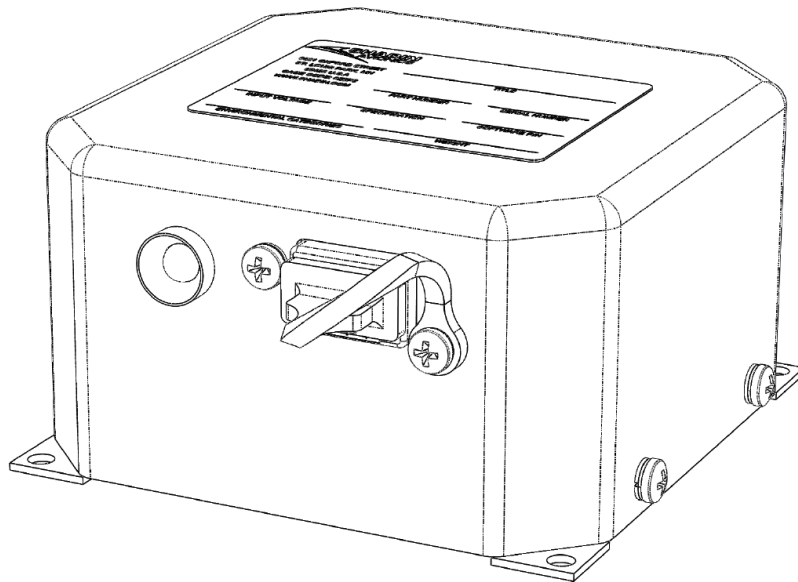




ETM RECORDER

P/N: 943200-10




INSTALLATION MANUAL MANUAL P/N: M943200-10 REV –

SHADIN AVIONICS
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REVISION LOG

Rev	Date	ERN	DESCRIPTION
–	11 JUNE 2015	1505/007	Initial Issue


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1 OVERVIEW

The information in this manual is subject to change without notification.

1.1 SCOPE

This manual describes the interface to the 943200-10 ETM Recorder. It also provides information to guide the proper installation of the Engine Trend Monitor (ETM) Recorder. Installation instructions should be read and followed.

1.2 PRODUCT DESCRIPTION

The ETM Recorder is a digital data recorder that records a serial input and provides a USB interface for uploading the data. The ETM Recorder is pin compatible and has the same mounting pattern as the ETM Key Recorder part number 943200. A USB port is available for users to insert a USB Flash drive and retrieve information stored on the ETM Recorder. The LED is externally visible to indicate unit health status and USB insertion/data recording status.

The ETM Recorder block diagram is shown in Figure 1 with an aircraft installation example with an ETM product.

