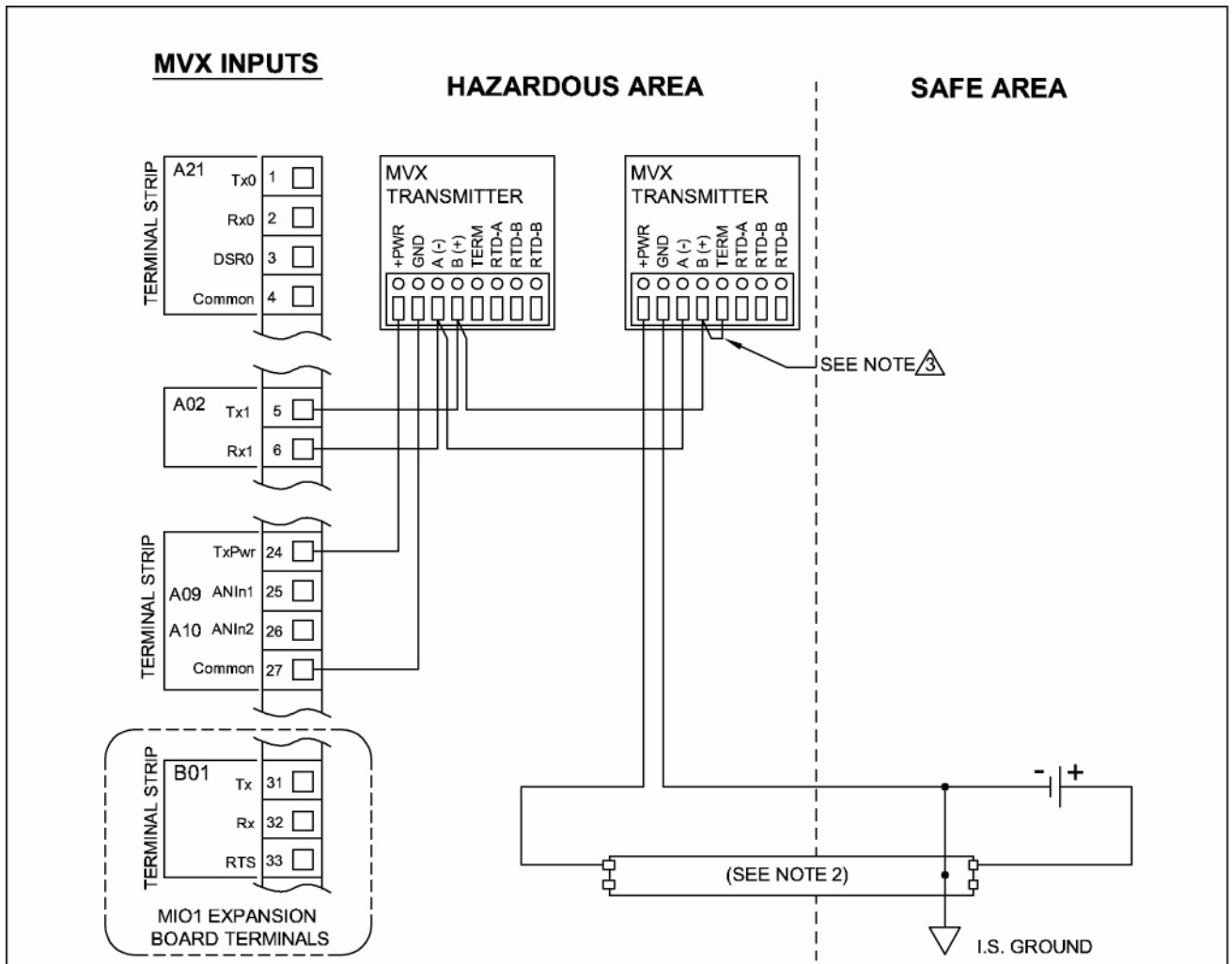
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APEGGA # P08708			SHEET 6 OF 8	9A-1140-11002

Drawing 6: RTD Inputs & Analog Inputs/Outputs (Div. 1)

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Drawing 7: Analog Outputs (Div. 1)



NOTES:

