<u>INSTRUCTION MANUAL</u>

<u>DOVETRON TBA-1000 BAUDOT-ASCII</u>

<u>CODE TRANSLATOR</u>

<u>MARK II</u>

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TBA-1000.300 and up.

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DESCRIPTION

The Dovetron TBA-1000 Code Translator actually consists of two code translators that share a common power supply and input/output (I/O) circuitry.

These code translators may be operated separately in Full Duplex, or in a Half Duplex (Send/Receive) mode. The Half Duplex mode is generally used when two stations are taking turns in transmitting to each other.

One code translator converts Baudot (Murray) coded characters (CCITT Telegraph Alphabet No. 2) to ASCII (American Standard Code for Information Interchange) coded characters.

The second code translator converts ASCII coded characters to the Baudot five-level code.

Serial to parallel conversion is accomplished at both I/Os by CMOS Universal Asynchronous Receiver/Transmitters (UARTs).

Separate crystal-controlled clocks establish the various baud rates. The Baudot Clock is front-panel selectable for 45.45, 50.00, 56.88, 74.2/75.0 and 110 Baud. The SBR-100 Selectable baud Rate assembly may be added to permit operation at non-standard Baudot baud rates.

The ASCII Clock is internally programmable for 110, 150, 300, 600, 1200, 2400, 4800 and 9600 bauds. Other baud rates may be selected.

An internal switch selects the outputted Baudot BELL as either FIGS-S or FIGS-J.

Both code translators work in real time and achieve code translation with a pair of proprietary PROMs.

Optical coupling isolates the two code translators from each other and from their respective I/O circuits.

Baudot I/O is serial, active or passive, high level neutral and EIA RS232C or MIL STD 188C low level polar.

ASCII I/O is serial, active or passive, high level neutral and EIA RS232C, MIL STD 188C or TTL low level. Parallel ASCII I/O is also available via a rear panel cable port.

Fifteen of the ASCII CONTROL characters are available. Some are used for internal control, some are outputted to the rear panel for peripheral control and the balance are available via the cable port for the user's particular assignment.

A preloadable 192 character FIFO buffer memory prevents character over-runs and may be controlled from the ASCII input with CONTROL characters. A bypass option is available that connects the Baudot high level I/O directly to the ASCII high level I/O (TBA-1000B).

Definitions of the Baudot (Murray) and ASCII codes, as pertains to the TBA-1000 Code Translator, may be found in PRINCIPLES OF TELEGRAPHY (Teletypewriter), NAVSHIPS 0967-255-0010, Department of the Navy, Electronic Systems Command. This manual is available from the Superintendent of Documents, U. S. Government Printing Office, Washington, D.C., 20402.

BAUDOT-ASCII SECTION

An incoming Baudot signal is converted from serial to parallel in a Baudot programmed UART (3B). The parallel information is routed to both the LTRS PROM (BAL3) at 9C and to the FIGS PROM (BAF4) at 8C. The logic section (8B, 9B, 10B and 8D) determines which PROM is to perform the translation from Baudot to ASCII, depending on whether a LTRS character or a FIGS character has been received.

A front panel switch (NORMAL - LTRS SHIFT ON SPACE - LTRS ONLY) permits three modes of operation.

In NORMAL, the PROM selected is determined by which shift character (LTRS or FIGS) was last received. If a FIGS character has been received, the FIGS PROM will do the translation until a LTRS character is received, disabling the FIGS PROM and enabling the LTRS PROM.

In LTRS SHIFT ON SPACE, the LTRS PROM is enabled each time a Space character is received. If an incoming garbled character "fakes" the selection of the FIGS PROM, the next Space character will re-enable the LTRS PROM.

In LTRS ONLY, the LTRS PROM is enabled and "locked" ON. The receipt of a FIGS character will not enable the FIGS PROM. The purpose of this feature is to prevent unwanted up-shifts to FIGS when copying poor quality signals.

After character-translation has taken place, the ASCII coded character is sent in parallel form to the ASCII programmed UART at 16B, where the character is serialized at the selected baud rate and outputted.

A pair of tri-state buffers at 11C and 13C provide a parallel ASCII output at socket J3. This parallel information may be routed out of the TBA-1000 via the rear panel cable port for use with parallel entry peripherals.

