

COMPANY OPERATING PROCEDURE

Construction / Assembly VM3/COP/40.05

Date: 23 Sep. 03

Revision Date: 13-Sep-11

Issue: 1

“A” Preparation of the Case

- 1.0 Unwrap the new cases and separate them into their component parts, being careful not to lose the case screw, which is inside the battery compartment, and the window, which is inside the case.
- 2.0 With a strong sharp blade, cut the two mounting pegs nearest to the top on the back case, down by approximately 1 – 2mm.

“B” Screening the Cases

- 1.0 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.
- 2.0 Cut away the piece of tape covering the bottom of the case, which forms the battery compartment.
- 3.0 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.
- 4.0 Place all the masked parts down on a suitable surface with their inside upwards for spraying.
- 5.0 Place the top panels down with their largest face upwards as this will become the inside surface.
- 6.0 With the screening spray, cover the exposed surfaces from every angle. Allow approximately 15 minutes for everything to (p) dry, then repeat the spraying process for a further coat. When fully dry, remove the tape. **Be careful not to over spray as this may interfere with the sealing of the case.**

“C” Drilling the Cases

- 1.0 Stick the top labels to the unsprayed surfaces of the top panel.
- 2.0 With a 6mm drill bit, drill a hole between the Vandagraph Logo and the address, below the centre of the panel.
- 3.0 With a 10mm drill bit, drill a hole in the front case exactly in the middle, from left to right, and 14mm from the top of the label area.
- 4.0 With a 12mm drill bit, 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.

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“D” Final Preparation of the Case

- 1.0 Remove any dust, and drilling swarf, from the front case and carefully stick on a “Front Label”, ensuring that there are no bubbles or wrinkles on the label.
- 2.0 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. (Place a 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 rubber washer onto the on/off switch and insert ensuring the correct position, push in firmly, then place the bar across the back of the switch inside the case and screw in place.
- 3.0 Put rubber washer on potentiometer and place in top hole, 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. Inside the case put the longest leg to the top. When tightened bend these apart.
- 4.0 Squirt a small amount of silicone rubber into the channel moulded into the front case, and smooth it flat. // Put a battery door into the back case, and 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.
- 5.0 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. These have a flaw in them and this should be on the inside.

“E” P.C.B. Assembly

- 1.0 The P.C.B. requires assembling using the principle that components of the lowest height are place in first. Polarity of IC's, the Diode D1 and the Capacitor C2 must be observed.
 - a) Insert link wire L, ensuring it is flat to the P.C.B.
 - b) Insert all resistors.
 - c) Insert Diode observing correct polarity.
 - d) Insert IC 2 & IC 3 ensuring that they are correctly aligned, by observing the markings on the P.C.B. Solder pins 3 and 4 together (top left to right).
 - e) Insert the 28 way socket ensuring that they are correctly aligned, by observing the markings on the P.C.B.
 - f) Insert C1 & C3 – polarity is not important.

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- g) Insert C2 noting that it must be inserted with the negatively marked leg to the Outside of the P.C.B. so as to connect to the negative track on the other side of the board. **As indicated on PCB.**
- h) Insert FET1 so that the flat side is to the outside of the P.C.B. **As indicated on PCB**
- i) Insert P1 with the adjustment screw to the right hand side. **As indicated on PCB**
- j) Insert the battery connector ensuring Red is to + and black is to -.
- k) Take 5 pieces of wire approximately 7cm long, strip and tin both ends.
- l) Solder 2 pieces into the P.C.B. at position marked SW. Solder the other 3 pieces into the P.C.B. at the position marked VR1.
- m) **Place two production stickers inside the front case, one between the switches and one inside the battery compartment, these are sequential numbers use to ensure that there is no tampering of the serial number at a later date. These are listed and linked the the serial number and LCD batch number.**

“F” P.C.B. Spraying

- 1.0 The P.C.B. requires spraying with a conformal coating. Always use in a well-ventilated area. Always follow the Instructions on the can.
- 2.0 Place 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 P.C.B. on the exposed part at the bottom, at right angles to the bottom edge of the P.C.B.
- 3.0 Spray the back of the board with conformal coating. Allow to dry. Turn the P.C.B. over and spray the other side.

“G” Attaching the Coiled Cable.