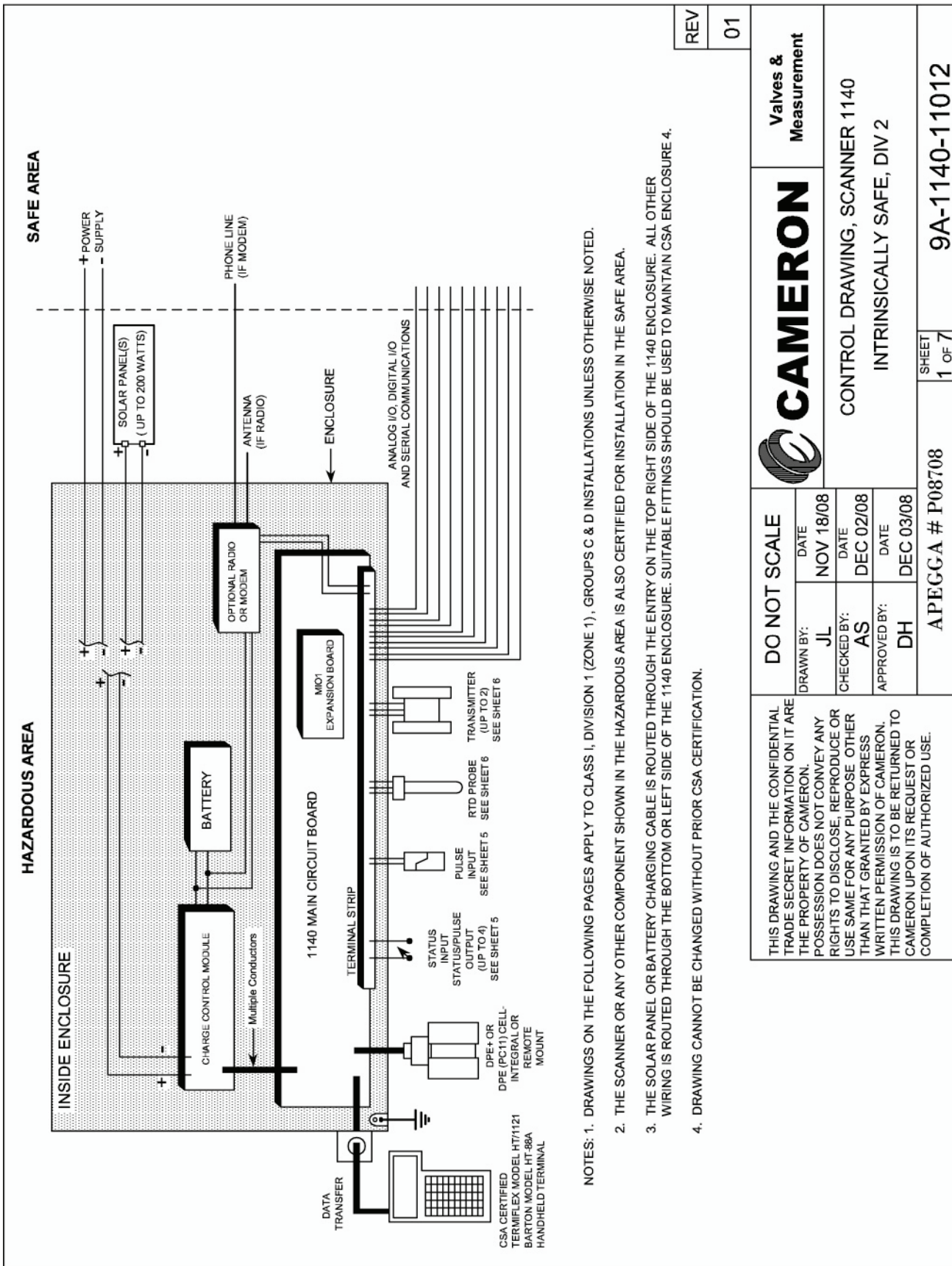
1. SEE SHEET 1 AND 2 FOR GENERAL NOTES.
2. SEE SHEET 2 FOR LIMITS ON QUANTITIES AND RATINGS OF BARRIERS.
3. DO NOT USE THE SWITCH SELECTABLE 100Ω RS-485 TERMINATION RESISTOR THAT THE SCANNER 1140 CAN PROVIDE. PLACE A TERMINATION JUMPER ON THE MVX TERMINALS AS SHOWN AND ONLY FOR THE LAST DEVICE IN THE CHAIN.
4. THE SCANNER 1140 TRANSMITTER POWER SUPPLY (TxPwr) IS A SOFTWARE CONTROLLED (ON/OFF DURATION) 9 - 11Vdc SUPPLY LIMITED TO 15mA MAXIMUM. EXTERNAL POWER MAY ALSO BE USED.
5. A MAXIMUM OF TEN MVX TRANSMITTERS CAN BE CONNECTED TO ANY OR ALL SERIAL PORT RESOURCES SHOWN.

