LUDLUM MODEL 44-110 & 44-110-1
LARGE AREA TRITIUM DETECTORS

March 2013

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LUDLUM MEASUREMENTS, INC
501 OAK STREET, P.O. BOX 810
SWEETWATER, TEXAS 79556
325-235-5494, FAX: 325-235-4672

STATEMENT OF WARRANTY

Ludlum Measurements, Inc. warrants the products covered in this manual to be free of defects due to workmanship, material, and design for a period of twelve months from the date of delivery. The calibration of a product is warranted to be within its specified accuracy limits at the time of shipment. In the event of instrument failure, notify Ludlum Measurements to determine if repair, recalibration, or replacement is required.

This warranty excludes the replacement of photomultiplier tubes, G-M and proportional tubes, and scintillation crystals which are broken due to excessive physical abuse or used for purposes other than intended.

There are no warranties, express or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description of the face there of. If the product does not perform as warranted herein, purchaser's sole remedy shall be repair or replacement, at the option of Ludlum Measurements. In no event will Ludlum Measurements be liable for damages, lost revenue, lost wages, or any other incidental or consequential damages, arising from the purchase, use, or inability to use product.

RETURN OF GOODS TO MANUFACTURER

If equipment needs to be returned to Ludlum Measurements, Inc. for repair or calibration, please send to the address below. All shipments should include documentation containing return shipping address, customer name, telephone number, description of service requested, and all other necessary information. Your cooperation will expedite the return of your equipment.

LUDLUM MEASUREMENTS, INC.
ATTN: REPAIR DEPARTMENT
501 OAK STREET
SWEETWATER, TX 79556

800-622-0828 325-235-5494
FAX 325-235-4672

TABLE OF CONTENTS

1. GENERAL

The Ludlum Model 44-110 and 44-110-1 Tritium Detectors are large area windowless gas flow proportional detectors used for detecting fixed tritium contamination. Due to the energy of tritium, certain restraints of the detector make it marginally more difficult to use than many of the other types of detectors.

A count rate instrument that is capable of providing an operating voltage of 1750 V ±50 V and a threshold of 4 mV ±1 mV is required.

The Model 44-110-1 is different from the Model 44-110 in that it is equipped with a multi-position gas flow selector valve. The selections available by rotary switch are OFF, PURGE (7 liters/min), NORMAL (1 liter/min), and STANDBY (20 cc/min).

The Model 44-110-1 also differs in the open surface area of the face plate and the type of handle. Window opening of the Model 44-110-1 is 150 × 15 mm.

2. SENSITIVITY

Typical sensitivity of the Model 44-110 or 44-110-1 is from 30% to 45% 4pi. Due to degradation of count from dust in the open chamber area, 30% efficiency is stated for determining minimum detectable activity (MDA).

The MDA (calculated per NUREG/ CR-5849), at 30% efficiency in a 400 cpm background and a count rate instrument with an approximate 22-second response time, is approximately 503 dpm/100 cm^2.

3. COUNTING GAS

Recommend 300 ft^3 P-10 cylinder mounted on a cylinder truck for mobile gas supply.

Estimated time of operation for one 300 ft^3 cylinder is approximately 40 hours.

4. OPERATION

ATTENTION:

Prior to use, it is necessary to remove the aluminum insert inside the gas connector. With it still installed, the user cannot plug in the gas supply. The purpose of the insert is to equalize the pressure inside the probe and to prevent the window from rupturing during shipping and transport in an aircraft. Remove it by releasing the locking collar while turning the probe upside down or simply pulling it out while releasing the collar. Once the aluminum insert is removed, the connector that is attached to the gas hose can be plugged in.

1. Connect the P-10 counting gas and HV/signal cable to the detector. Place the detector on an uncontaminated flat surface and turn the gas on. Check to see that the switch on the detector is in the ON or PURGE position. The count rate will increase as the detector purges, until the maximum background level of approximately 400 cpm is reached.

   Purge time for the Model 44-110 is approximately 30 seconds with a gas flow rate of 3 to 4 liters per minute. Purge time for the Model 44-110-1 is

approximately 15 seconds with a gas flow rate of 7 liters per minute. After obtaining the background measurement, the gas valve can be turned to OFF (Model 44-110) or STANDBY (Model 44-110-1) until the start of the survey.

2. For surveying, place the detector on the surface to be assessed and turn the gas valve to ON or NORMAL. Observe the count-rate meter until the maximum background count is reached. Slowly slide the detector along the surface, pausing for a moment for each detector width. If any increase in count rate above background is observed, keep the detector over the suspected area until maximum reading is obtained.

3. Survey Considerations

   a. Using the Model 44-110, very smooth surfaces such as tile floors and lab bench tops can be surveyed very effectively and rapidly because the detector can be purged once and then slid over the survey surface area.

   b. The Model 44-110-1 is more suited for surveying less regular surfaces and for personnel frisking.

   c. When surveying less regular surfaces with the Model 44-110, the probe cannot be slid across the surface and re-purged for each measurement.

   d. Irregular, curved, and very small surfaces, such as drain pipes, table legs, etc., cannot be effectively assessed using either of these detectors.