The BAF4 FIGS PROM generates the ASCII BELL on receipt of a Baudot FIGS-S. An optional BAF6 PROM is available that generates the ASCII BELL on receipt of a Baudot FIGS-J (European standard) per CCITT No. 2. If the optional PROM is supplied, it will be stored in a storage socket at 10C. To convert from FIGS-S to FIGS-J, the two PROMS are merely interchanged in their sockets.

A BAF-41 PROM is available that provides Control L (ASCII Form Feed) upon receipt of a Baudot FIGS-H (#).

To implement this function the BAF-4 PROM at location 8C is replaced with the BAF-41 PROM.

ASCII-BAUDOT SECTION

If the incoming ASCII character is in serial form, it is converted to parallel by the ASCII UART at 16B. If it is already in parallel form, it is entered via the tri-state buffers at 16D and 17D.

The parallel ASCII character is routed to the LTRS PROM (ABL1) at 11B and to the FIGS PROM (ABF2) at 12B. A FUNCTION PROM (LFB5) at 13B determines which of the PROMS (LTRS or FIGS) will do the ASCII to Baudot translation.

The LFB5 PROM also selects whether the ASCII CONTROL-G (BELL) character is to be translated as a FIGS-S or FIGS-J. The selection of one or the other is accomplished by pole 4 of the UART/PROM Program switch S6. Pole 2 of the same switch commands the LFB5 PROM to either switch between the FIGS and LTRS PROMS normally, or to always generate the Baudot output in the FIGS case.

Since the Baudot-ASCII section can be locked by the front panel switch into the LTRS ONLY mode, and the ASCII-Baudot section can be locked into FIGS ONLY mode, some degree of "secure" communications can be achieved by a pair of TBA-1000s.

Although the transmitted Baudot information will always be preceded by a FIGS character, forcing a normal teleprinter without a TBA-1000 interface to print only upper case (FIGS), the receiving TBA-1000 will always translate thru the LTRS PROM (BAL3) and output lower case (LTRS) data.

After translation from ASCII to Baudot, the data is rippled thru a 192 character FIFO buffer memory, which prevents character over-runs.

A FIGS-LTRS shift command is generated only when an actual change of shift state is required, effectively extending the storage capacity of the Memory Section many times.

Although 110 baud ASCII and 74.2 baud Baudot are both 100 WPM, the automatic insertion of the FIGS and LTRS characters into the Baudot output requires a memory buffer if machine-speed operation is to be achieved.

The output of the FIFO memory is routed thru a tri-state buffer that permits automatic BLANK FILL when the memory is empty.

The ASCII CONTROL characters are decoded at locations 17B/C, 18B/C, 19B/C and 20B/C. Some of these CONTROL characters are used to control internal functions of the TBA-1000 (Preload, etc.), others are outputted to the rear panel for control of external peripherals and the balance are available in socket J2 on the main board. These control signals may be routed out of the TBA-1000 thru a rear panel cable port.

Variable Character Rate and Data Inhibit circuitry has been designed into the ASCII-Baudot section, which protects the Memory Section from character over-runs. When the Memory Section is outputting at machine-speed, the Baudot Clock sets the maximum baud rate, which prevents over-runs at the receiving station.

BAUDOT INPUT-OUTPUT (I/O) PROVISIONS

The TBA-1000 I/O is separated into two sections: Baudot and ASCII.

The rear panel connectors for both sections are intended for serial operation.

The Baudot I/O may be high level neutral or low level polar.

The high level neutral may be switch-programmed internally for Active or Passive operation. When set for Active, the TBA-1000 supplies 120 VDC loop voltage. The loop current may be switch-selected internally for 20 mils or 40-60 mils operation. A loop adjust potentiometer is provided at the rear panel to set the 20, 40 and 60 mils current levels to individual circuit loads.

When set for Passive, the loop current must be supplied from an external source. Since the current limiting resistors are in the high level neutral circuit in both modes, it may be necessary to set the internal loop switch (S4) to 40-60 mils to reduce the impedance of the loop circuit.

It is a good idea to leave the current limiting resistors in the TBA-1000 as protection against over-current operation of the input optical couplers.

Two high level loop connectors are provided. One has positive polarity (tip is positive) and the other has negative polarity (tip is negative). Some teleprinters with electronic interfaces are polarity sensitive and the dual connectors simplify interfacing one or the other polarities.