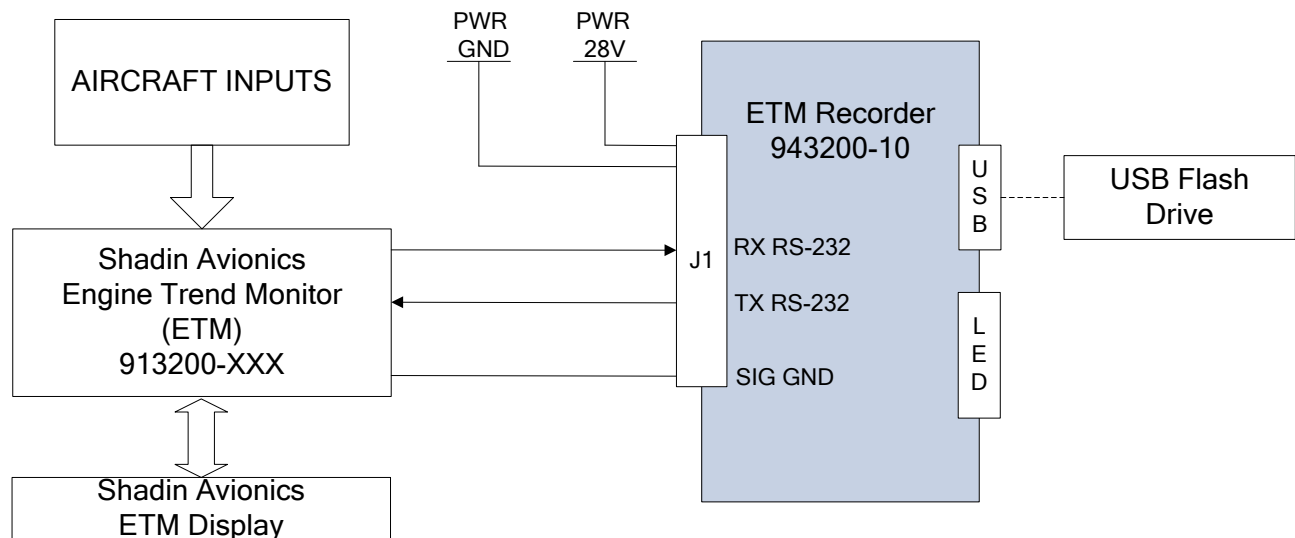



Figure 1: ETM Recorder Block Diagram

Data Port Interface

The Data Port interface is configured as an RS-232 port 1200 baud with 8 data bits, no parity and 1 stop bit. The Data Port RS-232 TX/RX pair is provided on the 15 pin D-Subminiature connector J1-14 (transmit) and J1-12 (receive).

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USB Port

The ETM Recorder utilizes an industry standard USB port interface to extract a copy of the Report files off the ETM Recorder. The Report files contained on the ETM Recorder can be extracted by connecting a USB Flash drive to the ETM Recorder USB port. The ETM Recorder uploads all the ETM Report files every time a USB Flash drive is installed. Files with the same “tail#_seq#.txt” name will not be overwritten if they already exist on the USB Flash drive. Fastest data upload is accomplished by using the same USB Flash drive each time.

The USB Flash drive used to extract the data from the ETM Recorder must be formatted to FAT32.

LED User Interface:

A tricolor LED is used to generate three basic colors: Red, Green and Orange. The LED shows the USB port and ETM Recorder status.

LED codes for USB port operation (USB Flash Drive Installed)

- Red flash USB Flash drive busy (Write/Read)
- Green/Red alternate Insufficient memory available on USB Flash drive
- Green steady USB Flash drive Write/Read complete, USB Flash drive may be removed


LED codes for ETM Recorder operation (USB Flash Drive Uninstalled)

- Orange flash At power up until first ETM message is received
- Green steady Normal operation
- Orange steady Internal memory 80% full
- Red steady Internal failure

Data Port Protocol

The ETM Recorder receives ETM message data on the Data Port. The ETM “Output Select” can be configured for “Key” or “Printer” modes; the ETM Recorder requires the ETM to be in “Printer” mode.

The ETM Recorder receives and records all of the ETM Report messages.

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2 SPECIFICATIONS

For a complete listing of product qualifications please review the Environmental Qualification Form found in Section 4.

2.1 PHYSICAL

Nominal Dimensions:	3.18”L x 3.18”W x 1.80”H
Weight:	0.35 pounds
Mounting:	Screw Size # 6
Mounting Dimensions:	2.938”L x 2.938”W

2.2 ELECTRICAL

Power Supply Voltage:	+18VDC to +33VDC
Supply Current:	50mA Maximum (at 28VDC)
Protection:	Not internally fused

2.3 ENVIRONMENTAL

RTCA/DO-160G [A2X]BAB[R(B,B1) U2(F,F1)]XXXXXXZ[AXX]AR[AC][RR]L[XXXXXX]AX

Operating Temperature	-40°C to +70°C
Storage Temperature	-55°C to +85°C

Equipment can run indefinitely within stated environmental range with no external cooling.

