INSTRUCTION MANUAL

DOVETRON MPC-1000R

REGENERATIVE RTTY TERMINAL UNIT

E-SERIES

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MPC-1000R.001 and up.

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PREFACE

The Dovetron MPC-1000R Regenerative RTTY Terminal Unit is the logical combination of an E-Series MPC-1000C Multipath-Diversity RTTY Terminal Unit and the TSR-100 Teleprinter Speed Converter-Regenerator assembly.

In addition, the TMS-100 AFSK Tri-Mode Selector, which permits front panel selection of three different Mark/Space/Shift combinations for the AFSK Tone Keyer, is an integral part of the MPC-1000R.

Since the optional TID-100 Teleprinter Identifier may also be installed in the MPC-1000, MPC-1000C and MPC-1000R, the TID-100 programming, installation and operating instructions are also included in this manual.

The main PC board assembly in the MPC-1000R is identical to the main board installed in the MPC-1000 and MPC-1000C, and unless specifically detailed differently in the MPC-1000R section of this manual, or in one of the MPC-1000R, TSR-100, TMS-100 or TID-100 prints or schematics, the MPC-1000/MPC-1000C section of this manual also applies to the MPC-1000R.

The MPC-1000/MPC-1000C section of this manual is complete when schematic diagram 75103E and component location print 75100E are attached.

The MPC-1000R section of this manual is complete when the following prints are attached:

75120	MPC-1000R Regenerative Function Diagram (MPC-1000C/TSR-100/TMS-100/TID-100)
75121	Assembly - Teleprinter Speed Converter-Regenerator TSR-100, Revision B.
75124	Schematic - Teleprinter Speed Converter-Regenerator TSR-100, Revision B.
75125	AFSK Tri-Mode Selector TMS-100.
75128	Teleprinter Identifier CW-Baudot-ASCII TID-100.

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MPC-1000R REGENERATOR SECTION

MPC-1000R REGENERATIVE RTTY TERMINAL UNIT

SECTION I - DESCRIPTION

The MPC-1000R Regenerative RTTY Terminal Unit consists of an MPC-1000C Terminal Unit, a TSR-100 Teleprinter Speed Converter-Regenerator and new front and rear panels contain additional controls apropos to the speed converter-regenerator circuitry.

The MPC-1000R also contains a TMS-100 AFSK Tri-Mode Selector assembly that is front panel controlled and permits operator selection of three different pre-set Mark/Space-Shift combinations for the AFSK tone keyer.

In addition, the front panel VFO's have been expanded in range to cover 1275 Hz to 2975 Hz with approximately 100 Hz over-lap at each end.

All front panel controls on the MPC-1000R perform in the same manner as their counterparts on the MPC-1000C.

The E-Series manual for the MPC-1000/MPC-1000C pertains to the MPC-1000R unless specifically changed in the following paragraphs or on the accompanying prints and schematics.

When the rear panel REGEN ON-OFF switch is in the OFF position, the TSR-100 Regenerator assembly is inhibited, and the MPC-1000R functions as an MPC-1000C.

When the REGEN ON-OFF switch is in the ON position, all incoming and outgoing signals (except Mark-Space Reversals) are regenerated to less than 1% bias distortion.

The input and output baud rates of the regenerator section are independently controllable by two front panel baud rate switches, which permits up-down speed conversion of the baud rate during regeneration. An 80 character FIFO buffer memory prevents character over-runs during down-speed conversion, and may be Preloaded and Recirculated. Automatic Phasing pulse generation and variable Character Rate controls are integral to the MPC-1000R and discussed in detail in the following paragraphs.

SECTION II - FRONT PANEL CONTROLS

AFSK SWITCH

The three positions (A, B & C) of the AFSK Tone Keyer switch selects the pre-set Mark and Space tones that have been calibrated into the tone keyer via the rear panel tone keyer calibration pots. Each pot is a 20 turn cermet potentiometer of infinite resolution

and has a clutch action at the end of travel. Over-running the pot during calibration will not damage it.

To calibrate the Space tone, a ground at rear panel SPACE CAL forces the AFSK Tone Keyer into the Space condition (when the TSR-100 is enabled). Turning the REGEN ON-OFF switch to OFF and removing the LOOP fuse, or breaking the loop line in some other manner, will also force the AFSK Tone Keyer to Space for calibration purposes.

