LUDLUM MODEL 44-110-4

WINDOWLESS GAS FLOW PROPORTIONAL DETECTOR

October 2020
Serial Number 319110 and Succeeding
Serial Numbers

LUDLUM MODEL 44-110-4

WINDOWLESS GAS FLOW PROPORTIONAL DETECTOR

October 2020
Serial Number 319110 and Succeeding
Serial Numbers

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

Model 44-110-4

Model 44-110-4 Windowless Gas Flow Proportional Detector

TABLE OF CONTENTS

Model 44-110-4 Windowless Gas Flow Proportional Detector

1. GENERAL

The Model 44-110-4 is a windowless gas flow proportional sample counter capable of holding up to a 5.1 cm (2 in.) diameter filter or planchet. High Voltage (HV) is continuously applied to the detector. The sample drawer is locked in the closed position by rotation of the sample drawer lever mounted on the side of the instrument.

If simultaneous alpha-beta discrimination is desired, the counting instrument must have separate power supplies or threshold controls for each channel. The Ludlum Model 3030 Scaler or Model 2360 instruments provide the necessary circuitry for simultaneous alpha-beta discrimination. Otherwise, a single-channel instrument, such as the Model 2200, may be adjusted to count alpha, beta, or both.

2. SPECIFICATIONS

DETECTOR OPERATING VOLTAGE: typically 1700-1900 Vdc

GAS FLOW: typically 0.1 L/min, detector equipped with 3.2 mm (0.125 in.) hose connection and two-position switch flow valve

EFFICIENCY (4π): 3% for ^{3}H; 21% for ^{14}C; 36% for ^{63}Ni; 42% for ^{239}Pu

COUNTER THRESHOLD SETTINGS: typically 2-5 mV

SAMPLE SLIDE AND HOLDER: anodized aluminum tray with 2.5 cm (1.0 in.) diameter sample ring to allow for 2.5 or 5.1 cm (1.0 or 2.0 in. (Dia x L) samples

CONSTRUCTION: aluminum housing

TEMPERATURE: -20 to 50 °C (-4 to 122 °F)

SIZE: 15.2 x 11.4 x 23.6 cm (6 x 4.5 x 9.3 in.) (H x W x L)

WEIGHT: 1.5 kg (3.3 lb)

3. OPERATING PROCEDURES

Connect the Model 44-110-4 to an appropriate counting gas by connecting tubing from a gas bottle regulator or adjustable flow meter to the hose barb on the toggle valve. Regulate the flow to approximately 0.1 L/min. The hose barb on the back of the housing is exhaust gas. The exhaust can be left unconnected or it can be connected to tubing to route the exhaust to another location.

Connect the detector to the counting instrument. The coax cable with "C" connectors carries both the signal and HV. High Voltage (HV) is continuously applied to the detector.

To check a radioactive sample, place sample, facing up, in the appropriate size cavity in the sample holder for the 2.5 or 5.1 cm (1 or 2 in.) filters. Do not allow the sample to extend above the top of the sample slide. Push the sample drawer in completely, then rotate the sample drawer lever to the locked position, securing sample drawer in the closed position.

Open toggle valve by moving lever on top of valve to the open position. Allow chamber to purge for approximately 30 seconds

before starting count. Purge times can be adjusted by adjusting the gas flow rate, but excessive flow could loosen contamination on the samples and contaminate the interior of the chamber.

After count is complete, turn off toggle valve and open drawer.

A background count should be taken after each source count to check for contamination on the sample holder or area within the O-ring.

4. CALIBRATION

CAUTION: Do not tip sample counter over, which could cause contamination of the anode wires and damage or destroy the instrument.

For instruments with separate power supplies (fixed threshold), the alpha channel will operate at a lower voltage than the beta channel.

4.1 Counting Instrument

Calibrated scaler instrument
HV range, nominally 1700-1900 V
Nominal input sensitivity:
-2 mV for a single-channel instrument or
alpha channel = -75 mV
beta channel = -2 mV (with upper discriminator set at 50 mV)

4.2 Operating Voltage

1. Set the scaler count time for 60 seconds.

2. Connect the Model 44-110-4 detector and place the source in the sample cavity. Close drawer, turn on gas, and allow chamber to purge.