2.4 SOFTWARE CERTIFICATION

This product was developed in accordance with RTCA/DO-178C Design Assurance Level D.

2.5 REGULATORY CERTIFICATION

This product meets requirements of TSO-C43a, -C44a, -C47, -C49a.

2.6 RELIABILITY

MTBF (Mean Time Between Failures) 48,527 hours [Airborne Uninhibited Cargo (AUC), 35°C]

The reliability predictions were performed using the general methodology of MIL-HDBK-217F. The component failure rate calculation models presented in MIL-HDBK-217F were used as a guide to determine each component’s initially assigned predicted failure rate.

3 INSTALLATION

3.1 LIMITATIONS

The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those installing this article either on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. TSO articles must have separate approval for installation in an aircraft. The article may be installed only if performed under 14 CFR part 43 or the applicable airworthiness requirements.

3.2 MOUNTING

The unit may be mounted in any orientation in environments specified in the environmental categories, Section 4.

The unit should be mounted according to Installation Drawing, P/N D943200-10.

3.3 ELECTRICAL CONNECTION

Table 1 lists the connector and pin number, signal name, and signal description of the electrical connections for the unit.

Table 1: Electrical Connection

Connector & Pin Number	Signal Name	Signal Description
Connection to Power Source		
J1:8	PWR 28V	POWER 28VDC
J1:15	PWR GND	POWER GROUND
Serial Data		
J1:12	RX RS-232	RECEIVE RS-232
J1:14	TX RS-232	TRANSMIT RS-232
J1:1	SIG GND	SIGNAL GROUND

Electrical connections listed in Table 1 are made through the use of the following

- Mating connector Standard 15 Pin Female D-SUB

3.3.1 TYPICAL INSTALLATION WIRING

Figure 2 is typical installations wiring diagram.

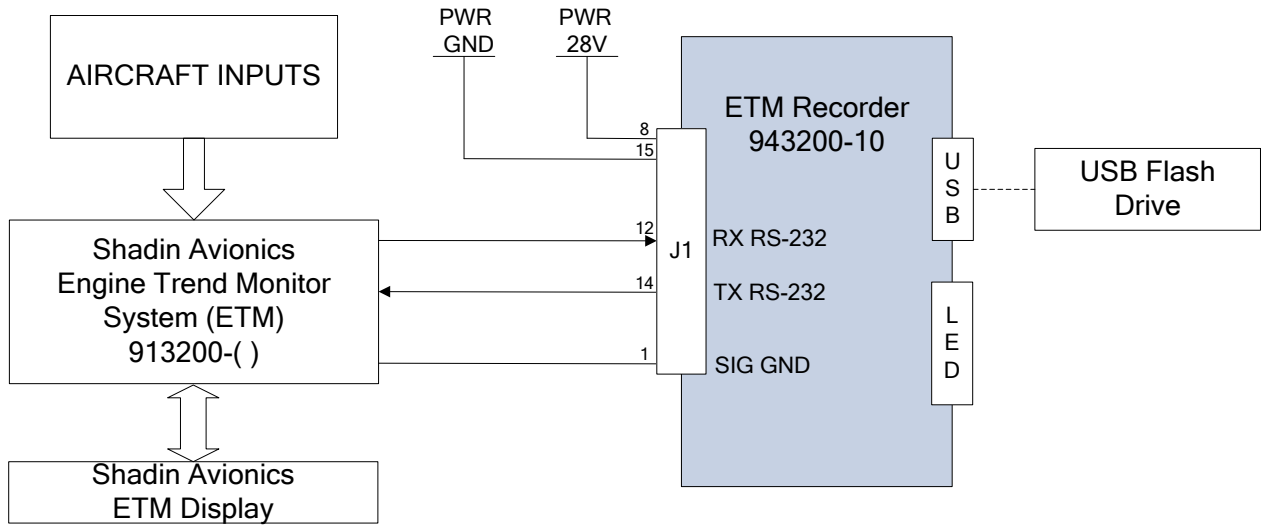



Figure 2 – Wiring Diagram

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4 ENVIRONMENTAL QUALIFICATION FORM

The ETM RECORDER hardware was environmentally tested with all functions active to RTCA/DO-160G and is documented in Shadin Qualification Test Reports.

