VIAMED

Work Instructions & Test Methods

Procedures for the Construction of VN202 Oxygen Analyser

Preparation of the Case

Unwrap the new cases and separate them into their component parts, be careful not to lose the case screw which is inside the battery compartment, and the window which is inside the case.

With a strong, sharp blade cut the two mounting pegs nearest the top on the back case down by approximately 1-2mm.

Screening the cases

Wrap masking tape around the sides of the back case, so that about 2mm of tape can be folded into the inside edge of the groove that runs around the case.

Cut away the piece of tape covering the bottom of the case which forms part of the battery compartment.

Wrap tape around the front case, covering the outside but not the inside of the ridge which runs around it.

Wrap tape around the edge of the battery door.

Place all the masked parts down on a suitable surface with their insides upwards for spraying.

Place the top panels down with their largest face upwards as this will become the inside surface.

With the screening spray, cover the exposed surfaces from every angle. Allow approximately 15 minutes to dry then repeat.

Remove tape.

Drilling the cases

Stick the top labels to the unsprayed surface of the top panel.

With a 6mm drill bit drill a hole between the Vandagraph logo and the address, below the centre of the panel.

With a 10mm bore, drill a hole in the front case exactly in the middle from left to right and 14mm from the top of the label area.

With a 12mm bore drill a hole in the front case below the first one, exactly in the middle from left to right and 14mm from the bottom of the label area.

Final preparation of case

Remove any dust from the front case and carefully stick on a front label, ensuring there are no bubbles or wrinkles.

From the inside of the case, cut around the holes with a scalpel blade.

On the larger hole, cut a triangular notch about 2mm deep.

Put a switch seal onto the switch and put the switch into the front case aligning the tag with the notch.

Place the small bar onto the back of the switch and screw it in.

Put the rubber washer onto the potentiometer and put into the front case.

Put the crimped washer and the nut onto the potentiometer and tighten, ensuring that when viewed from the front the white dot on the knob moves equal distances clockwise and anti-clockwise from the middle position.

Squirt a small amount of silicone rubber into the channel moulded into the front case and smooth it flat.

Put a battery door into a case back, then stick masking tape over the area where the battery door catch can be seen.

Cover the tape with silicone rubber and fill along the bottom edge of the back case to ensure a watertight seal.

Push a grommet through the top panel from the front making a neat fit if necessary by widening the hole slightly with a reaming tool.

Printed Circuit Board

Assembly

The PCB requires assembling using the principle that components of the lowest height are placed in first. Polarity of IC's, the diode D1 and the capacitor C2 must be observed.

Insert link wire L, ensuring it is flat to the PCB.

Insert all resistors.

Insert diode observing correct polarity.

Insert IC 1 and IC 2 ensuring they are correctly aligned by observing the markings on the PCB.

Insert the 28-way socket.

Insert C1 and C3, polarity is unimportant.

Insert C2 noting that it must be inserted with the negatively marked leg to the outside of the PCB so as to connect to the negative track on the other side of the board.

Insert FET1 so that the flat side is to the outside of the PCB.

Insert P1 with the adjustment screw to the right hand side.

Insert the battery connector ensuring red is to + and black to -.

Take 5 pieces of wire approximately 7cm long, strip and tin both ends.

Solder two pieces into the PCB at the position marked SW.

Solder the other three pieces into the PCB at the position marked VR1.

Spraying the PCB's.

The PCB's require spraying with a conformal coating.
Always use in a well ventilated area.
Always follow the instructions on the can.

Stick a piece of masking tape over the 28-way socket.

Take a piece of copper tape about 6cm long and peel back 1cm of the backing, stick this to the back of the PCB on the exposed part at the bottom at right angles to the bottom edge of the PCB.

Spray the back of the board with conformal coating. Allow to dry.

Turn the PCB over and spray the front.

Attaching the Coiled Cable

Fold dual plugged cable in half and cut into two equal lengths.

Strip about 4cm of outer sleeving being careful not to damage the shield or the inner conductors.

Separate the shield from the wires, twist it and shrink about 3cm of narrow heat shrink tubing over the shield.

Strip about 3-4mm of insulation from the inner conductors.

Carefully tin the inner conductors.

Push the cable through the grommet of a pre-prepared end panel.

Remove the masking tape from the 28-way connector on the PCB.

Insert a tie-wrap down through the bottom of the two holes under the 28-way connector, loop it back through the top hole and through the locking part of the tie-wrap.

Push the coiled cable through the tie-wrap loop on the underside of the board so that the inner conductors are nearest the solder pads where they are to be connected, allow the tie-wrap to grip the cable about 5mm from the end of the sleeving then with a pair of pliers pull the tie-wrap tight. Snip the excess from the tie-wrap.

Solder the yellow wire into the top solder pad and the grey wire into the bottom solder pad, ensuring that there isn't any strain on the wires.

With a soldering iron, on the back of a panel meter join the two halves of the solder pad marked "2".

Insert into 28-way connector ensuring that the side of the DPM with only 10 pins is nearest the top of the board.

Testing the PCB

Solder the 3 wires from the board at the point marked "VR1" to the potentiometer on the front case. They must be connected so that the wire nearest the top of the board goes to the far tag on the pot, the middle wire to the middle tag, and the bottom wire to the nearest tag.

Solder the 2 wires from the board at the point marked "SW" to the switch on the front case.

Connect the battery connector to a variable power supply set at 9V.

Press the switch on the front case to turn the unit on.

Connect the jack plug to a millivolt source, switched off so as to give zero output.

Set the pot on the front case to fully clockwise.

Adjust the trimpot P1 until a reading of 00.0 is observed.

Set the millivolt source to 50mV.

Adjust the pot on the front case to calibrate the monitor to 100.0, the reading should not drift.

Adjust the millivolt source until the LCD reads 88.8 to check the integrity of the LCD segments.

Adjust the millivolt source down to 10.5mV, the LCD should read 21.0 ± 0.2

Switch the millivolt source off checking that the display reads 00.0 adjusting the trimpot P1 if necessary.

Reduce the voltage from the power supply until the low battery indicator can just be seen to appear, the display should not drift by more than 1.0%.

Turn the unit of and back on again. The time elapsed before the auto shut off is activated should be approximately 3 minutes.

Encapsulating the P.C.B.

Cut a strip of conductive foil tape approximately 6cm long.

Stick one end to the back case on the bottom left hand side about 1cm up from the mounting peg, ensure that it is firmly stuck down the inside of the casing and at least 1cm across the back.

Stick the other end to the front case in the same way.

Peel the backing off the tape on the PCB and stick this to the back case above the silicone battery door seal.

Screw the PCB to the back, leaving the screw nearest the battery connector until last.

Put the battery door on the back of the case and connect a battery. Place the battery in the battery door so that the connector is on the right hand side of the case.

Pull the battery wires tight and tuck them into the channel moulded into the case.

Put a washer onto the last screw, separate the red and black wires so that they are to either side of the screw hole and insert the last screw, be careful not to over tighten.