3. Begin the search for the operating voltage at 1600 V. Observing the count, increase the HV until the desired efficiency is achieved. Note the HV.

4. Using one-minute count times, record count rates for the desired alpha and/or beta sources. The starting HV value should be 25 V less than the HV reading obtained in the above step. Continue in 25-volt steps until any one of the necessary criteria is not met (that is, alpha or beta efficiency, acceptable background, or "cross talk" parameters). The ending HV value should be at least 25 V greater than the HV reading obtained in the above step.

5. Select the optimum operating voltage that gives the greatest alpha and beta source efficiency and acceptable background cpm.

4.3 Calculating Efficiency

1. NIST-traceable sources required.

2. Set HV as determined above.

3. Record a one-minute background and one-minute source count. Subtract the background count from the source count. Divide the net source count by the dpm value of the source, times 100 for 4π efficiency.

If the source value is listed in µCi (activity):

4. Convert the µCi value to a dpm value by multiplying the microcurie value by 2.22 x 10^6. Calculate the 4π efficiency as in the previous steps.

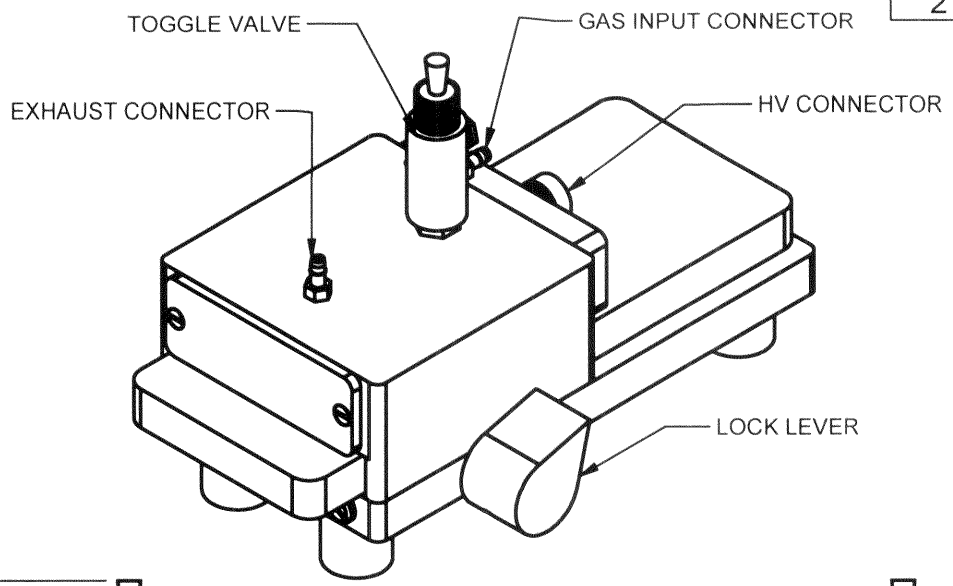