NOMENCATURE: ETM RECORDER

TYPE/MODEL/PART NO: 943200-10


CERTIFICATION: TSO-C43a, -C44a, -C47, -C49a

SPECIFICATION: RTCA/DO-160G

MANUFATURER: Shadin Avionics **ADDRESS:** 6831 Oxford Street, St. Louis Park, Minnesota 55426-4412

Items listed with an “X” for test conducted will be identified as not being tested. Any other description indicates either a test category or a modification to a test.

CONDITIONS	SECTION	DESCRIPTION OF TESTS CONDUCTED
Temperature and Altitude	4	A2X
Low Temperature (Operating)	4	-40°C
High Temperature (Operating)		+70°C
Altitude		50,000ft
Decompression		55,000ft
Overpressure		-15,000ft
Temperature Variation	5	B (5°C/min)
Humidity	6	A
Operational Shock and Crash Safety	7	B
Vibration	8	R(B,B1) U2(F,F1)
Explosive Atmosphere	9	X
Waterproofness	10	X
Fluids Susceptibility	11	X
Sand and Dust	12	X
Fungus Resistance	13	X
Salt Fog	14	X
Magnetic Effect	15	Z
Power Input	16	AXX
Voltage Spike	17	A
Audio Frequency Conducted Susceptibility	18	R
Induced Signal Susceptibility	19	AC
Radio Frequency Susceptibility (RS/CS)	20	RR
Emission of Radio Frequency Energy (RE/CE)	21	L
Lightning Induced Transient Susceptibility	22	XXXXXX
Lightning Direct Effects	23	X
Icing	24	X
Electrostatic Discharge	25	A
Fire, Flammability	26	X

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5 ETM RECORDER SETUP

5.1 INITIAL SETUP

5.1.1 *ETM RECORDER SETUP*

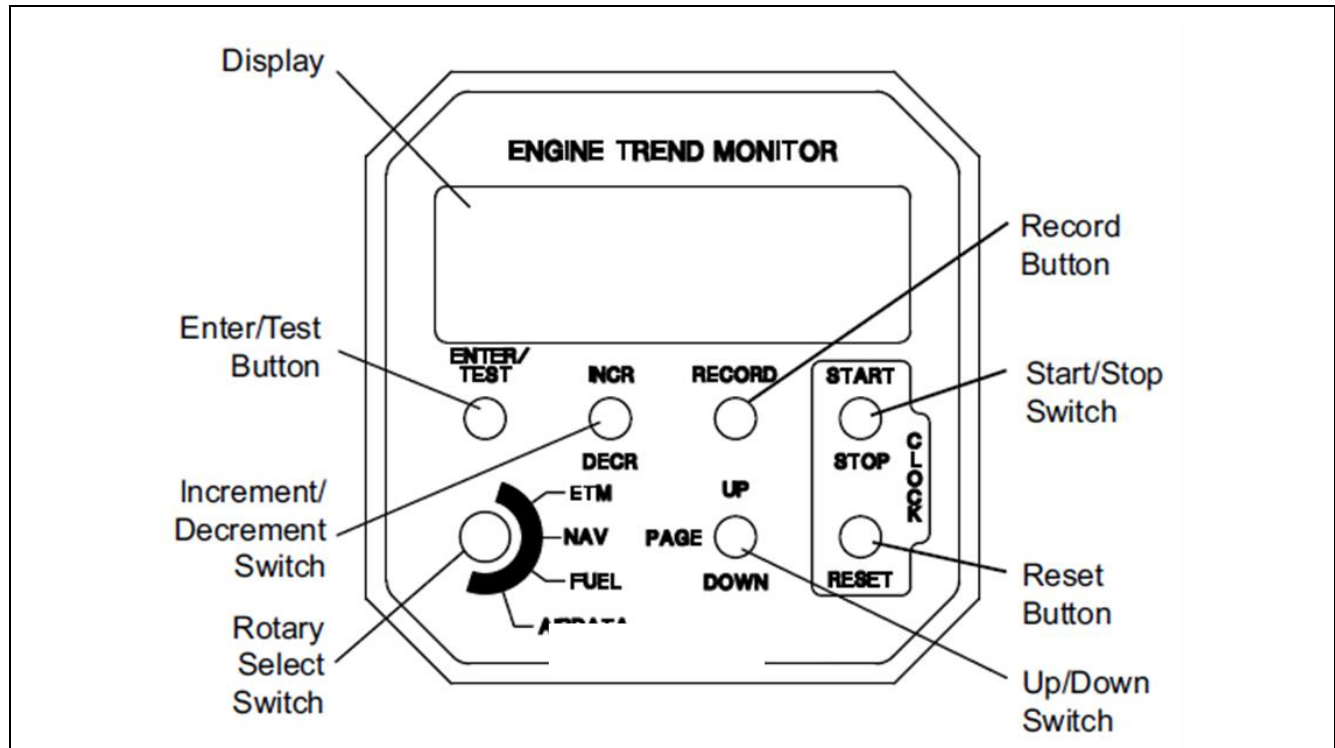
The ETM Recorder does not require initial setup. The unit becomes active and ready when power is applied to its power pins.