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APEGGA # P08708		SHEET 8 OF 8	9A-1140-11002

Drawing 8: MVX Inputs (Div. 1)

REV 01



Drawing 9: Installation (Div. 2)

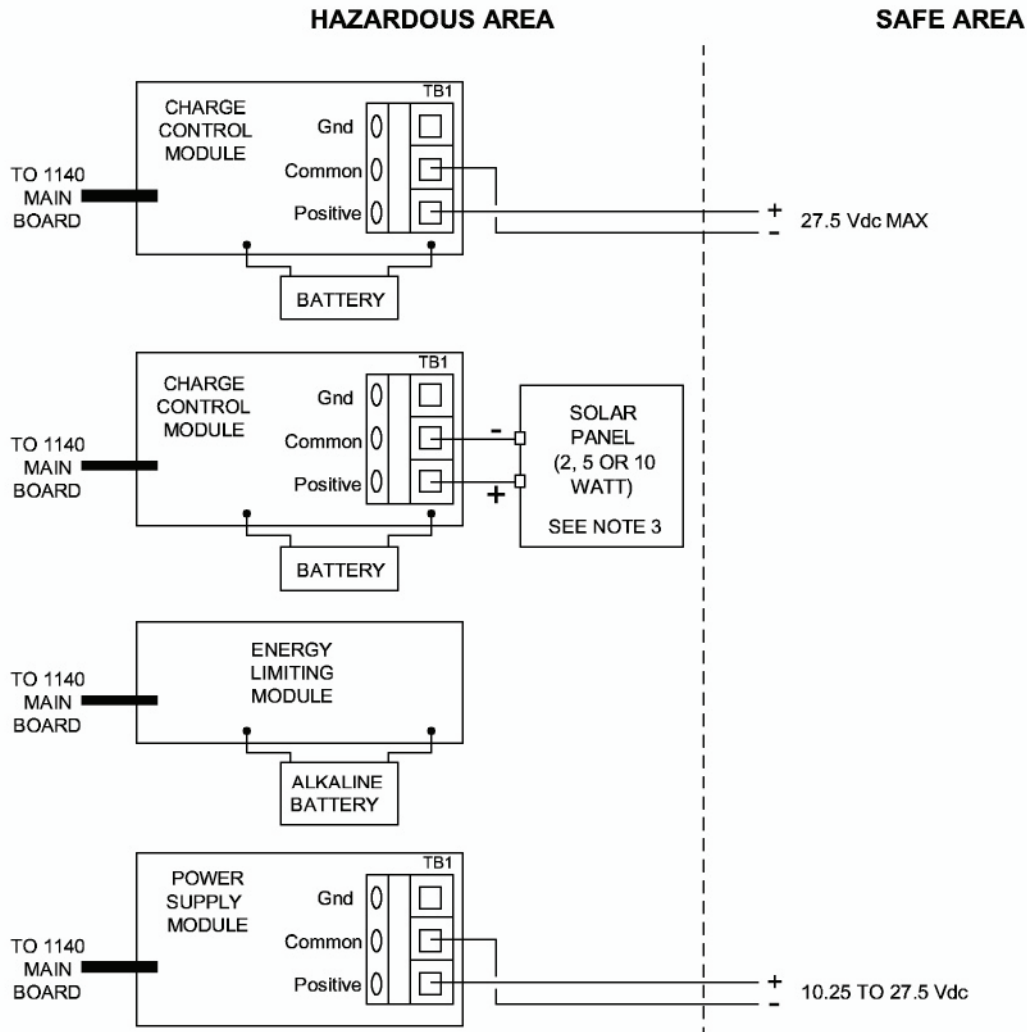
- NOTES: 1. DRAWINGS ON THE FOLLOWING PAGES APPLY TO CLASS I, DIVISION 1 (ZONE 1), GROUPS C & D INSTALLATIONS UNLESS OTHERWISE NOTED.
 2. THE SCANNER OR ANY OTHER COMPONENT SHOWN IN THE HAZARDOUS AREA IS ALSO CERTIFIED FOR INSTALLATION IN THE SAFE AREA.
 3. THE SOLAR PANEL OR BATTERY CHARGING CABLE IS ROUTED THROUGH THE ENTRY ON THE TOP RIGHT SIDE OF THE 1140 ENCLOSURE. ALL OTHER WIRING IS ROUTED THROUGH THE BOTTOM OR LEFT SIDE OF THE 1140 ENCLOSURE. SUITABLE FITTINGS SHOULD BE USED TO MAINTAIN CSA ENCLOSURE 4.
 4. DRAWING CANNOT BE CHANGED WITHOUT PRIOR CSA CERTIFICATION.