Although CW ID (NARROW) is normally used for identification purposes, and produces a 100 Hz shift from Mark to Space when connected to ground (thru a hand key, etc.), the SPACE CAL port may be used for CW ID and will produce a FULL shift from Mark to Space as the keying device grounds the circuit.

REGENERATOR/MEMORY SECTION SWITCHES

The SIGNAL and LOOP Signal Speed switches are calibrated in Baud. Each switch controls an independent BCD/N divider section that is driven by a common crystal-controlled oscillator.

The SIGNAL switch should be set to the baud rate of the RTTY circuit. The LOOP switch should be set to the baud rate of the local teleprinter. It is generally advantageous that the local teleprinter be operated at a baud rate equal to or faster than the fastest baud rate signal to be received.

The Memory section is controlled by two toggle switches. These switches are labelled CLEAR-UNLOAD and OPERATE-PRELOAD-RECIRCULATE.

The CLEAR-UNLOAD switch is normally in its center-off position. When lifted to CLEAR, this switch immediately dumps the contents of the 80 character silastic memory.

When lowered to the UNLOAD position, the preset Character Rate is increased to machine speed for approximately 13 seconds, and the FULL LED indicator lights.

During this period (FULL LED lit), the Tee Dee INHIBIT circuit is enabled and permits an external relay to open the solenoid circuit of a tape-pulling TD, thus preventing character over-runs during down-conversion of the baud rate.

This UNLOAD action is also automatically enabled whenever the FIFO memory section loads its 80th character, i.e., has been filled.

During normal operation, the OPERATE-PRELOAD-RECIRCULATE switch is left in the OPERATE position.

Moving the switch to PRELOAD permits the Memory section to accept and store RTTY signals, either from the incoming signal or from the local loop.

In the RECIRCULATE position, the contents of the Memory are re-circulated over and over again at SIGNAL speed if in SEND and at LOOP speed if in REC.

During normal operation, the EMPTY LED will be lit, indicating that the incoming signal is flowing thru the Memory and not being stored. If down-converting (i.e., copying a 50 Baud signal on a 45.45 baud teleprinter), this LED will extinguish as the Memory starts to store the over-runs, and will light when the incoming signal "marks" long enough for the Memory to empty out.

In the SEND mode, if the character rate has been set to something less than machine speed, a fast typist will be able to enter data into the Memory faster than it will be taken out. If the Memory is filled to its full 80 character capacity, the FULL LED will light, indicating that the Character Rate has been automatically raised to machine speed and that the Memory is being emptied out.

At the end of the empty-out period, the FULL LED will extinguish and the Character Rate will drop smoothly (not abruptly) back to its preset rate.

SECTION III - PROGRAMMING THE REGENERATOR SECTION

Assuming that the MPC-1000R is to be used for Radio TTY communication (5 level Baudot), program the UART via the 8 pole DIP-switch at location Z59:

SWITCH POLE	FUNCTION	MODE	SWITCH POSITION
8	PHASING	ON	RIGHT
7	NB-1	ZERO	LEFT
6	NB-2	ZERO	LEFT
5	TSB	ONE	LEFT
4	SBR	NO	LEFT
3	PARITY	NO	LEFT
2	REPEAT	NO	RIGHT
1	PRELOAD	YES	RIGHT

PHASING (BLANK/LTRS) PULSES

Programming the PHASING function ON will provide an automatic generation of the BLANK character when the MPC-1000R is in SEND and the Memory section is empty. This BLANK character may be changed to a LTRS character by cutting the trace between Points A and B and adding a jumper between Points A and C. Points A, B and C are located just above the Dovetron LOGO (front right-hand corner of board).

The BLANK character is advantageous over the LTRS character, since the case state (FIGS or LTRS) of the receiving teleprinter will not be changed by receipt of the BLANKS character.

The LTRS character option has been provided for commercial users that require Phasing Pulses (single Start pulses) during periods of inactivity to maintain synchronization of their crypto equipment.

The PHASING option (BLANKS or LTRS) may be inhibited entirely by switching Pole 8 of the UART program switch to OFF (LEFT) position or by grounding the rear panel PHASING connector. It is automatically inhibited when the MPC-1000R is in the REC mode.

The repetition rate of the BLANK (or LTRS) character is determined by the setting of the CHARACTER RATE adjustment pots. One pot is board-mounted on the TSR-100 assembly and the other is on the rear panel of the MPC-1000R.