5.1.2 *USB FLASH DRIVE REQUIREMENTS*


The ETM Recorder is compatible with USB Flash drives specified to 1.0, 2.0 and 3.0 standards. The USB Flash drive file system must be formatted to FAT32.

5.1.3 ETM SETUP

The following steps describe how to configure the ETM for use with the ETM Recorder.



Display	The display of the ETM contains two lines, 12 characters per line.
Enter/Test Button	Enter individual character in a line of data.
Increment/Decrement Switch	Steps to the next available character position in a data entry field or steps to the next field
Rotary Select Switch	Select one of the four files from which to display pages: Miscellaneous, Airframe, Left Engine, and Right Engine.
Up/Down Switch	Scrolls through pages
Reset Button	Erases data saved in various exceedance files in ETM memory. Scroll through the character sets for entering data. Character sets are as follows: Character set 1 contains the letters A through Z Character set 2 contains the numbers 0 through 9 Character set 3 contains the characters [' _ ^] and \ Character set 4 contains / . - , + *) (' & % \$ # " ! and a space
Start/Stop Switch	Start position begins Diagnostic Mode from Data Entry Mode. Stop position exits Diagnostic and Data Entry Mode.
Record Button	Enters selections into ETM memory

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5.1.3.1 SET ETM OUTPUT SELECT TO PRINTER MODE

It is required that an ETM is configured to “Printer” mode prior to use with the ETM Recorder.

Instructions to set the ETM “Output Select” to “Printer” mode:


1. Place the ETM Display rotary switch in the ETM position.
2. Simultaneously hold the Page switch to DOWN and the Start/Stop switch to STOP for 10 seconds. This commands the ETM to Data Entry Mode.
3. After the ten (10) seconds have elapsed, the system will prompt you to enter your password.
4. Enter the password if applicable. The default password is “A”. Use the INCR/DECR switch to navigate to “A”, press “ENTER/TEST” button and press the “RECORD” button.
5. Toggle the Page UP/DOWN switch to get to “Output Select” page.
6. Use the INCR/DECR switch to change to “Printer” mode and press the “RECORD” button. If the selection is accepted the ETM Display will display “Taken”.
7. Following the ETM configuration changes, exit Data Entry Mode by toggling the Start/Stop switch to STOP.

