SSD-100 SOLID STATE CROSS DISPLAY

OPERATING INSTRUCTIONS

CALIBRATION

Calibration of the SSD-100 Display is accomplished by setting the two gain pots at the top edge of the SSD-100 board (R17 and R18).

The Mark Gain pot (R17) is near the front panel MARK VFO and the Space Gain pot (R18) is near the front panel SPACE VFO.

The Intensity Threshold pot (R11) is mounted halfway down the left side of the SSD-100 board.

Turn ON the MPC Series terminal unit, set the Mode switch to MS-REV and set the LEVEL control to 12 o'clock.

Tune in the Mark and Space tones from the AFSK tone keyer, using both the SSD-100 display and the individual Mark and Space LEDs mounted directly above the VFOs.

With both channels peaked for maximum amplitude, set the Mark and Space Gain pots so that seven (7) LEDs on each side of the center pair (apex) are fully lit.

After a five minute warm-up, check the gain pots again. The display driver circuitry has a high degree of hysterisis and the gain in each channel may be set so that the seventh LED is "hard-on" and the eighth LED is fully off.

Set the Intensity Threshold potentiometer (R11) at mid-scale.

Block the ambient light flow to the photocell in the lower left quadrant of the display. (Use your thumb.) The light output of the display should drop to about half of the normal intensity. If not, adjust R11 so that this action occurs smoothly.

OPERATION AND INTERPRETATION

The incoming Mark signal is displayed on the horizontal line of LEDs and the space channel is displayed vertically.

The two LEDs (DS1 and DS2) at the apex of the cross are connected to the terminal unit's Signal Loss circuit.

When the two incoming tones are tuned-in properly, these two center LEDs will light, forming a complete cross.

If the terminal unit is incorrectly tuned, such as both channels tuned to the same tone, a cross will be displayed, but the center LEDs will not light, and a separate LED in the lower right-hand quadrant (DS5) will light, indicating that the terminal unit has automatically gone into Markhold.

This separate LED also lights when the terminal unit is switched to Standby (MPC-1000C) or Send (MPC-1000CR and MPC-1000R).

If the terminal unit is tuned to a steady Marking signal, the LEDs at the center of the cross will not light if the "sense" of the terminal unit is upside down. Reversing the NORMAL-REVERSE switch will cause the LEDs to light; filling in the line of lit LEDs.

A second separate LED (DS4) in the upper right quadrant monitors the high level loop supply and duplicates the indication from the front panel LOOP LED. This LED has been included in the SSD-100 display for operator convenience.

The SSD-100 also includes a unique Multipath Distortion Indicator (MDI) in the upper left quadrant. This LED (DS3) flashes in the presence of time or frequency dispersive multipath distortion. Its operation can be checked by tuning both channels of the terminal unit to the same incoming tone. The intersymbol interference generated by the RY Generator (MS-REV) will also flash this MDI LED.

The Multipath Distortion Indicator circuit consists of U3, Q2, DS3 and their associated components. To understand the validity of the MDI, it must be explained that terminal units generally use non-identical channel filters in the Mark and Space channels. For this reason, both filters exhibit their own characteristic group-response, time-delay, overshoot, ringing, etc. These non-identical filters have a tendency to distort the mark and Space channel signals unequally. The channel filters in the MPC Series terminal units are identical Bessel Function filters. Their Bessel characteristic makes them very "tame" in the presence of pulse signals (RTTY pulses in particular) and prevents ringing and overshooting.

Since they are identical, any distortion added to one channel is also added to the other channel.

The MDI monitors the output of the two channel filters. One channel is inputted to pin 8 of U3. The other channel is inputted to pin 9 of U3. This integrated circuit is a two-input NAND gate. If both channels contain amplitude energy simultaneously, the output of U3 (pin 10) goes LOW, i.e., zero. This is the normal function of a two-input NAND gate. This LOW is applied to three more NAND gates that are connected as inverters, whose outputs immediately go HIGH and drive Q2 into conduction. When Q2 conducts, the MDI (DS3) is turned on.

In this way, whenever the Mark and Space channels simultaneously

contain a significant amount of amplitude energy, the MDI will flash. By definition, time and frequency dispersive multipath distortion will flash the MDI.

The voltage dividers (R23/R25 and R24/R26) have been selected to "Flash" the MDI whenever pulse overlap at 45 to 75 bauds exceeds ten percent.

Since 10% bias distortion does not generally increase the error rate, it is best to operate the MPC Series terminal unit with the Multipath Corrector turned off. If the MDI starts to flash, turn the MPC on.