Pull the down the coiled cable and align it so that it is ready to go into the back case ie so that the grommet is to the front.

Pull the shield wire from behind the board so that it will be accessible from the front when the top panel is inserted.

Take a syringe filled with black silicone sealant and fill the gap between the PCB and the back case, including the groove in the back case that the top panel fits into.

Fill between the DPM and the board.

Insert the top panel into the back case, ensuring it goes right into the groove in the back case, then pull the cable through the grommet as far as possible

Take about 3cm of copper tape and stick the splayed shield to the top panel near the left hand case tag, stick the other end of the tape to the tag.

Fill the gap between the DPM and the top panel, being thorough around the grommet area.

Fill around the DPM and put a bezel over it. It may be necessary to pull on the coiled cable to allow the bezel space to fit.

Fill the gap around every side of the PCB, then completely encapsulate the board so that no part of any component can be seen, this ensures the board will not be affected by water.

Allow the sealant to cure, this is best done overnight.

Sealing the instrument

Retest the instrument as before, adjusting the trimpot back to 00.0 if necessary.

With a multimeter test the continuity between the back case, front case and top panel. If the meter can be made to ring through then the continuity is good.

Take a DPM window and peel off any stickers on the front but not the protective film.

Peel off the card on the back of the window to expose the adhesive, peel off the protective film that is on the DPM itself and stick the window to the DPM being careful not to trap any dust between the two.

Partly close the case to see if the window looks level, this is best done with the instrument on so as to see if the display looks correct. Adjust the window and retry if necessary.

Take a case window and insert it firmly into the front case, this is best done by using the plastic bag that the window came in to push the window into place to avoid creating fingerprints

Gently run a soldering iron around the edges of the window to fix it into place.

Take the front case and hold it over the top of the back then run a line of silicone sealant down the groove on the left hand side of the back case.

Carefully lift the front case back over to the left hand side trying not to touch the line of sealant just laid.

Lay sealant along the edge of the top panel, the bottom and right hand edges of the back case.

Peel the protective label off the DPM and quickly close the case ensuring not to trap any wires particularly at the bottom edge. If wires do get trapped they can be pushed in with a thin screwdriver.

Insert a case screw and tighten. Do not over tighten.

Place the instrument into a plastic hobby vice which has its jaws covered with foam rubber. It should grip the instrument about 1cm from the top and not be too tight.

Make one final check that the edges of the case are snapped closed as far as they can go before leaving the sealant to cure, again leave overnight if possible.

Finishing off the analyser

Retest analyser as mentioned in **Testing the PCB.**

Remove all the excess silicone rubber from the case, including inside the battery compartment.

Any rubber in the side grooves of the casing can be removed with a scalpel.

Stick a back label onto the case.

Stick a label on the front at the bottom.

These two labels are the only two labels that will be different if the monitors have been made with customer specific labels.

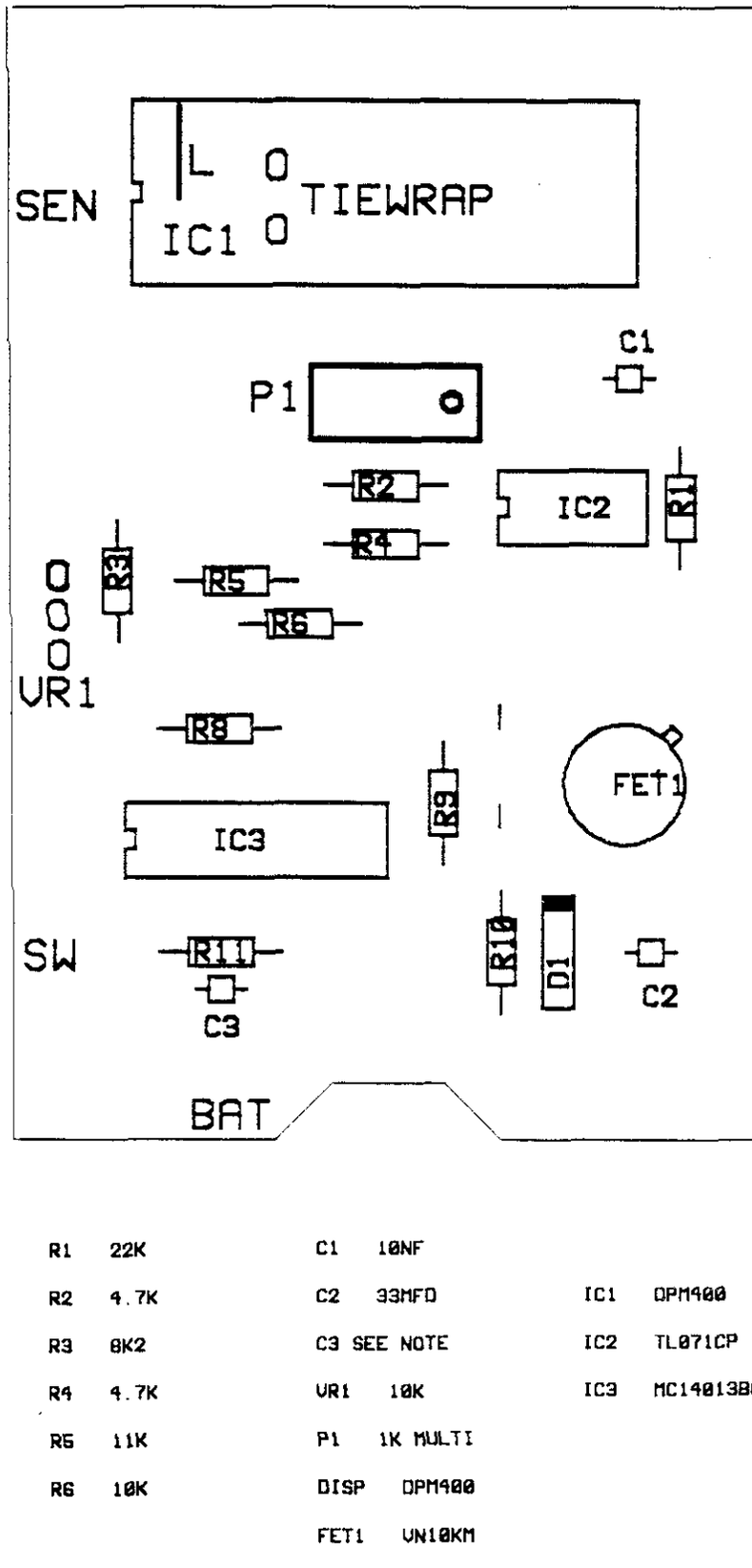
Stick a serial number label inside the battery compartment.

Place battery in the compartment and close the battery door.

Ensure the cable is clean and free from rubber.