5.1.3.2 SET ETM REGISTRATION

It is recommended that an ETM registration number is loaded in the ETM prior to use with the ETM Recorder. The initial message sent from the ETM contains the registration number used by the ETM Recorder. The ETM Recorder assigns a file name based on the ETM registration number for engine trend data analysis.

Instructions to set the ETM “Registration”:

1. Place the ETM Display rotary switch in the ETM position.
2. Simultaneously hold the Page switch to DOWN and the Start/Stop switch to STOP for 10 seconds. This commands the ETM to Data Entry Mode.
3. After the ten (10) seconds have elapsed, the system will prompt you to enter your password.
4. Enter the password if applicable. The default password is “A”. Use the INCR/DECR switch to navigate to “A”, press “ENTER/TEST” button and press the “RECORD” button.
5. Place the ETM Display rotary switch in the NAV position.
6. Toggle the Page UP/DOWN switch to get to “Registration” page.
7. Use the RESET button to change letters, numbers, special characters or spaces, use the INCR/DECR switch to scroll through the characters and press the “ENTER/TEST” button to accept and move to next. Upon completion of the registration characters press the “RECORD” button. If the selection is accepted the ETM Display will display “Taken”.
8. Following the ETM configuration changes, exit Data Entry Mode by toggling the Start/Stop switch to STOP.

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5.1.3.3 SET ENGINE SERIAL NUMBERS


It is recommended that engine serial numbers are loaded in the ETM prior to use with the ETM Recorder. The ETM records contain engine serial numbers for trend data analysis.

Instructions to set the ETM “Engine S/N”:

1. Place the ETM Display rotary switch in the ETM position.
 2. Simultaneously hold the Page switch to DOWN and the Start/Stop switch to STOP for 10 seconds. This commands the ETM to Data Entry Mode.
 3. After the ten (10) seconds have elapsed, the system will prompt you to enter your password.
 4. Enter the password if applicable. The default password is “A”. Use the INCR/DECR switch to navigate to “A”, press “ENTER/TEST” button and press the “RECORD” button.
 5. Place the ETM Display rotary switch in the FUEL position.
 6. Toggle the Page UP/DOWN switch to get to “L. ENGINE S/N” page.
 7. Use the RESET button to change letters, numbers, special characters or spaces, use the INCR/DECR switch to scroll through the characters and press the “ENTER/TEST” button to accept and move to next. Upon completion of the registration characters press the “RECORD” button. If the selection is accepted the ETM Display will display “Taken”.
- If the aircraft has two engines continue to step 4
8. Place the ETM Display rotary switch in the AIRDATA position.
 9. Toggle the Page UP/DOWN switch to get to “R. ENGINE S/N” page.
 10. Use the RESET button to change letters, numbers, special characters or spaces, use the INCR/DECR switch to scroll through the characters and press the “ENTER/TEST” button to accept and move to next. Upon completion of the registration characters press the “RECORD” button. If the selection is accepted the ETM Display will display “Taken”.
 11. Following the ETM configuration changes, exit Data Entry Mode by toggling the Start/Stop switch to STOP.

5.2 POST INSTALLATION CHECKOUT PROCEDURE

Each time power is applied to the ETM Recorder the LED will flash Orange until it receives an ETM message at power up. Once the message is received the LED will transition to solid Green.

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6 OPERATIONAL MODES AND PROCEDURES

The ETM Recorder will enter one of two operational modes at power up, Record mode or USB Data Upload mode. The ETM Recorder will remain in the same mode until power is cycled. The ETM Recorder software determines the mode by trying to access the external USB Flash drive when power is first applied. The procedures for the two modes are listed below:

6.1 RECORD MODE

Operator instructions

1. Verify USB Flash drive is not installed prior to power up
2. Apply power
 - LED – flashes Orange until first ETM message is received then transitions to solid Green for the duration of the flight.