VARIABLE CHARACTER RATE

Character Rate is normally set for some rate less than machine speed. Its sole purpose is to lengthen the Stop bit duration of each regenerated character as it is transmitted, smoothing out the signal at the receiving teleprinter. These two controls do not change the basic baud rate of the outputted signal. As an example, a 45.45 Baud signal that normally has a speed of 60 WPM (at machine speed), may have its Character Rate slowed to 40 or 45 WPM by lengthening the stop pulse on the end of each character. A dual one-shot circuit in the TSR-100 assembly provides this "long" stop pulse, and its time period is adjustable with the two Character Rate pots (one on the PC board and the other on the rear panel).

With a slower character rate, the memory section can be filled more easily, and should this happen, the character rate as generated by the TSR-100 is automatically increased to full machine speed. This effectively empties the memory and prevents characters from being lost due to over-runs. When this condition occurs, the front panel FULL LED will light, indicating to the operator that he has filled the memory to its 80th location, and that his signal (the stored data in memory) is now outputting at machine speed.

Whenever the FULL LED is lit, the TD INHIBIT circuit is also enabled and may be used to alert the operator with an aural or visual alarm, or may be used to inhibit a tape pulling TD, etc.

UART CODING

The regenerator section of the TSR-100 is a Universal Asynchronous Receiver/Transmitter (UART), which may be programmed for 5, 6, 7 or 8 level codes via poles 6 and 7 of switch Z59. These

poles are identified as NB-1 and NB-2. The coding chart for NB-1 and NB-2 is etched on the PC board in the lower right hand corner.

TOTAL STOP BITS

Switch (Z59) pole 5 sets the total number of stop bits (TSB) that are automatically attached by the UART to the end of each regenerated character. With all UARTS, this switch location may be set to ONE, which effects a 7.0 unit code.

If using a UART that can be programmed for a 1.5 CU stop bit, when using the five level (Baudot) code, the TSB may be set for TWO, which effects a 7.5 unit code.

The General Instruments AY-3-1014(A) and Intersil IM6402 are N-channel devices and offer the 1.5 stop bit option. Unless ordered special, the TSR-100 is equipped with the General Instrument AY-5-1013 and the TSB should be set for ONE (7.0 CU).

RECEIVED STOP BIT REQUIRED

Switch pole 4 sets the SBR (Stop Bit Required). Normally, it is best to leave this function in the NO position. There is no reason to force the UART to dump a good character just because the Stop Bit was not detected.

With the high redundancy of the English and Spanish languages, it is always better to print a character, even if it is wrong, because the automatic Stop Bit generated by the UART will prevent the local teleprinter from losing signal synchronization.

PARITY SELECT

Switch pole 3 permits selection of PARITY, a function not normally used in Radio TTY communication. This switch should be left in the NO position.

If Parity is required, consult the manufacturer's spec sheet on the particular UART installed in the TSR-100.

Parity select for the General Instrument AY-5-1013(A) is:

NP	ESP	MODE
Ø	Ø	ODD
Ø	1	EVEN
1	Ø or 1	NO

PRELOAD AND RECIRCULATE

Switch poles 2 and 1 provide Preloading and Recirculation of the Memory section. Since these positions are over-ridden by the front panel toggle switches, both of these switches MUST be left in the right-most position: REPEAT-NO and PRELOAD-YES.

SECTION IV - DUAL CLOCK

The dual-clock is crystal-controlled at 60.000 KHz. Two identical divider sections divide this frequency down to those frequencies required by the UART's input and output clock ports for operation at the various Baud rates.

The front panel speed select switches are calibrated in terms of Baud:

SWITCH CAL	ACTUAL BAUD	SPEED - WPM
45	45.45	60 (61.3)
50	50.00	66.6
57	56.88	75
75	74.2/75.0	100/106
110	110.00	100 ASCII

When the MPC-1000R is in REC, Clock 1 provides the SIGNAL speed clock frequency to the input clock port of the UART regenerator. Clock 2 provides the LOOP speed clock frequency to the output clock port.

When the MPC-1000R is switched from REC to SEND (locally or remotely), Clock 1 and Clock 2 are interchanged at the UART by the bilateral steering section. The input and output data lines are also interchanged at the Uart's data ports simultaneously.