Mark II versions of the MPC Series terminal units and the MPC-1000T TEMPEST terminal unit contain the BBP-100 Binary Bit Processor with automatic multipath correction. Flashing of the Multipath Distortion Indicator (MDI) at DS3 alerts the operator to pulse stretching and suggests a change in frequency or antenna combinations.

VARIATIONS

Provisions have been made for attaching an external intensity control to the SSD-100 (Mark II) at E-Point E1. Resistors R3 and R8 have not been installed, but locations have been provided that would provide part of an external intensity control circuit.

Resistors R21 and R22 are 15 ohm resistors and serve as jumpers.

They have been provided to permit flexibility in implementing the SSD-100 Solid State Display into other than MPC Series terminal units.

SSD-100 SOLID STATE CROSS DISPLAY

INSTALLATION INSTRUCTIONS

FACTORY INSTALLATION OF SSD-100

When an SSD-100 Solid State Cross Display is to be installed in a Dovetron MPC Series Terminal Unit, the following components are not installed on the MPC Main Board A75100-E:

F3, F3 Fuse Clips, C63, C64, C65, C66, C67, CR44(4), CR45, CR46, R173, R174, R175, R176, R177, R178, R179A, R179B, R180, R181, R182, R183, R184, R185, R186A, R186B, R187, R188, R190, R191, R192, R193, R194 and R195.

The photocell socket/leads assembly is not installed.

The CRT socket and cable assembly are not installed.

R114 (originally 1K) is changed to 68 ohms, 1/4 watt, 5%.
R170 (originally 33 ohms) is changed to 120 ohms, 1/4 watt, 5%.
R222 (originally 62K) is changed to 120 ohms, 1/4 watt, 5%.

The yellow wire connected to the cathode of the LOOP LED is moved from E34 to E47.

A jumper wire is installed between CRT-10 feed-thru and ground.

Z37 (originally µ741CP) op-amp is changed to TI TL081CP.

The 8 pin plug-in cable assembly that connects the SSD-100 to the MPC main board is connected to various E-Points and feed-thru holes on the main board per the Installation Chart on SSD-100 Assembly/Schematic Print 75307.

FIELD RETROFIT INSTALLATION OF THE SSD-100K

The SSD-100K retrofit kit consists of an SSD-100 Display Assembly, an SSD Bezel with optical filter, an 8 pin interconnecting cable, 3 replacement resistors, an op-amp (TL081CP), and the necessary hardware to mount the SSD-100 in place of the original CRT assembly.

Since simple modifications are normally more successful than complex ones, only those components that would interfere with the operation of the SSD-100 are removed. Excess components may be removed.

1) Remove and discard the CRT bezel, the mounting screws, the CRT shield, the CRT tube and the CRT socket assembly. When removing the CRT socket assembly, clean out the holes at points 1, 10 & 11.

2) Remove and discard the high voltage diodes at CR45 and CR46. This effectively removes high voltage from the CRT's original high voltage power supply.

3) Remove the F3 fuse located on the bottom side of the MPC main board.

4) The high voltage filter capacitors C66 and C67 may be removed. Save C66 (40 Mfd, 350 VDC) as a spare for loop supply filter capacitor C60.

5) Remove 1K (R114) to the right of Z37 and replace with 68 ohms.

6) Remove 33 ohms (R170) near pin 8 of Z43 (XR2206C) tone keyer and replace with 120 ohms.

7) Remove 62K (R222) in left front corner of main board and replace with 120 ohms.

8) Remove photocell socket/leads assembly by disconnecting the two leads from E47 and E48. Clean out E47.

9) Move the yellow wire from LOOP LED from E34 to E47.

10) Connect jumper wire from CRT E10 to ground feed-thru marked (-). This ground is also at the anode end of CR53.

11) Remove (μ741CP) and replace with Texas Instruments TL081CP (Z37).

12) The 2N3439 transistors (Q10, Q11 & Q12) may be left in their sockets. They will spare the Q7 loop keyer, Q5 and Q6 on the main board and Q1 and Q2 on the SSD-100 Display assembly.

13) Remove the disc capacitors (.01) at C63 and C64.

14) Install the 8 wire interconnecting cable per Cable Installation chart on SSD-100 Assembly/Schematic print 75307.

The 8 wire cable has standard EIA color coding: Pin 1 = brown, pin 2 = red, pin 3 = orange, pin 4 = yellow, pin 5 = green, pin 6 = blue, pin 7 = violet and pin 8 = gray.

Secure the cable (2 inches from connector end) with the cable clamp supplied at the main board mounting screw at the front edge. Dress the cable to run directly down the center line of the terminal unit.