NOTE

In order to prevent residue forming on the chamber and anode wires, the detector should not be used on very dirty or dusty surfaces. Extreme humidity in the air (in excess of 85%) and moisture on surfaces can cause the detector to behave erratically. Therefore, it is not recommended to use the detector in high humidity or in moist conditions.

Static electricity on a surface is sufficient to prevent some tritium beta particles from escaping from the surface, thus reducing calculated surface emission.

5. MAINTENANCE

Dust on the anode wires may impair the efficiency. This is manifested by changes in the background count rate. A background count rate change of ±150 cpm may be due to dust accumulation, rather than an actual change in background or low-level contamination. A careful assessment is required to determine the exact cause of variation in count.

Surveying in a dusty environment may require cleaning the anode wires and chamber several times a day.

Cleaning anode wires:
Use a dust remover spray such as those used by photographers, followed by a spray of electrical contact cleaner. The cleaner or solvent must be 100% residue free.

CAUTION

When cleaning the counting chamber, be extremely careful not to damage or break the delicate anode wires.

6. DRAWINGS AND DIAGRAMS

M 44-110 TRITIUM FRISKER, Drawing 342 × 170A

M 44-110 ASSY, Drawing 342 × 170B – 170D

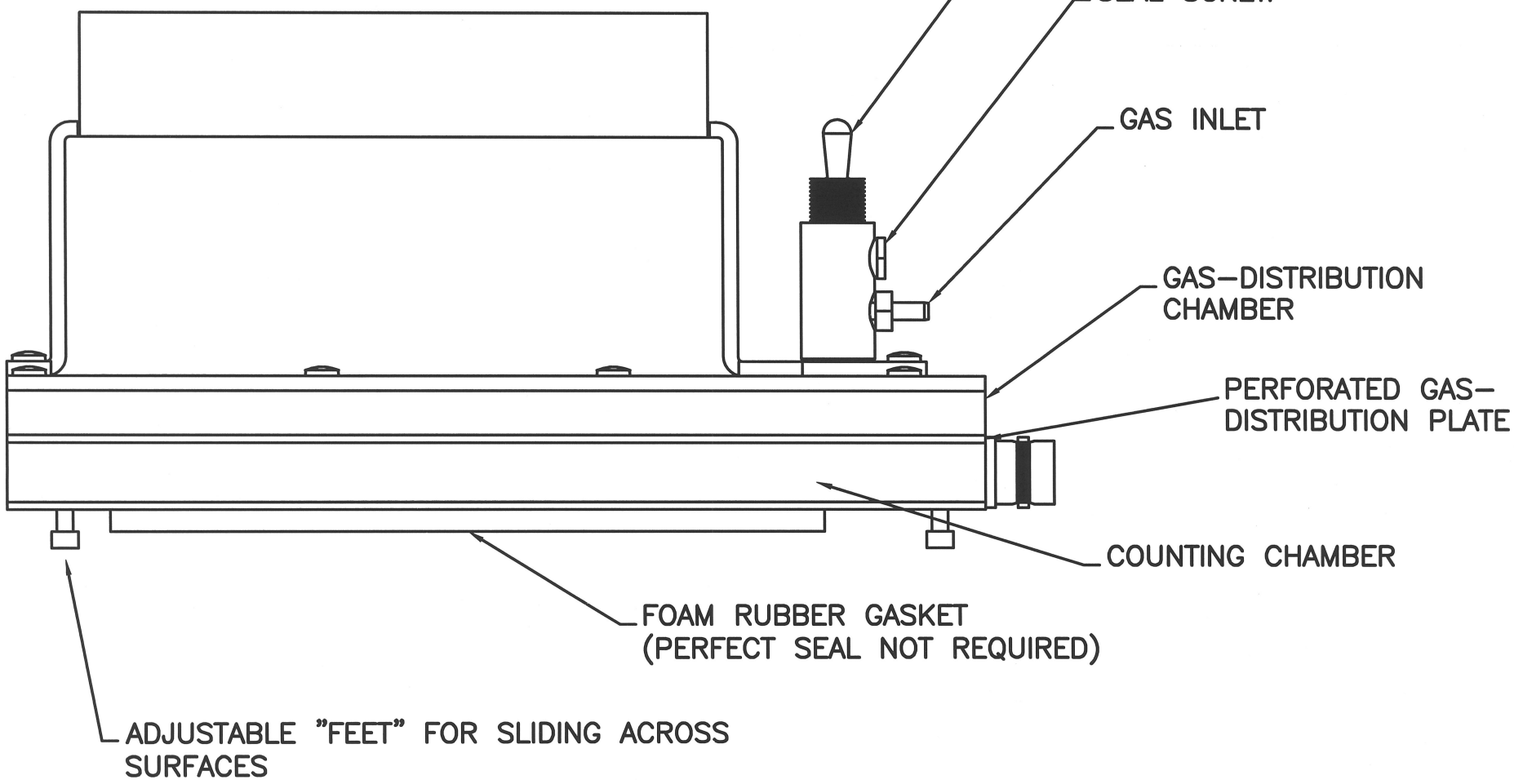
M 44-110-1 VALVE ASSEMBLY, Drawing 342 × 171