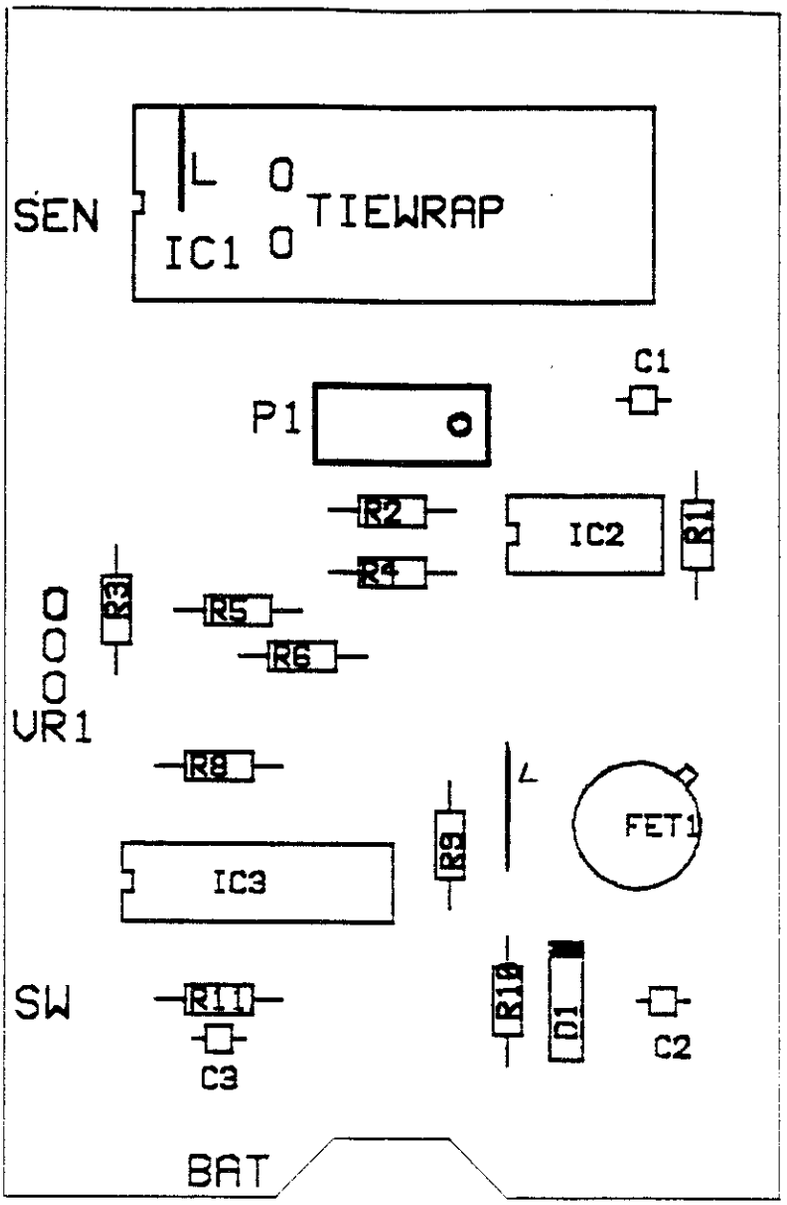
Clean the entire instrument with silicone polish using a soft cloth or kitchen roll.

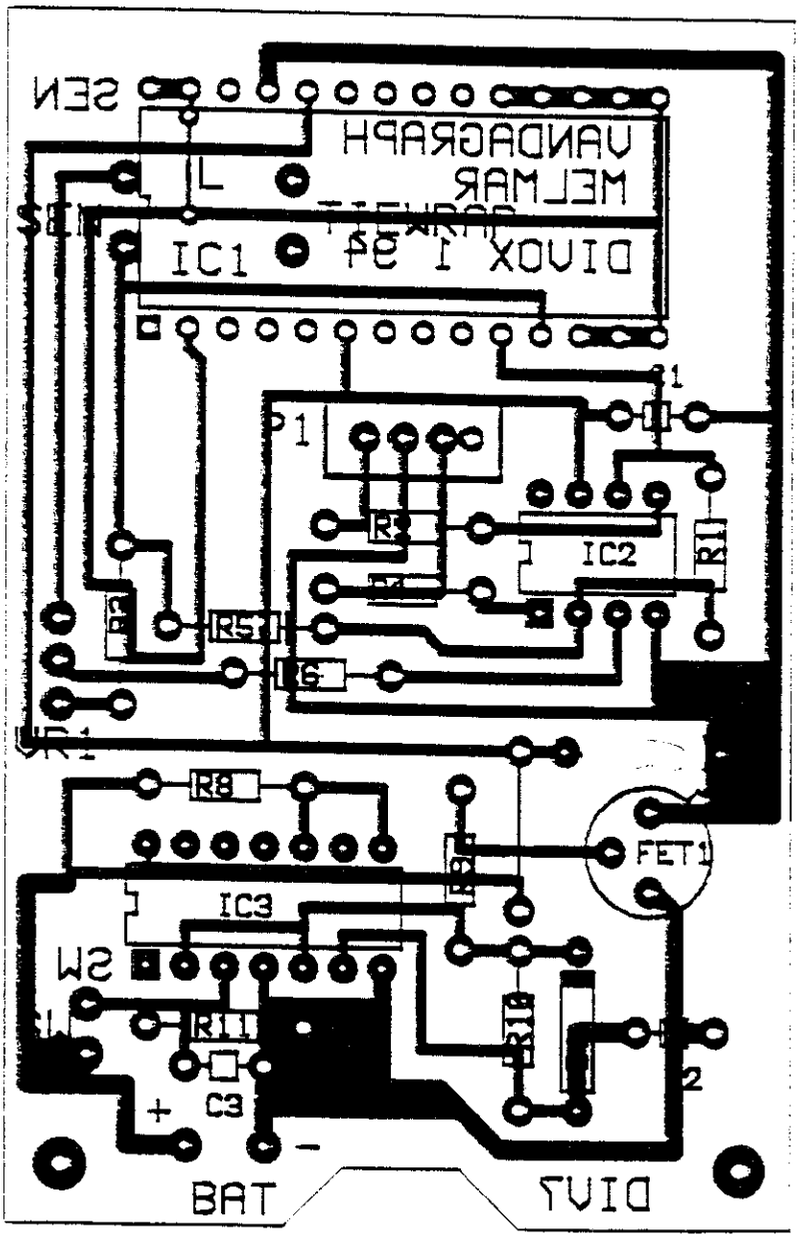
Place the analyser into a bag making sure the coiled cable is down the side of the instrument and not across the labels as this can leave a lasting mark on them.