Note: If the operator does not remove the USB Flash drive prior to power up, the ETM Recorder will remain in USB Data Upload mode and will not record ETM data.

6.2 USB DATA UPLOAD MODE

Operator instructions

1. Install USB Flash drive prior to power up
2. Apply power
3. Wait for the LED to stop flashing Red
4. The data copy is complete when the LED is solid Green
5. Remove the USB Flash drive


Note: Do not leave the USB Flash drive in the ETM Recorder.

Note: For time efficiency it is recommended that the same USB Flash drive is used between uploads since all ETM files not present on the USB Flash drive will be copied from the ETM Recorder.

6.3 GROUND BASE SOFTWARE

To import the ETM Recorder data into FleetView:

1. Insert the USB Flash drive into a Window PC
2. Execute FV_import

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7 TROUBLESHOOTING

This section provides some methods for troubles shooting the ETM Recorder.

IF NO FILES ARE ON THE USB FLASH DRIVE

- A. Verify the USB Flash drive was not left in the ETM Recorder during a flight.
 - 1. If the USB Flash drive is present at power up the ETM Recorder goes into USB Data Upload mode and will not record the ETM data.
 - 2. **DO NOT LEAVE THE USB FLASH DRIVE IN THE ETM RECORDER DURING FLIGHT.**
- B. Verify the USB Flash drive is inserted prior to applying power.
 - 1. Only at power up will the ETM Recorder recognize the USB Flash drive.
 - 2. Power cycle the ETM Recorder
- C. Verify the USB Flash drive is formatted to FAT32.
 - 1. This can be done by connecting the USB Flash drive to a Windows PC, click on the start menu and click on Computer.
 - 2. Click on the USB Flash drive to highlight, right click and click on Properties.
 - 3. Look for the File system type, it should be formatted to FAT32.
 - 4. If the File System type is not FAT32, click Cancel, right click on the USB Flash drive and click Format...
 - 5. Select File System type FAT32 and click Start.
 - 6. A warning will pop up to confirm that you want to reformat the USB Flash drive, this will erase all the existing data on the USB Flash drive so only click OK if existing files on the USB Flash drive are not needed.
 - 7. Once complete click OK and the USB Flash drive is ready to use.

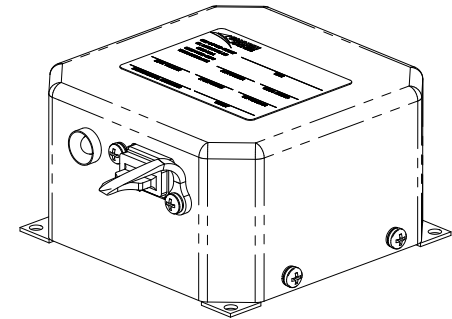
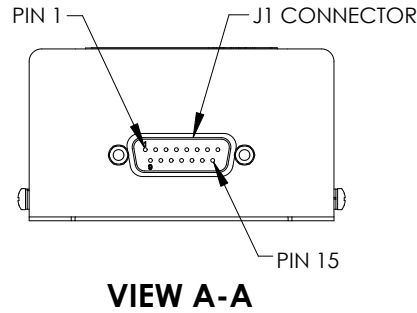
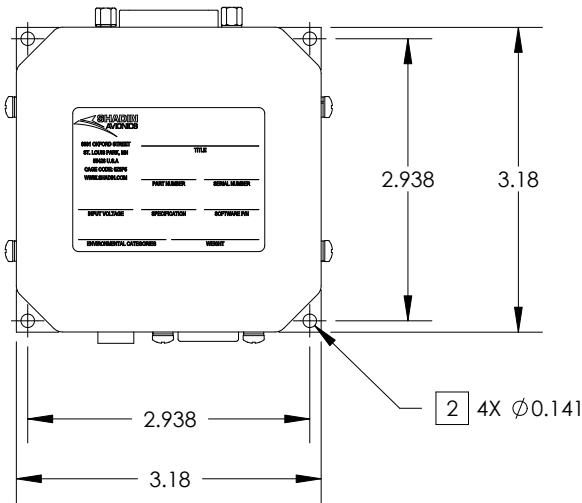
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8 APPENDIX A: INSTALLATION DRAWING