This switching action permits an incoming signal to be up-converted to a faster teleprinter during REC, and the teleprinter's faster keyboard signal to be down-converted to the slower signal rate during SEND.

SECTION V - REMOTE CONTROL

The front panel REC-SEND switch may be left in the REC position, and the MPC-1000R may be remotely switched to SEND by applying +5 to +15 volts to the rear panel LOCK connector.

A source of +15 volts regulated has been provided at the rear panel for this purpose and is current-limited to 3 mils.

Do not attempt to use this voltage source for external relays, etc.

If the +15 volt is shorted, or over-loaded, no damage will occur within the terminal unit. The accidental application of high voltages to this port from an external source will probably not damage the terminal unit either.

The impedance protection of this +15 volt source is accomplished by a 4.7K resistor mounted on a terminal strip next to the 600 ohm audio input transformer.

SECTION VI - TEE DEE INHIBIT CIRCUIT

The TD INHIBIT circuit is an open collector transistor switch, 2N697 (Q4).

This circuit is not current-limited within the terminal unit, but the collector circuit does contain a polarizing diode.

Current limiting of this circuit is normally accomplished by the impedance of the external relay, used to control the TD solenoid. This relay is not furnished by Dovetron, and any fast 12 or 24 VDC relay is adequate. The external relay should have a despiking diode across its solenoid. If 110 VDC switching is required, the 2N697 may be replaced with a 2N3439 or similar.

SECTION VII - PARALLEL DATA OUTPUT OPTION

All eight parallel data lines at the output of the Memory section are available for expansion to peripheral equipment via a 16 pin DIP pattern at Z60. To use these data lines, cut the 8 parallel lines on the bottom side of the TSR-100 board and install a 16 pin DIP socket at Z60.

A second 16 pin DIP pattern has been provided between the two FIFO memory packages, Z52 and Z53.

This second output port permits the 8 parallel data lines to be buffered on both sides by 40 characters of Silastic memory. To use this port, cut the 8 parallel lines on top of the TSR-100 board and install a 16 pin DIP socket.

Be careful not to cut any of the lines that are not pre-drilled with the 16 pin DIP pattern.

SECTION VIII - TEST POINTS (TSR-100)

Test points have been provided on the TSR-100 assembly to aid in trouble shooting.

TP-1: CRYSTAL OSCILLATOR OUTPUT

The oscillator circuit is comprised of a Statek "tuning-fork" type quartz crystal, sealed in a TO-5 (three lead) type can and a CMOS 4007A dual complementary pair plus inverter. This type of oscillator requires very low current and often requires two or three seconds to start oscillating after turn-on. The nominal frequency of the crystal is 60.000 KHz ±0.05%.

TP-2A: CLOCK 1 OUTPUT

The frequency at TP-2A is the output of the BCD/N dividers Z61 and Z63 as programmed by the SIGNAL speed select switch located at Z65.

TP-3A: CLOCK 2 OUTPUT

The frequency at TP-3A is the output of the BCD/N dividers Z62 and Z64 as programmed by the LOOP speed select switch located at Z66.

Clock 1 and Clock 2 should output the following frequencies depending on the setting of their respective speed switches:

45 Baud (60 WPM)	732 Hz.
50 Baud (66 WPM)	800 Hz.
57 Baud (75 WPM)	909 Hz.
75 Baud (100 WPM)	1200 Hz.
110 Baud (100 WPM ASCII)	1765 Hz.

TP-2B: UART INPUT CLOCK

The frequency at TP-2B is the Input Clock to the UART at the output of the bilateral steering section. In REC, it is Clock 1 and in SEND it is Clock 2.

TP-3B: UART OUTPUT CLOCK

The frequency at TP-3B is the Output Clock to the UART at the output of the bilateral steering section. In REC, it is Clock 2 and in SEND it is Clock 1.

In PRELOAD, TP-2B and TP-3B will both have Clock 1 signals when the MPC-1000R is in REC. When in SEND, both test points will have Clock 2 signals.

In RECIRCULATE, both test points will have Clock 2 in REC and CLOCK 1 when in SEND.

Since the UART is being clocked by Clock 1 when the MPC-1000R is in SEND/RECIRCULATE, and the local teleprinter is normally geared to match Clock 2, it would be normal for the teleprinter to print garble. For this reason, when the MPC-1000R is in SEND/RECIRCULATE, the high level loop line is locked in Mark-Hold.