The low level polar I/O may be configured for either EIA RS232C or MIL STD 188C. The EIA configuration is -12 volts Mark and +12 volts Space. Op-amp 3E must be in the A location and op-amp 4E must be in the B location.

To invert the polarity of the EIA RS232C to +12 Mark and -12 Space, move 3E to location B and 4E to location A.

For MIL 188C operation, which is +6 volts Mark and -6 volts Space, the op-amps must be configured as inverted EIA (3E-B and 4E-A) and a 62K, 1/4 watt, 5% resistor installed at the open location R38.

Switching the op-amps to 3E-A and 4E-B will provide an inverted version of MIL 188C, i.e., -6 volts Mark and +6 volts Space.

The Baudot INTERNAL-EXTERNAL switch at S5 must be switched to External for low level input operation. See LOW LEVEL POLAR INPUTS section below.

Consult Page 1 of the Schematic print 75182 for additional information.

ASCII I/O PROVISIONS

The ASCII I/O is similar to the Baudot I/O.

The high level ASCII neutral I/O may be operated in either an Active or Passive mode.

In the Active mode, the TBA-1000 supplies a nominal 20 mils of loop current at 28 VDC. This loop current can be changed by modifying the value of the 2 watt resistor at R55. It can be lowered by plugging impedance into the loop via one of the rear panel loop connectors.

In the Passive mode, the 20 mils of loop current must be supplied from an external source. No current limiting is provided in the passive loop circuit, so care should be exercised when connecting external peripherals with their own built-in loop supplies. Generally, such peripherals contain their own current-limiting devices and there is not much chance of harming the TBA-1000.

The low level polar ASCII I/O is available in either MIL 188C, EIA RS232C or TTL serial configurations and a TTL parallel configuration. This parallel I/O is available at sockets J3 and J7 on the main board and is accessible thru a cable port at the rear panel.

EIA RS232C (-12 volts Mark and +12 volts Space) is provided when the op-amps are configured 6E-A and 7E-B.

Moving 6E to B and 7E to A inverts the voltage scheme to +12 volts Mark and -12 volts Space.

For MIL 188C operation (+6 volts Mark and -6 volts Space), the op-amps are inverted (6E-B and 7E-A) and a 62K, 1/4 watt, 5% resistor is installed at open location R57.

An ASCII TTL output is also provided at the rear panel: +5 volts Mark and Ø volts Space. This TTL output may be used simultaneously with the MIL/EIA output.

LOW LEVEL POLAR INPUTS

Although the low level polar outputs may be used when the TBA-1000 is set up for high level neutral operation, the low level polar input circuits are useable only when the Baudot INTERNAL-EXTERNAL switch S5 and the ASCII INTERNAL-EXTERNAL switch S8 are in the EXTERNAL positions. These switches are mounted on the main board.

Conversely, these switches must be in the INTERNAL position when entering data via the high level neutral connectors.

Generally, when the Low Level Polar Inputs are being used, the TBA-1000 will be operated in the Full Duplex mode, and Switch S3 is set in the center(C) position. See the following section for additional details on Full Duplex operation.

ASCII LOCAL, BAUDOT LOCAL & FULL DUPLEX OPERATION

Switch S3 on the main board selects the mode of Send/Receive control.

This switch has three positions:

A: ASCII LOCAL
B: BAUDOT LOCAL
C: FULL DUPLEX

If the TBA-1000 is to be used with an ASCII teleprinter, etc., for primary control, S3 is put in the A (ASCII LOCAL) position. In this mode, the TBA-1000 may be switched back and forth from SEND to RECEIVE by ASCII CONTROL characters generated at the local keyboard and by the front panel SEND/RECEIVE switch.

If the primary control is from a Baudot teleprinter, the S3 switch is put in the B (BAUDOT LOCAL) position, and the SEND/ RECEIVE switching is done by the front panel SEND/RECEIVE switch.

A LED (SEND/RECEIVE) is lit when the TBA-1000 is in SEND and extinguished when the unit is in RECEIVE.

For remote control of the SEND/RECEIVE line, a wire may be run from E-Point E4 (left rear main board) to the SPARE connector on the rear panel. A momentary ground at the SPARE connector will then perform the SEND/RECEIVE switching.

If the TBA-1000 is operated in a low level FULL DUPLEX mode, switch S3 is moved to the C (Center) FULL DUPLEX position. In this condition, both code translators within the TBA-1000 are operating simultaneously and independently of each other.