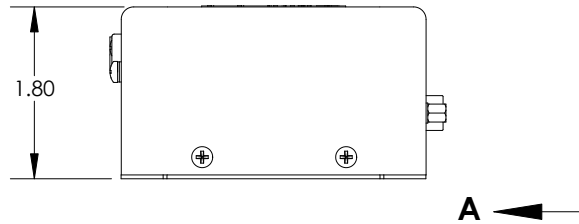
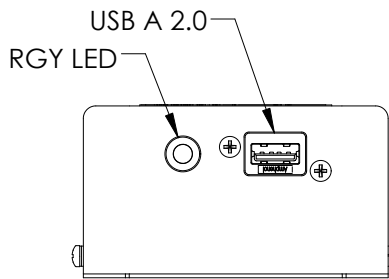
Installation drawing D943200-10 can be found on the next page.

WHERE USED	
NEXT ASSEMBLY	USED ON
M943200-10	943200-10

REVISIONS					
ERN #	REV.	DATE	BY	APP'D	DESCRIPTION
1505/004	-	5/22/2015	EG	RJW	BASELINE RELEASE



PICTORIAL VIEW



4 J1 CONNECTOR PINOUT				
PIN	SIGNAL NAME	DESCRIPTION	TYPE (REF)	PAIR (REF)
1	SIG GND	SIGNAL GROUND	SINGLE	SINGLE
2	RESERVED	N/A	N/A	N/A
3	RESERVED	N/A	N/A	N/A
4	RESERVED	N/A	N/A	N/A
5	RESERVED	N/A	N/A	N/A
6	RESERVED	N/A	N/A	N/A
7	RESERVED	N/A	N/A	N/A
8	PWR 28V	POWER 28 VDC	SINGLE	SINGLE
9	RESERVED	N/A	N/A	N/A
10	RESERVED	N/A	N/A	N/A
11	RESERVED	N/A	N/A	N/A
12	RX RS-232	RECEIVE RS-232	STP	14
13	RESERVED	N/A	N/A	N/A
14	TX RS-232	TRANSMIT RS-232	STP	12
15	PWR GND	POWER GROUND	SINGLE	SINGLE

NOTES:

1. USB PORT MUST HAVE 6" OF SPACE IN FRONT OF USB SIDE OF THE DEVICE

2 MOUNTING SCREW SIZE IS NO. 6

3. WEIGHT: 0.35 LBS

4 J1 CONNECTOR
-15 PIN D-SUB, MALE
-WIRE TYPE "STP" IS A SHIELDED TWISTED PAIR

5. MATING CONNECTOR IS A STANDARD 15 PIN FEMALE D-SUB
-STP WIRE SHIELDS SHALL BE TIED TO MATING CONNECTOR SHELL.

UNLESS OTHERWISE SPECIFIED:
DRAWN PER ASME Y14.5M-2009
DIMENSIONS ARE IN INCHES

THIRD ANGLE PROJECTION	TOLERANCES: X/X ±1/64 X.X* ±0.1 X.X ±0.1 X.XX ±0.01 X.XXX ±0.005
------------------------	---

FINISH	N/A
MATERIAL	N/A



ST. LOUIS PARK, MN 55426

DRAWN	EG	1/22/2015
CHECKED	RJW	5/22/2015
ENG APPR.	RJW	5/22/2015

SIZE	CAGE CODE: OZ5P5
	F/N D943200-10.SLDDRW
A	SCALE: N/A SHEET 1 OF 1

**INSTALLATION DWG,
P/N 943200-10**

P/N	REV
D943200-10	-