During this condition, the local keyboard and page printer may be used with a series connected perforator to prepare tapes, etc.

If speed conversion is not being used, that is, the local teleprinter is geared for the same speed as the signal speed, the TSR-100 may be modified to print the recirculated signal when the MPC-1000R is in SEND/RECIRCULATE.

This modification is performed by removing Z71 from its socket and bending up pins 1 and 2. Connect pins 1 and 2 together (converting this gate to an inverter configuration) with a small wire. Connect the other end of this wire to pin 4 of the same DIP, Z71.

Replace Z71 in its socket, being sure that all pins (including Pin 4) are in their proper place, and that pins 1 and 2 are outside of the socket and electrically tied to Pin 4.

Now the DATA OUTPUT line from Q1 will key at the same Baud rate as the AFSK KEYER (Q2), but will be inverted, which is the proper configuration to drive the high level loop keyer (Q7 on main board).

During SEND/RECIRCULATE, the local teleprinter will now print the outgoing (and recirculated) signal, provided the MPC-1000R has not been forced into automatic mark-hold. Operating the TU in the FSK AUTOSTART or MOTOR ON will prevent the loop keyer from being held in mark-hold.

Since the AFSK KEYER (Q2) is permitted to run in the REC mode, the teleprinter will still perform properly.

Do not attempt to cut traces on the PC board to accomplish this modification, since some of the traces that would have to be cut are hidden under the IC socket.

TP-4: UART DATA INPUT LINE

This test point is the same as pin 20 on the Uart, which is the DATA INPUT port. In REC, it will contain the unregenerated incoming signal, and in SEND, it will contain the unregenerated signal as originated at the local teleprinter, Tee Dee, etc.

TP-5: UART DATA OUTPUT LINE

This test point is the same as pin 25 of the Uart, which is the DATA OUTPUT port. In REC, it will contain the regenerated incoming signal, and in SEND, it will contain the regenerated outgoing signal as generated by the local teleprinter, Tee Dee, etc.

TP-6: SPACE CAL

A ground to this point will force the AFSK tone keyer into the space condition, if the rear panel REGEN ON/OFF switch is in the ON position. This test point is also available at the rear panel SPACE CAL port.

SECTION IX - CHARACTER RATE CONTROLS

Two Character Rate controls have been provided in the MPC-1000R.

One is located on the TSR-100 assembly (R62-100K) and should be set full CCW looking at the control from the thumbwheel side.

The rear panel Character Rate control will now set the preferred Character Rate. Full CCW (as viewed from the rear of the TU) produces normal machine speed operation.

NOTE: If using a UART other than supplied by Dovetron or listed on the TSR-100 schematic (75124), data may be lost when recirculating, if the Character Rate control(s) are both set for full machine speed operation.

Rotating the rear panel Character Rate control CW reduces the outputted Character Rate by lengthening the time interval between the end of the normal stop pulse and when the TSR-100 is permitted to start the following character. This effectively lengthens the stop bit affixed to the end of each regenerated character.

SECTION X - REGEN ON/OFF SWITCH

With the rear panel REGEN ON/OFF switch in the OFF position, the MPC-1000R functions as a standard MPC-1000C and the REGEN FSK, PHASING and SPACE CAL connectors, and the CHARACTER RATE control are inoperable, as are the front panel Speed Switches, the Memory Section Switches and the EMPTY and FULL LED indicators.

With the REGEN ON/OFF switch in the ON position, all incoming and outgoing data (except MS REV) are processed by the TSR-100 regeneration assembly.

SECTION XI - MS REVERSALS (RY GENERATOR)

When the MODE switch is in the MS-REV position (in both SEND and REC functions), the AFSK tone keyer outputs mark-space reversals, whose baud rate is dependent on the setting of R163.

In REC, the REGEN FSK outputs a continuous string of regenerated Ys. The SIGNAL SPEED switch must be set to the same baud rate as the internal RY Generator (R163), and the LOOP SPEED switch must be set to an equal or faster baud rate.

In SEND, the input of the regenerator is clocked by the LOOP SPEED switch setting and if it is not set to the same baud rate as the RY generator (MS-REV), no useful information will be available.

In both SEND and REC, when using the MS-REV mode, the EIA and the MIL FSK outputs are locked in a Marking condition.