When shipped from the factory, S3 is normally put in the A position.

INTERNAL SWITCH SETTINGS

With the exception of the power mains Select Switch S9 (110-220), the slide switches on the main board are normally factory-set:

S3:	ASCII LOCAL.	A (rear).
S4:	BAUDOT LOOP.	40-60 mils (forward).*
S5:	BAUDOT I/O.	INTERNAL (left).
S7:	ASCII LOOP.	PASSIVE (left).
S8:	ASCII I/O.	INTERNAL (right).
S10:	BAUDOT LOOP.	PASSIVE (rear).*

*The Baudot loop is programmed for a passive 40-60 mils operation for interfacing to an RTTY terminal unit that has a self-contained 120 VDC loop supply. It may be necessary to modify the current-limiting scheme in the terminal unit to provide sufficient current in the loop. The loop current may be measured with a milliameter connected to the unused high level loop connector on the rear of the TBA-1000.

The power mains Select Switch S9 selects either 115 or 230 VAC operation.

A tag attached to the lid indicates the setting of S9.

UART/PROM PROGRAMMING

Programming of the various functions available in the UARTs and the ASCII-Baudot PROMs is accomplished with an 8PST DIP switch (S6) mounted in a high profile socket at location 14A.

Programming instructions for S6 are permanently etched on the main board at location 5A.

Factory programming is normally:

Pole 1:	ON.	Baudot Stop Bit not required.
Pole 2:	OFF.	If switch is programmed ON, which is called FIGS, the TBA-1000 will be forced to always select the FIGS PROM and outputted information will be in FIGS case.
Pole 3:	OFF.	Baudot Total Stop Bit structure of a regenerated character will be 1.5 C.U. (Character Units).
Pole 4:	ON.	A Baudot BELL will be sent as FIGS-S. If this switch is set to OFF, the Baudot BELL will be sent as FIGS-J.
Pole 5:	OFF.	Don't care. Parity not used.
Pole 6:	OFF.	The ASCII Uart is programmed for an 8 bit code. (ON programs for a 7 bit code.)
Pole 7:	OFF.	This pole has been deactivated. May be set for ON.
Pole 8:	OFF.	Selects a 2.0 C.U. Stop Bit construction for the ASCII characters.

FRONT PANEL CONTROLS AND INDICATORS

The main power switch (S1) is a single pole, double throw switch with a center-off position, which is labeled AC-OFF.

An electronic BYPASS circuit consisting of NAND gates G1 and G2 routes the I/O circuits around the Code Translation Section when the front panel Power switch is put in the BYPASS position. See Page 15A.

Switch S2 also has a center-off position and provides three functions:
NORMAL, LTRS SHIFT ON SPACE and LETTERS ONLY.

When receiving a Baudot signal and converting to ASCII, this switch will be operated in either NORMAL or in LETTERS SHIFT ON SPACE.

In NORMAL, the ASCII output will faithfully follow the LTRS-FIGS shift commands received in Baudot.

In LETTERS SHIFT ON SPACE, the TBA-1000 will translate incoming Baudot characters thru the LTRS PROM if it has received a Space character after the last FIGS Shift character.

With the switch in the LETTERS ONLY position, incoming FIGS shift characters are ignored and the TBA-1000 continues to translate from the LTRS PROM.

In addition to offering a semi-secure mode of operation as detailed above in the ASCII-BAUDOT SECTION, this mode of operation also prevents the ASCII teleprinter from being "faked" into printing in FIGS case by a false FIGS shift command generated by a weak or noisy signal.

The BLANK FILL switch (S11) functions when the TBA-1000 is translating ASCII into Baudot.

If the BLANK FILL switch is in the ON position, a tri-state buffer at location 4C permits repetitious generation of the Baudot BLANK character whenever the 192 character FIFO buffer memory is empty.

This BLANK FILL feature improves the error rate at the receiving end when the signal is running at less than machine speed, by balancing the energy in the Mark and Space channels closer to the optimum 50% Mark-50% Space ratio.

A well balanced signal not only enhances the propagation path in the HF spectrum, but improves the performance of the receiving terminal unit's axis restoration circuits with a resultant decrease in "first character error".

Switch S12 is a momentary SPDT with a center off position.