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<p>DO NOT SCALE</p> <table border="1"> <tr> <td>DRAWN BY:</td> <td>JL</td> <td>DATE</td> <td>NOV 18/08</td> </tr> <tr> <td>CHECKED BY:</td> <td>AS</td> <td>DATE</td> <td>DEC 02/08</td> </tr> <tr> <td>APPROVED BY:</td> <td>DH</td> <td>DATE</td> <td>DEC 03/08</td> </tr> </table>	DRAWN BY:	JL	DATE	NOV 18/08	CHECKED BY:	AS	DATE	DEC 02/08	APPROVED BY:	DH	DATE	DEC 03/08	<p>CAMERON</p> <p>CONTROL DRAWING, SCANNER 1140 INTRINSICALLY SAFE, DIV 2</p>	<p>Valves & Measurement</p>
	DRAWN BY:	JL	DATE	NOV 18/08										
	CHECKED BY:	AS	DATE	DEC 02/08										
APPROVED BY:	DH	DATE	DEC 03/08											
<p>APEGA # P08708</p>														
<p>SHEET 1 OF 7</p> <p>9A-1140-11012</p>														

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POWER SUPPLY



NOTES:

1. SEE SHEET 1 FOR GENERAL NOTES.
3. SOLAR PANELS MANUFACTURERS CAN BE SOLAREX, SEIMENS, BPSOLAR, KYOCERA OR UNI-SOLAR WITH MAXIMUM RATING (COMBINED) OF 200 WATTS.
4. THE TYPE OF RECHARGEABLE BATTERIES MAY BE SEALED LEAD ACID, SEALED ABSORBED TECHNOLOGY OR VALVE REGULATED LEAD ACID WITH A MAXIMUM RATING (COMBINED) OF 12 Vdc AND 300Ah.
5. THE CHARGE CONTROL MODULE FOR 6 VOLTS RECHARGEABLE BATTERIES IS 9A-1140-0300C (3658300 OR 3658301). THE CHARGE CONTROL MODULE FOR 12 VOLTS RECHARGEABLE BATTERIES IS 9A-1140-0303C (3658600). FOR 6 VOLTS ALKALINE BATTERIES, USE ENERGY LIMITING MODULE 9A-1140-0301C (3658201). THE 24 Vdc POWER SUPPLY MODULE IS 9A-1140-0304C (3658302).

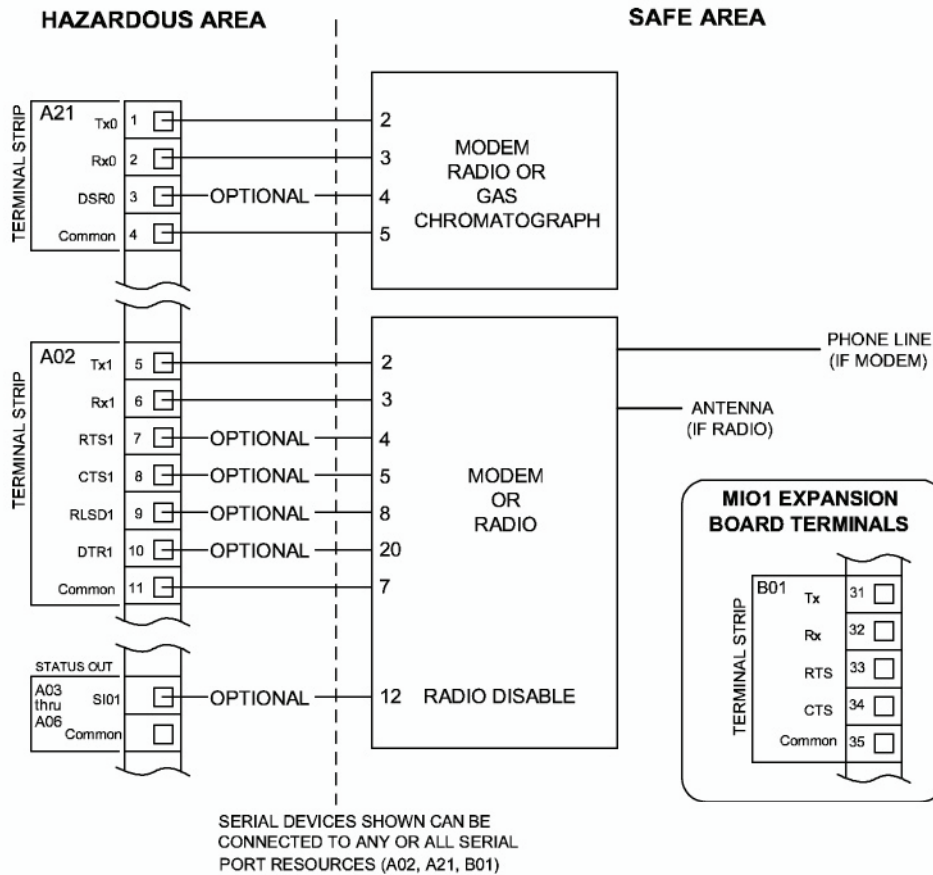
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APEGGA # P08708	SHEET 2 OF 7	9A-1140-11012	