PARTS LIST

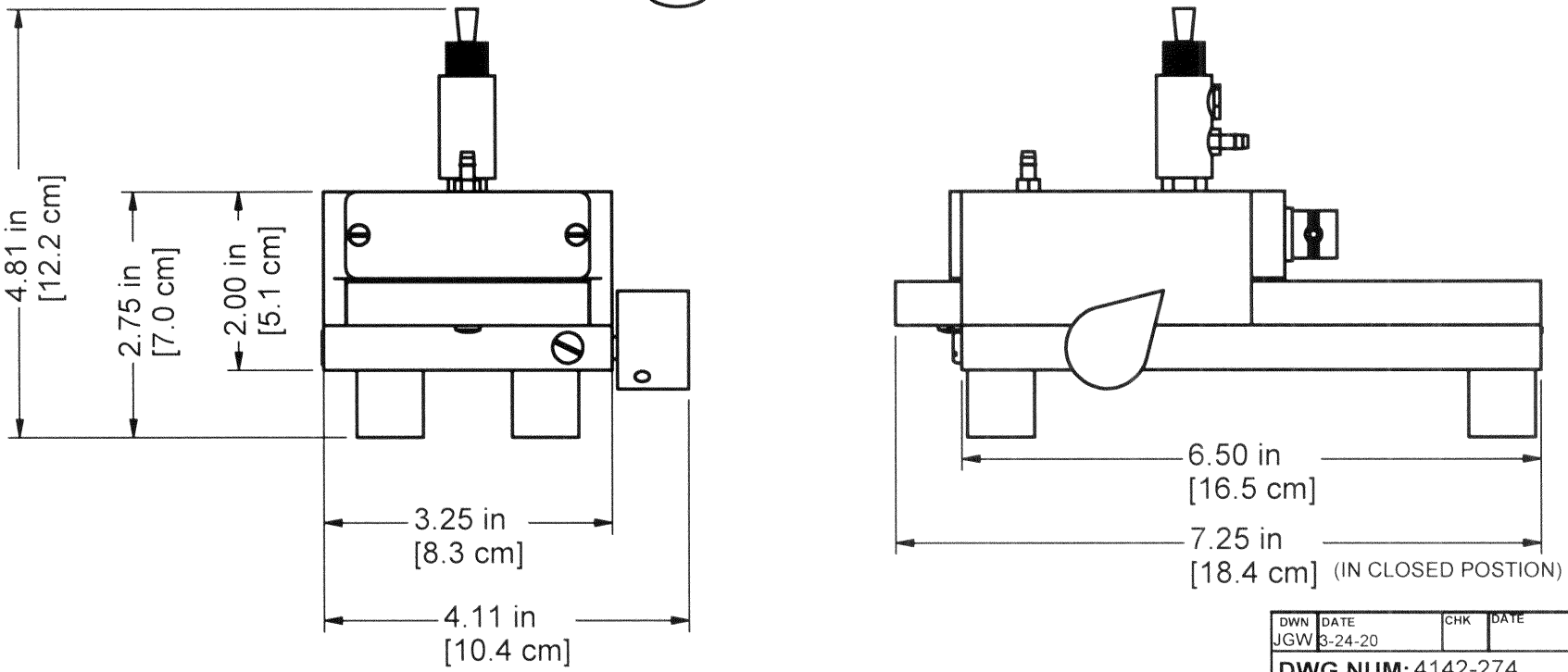
Ref. No.	Description	Part No.
	Model 44-110-4 Windowless Gas Proportional Detector	
UNIT	Completely Assembled 44-110-4 Detector	47-3929
	Assembly View, Drawing 142 X 274	
1 EA.	MODEL 44-110-4 BASE PLATE	7142-275
1 EA.	MODEL 44-110-4 HOUSING	
1 EA.	MODEL 44-110-4 CONNECTOR BLOCK	7142-276 7142-277
1 EA.	RECPT-UG706/U "C"	4478-011
1 EA.	KNOB-POINTER MS91258-2P2B	8-6608
1 EA.	O-RING-2-229	16-8286
1 EA.	O-RING-2-012	16-8302
4 EA.	FEEDTHRU-1115-07-0519	18-9353
1 EA.	SPRING PLUNGER-10-32	18-9365
4 EA.	MOUNT-ISOLATION 8-32 X 1/2 BLK	21-8922
2 EA.	FTG-1/8 HOSE MH1332-1/4 HEX	21-9305
1 EA.	VALVE-MTV-2P	21-9754
1 EA.	M 44-10, 43-17 SMPL DRWR	7142-001-06
1 EA.	M 43-10 PLANCHET HOLDER	7142-001-07
1 EA.	M 43-10/43-17 SHAFT	7142-019
1 EA.	M 43-10/43-17 PIN X5	7142-021
1 EA.	M 44-110-2 LIFTER	7142-250
1 EA.	MODEL 44-110-4 ELECTRODE COVER PLATE	7142-278
1 EA.	M 43-10-1 PROTECTION LBL	9142-212

DRAWINGS AND DIAGRAMS

Model 44-110-4 Assembly Overview, Drawing 142 x 274
Model 44-110-4 Assembly Step 1, Drawing 142 x 274A
Model 44-110-4 Assembly Step 2, Drawing 142 x 274B
Model 44-110-4 Assembly Step 3, Drawing 142 x 274C

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
1	VALID	2-6-12	CMC
2	ADDED NOTES	08/29/12	ADG





