

INSTRUCTION MANUAL

DOVETRON MPC-1000R

TSR-500D/DAS-100

REGENERATIVE RTTY TERMINAL UNIT

DIGITAL AUTOSTART

E-SERIES

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MPC-1000R.400 and up.

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## PREFACE

The Dovetron MPC-1000R Regenerative RTTY Terminal Unit normally consists of an E-Series Main Frame (Board Number A75100A-E), a TMS-100 AFSK Tri-Mode Tone Selector Assembly, a TSR-500D Signal Regenerator Board and a DAS-100 Digital Autostart Module.

When supplied with the TSR-500D/DAS-100 combination, the terminal unit provides Signal Regeneration, Speed Conversion with a 200 Character FIFO Buffer Memory, Keyboard-Controlled Word Correction and Digital Autostart.

The MPC-1000R is also available as a BASIC-R with a TSR Adapter (75156) which replaces the TSR-500D assembly, and functions as an MPC-1000C with a TMS-100 Tri-Mode Tone Selector.

If a TID-100 Station Identifier board is factory installed, it is mounted underneath the appropriate TSR assembly.

The KOS-100 Keyboard Operated Send option (if installed) is usually used in conjunction with a TID-100 assembly and is mounted underneath the TID-100.

A SCL-100 Selective Calling module may be plugged directly into the TSR-500D assembly for Sel Cal functions.

A PKC-100 Polar Keyer option is also available for use with Polar (double current) teleprinters.

With a TSR Adapter installed, the front panel Memory Empty LED is always lit and the Memory Function and Speed Selection switches are inoperative.

With the TSR-200D/TSR Adapter combination installed, the Signal and Loop Speed switches select the input and output baud rates of the TSR-200D Regenerator assembly.

The front section of this manual details the digital section (TSR-500D) of the terminal unit and the rear section (which is an MPC-1000C manual) details the mainboard section.

In case of conflict between the front and rear section of the manual, the information provided in the TSR-500D section should be considered correct.

## OPERATING HINTS

### MPC-1000R and TSR-500D

For the operator who prefers to turn on a new piece of equipment and read the manual later, the following is offered:

- 1) Remove the top lid and inspect the large-scale (LSI) integrated circuits and the four inter-connecting cables for a firm fit in their sockets. It is not unusual for transportation vibration to loosen them in their sockets.
- 2) Set the rear panel LOOP adjustment pot to midscale and check that the REGEN ON-OFF switch is in the ON position (UP).
- 3) Attach the power cord, teleprinter's loop line and an audio line from the receiver.
  - A) Power cord should be grounded for safety and maximum performance.
  - B) Teleprinter's loop line should NOT be grounded thru either loop jack. The teleprinter's loop line must be floating. If a three-way plug with a shield is used, insert it into the rear panel loop connector marked: 3-Way. The shield may be grounded to the terminal unit's cabinet.
  - C) The input impedance of the MPC-1000R is 600 ohms, but the terminal unit may be driven with low impedance speaker audio lines, provided the audio is turned up high enough. Many receivers have phone patch or anti-vox outputs, which are usually in the 500 to 2500 ohm region and they make ideal audio sources for the terminal unit.
- 4) Place all the front panel toggle switches UP, except the Autostart/Motor Control switch. Place it in the Motor ON position.
- 5) Set the LEVEL control to 9 o'clock and the THRESHOLD control to 12 o'clock.
- 6) Set the MODE switch to MS, which is the proper position for normal In-Band Diversity operation.
- 7) Adjust the Mark and Space VFOs to the desired tone frequencies.
- 8) Set the SIGNAL Speed Switch to the anticipated speed of the incoming signal.
- 9) Set the LOOP Speed Switch to the speed of the local teleprinter. (45 Baud = 60 WPM, 75 Baud = 100 WPM, etc.)
- 10) Tune in a known RTTY signal, peaking the Mark and Space VFOs for maximum amplitude of the horizontal and vertical CRT traces and start copying. If the copy is garbled, reverse the NORMAL/REVERSE switch.
- 11) Now sit back and read the rest of this manual and discover how easy it is to implement all the operating features and functions.

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## MPC-1000R REGENERATIVE RTTY TERMINAL UNIT

### SECTION I - DESCRIPTION

The MPC-1000R Regenerative RTTY Terminal Unit is basically an MPC-1000C Multipath-Diversity RTTY Terminal Unit with a TSR-500D Teleprinter Speed Converter-Regenerator mounted internally to provide Signal Regeneration, Speed Conversion, up to 200 characters of Silastic Buffer Storage and keyboard-controlled Word Correction.

The front panel contains switches for basic control of the regeneration, speed conversion and memory exercising functions.