Drawing 10: Power Supply (Div. 2)

REV 01

COMMUNICATIONS - SERIAL PORTS



NOTES:

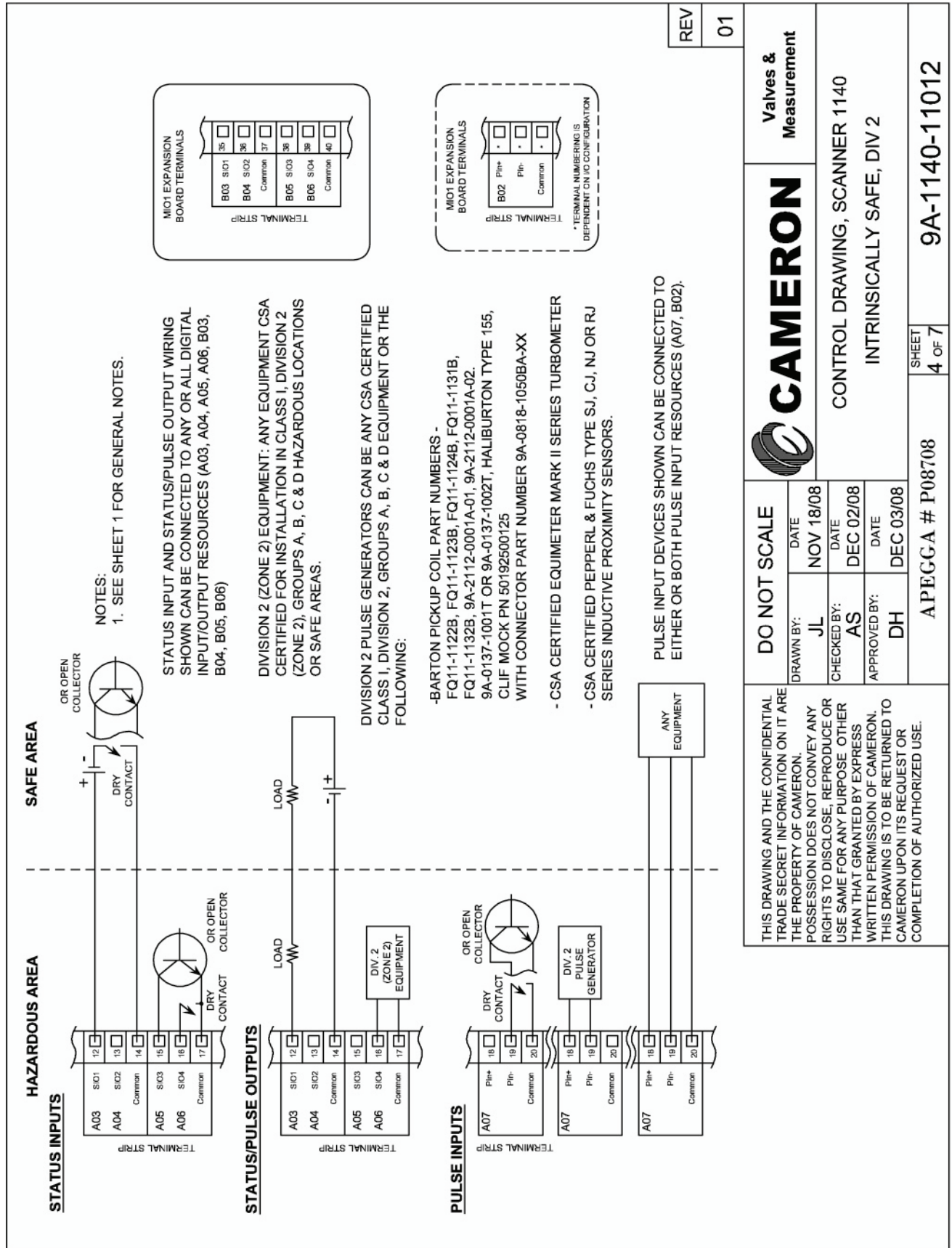
- SEE SHEET 1 FOR GENERAL NOTES.
- CONNECTION TO RS422 OR RS485 SERIAL PORTS IS PERMITTED ONLY WHEN THE SCANNER 1140, IN IT'S ENTIRETY, IS INSTALLED IN CLASS I, DIVISION 2 (ZONE 2), GROUPS A, B, C & D HAZARDOUS LOCATIONS.
- THE RADIO OR MODEM MUST BE CSA CERTIFIED FOR CLASS I, DIVISION 2 (ZONE 2), GROUPS A, B, C & D HAZARDOUS LOCATIONS OR ONE OF THE FOLLOWING:
 BARTON SERIAL WORLD MODEM
 MICROWAVE DATA SYSTEMS (MDS) MODELS 2310 & 9310 DATA TRANCEIVERS
 NOVATEL NRM 6812 (CDPD MODEM)
 MOTOROLA CTM2400 CELLULAR MODEM MODEL S5692A
 MOTOROLA S5689A CELLULAR TRANSCEIVER WITH S1936D INTERFACE
 LINE DRIVER, RS232 TO RS485, B&B MODEL 485TBLED
 PACIFIC CREST RFM96S AND RFM96W RADIO MODEMS
 PANASONIC KX-G7100 AND KX-G7101 ORBCOMM SATELLITE DATA COMMUNICATORS WITH OR WITHOUT
 CONTROLSAT FIELD SENTRY MODULE CS-2000 (MANUFACTURED BY ARCOM)
 R.E. SMITH MODEL IRSFC24FB RS485 CONVERTER / REPEATER
 INTERSAT PAC MODEL 1999-07 PROCESSOR ASSISTED CONNECTOR
 FREEWAVE TECHNOLOGIES DGR09RFS DATA TRANSCEIVER