When raised to the CLEAR position, the contents of the FIFO buffer memory are erased.

When lowered to the SEND-RECEIVE position, the TBA-1000 is switched from Send to Receive and vice versa. A front panel LED (SEND-RECEIVE) indicates the status of the TBA-1000. This LED is lit in SEND and extinguished in RECEIVE.

The Baudot Speed Select switch (S13) in the upper left section of the front panel selects the baud rate of the crystal-controlled clock of the Baudot UART. Baudot baud rates of 45.45, 50.00, 56.88, 74.2/75.0 and 110 baud are selectable. An option is available that converts the 110 baud position to an internally selectable baud rate, permitting Baudot operation at non-standard baud rates: SBR-100 Selectable Baud Rate Option.

The CHARACTER RATE control (R100) in the right section of the front panel sets the time interval between the outputted Baudot characters, effectively lengthening the length of the Baudot Stop Pulse. This feature does not change the baud rate, just the effective character rate as expressed in WPM. The board mounted Character Rate pot (R503) is normally set at mid-scale.

When the front panel CHARACTER RATE control is set at 12 o'clock, the character rate will be approximately 60% of machine-speed. For a 45.45 baud (60 WPM) signal, the actual word rate will be about 35 WPM.

If the Speed Select switch is set to 75 baud (100 WPM), the effective word rate will be about 60 WPM.

This variable character rate feature has been provided to smooth out the transmission of Baudot characters from a "hunt and peck" typist sending at keyboard speed.

A Character Rate Over-Ride circuit has been provided and is discussed in the following Section.

BYPASS CIRCUITS

A solid-state BYPASS circuit has been factory installed in the Mark II TBA-1000, which is enabled when the front panel Power switch is in the BYPASS position. This circuit consists of a pair of 4011 NAND gates at locations G1 and G2. When enabled, this circuit passes the ASCII and Baudot I/Os around the code translation section. This is a useful circuit when the TBA-1000 is connected to an RTTY Terminal Unit, since the loop characteristics driving the local teleprinter are not changed.

To disable the electronic Bypass Circuit, remove G1 and G2, and install jumpers at locations C and D which are adjacent to G1 and G2.

A mechanical relay Bypass Circuit is also available as an option, which essentially makes the TBA-1000 transparent to the ASCII and Baudot I/O ports. This is the least desirable of the two methods of Bypassing, since the local teleprinter is switched to the external loop condition when the TBA-1000 is in the BYPASS mode. See Print 75182, Sheet 2.

MEMORY STATUS INDICATORS

Five LEDS indicate the status of the 192 character FIFO buffer memory Section, which consists of three 64 character memory blocks.

When all memory blocks are empty, the EMPTY LED is lit.

With one character, but less than 64 characters, in storage, the Memory EMPTY LED will extinguish and the second LED will light.

With 64 characters (but less than 128), the third LED will light and the second LED will stay lit.

When the second memory block fills, the memory will contain 128 characters and the fourth LED will light, indicating that 2/3rds of the available memory has been filled.

Simultaneously, the DATA INHIBIT and NORMAL LEDs will light.

Although these two circuits operate independently of each other, it is normal for them to come on and go off at approximately the same time.

When the NORMAL indicator is lit, the character rate of the outputted Baudot signal is automatically increased to full machine-speed, preventing the third memory block of 64 characters from being quickly over-run.

When the DATA INHIBIT LED is lit, the Data Inhibit relay (K1) on the main board is energized. This relay is configured as SPDT and both contacts and the wiper are brought to the rear panel

DATA INHIBIT connector. The current rating of the relay's contacts is 2 amps.

At the end of a predetermined period, norminally 20 seconds, the DATA INHIBIT and NORMAL LEDs will extinguish, indicating that K1 has switched back to the original state and that the variable character rate has returned to the rate set by the front panel CHARACTER RATE control.

The basic time constant of these circuits is controlled by the values of R97 and R98. The "slide-back" timing of the character rate is set by R99. Increasing the resistance increases the time constant.

MEMORY PRELOAD

The front panel PRELOAD LED indicates when the Memory Section is storing the incoming data, that is, preloading.

The Memory Section may be switched into PRELOAD by generating a CONTROL-U character from the ASCII keyboard.

CONTROL-F will also put the Memory Section into PRELOAD and simultaneously issue a momentary ground to the rear panel IDENT connector. This feature is intended to permit a Station Identifier to be enabled from the ASCII keyboard without interrupting data flow into the TBA-1000.