M 44-110-1 PLUMBING ASSEMBLY, Drawing 342 × 171A

M 44-110-1 VALVE CALIBRATION, Drawing 342 × 171B

FACE PLATE (M 44-110-1), Drawing 342 × 172

REV #	ALTERATIONS	DATE	BY
1	VALID	7-14-03	JSM



DWN	DATE	CHK	DATE	APP	DATE
JSM	7-14-03			JGS	7-14-03

DWG NUM: 4342-170 SCALE: FULL ☐ OTHER

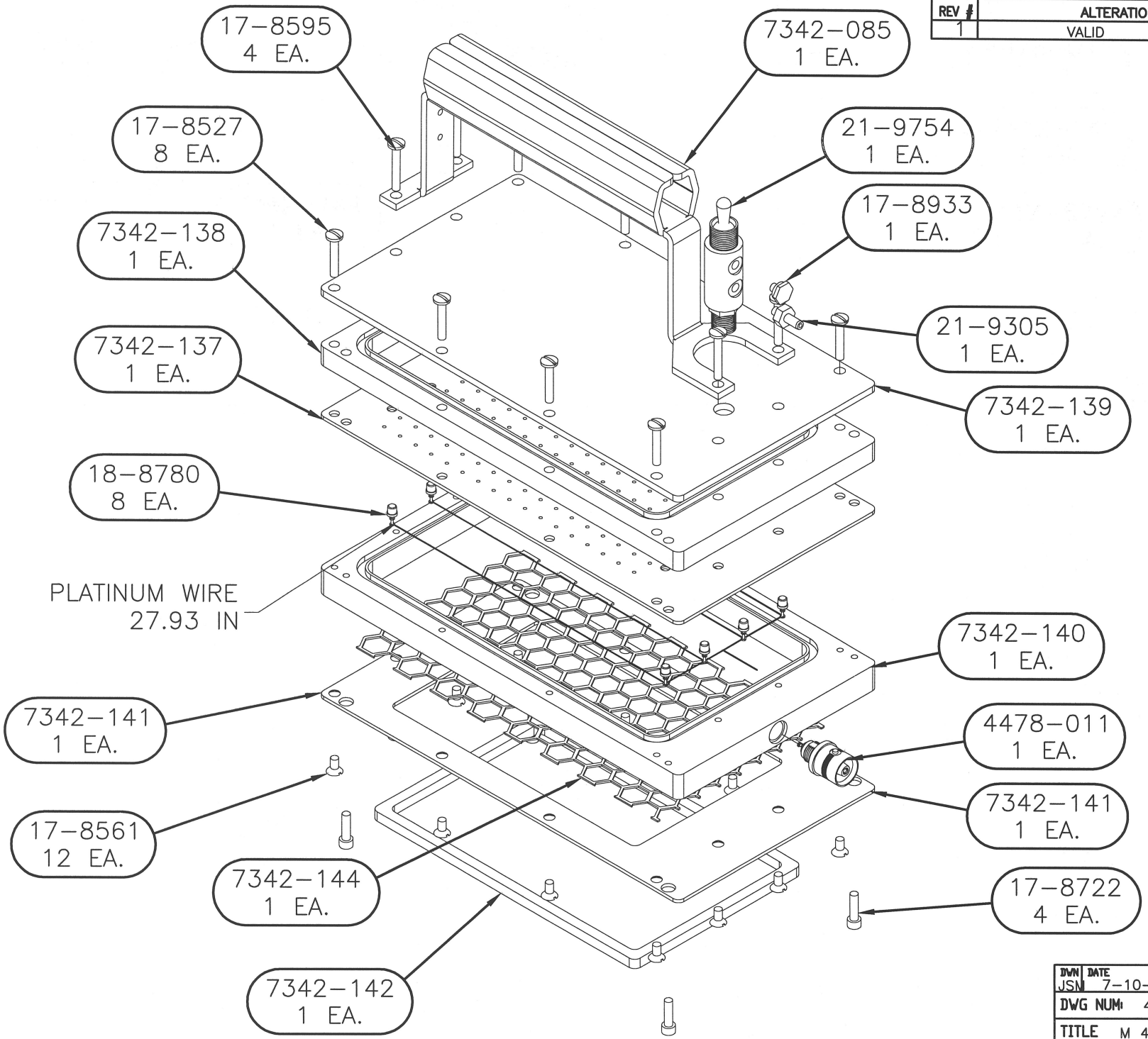
TITLE M 44-110 TRITIUM FRISKER

LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556

SERIES 342

SHEET 170A

REV #	ALTERATIONS	DATE	BY
1	VALID	7-9-03	JSM



DWN	DATE	CHK	DATE	APP	DATE
JSN	7-10-03			JGD	7-10-03

DWG NUM: 4342-170B		SCALE: FULL ☐ OTHER	
TITLE M 44-110 ASSY.			
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556		SERIES 342	SHEET 170B