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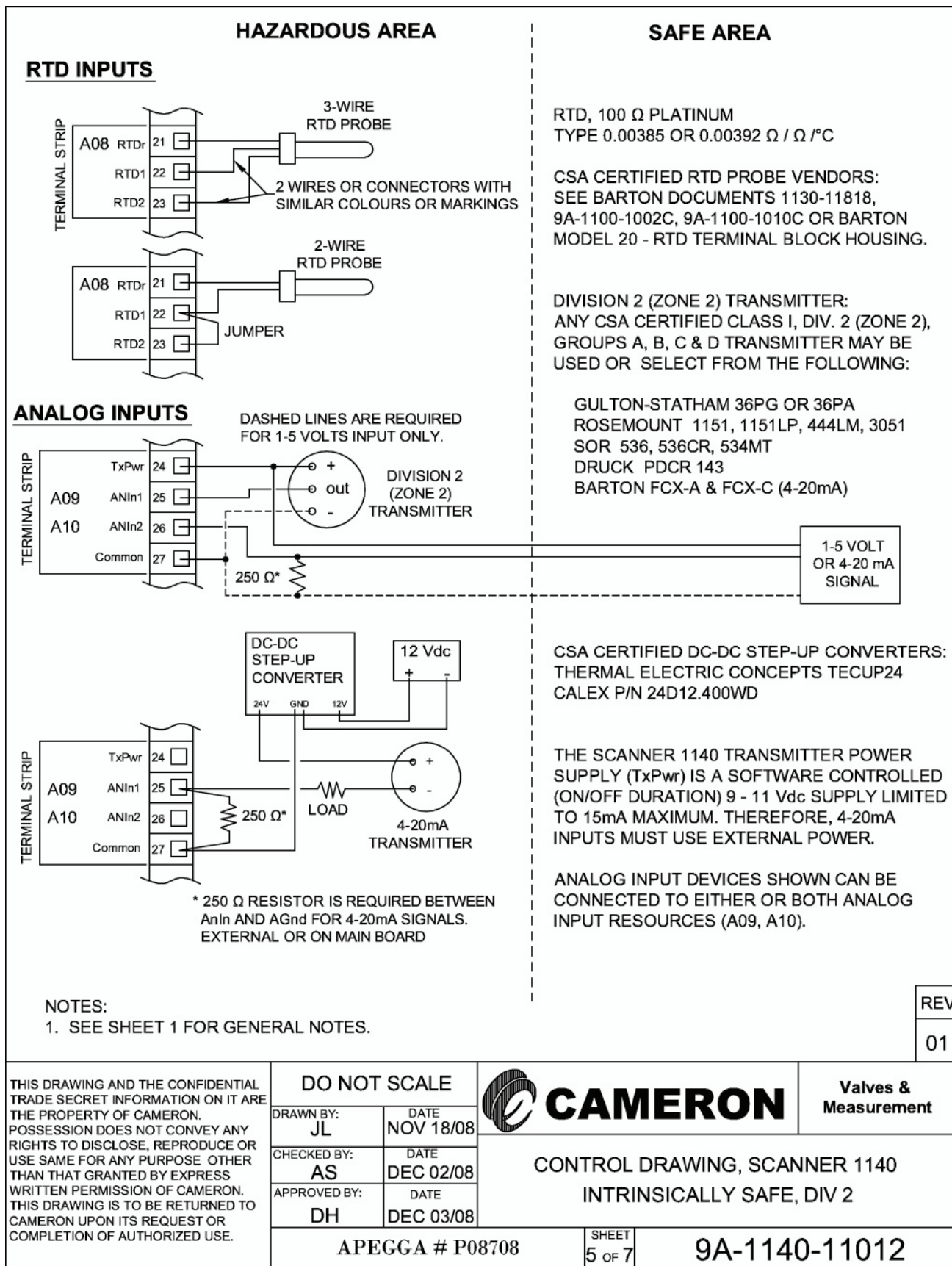
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Drawing 11: Communications - Serial Ports (Div. 2)