DWN	DATE	CHK	DATE	APP	DATE
JGW	3-24-20			JGW	3-24-20

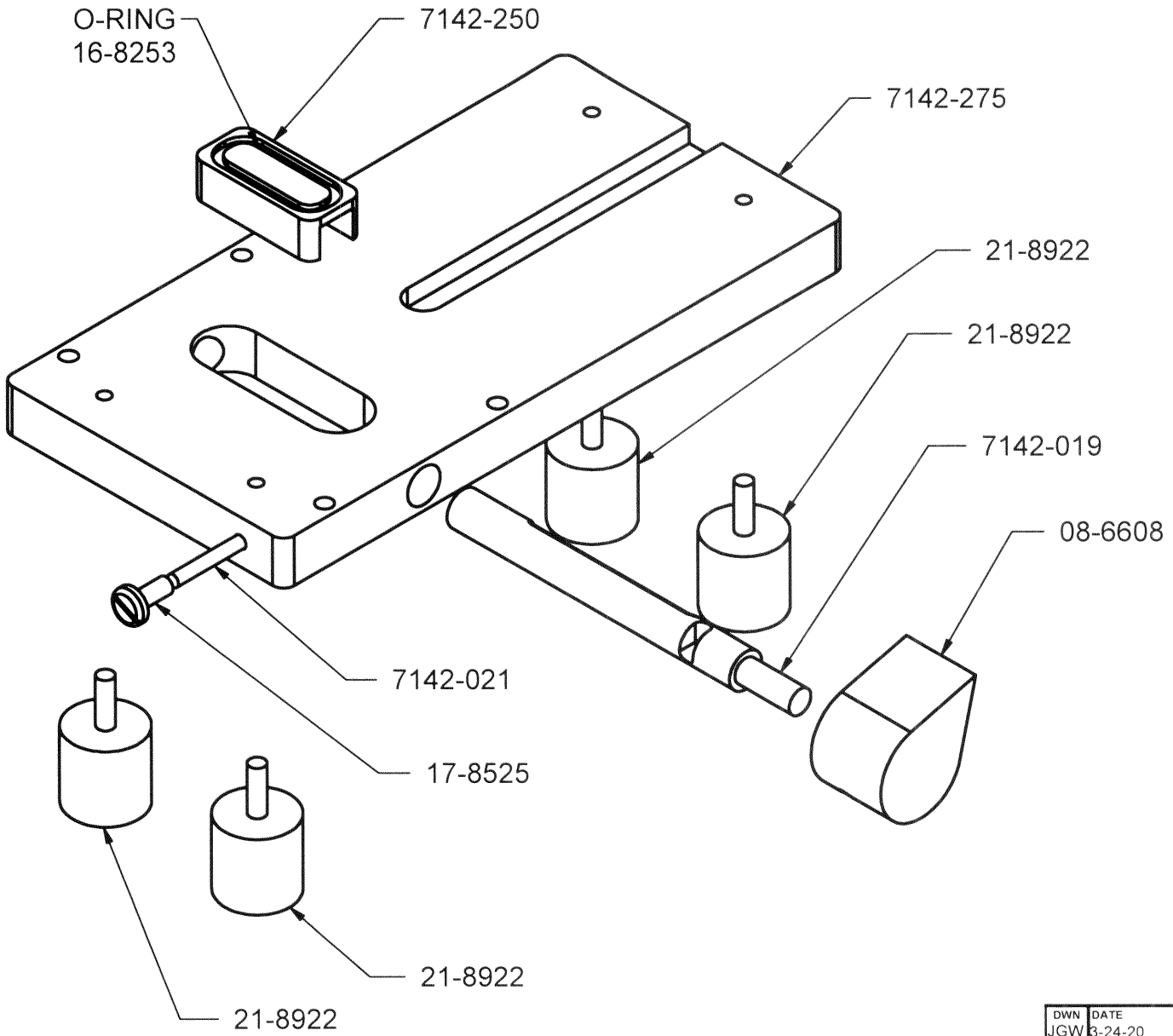
DWG NUM: 4142-274 SCALE: 1/2

TITLE M 44-110-4 2" DIA GAS PROBE

LUDLUM MEASUREMENTS, INC
501 OAK STREET
SWEETWATER, TEXAS 79556

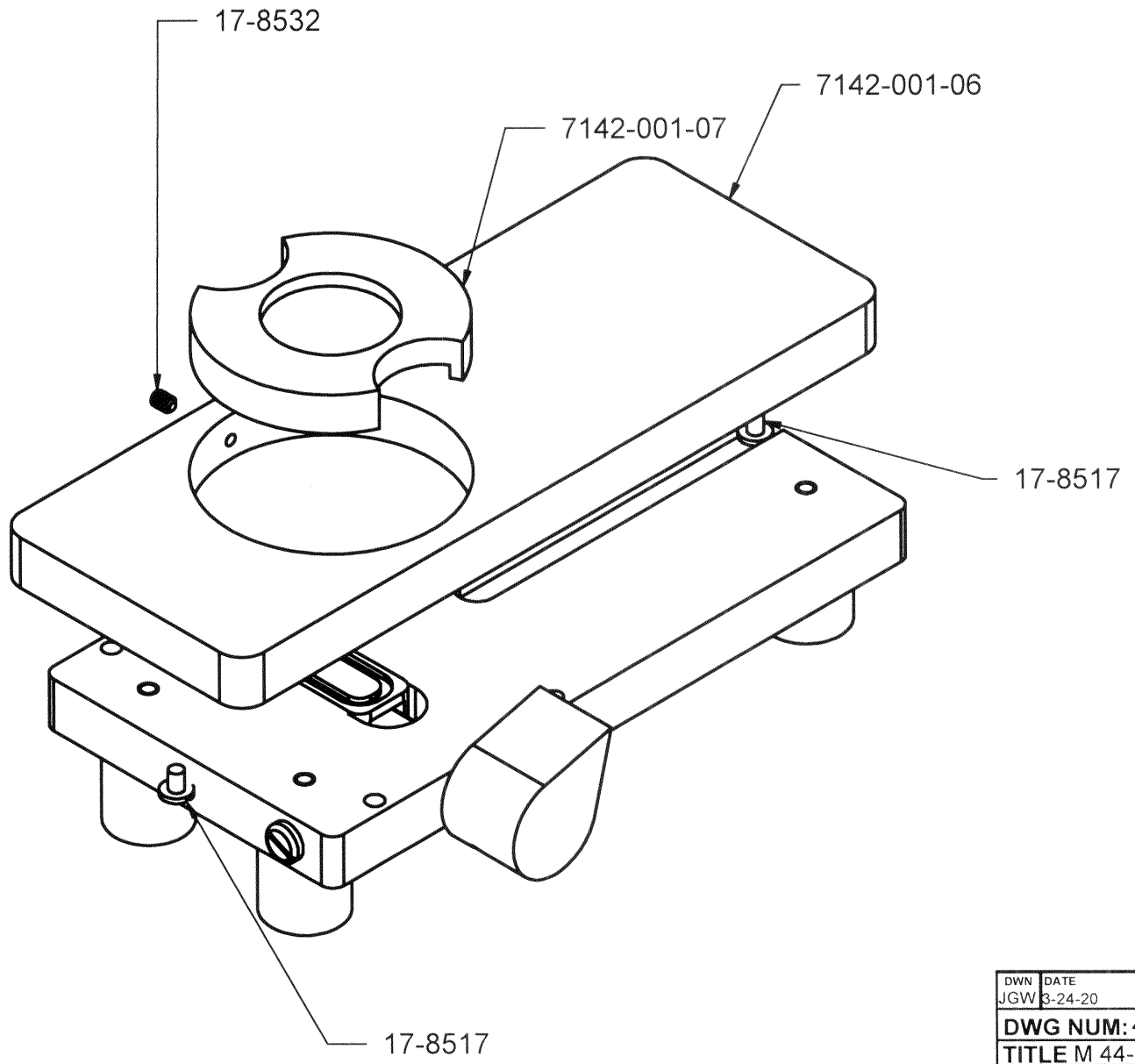
SERIES	SHEET
142	274

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
1	VALID	2-7-12	CMC



DWN JGW	DATE 3-24-20	CHK	DATE	APP JGW	DATE 3-24-20
DWG NUM: 4142-274				SCALE: 3/4	
TITLE M 44-110-4 ASSY STEP 1					
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556			SERIES 142	SHEET 274A	