R1	22K	C1	10NF		
R2	4.7K	C2	33MFD	IC1	DPM400
R3	8K2	C3	SEE NOTE	IC2	TL071CP
R4	4.7K	VR1	10K	IC3	MC14013BCP
R5	11K	P1	1K MULTI		
R6	10K	DISP	DPM400		
		FET1	VN10KM		
R8	10K				
R9	10K	D1	1N418		
R10	6M8				

COMPANY VANDAGRAPH	DRAWING BY MELMAR PRODUCTS
MODEL DIVOX MK1 1994	DRAWING NUMBER 0801
DATE 1 AUG 1994	ENGINEER MR J MELVIN


SEN
IC1
TIEWRAP
C1
P1
R2
IC2
R1
R4
R3
R5
R6
VR1
R8
R9
FET1
IC3
SW
R11
R10
D1
C2
C3
BAT


SEN
VANDAGRAPH
MELMAR
IC1
DIVOX 1 94
P1
R3
IC2
R1
R5
R6
R8
FET1
IC3
SW
R11
R10
C3
+
-
BAT
DIV7

LCD 3½ Digit Meter Instruction Sheet IS1

Covers the following meters

DPM 100, DPM 116, DPM 125, DPM 400, DPM 500	**(Normal)**
DPM 100S, DPM 500S	**(S-type)**
DPM 100 BL, DPM 500 BL	***(LED Backlit)***
DPM 100S BL, DPM 500S BL	**(S-type LED Backlit)**

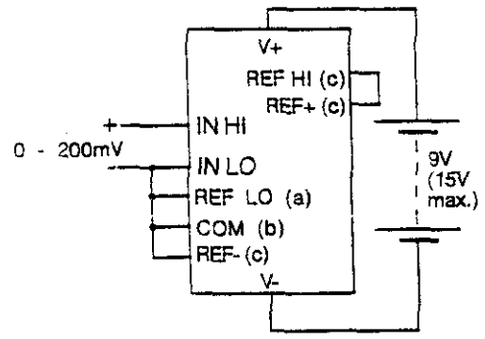
Basic Applications

The following diagrams show the basic measuring configurations. In order to simplify connection, all meters feature on board links. They are either "open" or "short" but may be easily changed by the user. E.g. To connect REF HI to REF+ on the DPM 500 short out Link 1 with a blob of solder.

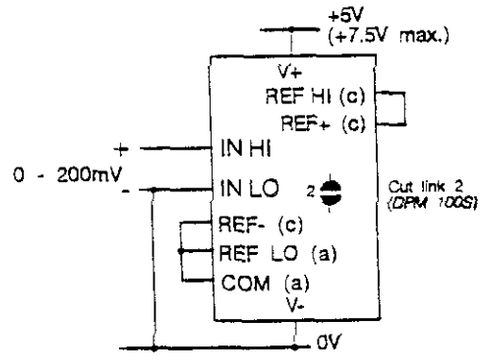
Ensure that inputs are not taken beyond the supply voltage. With non-"S" type meters, use a battery or an isolated supply because V- cannot be connected to signal ground. Do not connect more than one meter to the same power supply if the meters cannot use the same signal ground.

For advice on other operating modes contact Lascar or appointed agent.

Measuring voltage



Floating Input

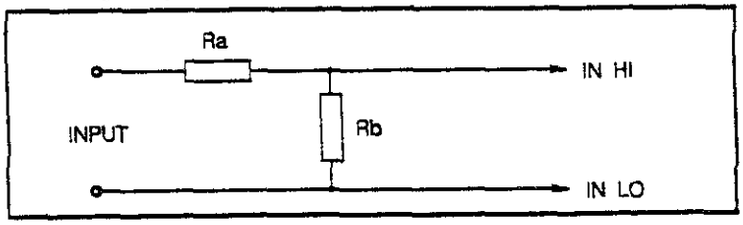


Single ended "S" type input - DPM 100S & DPM 500S only

Note: (a) Except DPM 100 and DPM 116
(b) Except DPM 100
(c) DPM 500 only

Input Scaling

The meter has a full scale reading (F.S.R.) of 200mV. This may be changed by the use of two resistors.



REQUIRED F.S.R.	Ra	Rb
2V	910k	100k
20V	1M	10k
200V	1M	1k
2kV	1M	100R
200µA	0R	1k
2mA	0R	100R
20mA	0R	10R
200mA	0R	1R

Driving Decimal Points/Annunciators

DPM 100, 116, 125, - Connect relevant "DP" Pin to V+.

DPM 400, 500 and DPM 100 annunciators - Connect relevant pin to "XDP".

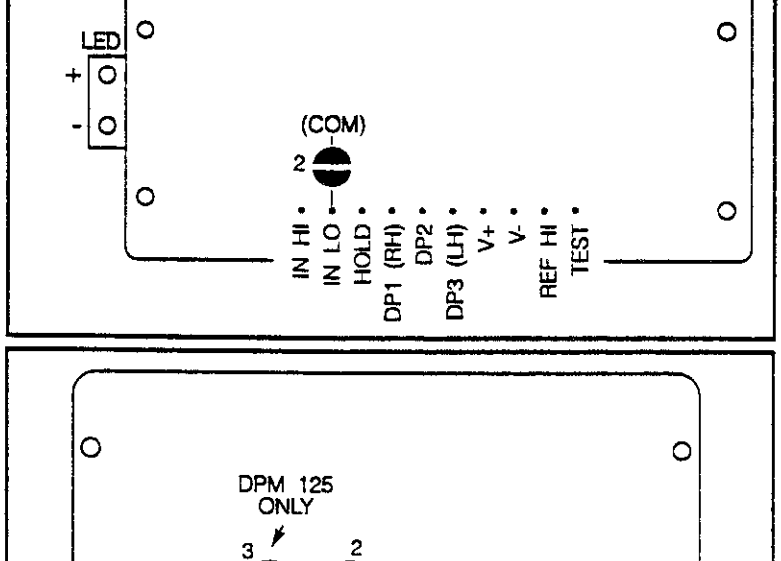
LED Backlit Versions

Apply 5V D.C. to the backlight tab on the side of the meter. Typical current is 30mA. For higher voltages fit a resistor in series. *E.g. for 9V use R= 150Ω. Maximum current = 60mA.*

Pin Connections - Rear View

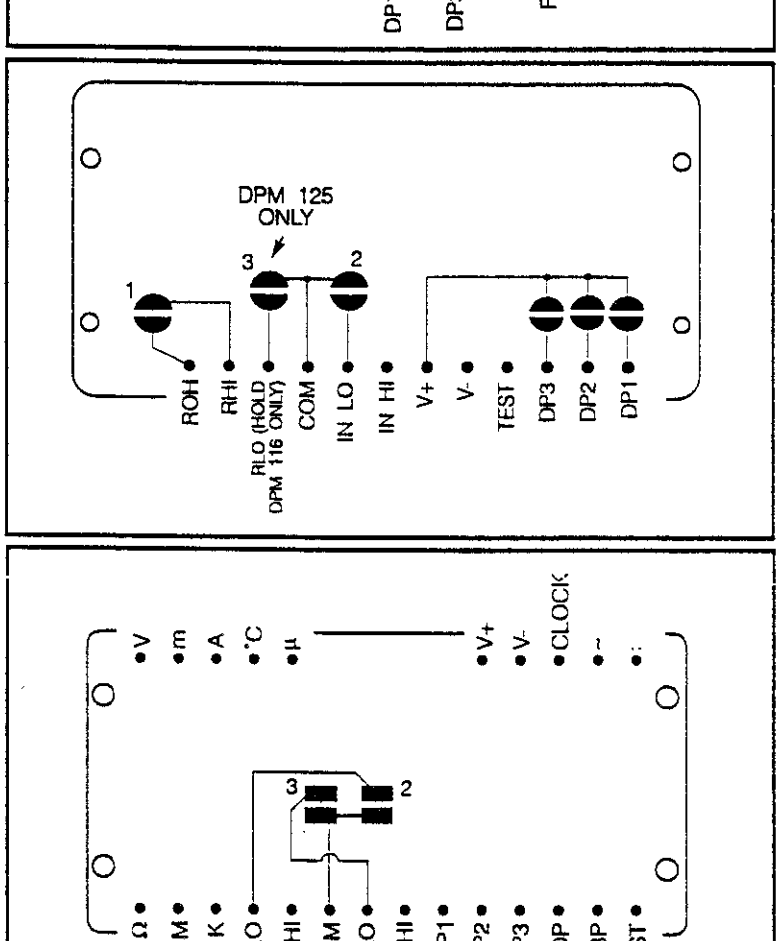
DPM 100 (S) (BL)