REV #	ALTERATIONS	DATE	BY
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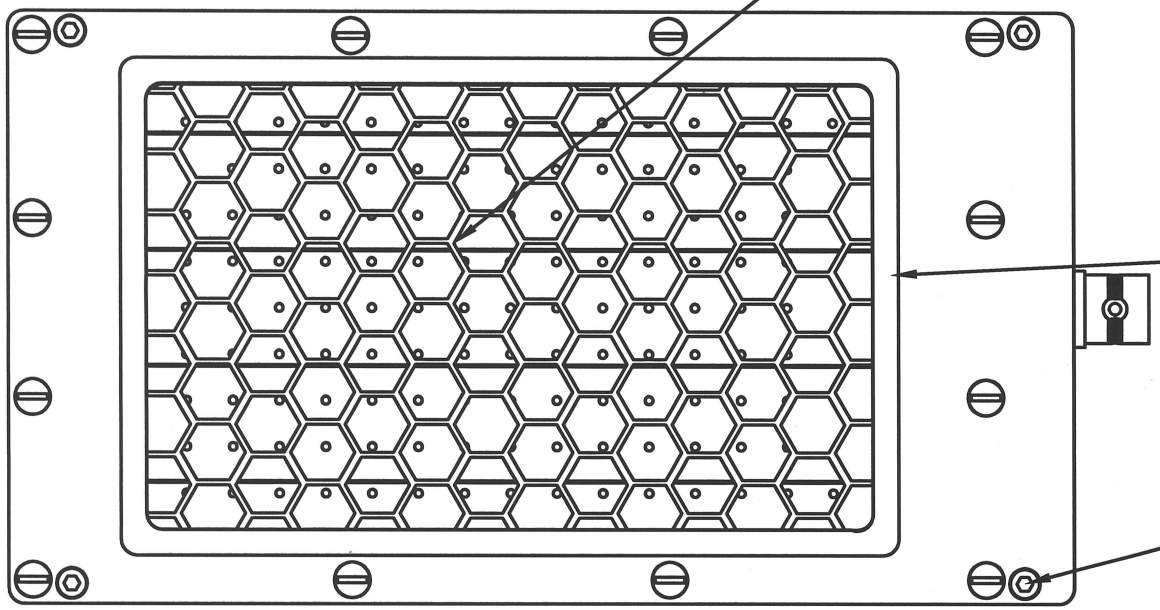

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JSM	7-10-03			JGW	7-10-03

DWG NUM: 4342-170C	SCALE: FULL ☐ OTHER 3/4		
TITLE: FIGURE 2			
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556	SERIES 342	SHEET 170C	

REV #	ALTERATIONS	DATE	BY
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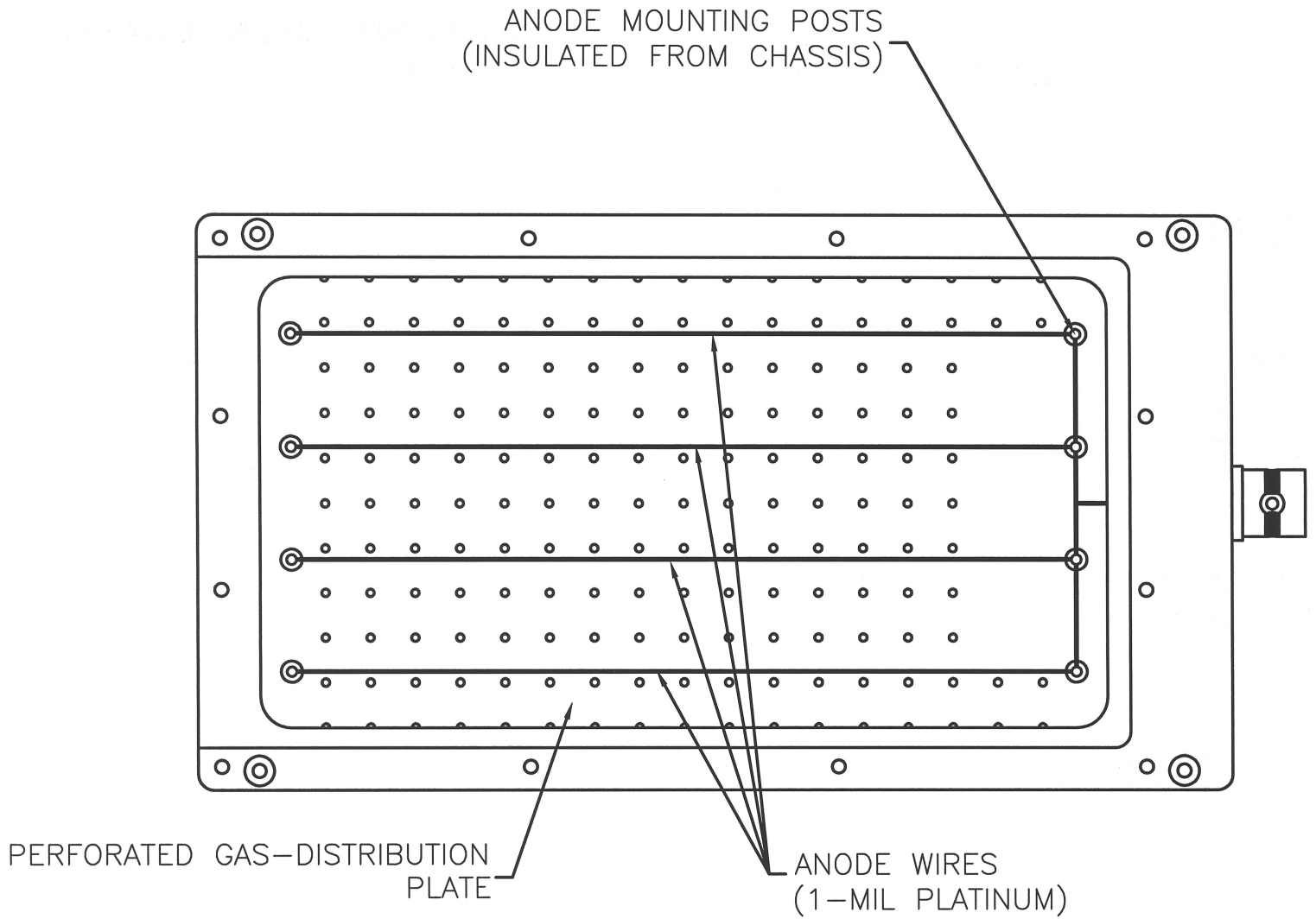