- 1.0 Fold the dual plugged cable in half and cut into two equal lengths.
- 2.0 Strip about 4cm of the 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 over the shield.) **cut short then protect it using insulation tape, so the are no risks of shorting.**
- 3.0 Strip about 3 – 4 mm of insulation from the inner conductor. Carefully tin the inner conductors.
- 4.0 Push the cable through the grommet of a pre-prepared end panel. Remove the masking tape from the 28-way connector on the P.C.B.

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- 5.0 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.
- 6.0 Push the coiled cable through the tie wrap loop on the underside of the board so that the inner conductors are nearest to the solder pads where they are connected, allow the tie wrap to grip the cable about 5mm from the end of the sleeving, then with pair of pliers, pull the tie-wrap tight. Snip the excess from the tie wrap.
- 7.0 Solder the (yellow)black wire into the top solder pad, and the (grey) white wire into the bottom solder pad, ensuring that there isn't any strain on the wires.
- 8.0 With a soldering iron, on the back of the 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 to the top of the board. **On the reverse of the LCD place a batch number (usually the date) for identification and make sure they are listed with the production number and serial number and date manufactured.**

"H" Testing the P.C.B.

- 1.0 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.
- 2.0 Solder the two wires from the board at the point marked "SW" to the switch on the front case.
- 3.0 Connect the battery connector to a variable power supply set at 9v. Press the switch on the front case to turn the unit on.
- 4.0 Connect the Jack Plug to a millivolt source, switch off so as to give Zero output. Set the pot on the front case to fully clockwise. Adjust the Trim-pot "P1" until a reading of 00.0 is observed.
- 5.0 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.
- 6.0 Adjust the millivolt source until the LCD reads 88.8, to check the integrity of the LCD segments.

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- 7.0 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 Trim-pot if necessary.
- 8.0 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 off and back on again. The time elapsed before the auto shut-off is activated should be approximately 3 minutes.

“J” Encapsulating the P.C.B.

- 1.0 Cut a strip of conductive foil tape approximately 6cm long. **Make sure it touch the back of the board and it is fixed firmly.** 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.
- 2.0 Stick the other to the front of the 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.
- 3.0 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.
- 4.0 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 to either side of the screw hole and insert the last screw, **be careful not to over-tighten.**
- 5.0 Pull down the coiled cable and align it so that it is ready to go into the back case i.e. 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.)
- 6.0 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.
- 7.0 Insert the top panel into the back case, ensuring it goes right into the groove in the back case, and then pull the cable through the grommet as far as is possible.
- 8.0 (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.)

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- 9.0 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.
- 10.0 Fill the gap around every side of the PCB. Allow the sealant cure, this is best done by being left over-night.

“K” Sealing the Instrument

- 1.0 Retest the instrument as before (section “H” 3.0 – 8.0), adjusting the trim-pot back to 00.0 as necessary.
- 2.0 With a multimeter, test the continuity between the back case, front case and the top panel. If the meter can be made to ring through, then the continuity is good.
- 3.0 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.
- 4.0 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.
- 5.0 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.
- 6.0 Gently run a soldering iron around the edges of the window to fix it into place.
- 7.0 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. Gently lift the front case back over to the left hand side, trying not to touch the line of sealant just laid.
- 8.0 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.
- 9.0 Insert a case screw and tighten. **Do not over-tighten.**

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- 10.0 Place the **top of the** instrument into a (plastic hobby vice) **clamp** (which has its jaws covered with foam rubber). It should be able to grip the instrument about 1cm from the top, and not be too tight. **Ensure this doesn't touch the case window**
- 11.0 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, this is best done by leaving over-night. **Wipe off all excess sealant before leaving including inside the battery door and on the cable.**

"L" Finishing off the Analyser

- 1.0 Retest the Analyser as before (section "H" 3.0 – 8.0).
- 2.0 (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.)
- 3.0 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 labelling.
- 4.0 Attach a serial number label on the inside of the battery compartment **over the production label**. Place the battery into the compartment and close the door.
- 5.0 Ensure the cable is clean and free from rubber. Clean the entire instrument with silicone polish using a soft cloth or kitchen roll.
- 6.0 Place the Analyser into a bag, making sure that the coiled cable is down the side of the instrument, and not across the labels, as this can leave a lasting mark on them.
- 7.0 **Label the bag with a serial number label. Batteries should be removed prior to despatch or storage. But are best left on for a couple of days to ensure no problems develop eg. Drifting or draining.**
- 8.0 **None auto switch off can be enabled by connecting together both points of C2 and a green on/off switch being used.**

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