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
1	VALID	2-7-12	CMC



DWN	DATE	CHK	DATE	APP	DATE
JGW	3-24-20			BW	3-24-20

DWG NUM: 4142-274 SCALE: 3/4

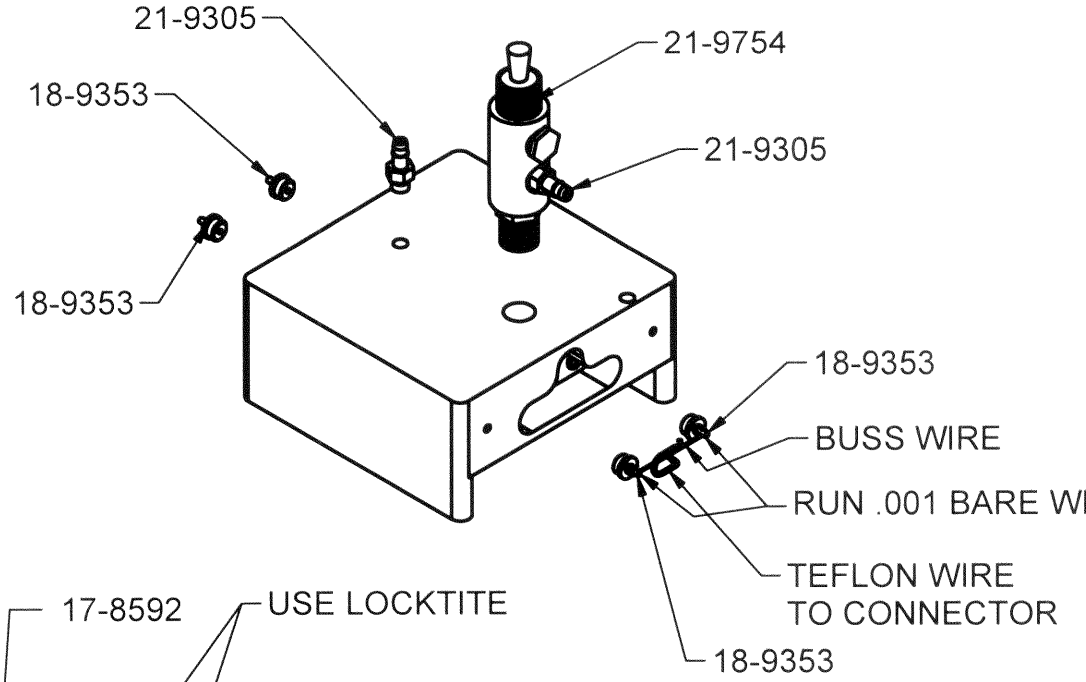
TITLE M 44-110-4 STEP 2

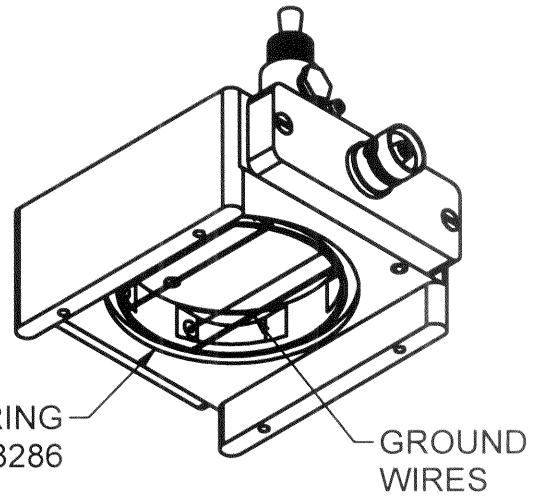
LUDLUM MEASUREMENTS, INC.
501 OAK STREET
SWEETWATER, TEXAS 79556

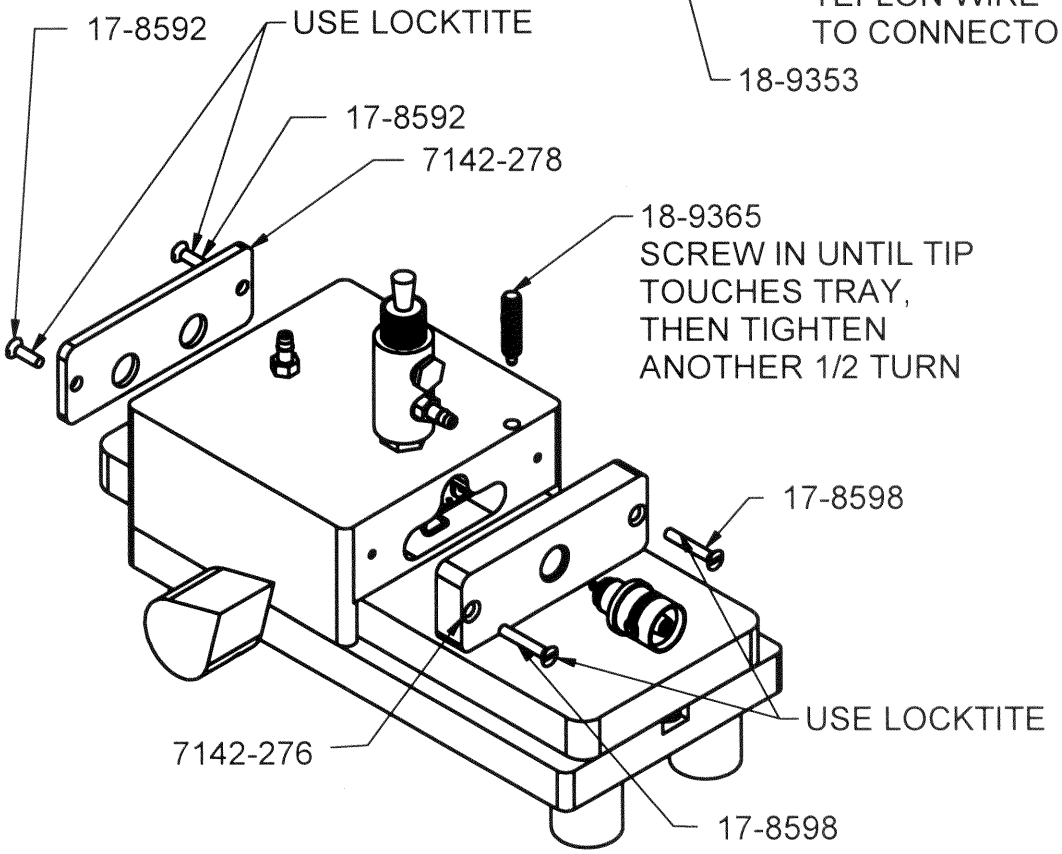