1) MPC +V at TP9, which is located between TP10 and CR60.

2) MPC jumper location C, just to the rear of CR60, and to the left of locations A and B.

3) Junction of R214 and R215. R214 is not normally installed. Connect wire to the front-most feed-thru of R214. This

location is to the left of Q13 and about 1 inch from the front edge of the main board.

4) MPC Ground at TP8, which is just to the left of the large white capacitor (1.0J100) C55.

5) CRT Filament Line 1, located behind the FOCUS potentiometer, R193.

6) CRT Filament Line 11, located behind the ASTIG potentiometer, R194.

7) Space Channel. Locate the old C64 location. Follow the trace from C64 to the left and locate feed-thru on this trace at the center-line of the terminal unit.

8) Mark Channel. Locate the old C63 location. The proper location for wire 8 is the feed-thru directly behind the feed-thru used in the previous step.

MECHANICAL INSTALLATION OF MARK II SSD DISPLAY AND BEZEL ASSEMBLIES

The bezel and the four bolts are installed from the front panel of the terminal unit. Looking at the terminal unit from the front, install a short bolt in the upper-right and lower-left corners. Secure with one of the 6/32 nuts.

Install the long bolts in the lower-right and upper-left corners. Slip a 1/2 inch metal spacer on each bolt and secure with a 6/32 nut.

This arrangement permits the SSD-100 display board to be cocked at an angle during installation, simplifying display insertion and removal.

Be careful not to pinch any of the local wires between the bolts and SSD board.

Secure the SSD-100 board in place with the two remaining 6/32 nuts.

ELECTRICAL INSTALLATION OF THE SSD-100 DISPLAY

The connector on the end of the 8 wire cable plugs into the SSD-J1 socket, which is located at the lower center rear of the SSD board.

The notched corner on the connector shell indicates Pin 1.

The cable is installed properly when this notched corner (Pin 1) is closest to the power diode CR3. This diode is easily recognized, since it is one of the three diodes and a resistor installed directly above the lower left mounting hole.

If a plastic cable clamp has been supplied with the SSD-100K kit, it may be used to secure the SSD cable at the front center edge of the main board.

This completes the modification of the terminal unit, and the electrical and mechanical installation of the SSD-100 Solid State Display.

If the original CRT adjustment potentiometers have been left on the main board, set them for Mid-scale and forget. Refer to the SSD-100 Operating Instructions for the proper calibration procedure for the Mark Gain, Space Gain and Intensity Threshold pots.

REMOTE CRT DISPLAY

The MPC-1000C and MPC-1000CR have both Remote Scope Display and Dual-Diversity connectors on the rear panel.

The MPC-1000CR/DK and MPC-1000R (above Serial R050) have only Dual-Diversity connectors at the rear panel. These Diversity connectors are connected Mark J3 to E54 and Space J2 to E53. For remote oscilloscope operation, move the orange wire from E53 to E51. Move the yellow wire at E54 to E52. These E-Points are located at the left rear corner of the MPC main board.

SSD-100 LOOP LED INTENSITY

Light Emitting Diodes (LEDs) act somewhat like zener diodes, but their zener voltages are not precise.

The LOOP LED (SSD-DS4) is paralleled across the front panel LOOP LED (MPC-DS1).

If one of the LEDs has a significantly lower zenering point than the other, the second LED will not light, or at best, will operate with a very low light level output.

In the case that the SSD-DS4 LED does not light, but the front panel LED does light, put a 120 ohm, 1/4 watt resistor in series with the front panel LED (MPC-DS1).

At Dovetron, this resistor is added by moving the yellow wire on the anode of MPC-DS1 from E-Point 34 to E-Point 47 and installing the 120 ohm resistor in location R222. (If this location contains a 62K resistor, which was part of the CRT photocell circuit, remove it and discard it). Locate CRT Pin 10 on the mainboard. This location is directly in front of diode CR47. Connect a wire between CRT Pin 10 and Ground. A convenient ground location is the mounting feedthru for the anode end of zener diode CR53, which is directly to the right of C65 and in front of CRT INTENSITY pot R195.

If the front panel MPC-DS1 LED does not light, and the SSD-DS4 does light, add the 120 ohm resistor in series with the SSD-DS4 LED. This is easily accomplished by removing the SSD-100 display assembly and installing the 120 ohm resistor at location SSD-R21, which is just above the LM3914 at location U1, replacing the jumper wire.

When re-installing the SSD-100, be sure that pin 1 of the 8 wire connecting cable is toward the center of the SSD-100 board. Pin 1 is identified with a "notched" corner on the top of the cable connector.