Rear panel connectors permit remote control of the other functions, such as Phasing On-Off, Word Erase, etc.

The Word Correction function is automatic and keyboard-controlled via internal circuitry that is capable of recognizing the SPACE and BLANK characters generated by the local teleprinter.

In addition, the MPC-1000R contains a TMS-100 Tri-Mode AFSK Tone Selector assembly, which permits front panel selection of one of three different Mark-Space-Shift combinations that have been preset for the AFSK Tone Keyer.

All other front panel controls perform in the same manner as their counter parts on the MPC-1000C.

For this reason, the E-Series manual for the MPC-1000C pertains to the MPC-1000R unless specifically noted in the following paragraphs or on the accompanying MPC-1000R prints and schematics.

When the rear panel REGEN ON-OFF switch is in the OFF position, the TSR-500D Regenerator assembly is inhibited, and the MPC-1000R functions as an MPC-1000C. With this switch OFF, the TSR-500D may be removed for service and the terminal unit continued to be used as a non-regenerating modem.

When the REGEN ON-OFF switch is in the ON position, all incoming and outgoing signals (except Mark-Space Reversals from the RY Generator) are regenerated to less than 0.5% bias distortion.

Since the input and output baud rates of the Regenerator may be controlled by the front panel speed switches, and may be set to different speeds, the Regenerator section may also be used as a simultaneous up-down speed converter.

A silastic buffer storage section prevents character over-runs during Down-Speed Conversion, and may be Preloaded and Recirculated.

This buffer memory section consists of five 40 character FIFO buffer elements for a total storage of 200 characters.

## SECTION II - THEORY OF OPERATION

The TSR-500D Teleprinter Speed Converter-Regenerator is a digital device that performs Signal Regeneration, Up-Down Speed Conversion, Buffer Storage, Word Correction, Phasing Pulse Generation (BLANK or LTRS) and Variable Character Rate Control.

These functions are accomplished thru the use of a pair of Universal Asynchronous Receiver/Transmitters (UARTs), First-in First-out (FIFO) Silastic memory chips, a crystal-controlled oscillator and various logic and switching elements.

The crystal-controlled oscillator operates at 60 KHz and uses a tuning-fork type piezoelectric quartz crystal.

The output of this oscillator is divided down by two separate BCD/N stages which are switch controllable and provide the two separate clock frequencies required by the UARTs for up-down speed conversion.

The Signal Speed clock is Clock 1 and the Loop Speed clock is Clock 2.

With the MPC-1000R in Receive and the Memory section in Operate, Clock 1 drives the Input register and Clock 2 drives the Output register of Uart 1. When the TU is switched to SEND, the two clocks are reversed.

If the two clocks have been set to the same frequency, that is, the same speed, UART 1 functions solely as a regenerator.

When the two clocks are set for different speeds, the UART also functions as a speed converter, because it is outputting the data at a different speed than it took it in at.

When the MPC-1000R is in SEND-Recirculate (as when calling CQ from the preloaded memory), both the input and output registers of UART 1 are being driven by Clock 1, the Signal Speed clock.

When in RECEIVE-Preload, the output register is not permitted to output, because the memory is being deliberately loaded-up.

For this reason, a second UART has been implemented in the TSR-500D. Its input clock is always Clock 1 (Signal Speed) and the output clock is always Clock 2 (Loop Speed). Since the Loop Speed is identical to the local teleprinter's Baud rate, UART 2 provides local copy even when the TSR-500D is Recirculating or Preloading at Signal Speed.

A Memory Hold circuit (three elements of U25) has been incorporated which permits the local teleprinter to receive an incoming message via UART 2 when the Memory is recirculating.

This permits the operator to Preload the Memory with a CQ (or any other message), and to switch the TU to SEND-Recirculate, which will repetitiously transmit the contents of the Memory over and over again.

At the end of the transmission, the TU may be switched to Receive, leaving the Memory intact (still in Recirculate), and receiving an incoming answering signal, without losing the Preloaded message.

If no answer is received, the TU may be switched back to SEND and it will immediately resume sending the originally Preloaded message.

If an answer is received, when the TU is switched back to Send, the Memory is simply cleared with the front panel CLEAR switch and the Memory switched to OPERATE.

Whenever the MPC-1000R is in RECEIVE, the Space-shift feature of the Word Correction circuit is inhibited by CR13 and the Input FIFO will always function as part of the main memory.

The Blank Erase circuit in Receive is also inhibited (when it is necessary to do so), because when the main memory section fills, it will enable the TD Inhibit circuit which in turn inhibits the Blank Erase circuit via CR15.

In other words, in Receive, with five FIFOs, a full 200 character buffer memory is provided.