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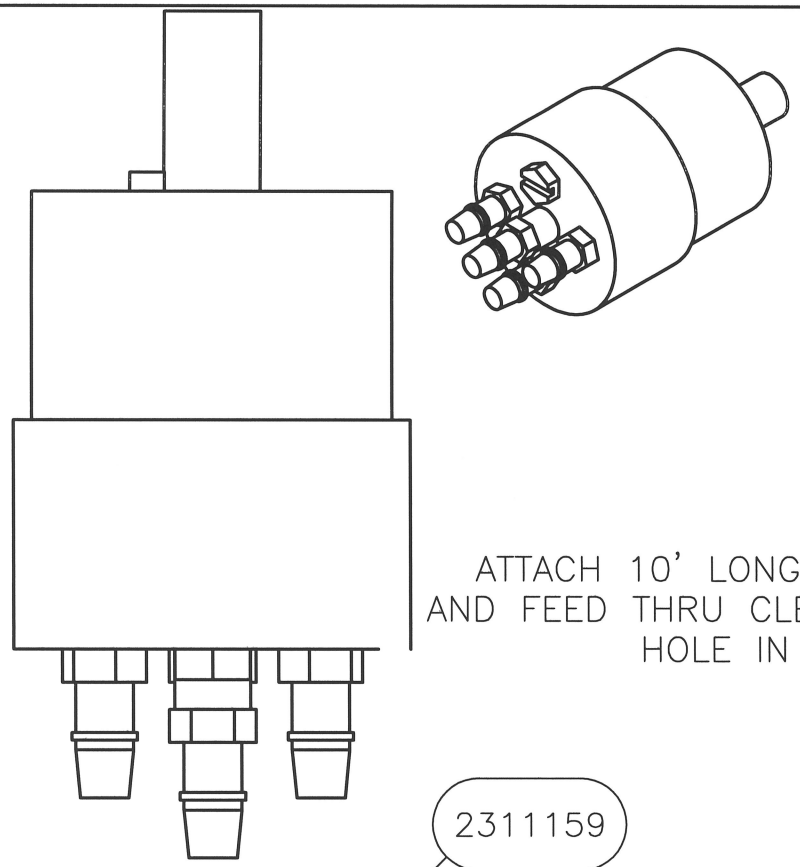
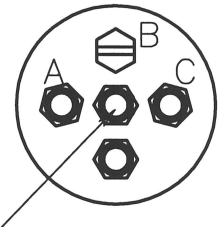
JSM	7-10-03			JW	7-10-03

DWG NUM: 4342-170D	SCALE: FULL OTHER
TITLE FIGURE 3	

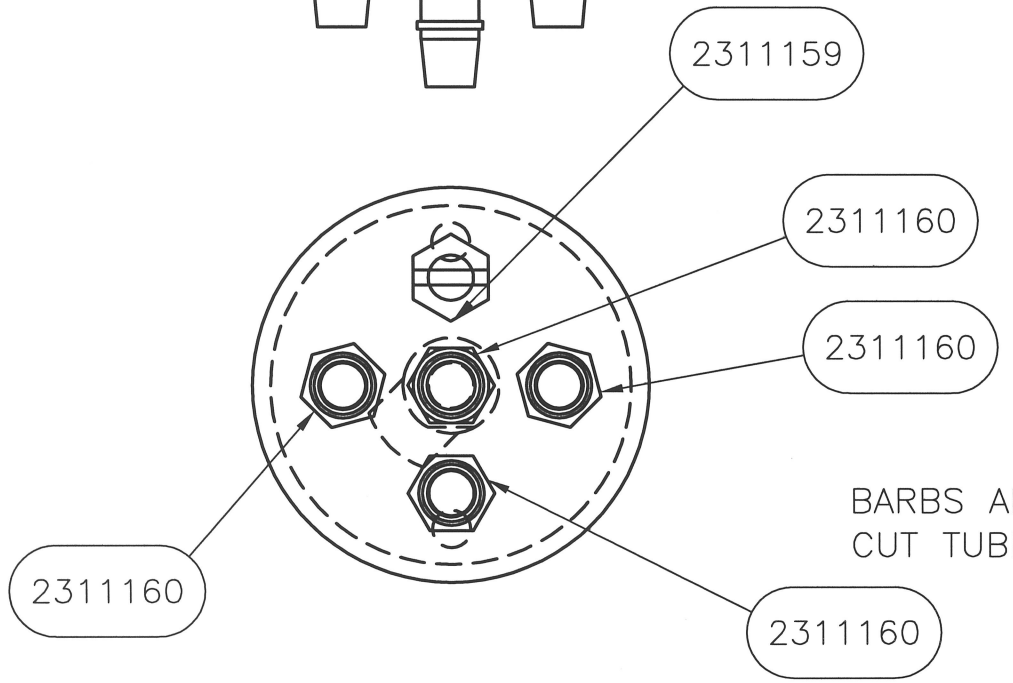
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556	SERIES 342	SHEET 170D