At the end of a predetermined time period, about 20 seconds, the Memory Section will switch from Preload to Operate, and the contents of the Memory Section will be outputted.

This automatic switching from Preload to Operate may be inhibited by removing R126, or lengthened in time, by increasing its value.

When the Memory has been put into Preload by CONTROL-U or CONTROL-F, it can be switched back to Operate by generating a CONTROL-T (PRELOAD OFF) command from the ASCII keyboard.

To generate CONTROL Characters, the Control (CTRL) key on the keyboard is held down and the desired alphabet key is pressed simultaneously. See ASCII CONTROL CHARACTERS Section.

LOOP INDICATORS

The LOOP LEDs (ASCII and BAUDOT) indicate only when the high level neutral loops are carrying loop current.

The rear panel LOOP connectors are polarized Positive and Negative, referring to the polarity of the loop voltage on the tip of the plug wired to the teleprinter, etc.

Most mechanical Baudot teleprinters are not polarized, but some of the newer units with electronic interfaces might be.

Most ASCII teleprinters have the ability to be polarized and many have built-in loop supplies.

Observing the status of the LOOP LEDs will aid in selecting the proper polarity and the Active/Passive mode. Generally, an incorrect connection to the TBA-1000 will not result in damage.

HIGH LEVEL NEUTRAL LOOPS

Generally, an incorrect connection to the TBA-1000's high level neutral loop connectors will not result in damage to the internal circuits of the TBA-1000, but Dovetron does not guarantee or warranty the TBA-1000 against this type of damage.

Caution should be used when initially connecting the TBA-1000 to the outside world.

If the BAUDOT peripheral (teleprinter, terminal unit, etc.) is to supply the loop current, the BAUDOT Active-Passive switch should be set to Passive. Conversely, if the peripheral requires the loop to be generated by the TBA-1000, the switch should be set to Active, and the loop select switch on the main board should be set for either 20 or 40-60 mils operation.

The ASCII high level neutral loop should be carefully selected in the same manner.

If the ASCII peripheral is to supply the required loop current, set the ASCII switch to Passive. If thc ASCII unit requires an external loop current, set the switch to ACTIVE, in which case the TBA-1000 will supply a nominal 20 mils at 28 volts DC.

The actual current flowing in either loop may be measured by inserting a milliameter in the unused rear panel loop connector. The Baudot loop can be adjusted for the required current by the rear panel Loop Adjust potentiometer. The ASCII loop current may be adjusted by changing the value of the 2 watt resistor located at R55. Increasing the value of R55 decreases the loop current, and decreasing the value of R55 increases the loop current. See page 27A, ASCII LOOP KEYER.

ASCII KEYBOARDS

Unlike Baudot keyboards, which have two cases (LTRS and FIGS), the ASCII keyboard contains a lower case alphabet, an upper case alphabet, a numerals case, the upper case of which provides punctuation, and a CONTROL case. Another case, known as ESCAPE (ESC) will be discussed later.

Mechanical teleprinters, such as the Teletype Corporations Model 33 and 35, do not incorporate lower case alpha, and all alpha characters are generated with an upper case coding.

More recent mechanical teleprinters, and most electronic keyboards generate both upper and lower case alpha.

The Dovetron TBA-1000 incorporates a special circuit (consisting of 15E, CR40, CR41 and R139) which permits a two-case keyboard to be used with no concern of whether upper or lower case is being generated. When lower case alpha is fed into the TBA-1000, this circuit automatically converts it to upper case alpha.

The TBA-1000 translates all ASCII upper-case alpha, numerals and punctuation that have a Baudot equivalent and 15 of the CONTROL keys.

Some of these CONTROL functions are used internally to control the various functions of the TBA-1000.

Others are outputted to the rear panel connectors for easy interface to external equipment for control purposes.

Still others are generated, but not used. All of them, including the unused ones, are available at the J1 and J2 locations at the rear edge of the TBA-100's main board.

Sockets and/or cables may be installed in these locations and routed out of the TBA-1000 thru the rear panel cable port.

ASCII CONTROL CHARACTERS

To generate a CONTROL character, the CONTROL (CTRL) key on the keyboard is held down and the desired alpha key is depressed simultaneously.