The Dual One-Shot (U22) provides the automatic Variable Character Rate Control and functions only in SEND. It also provides the logic for the Phasing Pulse circuit, which only operates when the TU is in SEND and the Memory section is empty.

The BLANK and LTRS character generation is accomplished by pulling the tri-state output lines of FIFO 1 (OUTPUT FIFO-U4) either to ground or up to +5 volts thru the 4.7K resistors at R40 thru R47. These FIFO lines automatically go to tri-state when the Memory is empty.

As supplied by the factory, the BLANK character is enabled. LTRS character may be generated by removing the jumper AB and installing a jumper or 15 ohm resistor at AC.

The BLANK "diddle" is preferable, because it will not affect the FIGS or LTRS state of the receiving teleprinter.

A LTRS "diddle" may interfere with a slow typist's ability to send a FIGS character and then a numeral. If the LTRS character is automatically inserted by the diddler between the FIGS and the numeral, the receiving teleprinter will be back in LTRS case by the time the numeral character arrived, and the character Y

would be printed instead of the numeral 6, etc.

The LTRS character generation mode has been incorporated on the TSR-500D for commercial and military users that require an automatic SPACE pulse (Start) to be sent during Marking periods to phase crypto equipment.

Other options on the TSR-500D are the inverters provided on the input and output lines. Jumpers have been provided to permit easy inversion of these signal lines when interfacing the TSR-500D to other types of data modems.

The Memory Clear line (J1-1) is connected to the front panel Memory Clear switch and clears all five FIFOs. The Word Erase line (J2-7) goes to a rear panel connector (Word Erase) and only clears the Input FIFO. A contact closure to ground at this connector will provide Word Erase and has been provided for users of teleprinters that do not have a keyboard BLANK button. Automatic Memory Clear is provided by C20.

If the UARTs have been programmed for Stop Bit NOT Required (SBR switch S3 set to NO), breaking the local loop line with the keyboard BREAK line will also provide WORD ERASE. But breaking the loop via the BREAK key will also let the local typing unit run open and possibly print garble. A separate Word Erase button is probably preferable.

If the rear panel Word Erase connector is not being used, this connector may be converted to a Space Cal line by removing Jumper X2 and installing Jumper X1 on the TSR-500D board.

This Space Cal line may also be used as a full-shift CW-ID connector.

If the TID-100 Station Identifier has been coded for Baudot or ASCII code generation (as used in an Answer back mode), the open-collector output of the IDer may be connected to this Space Cal line.

Most TSR-500D assemblies are factory-supplied with 5 FIFOs, i.e., 200 characters of storage.

FIFOs U4 and U8 are always installed and provide the minimum 80 characters of storage.

If any of the optional FIFOs (U5, U6 or U7) are not installed, ten jumpers or low resistance resistors are installed in lieu of the missing FIFO and socket. These locations are detailed on print 75142, upper right corner.

Additional FIFOs may be field-installed in any of these locations by removing the ten jumpers and installing a socket and a Fair-

child 33511 or 33512 FIFO package.

To break-out the parallel data lines between the Input and Output registers of Uart 1 (for routing to some other peripheral device, such as a processor or additional memory), replace FIFO U5 or U6 with a 28 pin/cable assembly, or hard-wire directly to the jumper locations under the socket.

Code Conversion peripherals will not function properly with the TSR-500D, because the input and output registers of both UARTs are always set to the same coding level by NB-1 and NB-2 of the UART Program switch S3.

Although all logic elements in the TSR-500D are CMOS, they are fully-buffered to interface with TTL logic.

When interfacing to other CMOS circuits that are operating at higher levels, such as +12 or +15 volts, remember that Q1 is switching between zero to +5 volts.

The keyboard-controlled Word Correction circuit has been implemented at the Input FIFO (U8).

Whenever the MPC-1000R is in SEND, this Input FIFO stores the data from the local keyboard or Tee Dee. When it receives a SPACE character from the local teleprinter (which would normally be sent at the end of a word), the Input FIFO releases the word into the next FIFO (U7) and the word ripples down thru the memory to the first open location.

SPACE character recognition is accomplished in U12.

If an incorrect or mis-spelled word has been entered into the Input FIFO, it may be erased by sending a BLANK character from the local teleprinter.

BLANK character recognition is accomplished in U13.

The main memory section may contain one, two, three or four 40 character FIFO elements (U4 thru U7). Whenever the last FIFO in this section is filled, the Input FIFO (U8) is brought on-line as an over-flow FIFO, which adds 40 additional characters of storage to the main memory section.

Word Correction is automatically inhibited when the Input FIFO is in the Over-Flow mode and is accomplished by CR14 and CR15.

These diodes are tied back to the Set-Reset latch circuit in the Tee Dee Inhibit circuit, which in turn, is enabled when the last FIFO in the main memory section is filled.