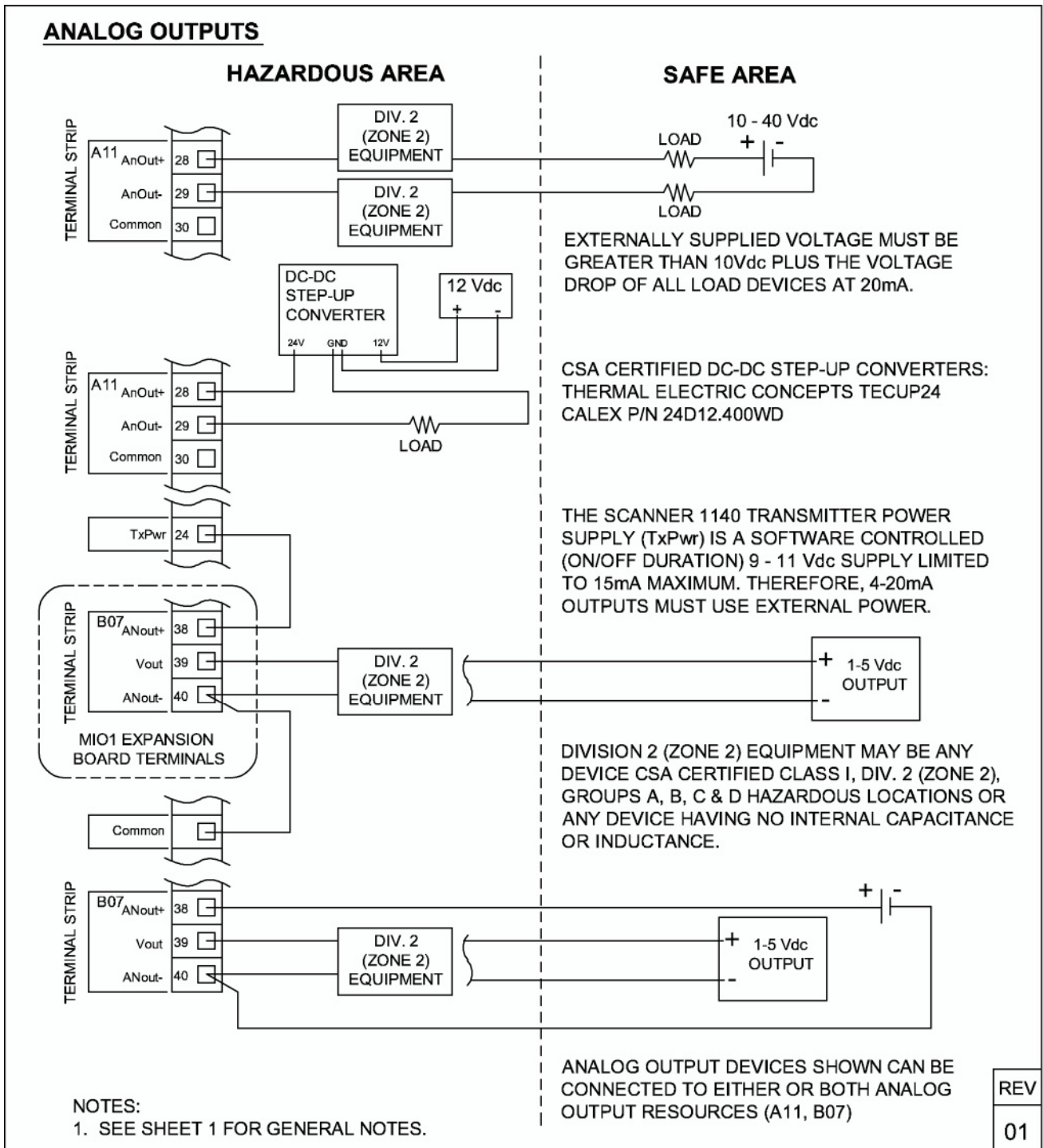
Drawing 12: Status & Pulse Inputs/Outputs (Div. 2)