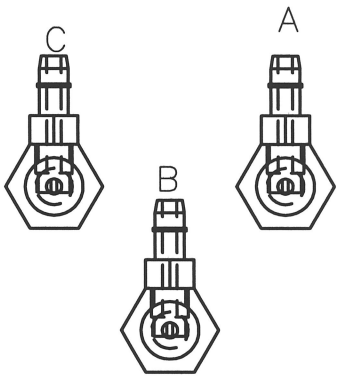
REV #	ALTERATIONS	DATE	BY
1	VALID	8-25-06	CMC
2	REDESIGNED PLUMBING	9-14-06	CMC





ATTACH 10' LONG TUBING
AND FEED THRU CLEARANCE
HOLE IN HANDLE





BARBS ARE LABELED FOR INSTALLING 1/4" TUBING
CUT TUBING FOR BARBS A, B, & C 5" LONG

DWN	DATE	CHK	DATE	APP	DATE
CMC	9-14-06			JGW	9-15-06

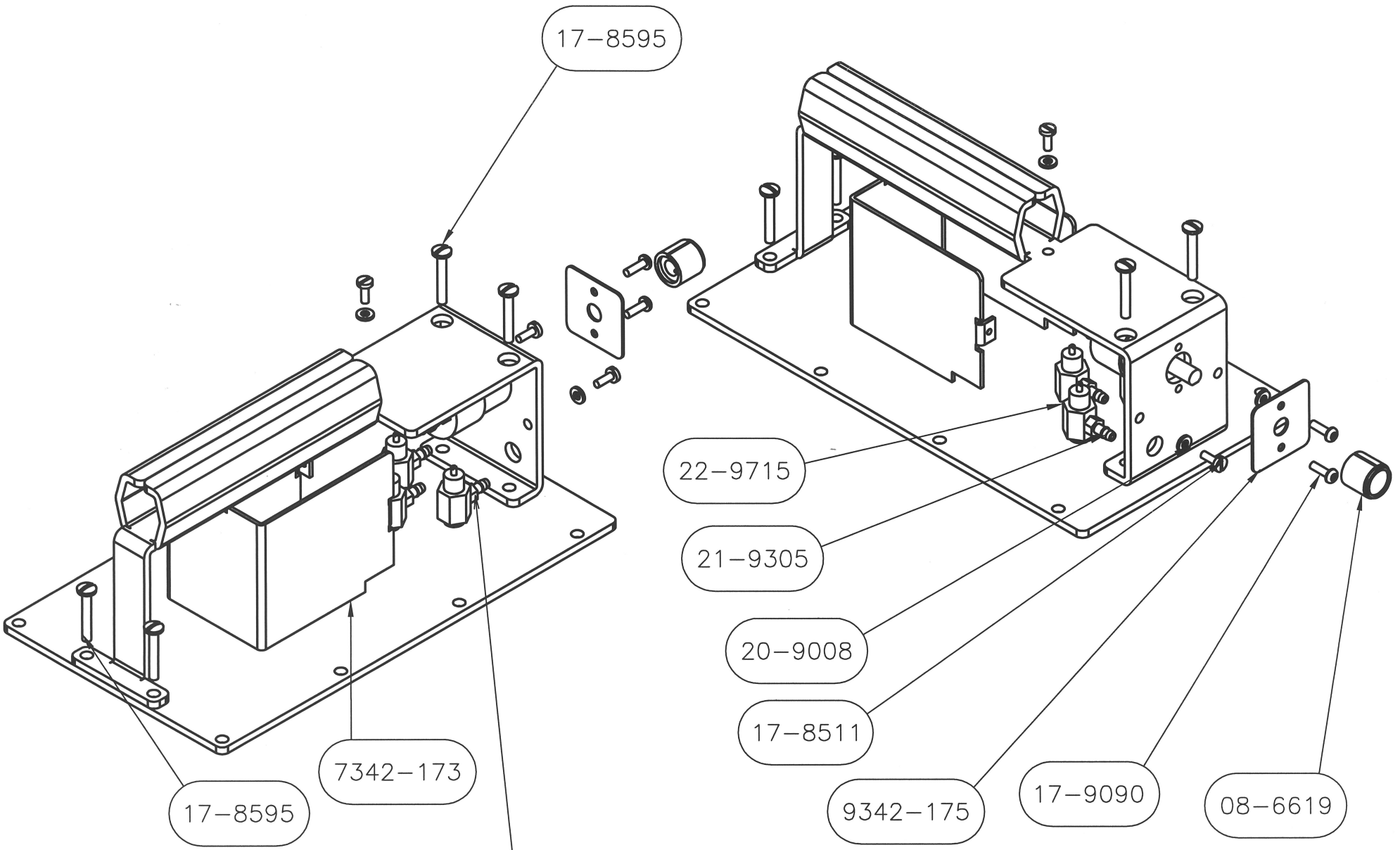
DWG NUM: 4342-171 SCALE: FULL ☒ OTHER

TITLE: M 44-110-1 VALVE ASSEMBLY

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES: 342 SHEET: 171