Panel cut-out 57mm x 27mm
(2.24" x 1.06")



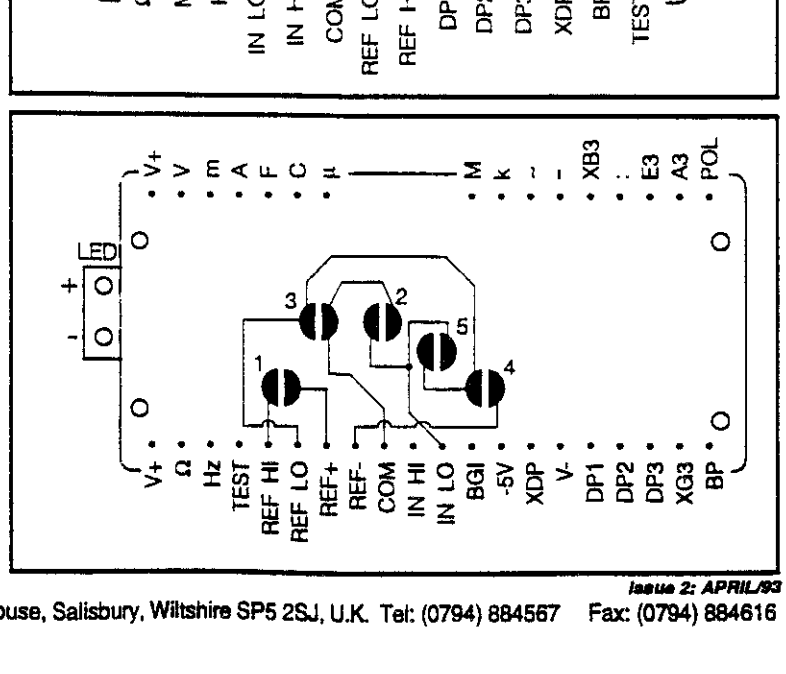
DPM 116/125

Panel cut-out 45mm x 22.2mm
(1.77" x 0.87")



DPM 400

Panel cut-out 45mm x 22.2mm
(1.77" x 0.87")



DPM 500 (S) (BL)

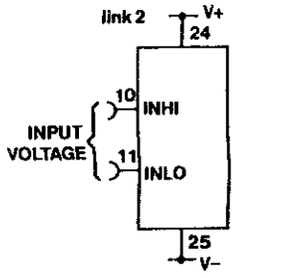
Panel cut-out 57mm x 27mm
(2.24" x 1.06")

LASCAR Lascar Electronics Ltd. Module House, Salisbury, Wiltshire SP5 2SJ, U.K. Tel: (0794) 884567 Fax: (0794) 884616

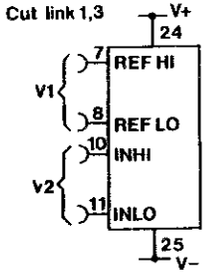
ANALOGUE INPUTS
IN HI, IN LO and REF HI, REF LO are differential inputs. They respond only to the voltage across them and not their voltage with respect to the power supply. However, no input must be higher than 0.5V below V+ or lower than 1.0V about V−. If the power supply is floating with respect to the circuit being monitored, connect IN LO and REF LO to AN COM for best results. If there is any danger that an input may be taken beyond the power supply rails, a series resistor MUST be fitted to limit the input current to less than 100uA.

CIRCUIT CONNECTIONS
The meter can be configured for any of the applications shown below. Interconnections can be made by one of two methods:
1. Via the user's conditioning PCB, terminating at the meter edge connector.
2. Bridging solder across the appropriate solder pad links provided (see circuit diagram).

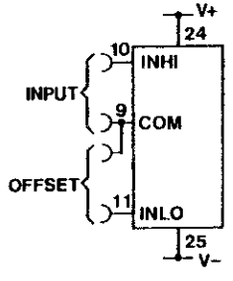
PANEL FITTING
Fit the bezel to the front of the panel and then locate the meter into the bezel from behind. Alternatively the meter and bezel may be assembled before fitting into the front of the panel but care must be taken not to use excessive force.



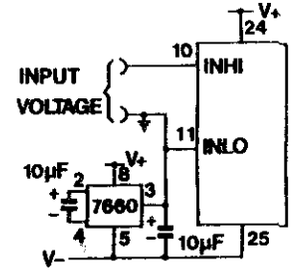
Measuring a floating voltage source of 200mV full scale.



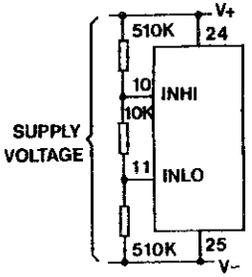
Measuring the ratio of two voltages.
Reading = 1000 V2/V1.



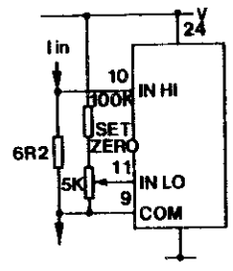
Zero display when the applied input is not zero. The offset and input voltages should be applied as shown.



Measuring a single ended input referenced to supply.



Measuring a supply voltage (min 5V, max 15V).



Measuring 4–20mA to read 0–999.