When in DIV OFF, MO, MS (Normal operation) or SO, and in REC function, the EIA and MIL FSK outputs are regenerated, since they are driven by the regenerated high level loop keyer on the main board. A 3rd regenerated FSK signal (Zero volts, Mark & +5 volts, Space) is available at REGEN FSK (J7) at the rear panel.

When in SEND, EIA and MIL FSK outputs are not regenerated, but the REGEN FSK output at J7 is regenerated. If the Memory section is empty and no data is being entered, this REGEN FSK will output the PHASING pulse (selectable BLANKS or LTRS character), if the Phasing switch at Z59 (pole 8) is ON, and if the rear panel PHASING port has not been grounded.

SECTION XII - TMS-100 TRI-MODE SELECTOR

In addition to Regeneration, Speed Conversion and Buffer Storage, the MPC-1000R also offers front panel selection of three different Mark/Space/Shift combinations. The TMS-100 Tri-mode selector card mounted on the rear panel accomplishes selection of the proper Mark and Space calibration potentiometers (R1 thru R6) thru a pair of CMOS solid state switches (CD4066/MC14066). Each CMOS unit is four bilateral switches and are controlled by the front panel AFSK Select switch.

SECTION XIII - AFSK TONE INHIBIT OPTION

As supplied by the factory, the MPC-1000R outputs the AFSK tone from the tone keyer in both the REC and SEND functions. Provisions have been made to inhibit the tones during REC. In this manner, when the MPC-1000R is switched (locally or remotely) to SEND, the tones will be enabled and may be used to key on a companion transmitter/transceiver via its VOX circuits.

To inhibit the AFSK tones during REC, remove the jumper installed between the TONE CONTROL and +15 VDC E-Points on the TMS-100 PC card. Connect a wire between the TONE CONTROL (or the NC POINT next to it) and the anode of CR54 or CR55 on the TU's main board. These diodes are normally installed and are located in front of the TU's autostart relay, directly behind the front panel SEND/REC switch.

Some transceivers (Collins KWM-2, KWM-2A, etc.), even if not used in the VOX mode, output audio input signals during receive. The above tone inhibit feature is provided to silence the AFSK tones when used with this type of equipment.

SECTION XIV - ADDENDA (MAIN BOARD CHANGES)

The main PC board in the MPC-1000R is identical to the main board that is used in the E Series MPC-1000 and MPC-1000C and the main board print (75103-E) applies with a very few minor variations. The variations are called out on the MPC-1000R REGENERATIVE FUNCTION DIAGRAM (MPC-1000C/TSR-100/TMS-100/TID-100). Information on this print supercedes any conflicting information in the MPC-1000/MPC-1000C manuals or prints.

The following applies to all MPC-1000R terminal units:

1) R5 has been changed from 10K to 270 K. The PC board input gain pot that controls the feedback of Z2 is factory set to zero.

2) R143 and R146 have been changed from 2.0K to 2.49K, and expand the tone range of the AFSK tone keyer.

3) R206 and R207 were single-turn tone adjustment pots on the rear panel. They have been replaced by the TMS-100 Tri-mode Selector assembly.

4) The Mark and Space calibration pots for the front panel VFOs were 5K, and have been replaced with 2500 ohm PC pots, which permit an easier calibration of the Mark and Space VFOs.

5) The Mark and Space VFO timing capacitors are 0.056 Mfd polycarbonates, similar to those used in the MPC-1000C.

6) R179A has been changed from 1.5 Megohm to 1.0 Megohm and permits the CRT dot to deflect all the way off of the CRT's screen. CR53 is not installed. See page 18.

7) CR38 has been replaced with a 2K, 5%, 1/4 watt carbon-film resistor and provides harder keying for the high level loop keyer.

8) Input impedance of the MPC-1000R is 600 ohms, isolated and balanced.

SECTION XV - TID-100 TELEPRINTER IDENTIFIER OPTION

If installed in the MPC-1000R, the TID-100 is mounted between the main board and the TSR-100 Regenerator assembly.

Output 1 is connected to E56 on the TU's main board. The START line is connected to J9 at the rear panel (CW ID). A momentary ground at J9 initiates the TID-100, which keys the CW ID circuit in the TU at approximately 10 WPM. This configuration provides narrow shift CW ID. If FULL SHIFT CW ID is preferred, move OUTPUT 1 line from E56 to the rear panel SPACE CAL port (J20).

OUTPUT 2 of the TID-100 is not used and R6, R8 and R9 are not installed.