REV #	ALTERATIONS	DATE	BY
1	VALID	8-25-06	CMC
2	CHANGED SCREWS AND KNOB	9-18-06	CMC



DWN	DATE	CHK	DATE	APP	DATE
CMC	9-18-06			KDS	10-5-06

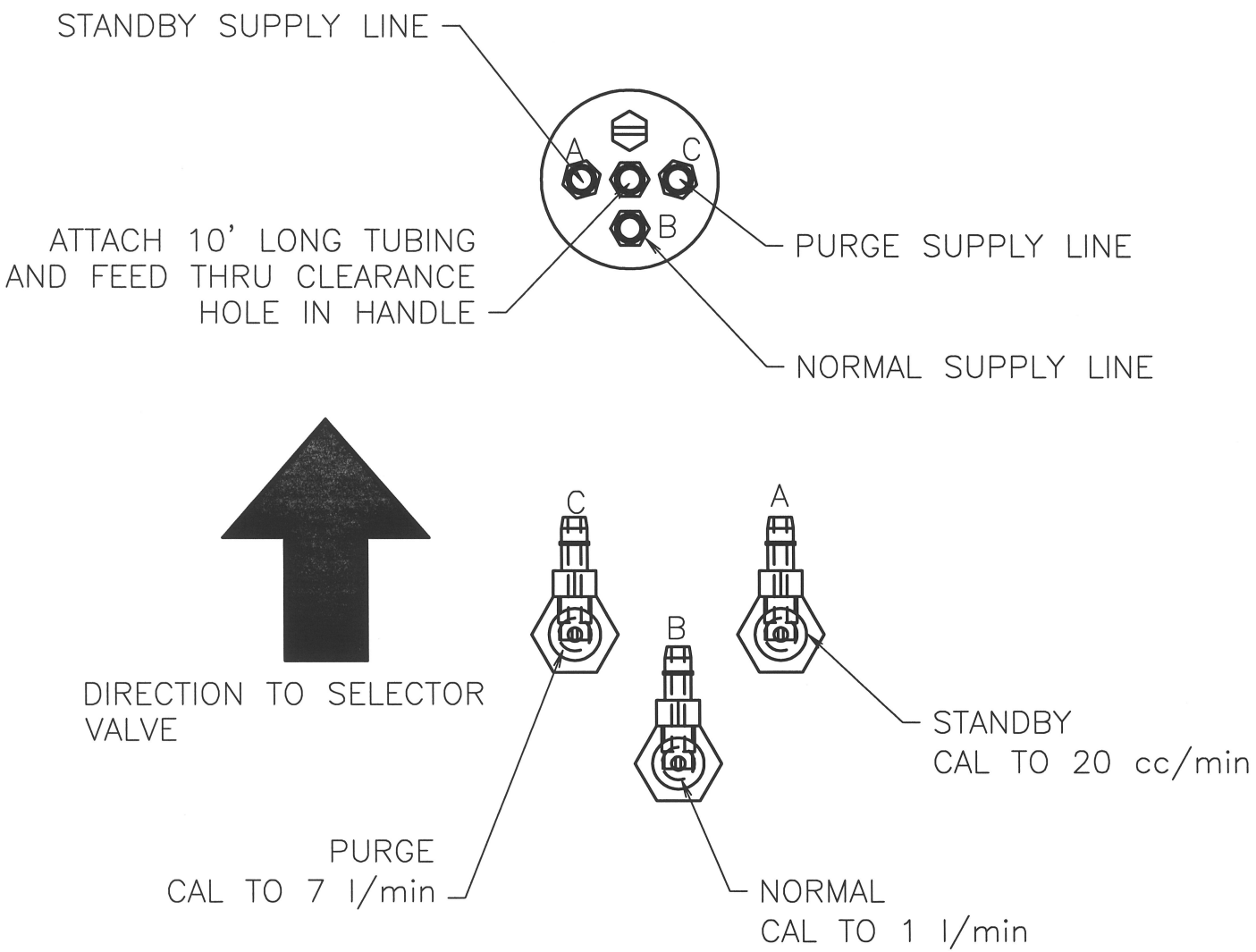
DWG NUM: 4342-171 SCALE: FULL OTHER

TITLE M 44-110-1 PLUMBING ASSEMBLY

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES 342 SHEET 171A

REV #	ALTERATIONS	DATE	BY
1	VALID	9-14-06	CMC



DWN	DATE	CHK	DATE	APP	DATE
CMC	9-18-06				

DWG NUM: 4342-171 SCALE: FULL OTHER

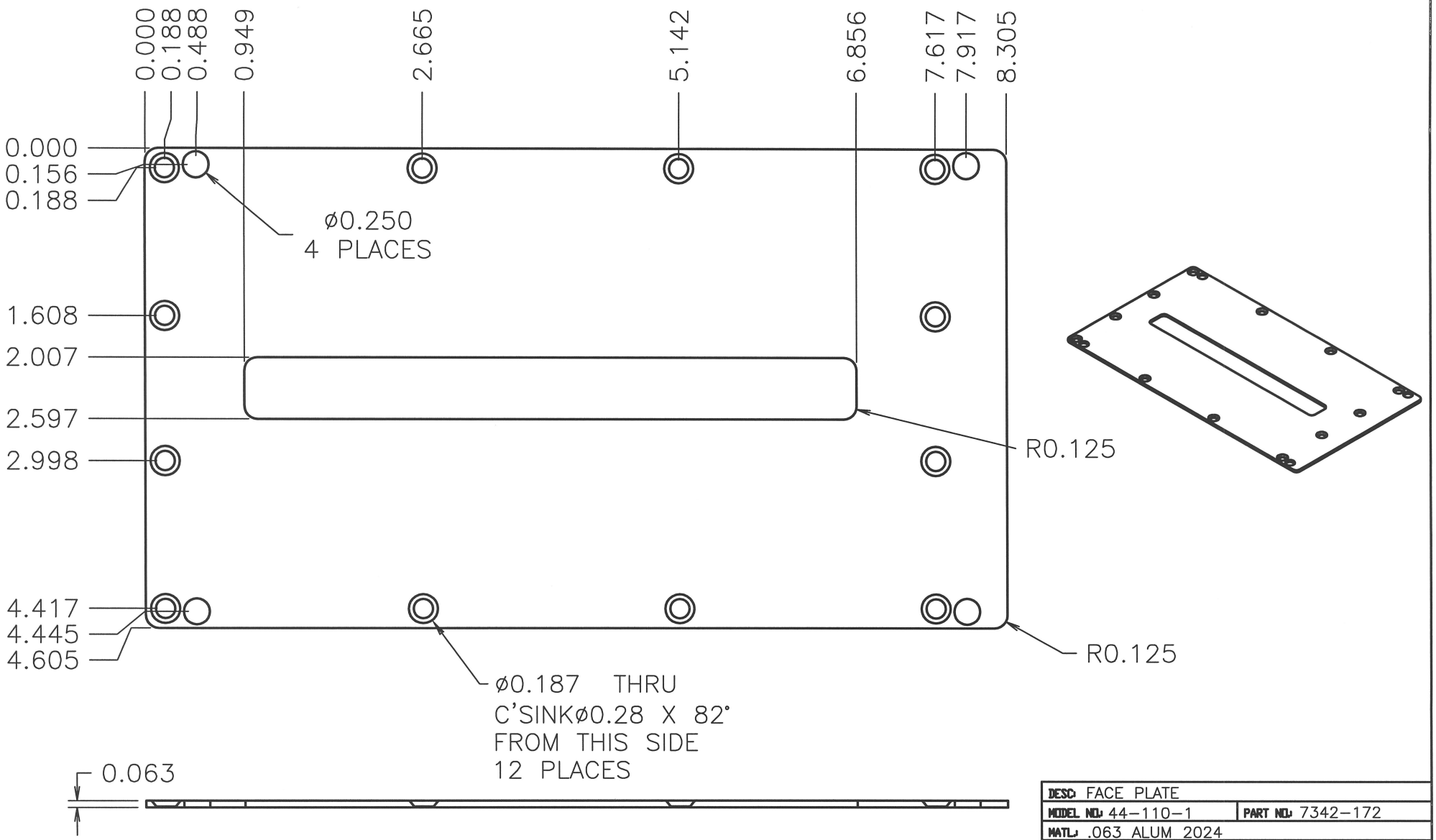
TITLE: M 44-110-1 VALVE CALIBRATION

LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

SERIES: 342

SHEET: 171B

REV#	ALTERATIONS	DATE	BY
1	VALID	8-3-06	CMC



DESC: FACE PLATE					
MODEL NO: 44-110-1			PART NO: 7342-172		
MATL: .063 ALUM 2024					
SIZE: 38.25 SI.					
MATL. NO: 27-9825					
FINISH: DIP			NO. REQD: 1		
FINAL ASSY. NO:			SILK SCREEN: N		
DWN: CMC	DATE: 8-3-06	CHK	DATE	APP: JGW	DATE: 8-3-06
TOL: SHOP STD ☒ OTHER		SCALE: FULL ☒ OTHER			
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556		SERIES: 342		SHEET: 172	