REV 01

Drawing 13: RTD Inputs & Analog Inputs/Outputs (Div. 2)

ANALOG OUTPUTS

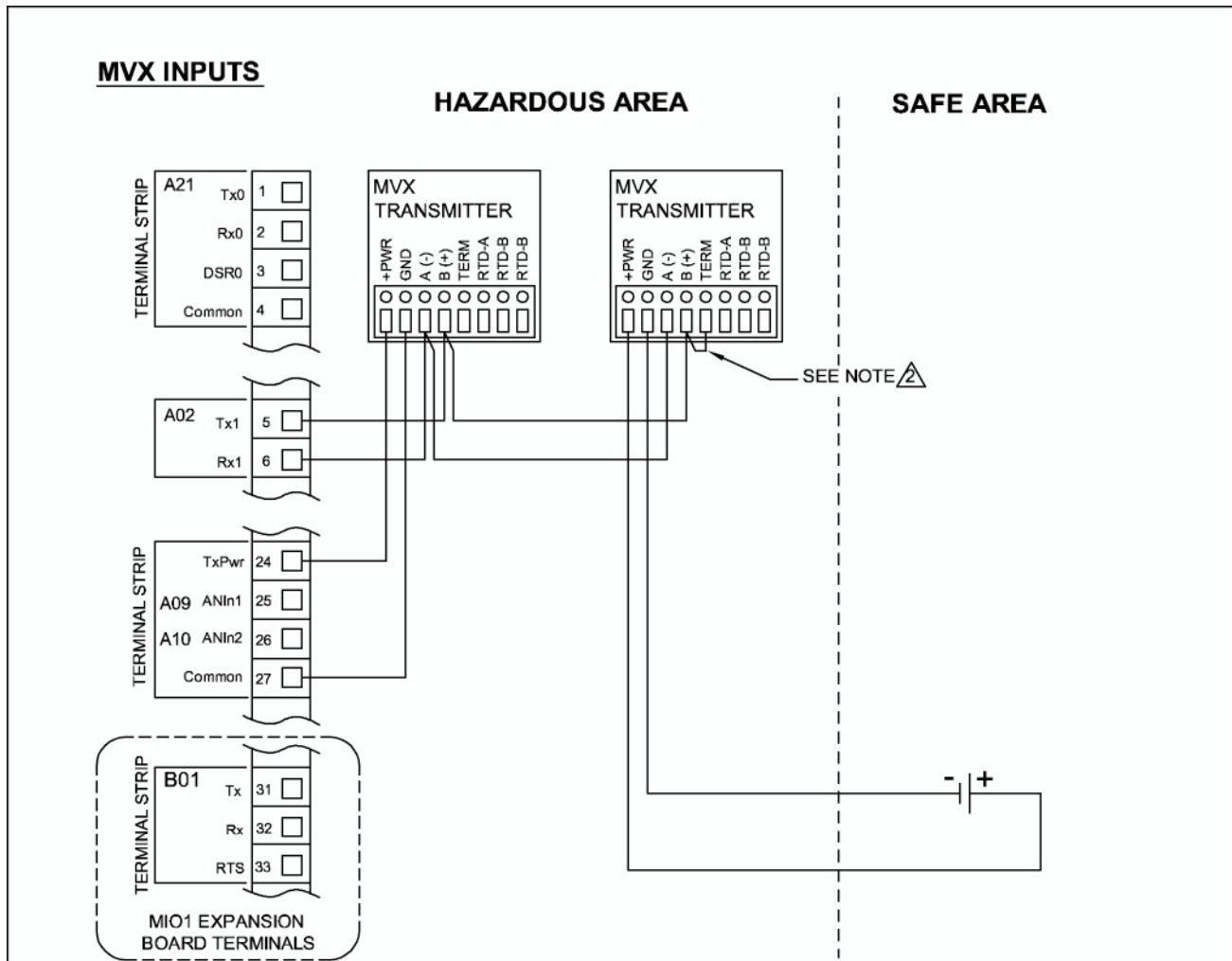


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APEGGA # P08708			SHEET 6 OF 7	9A-1140-11012

Drawing 14: Analog Outputs (Div. 2)

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NOTES:

1. SEE SHEET 1 FOR GENERAL NOTES.
2. DO NOT USE THE SWITCH SELECTABLE 100Ω RS-485 TERMINATION RESISTOR THAT THE SCANNER 1140 CAN PROVIDE. PLACE A TERMINATION JUMPER ON THE MVX TERMINALS AS SHOWN AND ONLY FOR THE LAST DEVICE IN THE CHAIN.
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Drawing 15: MVX Inputs (Div. 2)

MEASUREMENT SYSTEMS

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