RS 3½ DIGIT LCD DPM
Stock No. 260-274

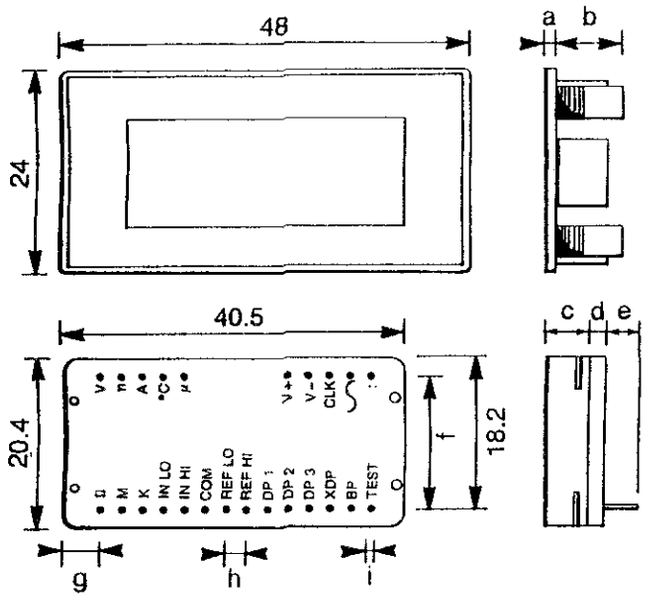
Features:

- △ Ultra-Low Power
- △ Ultra Compact
- △ Annunciators
- △ Snap In Bezel

A uniquely compact LCD DPM ideally suited for low or high volume applications. The meter has a 28 pin DIL integrated circuit format and can be plugged directly into a DIL socket or panel mounted using the snap-in bezel provided. The low profile bezel incorporates a flat reverse printed window giving a superb appearance that cannot be damaged or rubbed off by contact.

The meter features Auto-Zero, Auto-Polarity, 200mV FSD, 10mm digit height and Programmable Decimal Points. On card solder pads for essential interconnections make selection of operating modes quick and easy with the minimum of external wiring. Very low current consumption allows long battery life making it especially useful in portable equipment.

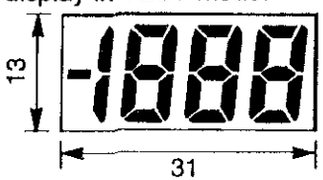
SPECIFICATION	MIN	TYP	MAX	UNIT
Accuracy (±1 count)		0.05	0.1	%
Linearity			±1	Count
Sample Rate		3		per sec
Temp. Stability		100		ppm/°C
Temp. Range	0		50	°C
Supply Voltage	7.5	9	15	V
Supply Current		150	200	µA
Max D.C. Input Voltage			±20	V
Input Leakage Current (Vin = 0V)		1	10	pA
Low Battery Threshold		7.5		V



a. 1.5	f. 15.24
b. 8.5	g. 3.7
c. 5.0	h. 2.54
d. 1.6	i. 0.5
e. 4.0	

Panel cut-out
45 × 22

Actual viewing area showing display in TEST mode.

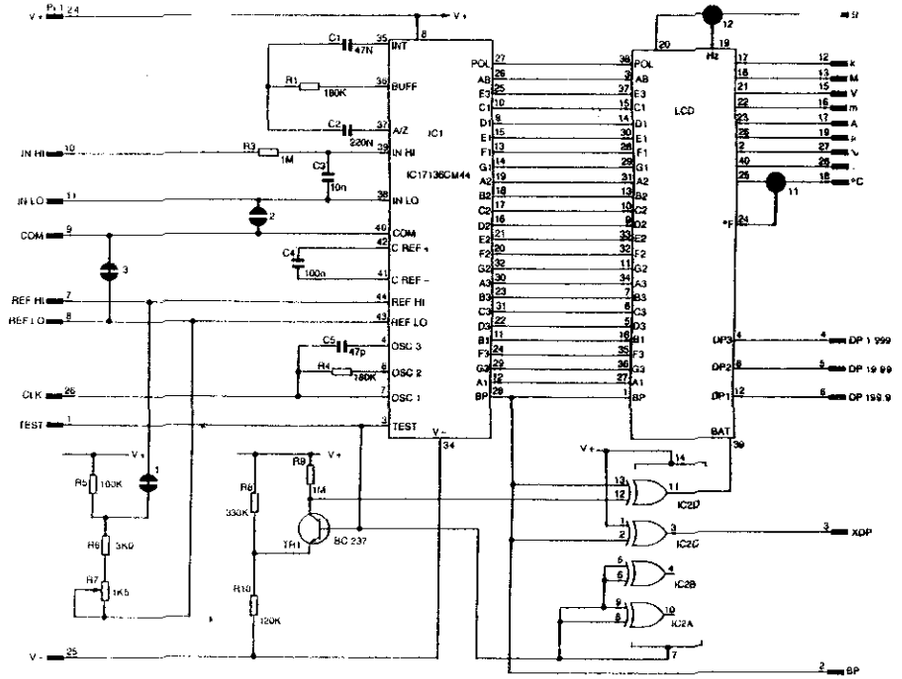


PIN FUNCTIONS

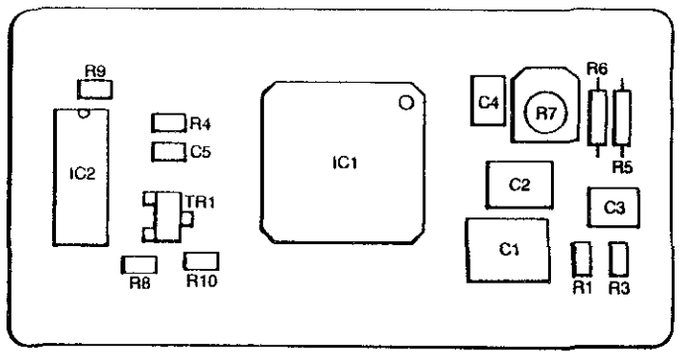
1. TEST. Connect to V+ to display segments as illustrated. It should NOT be operated for more than a few seconds as the DC voltage applied to the LCD may "burn" the display. This pin is normally at 5V below V+ and is the ground f or the digital section of the meter. It can be used to power external logic up to a maximum of 1mA.
2. BP. LCD Back Plane drive waveform.
3. SDP. Connect to required annunciators/DPs (see note).
4. DP3. 1.999
5. DP2. 19.99
6. DP1. 199.9
7. REF HI. Positive input for reference voltage (connected via link 1 to internal reference).
8. REF LO. Negative input for reference voltage (connected via link 3 to com).
9. COM. The ground for the analogue section of the converter, held actively at 2.8V (nom) below V+. COM must not be allowed to sink, excessive current (>100uA) by connecting it directly to higher voltage.
10. IN HI. Positive measuring input.
11. IN LO. Negative measuring input.
24. V+. Positive power supply.
25. V–. Negative power supply.
26. CLOCK. Clock output may be used for systems timing or as an input to override the internal oscillator and control the sample rate.

SPECIAL NOTE: ANNUNCIATORS
The DPM annunciators (DPs, °C, etc.) can be shown by connecting them to XDP. However, as these annunciators are normally "floating", under certain conditions they may appear when not wanted. To suppress unwanted annunciators link them to the Back Plane (pin 2). If the annunciators are being switched, connect them via a 1M resistor to pin 2. The annunciators will operate normally when connected to XDP. Ensure that an annunciator is NOT connected directly to the XDP and BP at the same time.