As an example, to generate CONTROL-A (CTRL-A), hold down the CONTROL key and depress the A key.

The following is a complete list of the CONTROL characters that are decoded by the TBA-1000 and their assigned function. Its particular location in either J1 or J2 is also listed. The designator in parenthesis () is often found marked on the top of individual keys.

CONTROL-A: (SOH) REMOTE LOCK ON. Controls LOCK 2 at rear panel. May be used to control a transmitter's PTT line. Pin 4 of J2. See CONTROL-D.

CONTROL-B: (STX) SEND-RECEIVE. Controls the rear panel LOCK 1 and PTT lines. Also switches the TBA-1000 between SEND and RECEIVE modes, which are indicated by the front panel SEND-RECEIVE LED. LOCK 1 will go high when the PTT line is down. When used with a Dovetron E-Series terminal unit without KOS-100, LOCK 1 should be connected to the terminal unit's rear panel LOCK connector, and PTT should control the transmitter. Pin 6 of J2.

CONTROL-C: (ETX) NORMAL CHARACTER RATE. Permits the variable character rate of the TBA-1000 to be increased to full machine speed at the end of a transmission to quickly empty Memory Section. Pin 7 of J2.

CONTROL-D: (EOT) REMOTE LOCK OFF. Works with CONTROL-A, which provides 2 ON at rear panel. CONTROL-D provides LOCK 2 OFF. The use of CTRL-A and CTRL-D permits one key to turn a peripheral ON and the other key to turn the peripheral OFF. Pin 1 of J1.

CONTROL-E: (WRU) IDENTIFICATION. Provides a ground state at rear panel IDENT. May be used to control an external Station Identifier such as a Dovetron TID-100. Pin 2 of J1.

CONTROL-F: (ACK) IDENT/PRELOAD. Provides a ground state at rear panel IDENT and simultaneously commands the TBA-1000 Memory Section into PRELOAD, permitting data to be entered while the ID function is taking place. At the end of the ID period, the Memory goes back to Operate and the preloaded data is released from memory for transmission. Pin 5 of J1.

CONTROL-G: (BELL) BELL. Generates either a FIGS-S or a FIGS-J for a Baudot BELL, depending on the setting of Pole 4 of the UART/PROM programming switch S6. Pin 7 of J1.

CONTROL-P: (DLE) NORMAL CHARACTER RATE OFF. If the variable character rate of the TBA-1000's Baudot output has been increased to full machine-speed by the Memory Section reaching 128 characters (2/3rds full), or by a command from CONTROL-C, the character rate can be dropped back down to the setting of the front panel CHARACTER RATE control by generating a CONTROL-P. If CR14 is removed from the main board, Pin 2 of J2 may be brought out thru the cable port for an additional external control line. Pin 2 of J2.

CONTROL-Q: (DC1) UNASSIGNED. Pin 3 of J2.

CONTROL-R: (DC2) UNASSIGNED. Pin 5 of J2.

CONTROL-S: (DC3) UNASSIGNED. Pin 8 of J2.

CONTROL-T: (DC4) PRELOAD OFF. If the Memory Section has been switched into Preload by a CONTROL-U command, it may be switched back to Operate by a Control-T character. Pin 14 of J1.

CONTROL-U: (NAK) PRELOAD ON. Switches Memory Section to PRELOAD for

A predetermined period of time. Pin 3 of J1.

CONTROL-V: (SYN) UNASSIGNED. Pin 4 of J1.

CONTROL-W: (ETB) END OF TRANSMISSION A/B. Controls a flip-flop that drives a 2N697 at Q10. The input drive to the transistor is an E-Point (E-3) on the main board. The output of the transistor is available at another E-Point (E-2). The signal characteristics at E-2 are +15 VDC and ground (zero). The ETB-A and ETB-B lines are also available at Pins 13 and 6 of J3. The ETB command itself is available at Pin 6 of J1. Consult Page 2 of Schematic Print 75182 for additional information.

BREAK BUTTON: (NUL) Although the BREAK BUTTON is not considered to be part of the CONTROL level of the ASCII keyboard, it generates a similar code and is known as "NUL". When the ASCII BREAK button is depressed, a level shift is generated by the 4012 at location 17C and outputted to Pin 1 of J2. See Page 27.