SERIES 142

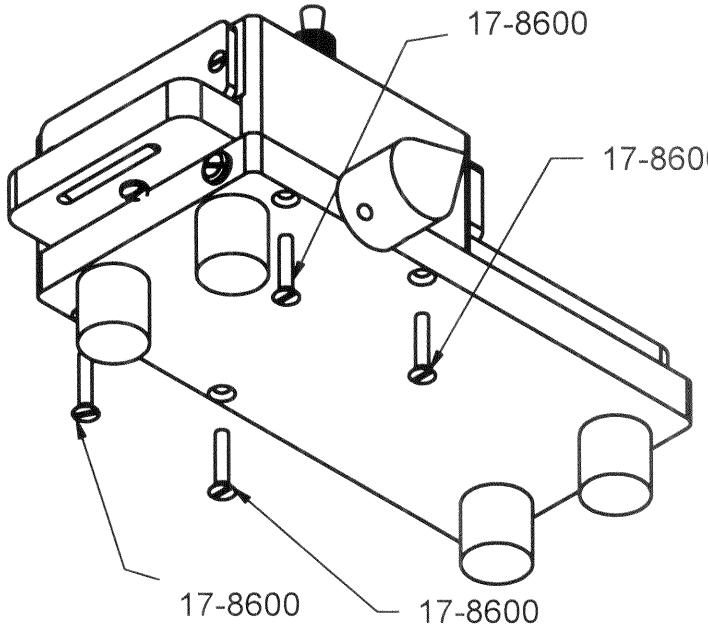
SHEET 274B

REVISION HISTORY			
REV	DESCRIPTION	DATE	BY
1	VALID	2-7-12	CMC
2	REDESIGN	6-11-12	CMC









DWN JGW	DATE 3-24-20	CHK	DATE	APP NGW	DATE 3-24-20		
DWG NUM: 4142-274						SCALE: 1/2	
TITLE M 44-110-4 STEP 3							
LUDLUM MEASUREMENTS, INC. 501 OAK STREET SWEETWATER, TEXAS 79556				SERIES 142		SHEET 274C	