CIRCUIT DIAGRAM

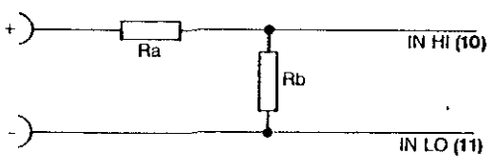


COMPONENT LAYOUT



APPLICATIONS

Input Scaling: Two resistors may be used to alter the full scale reading of the meter – See Table.



Required F.S.D.	Ra	Rb
2V	910K	100K
20V	1M	10K
200V	1M	1K
2000V	1M	100R
2µA	LINK	1K
2mA	LINK	100R
20mA	LINK	10R
200mA	LINK	1R

Vandagraph Ltd
VN202 Analyser
Quality Control

Serial Number:

Production Number:

Initial Test of Board and calibration

(01) Connect Variable Power supply and Set to 9V

Test On / Off Button ☐

(02) Connect Micro Cal and Set to 00.0
Set VR1 to fully clockwise
Calibrate Pot P1 So LCD reads 00.0

No Drift ☐

(03) Set Micro Cal to 50 mV
LCD displays Approx 150.0
Set VR1 so LCD displays 100.0

Set Micro Cal to 44.4 mV LCD Displays 88.8 ☐

(04) Set Micro Cal to 10.5 mV LCD Displays 21.0 ☐

(05) Set Micro Cal to Zero LCD Displays 0.00 ☐

(06) Reduce PSU until battery symbol just visible
Voltage reads 7.2v +/- 0.5V

LCD Drift <1.0 ☐

(07) Auto Shut off test 2.45 - 3.15 minutes ☐

Signed:_____Date:_____

Test of Board Prior to Sealing

(08) Connect Variable Power supply and Set to 9V

Test On / Off Button ☐

(09) Connect Micro Cal and Set to Zero
Set VR1 to fully clockwise
Calibrate Pot P1 So LCD reads 00.0 if required

No drift ☐

(10) Set Micro Cal to 50 mV
LCD displays Approx 150.0
Set VR1 so LCD displays 100.0

Set Micro Cal to 44.4 mV LCD Displays 88.8 ☐

(11) Set Micro Cal to 10.5 mV LCD Displays 21.0 ☐

(12) Set Micro Cal to Zero LCD Displays Zero ☐

(13) Reduce PSU until battery symbol just visable

Voltage reads 7.2V +/- 0.5V , LCD Drift < 1.0 ☐

(14) Auto Shut off test 2.45 -3.15 minutes ☐

(15) Current Test (Vn202 Off) < 100uA ☐

Signed:_____Date:_____

Final Test Before Dispatch

(16) Insert Battery LCD reads 0.00 +/- 0.2 ☐

Connect Micro Cal and Set to 50mV
Calibrate VN202 to 100.0
Set Micro Cal to 44.4mV

VN202 reads 88.8 +/- 0.2 ☐

(18) Set Micro Cal to 10.5mV

VN202 reads 21.0 +/- 0.2 ☐

(19) Auto shut off 2.45 - 3.15 minutes ☐

(20) Place S/N inside Battery Compartment ☐

(21) Clean VN202 ready for dispatch ☐

Signed:_____ Date:_____

Fault Comments:

Vandagraph Ltd VN202 Analyser Quality Control

Serial Number:

Production Number:

Initial Test of Board and calibration

(01) Connect Variable Power supply and Set to 9V

Test On / Off Button ☐

(02) Connect Micro Cal and Set to 00.0
Set VR1 to fully clockwise
Calibrate Pot P1 So LCD reads 00.0

No Drift ☐

(03) Set Micro Cal to 50 mV
LCD displays Approx 150.0
Set VR1 so LCD displays 100.0

Set Micro Cal to 44.4 mV LCD Displays 88.8 ☐

(04) Set Micro Cal to 10.5 mV LCD Displays 21.0 ☐

(05) Set Micro Cal to Zero LCD Displays 0.00 ☐

(06) Reduce PSU until battery symbol just visible
Voltage reads 7.2v +/- 0.5V

LCD Drift <1.0 ☐

(07) Auto Shut off test 2.45 - 3.15 minutes ☐

Signed:_____Date:_____

Test of Board Prior to Sealing

(08) Connect Variable Power supply and Set to 9V

Test On / Off Button ☐

(09) Connect Micro Cal and Set to Zero
Set VR1 to fully clockwise
Calibrate Pot P1 So LCD reads 00.0 if required

No drift ☐

(10) Set Micro Cal to 50 mV
LCD displays Approx 150.0
Set VR1 so LCD displays 100.0

Set Micro Cal to 44.4 mV LCD Displays 88.8 ☐

(11) Set Micro Cal to 10.5 mV LCD Displays 21.0 ☐

(12) Set Micro Cal to Zero LCD Displays Zero ☐

(13) Reduce PSU until battery symbol just visable

Voltage reads 7.2V +/- 0.5V , LCD Drift < 1.0 ☐

(14) Auto Shut off test 2.45 -3.15 minutes ☐

Signed:_____Date:_____

Final Test Before Dispatch

(15) Insert Battery LCD reads 0.00 +/- 0.2 ☐

(16) Connect Micro Cal and Set to 50mV
Calibrate VN202 to 100.0
Set Micro Cal to 44.4mV

VN202 reads 88.8 +/- 0.2 ☐

(17) Set Micro Cal to 10.5mV

VN202 reads 21.0 +/- 0.2 ☐

(18) Auto shut off 2.45 - 3.15 minutes ☐

(19) Place S/N inside Battery Compartment ☐

(20) Clean VN202 ready for dispatch ☐

Signed:_____Date:_____

Fault Comments:

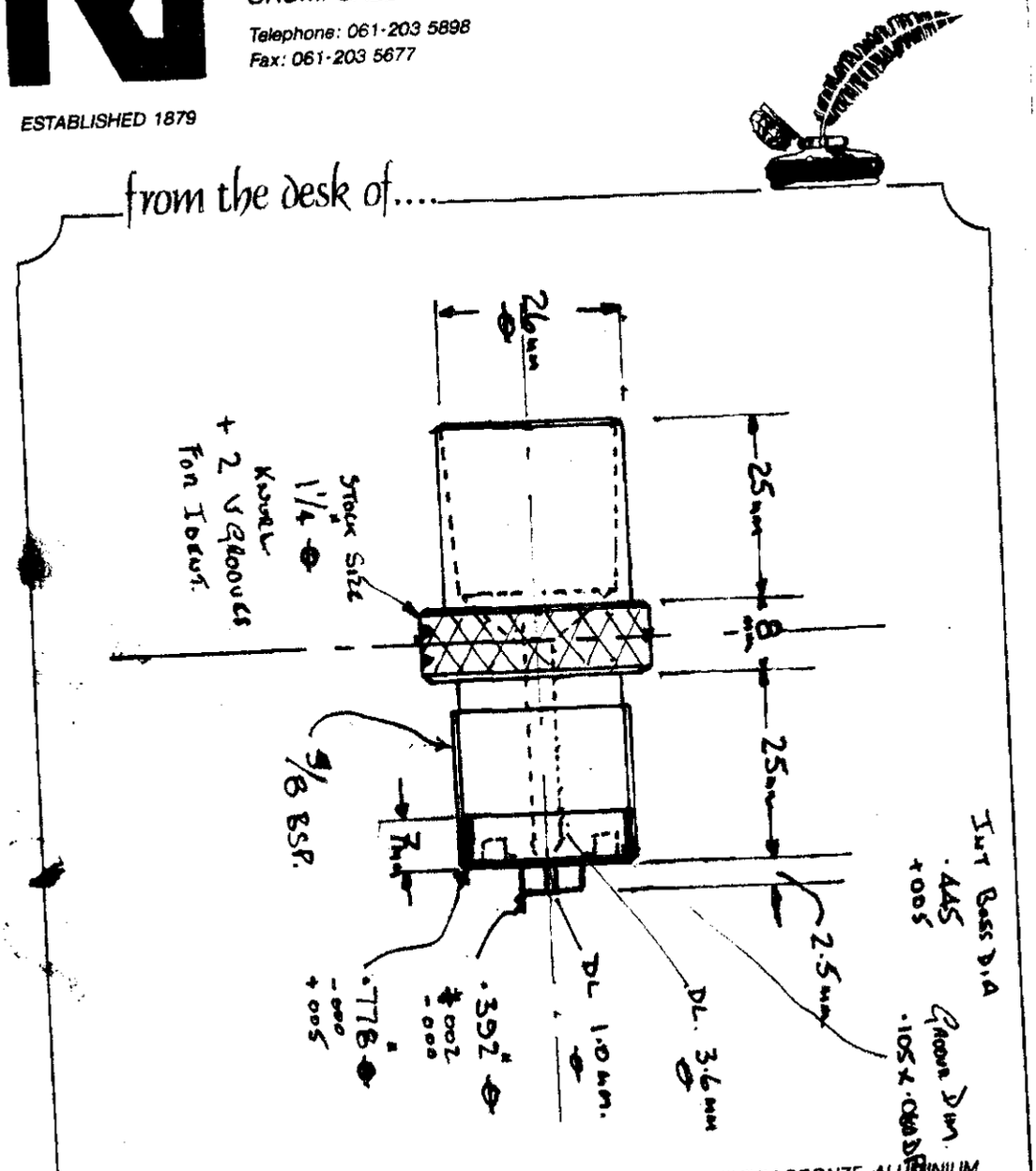
HOLME DODSWORTH METALS LIMITED

UNIT 2 VALE PARK INDUSTRIAL ESTATE
HAZELBOTTOM ROAD
CRUMPSALL MANCHESTER M8 0GF

Telephone: 061-203 5898
Fax: 061-203 5677

ESTABLISHED 1879

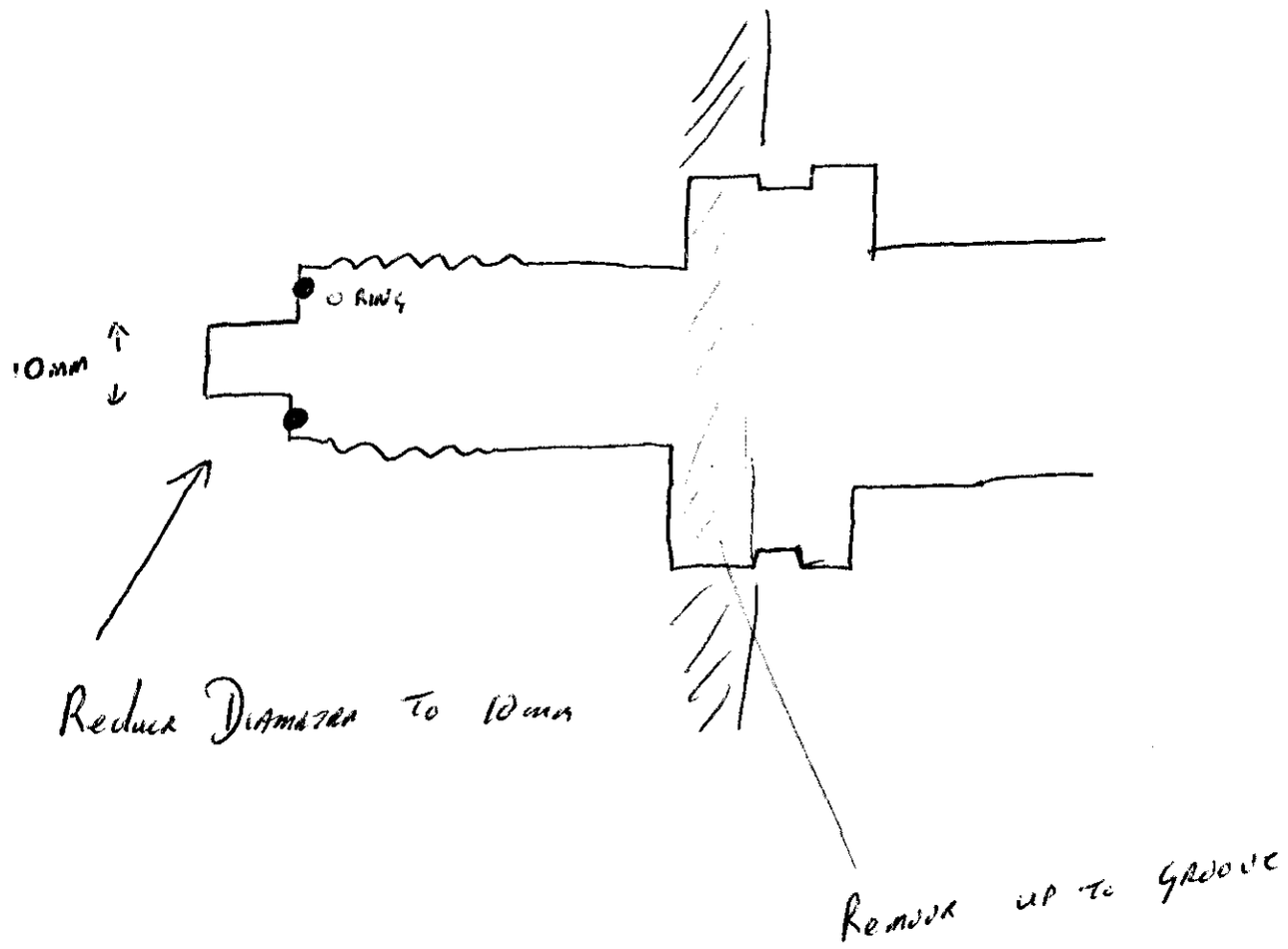
from the desk of....



STOCKHOLDERS OF: COPPER, BRASS, PHOSPHOR BRONZE, ALUMINIUM BRONZE, ALUMINIUM AND ALLOYS, STAINLESS STEEL AND CON CAST IRON.

VIAMED

Peter



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