ESCAPE: (ESC) BLANK To generate a Baudot BLANK character from a standard ASCII keyboard, the ESCAPE (ESC) key has been assigned a BLANK character location in the PROM scheme. Pressing the ESCAPE key generates a Baudot BLANK, which can be used to control the Word Correction circuit in a Dovetron MPC-1000R terminal unit.

RUBOUT: (DEL) Pressing the RUBOUT key resets the Baudot and ASCII UARTS and erases the contents of the Memory Section.

PARALLEL ASCII I/O

Provisions have been made at locations J3 and J7 at the rear of the TBA-1000's main board for both Parallel ASCII Input and Output. The Input is at J3 and the Output is at J7. Both are buffered by 14503 tri-state buffers. Pin 10 of J3 is the Serial/parallel Control line.

When Pin 10 of J3 is open, the TBA-1000 provides only Serial I/O as discussed earlier. When Pin 10 of J3 is grounded, the ASCII UART at 16B is tri-stated, i.e., disconnected and parallel ASCII data may be entered at J3.

With Pin 10 of J3 grounded, parallel ASCII (output) data is available at J7, and serial ASCII data is still available at the serial output connectors.

Since there appears to be very little standardization of handshake requirements between various ASCII peripherals, when operating in the parallel mode, some external logic may be required to accomplish a working interface. The following definitions are intended to aid the user in defining the interface circuits.

PARALLEL ASCII INPUT AT J3

IR - INPUT READY. A high to low transition on this "output"

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MARK II TBA-1000 BREAK BUTTON LOOP CONTROL

When the ASCII BREAK BUTTON is depressed, opening the ASCII loop to the TBA-1000, a logic command is generated within the TBA-1000 that opens the Baudot loop. As explained on Page 27, this feature may be inhibited by removing Jumper A and installing Jumper B. These jumper locations are directly above transistor Q5 on the mainboard.

When the Baudot loop has been opened by an ASCII Break-Button command, it will NOT return to normal (closed) loop condition until some other ASCII character has been entered into the TBA-1000.

A SPACE character is a good choice for inhibiting the Baudot open loop condition.

Although other schemes could be devised for opening the Baudot loop, this method appears to be the most flexible and reliable.

line indicates that the Memory is ready to accept the next character.

DE - DATA ENTRY. This input line must be driven low to enter data.

PARALLEL ASCII OUTPUT AT J7

DI - DATA INTERRUPT. This "input" is normally low and parallel ASCII data will be outputted. To interrupt data, this line must be pulled high.

DR - DATA READY. This line goes low when data is available.

PARALLEL ASCII ENTRY CONSIDERATIONS

When interfacing parallel ASCII peripherals, care should be taken not to couple high speed transients into the TBA-1000. Such spikes and glitches may trigger false internal commands.

As pointed out earlier, the TBA-1000 contains a special circuit that converts lower case ASCII to upper case ASCII.

The RUBOUT (DEL) key on a standard upper case ASCII keyboard, such as found on a Model 33 or 35 teleprinter, generates a Memory Clear command within the TBA-1000. This command clears the 192 character FIFO buffer memory and resets the output registers of both UARTS.

Since RUBOUT is coded 1-1-1-1-1-1-1, ASCII keyboards with both upper and lower alpha cases would normally generate the Memory

Clear command only from the lower case.

To generate the RUBOUT code in both cases, Pin 13 of the 14048 at location 15D has been tied up to +5 volts. This configuration permits the RUBOUT (DEL) key to generate the Memory Clear in either case.

The ASCII "underscore" character lost by this configuration was of no use in an ASCII to Baudot conversion, since "underscore" does not exist in the Baudot code.

BREAK BUTTON

In addition to the level shift at Pin 1 of J2, the Mark II TBA-1000 will open the Baudot Loop when the ASCII Break Button creates an open-loop condition. This circuit is provided by the factory-installation of Jumper A at the input of integrated circuit 12D. To disable this circuit, remove Jumper A and install Jumper B. The ability to transmit an open loop condition thru the TBA-1000 (ASCII to Baudot) is very useful if an open loop condition is used for control purposes. One example of this is the Station Identification command circuitry of the KOS-100 assembly of the Dovetron MPC Series RTTY terminal units.

ASCII LOOP KEYER

The Mark II TBA-1000 has a current-protected ASCII Loop Keyer circuit that consists of Q12, Q18 and R141. Both transistors are high-beta, low-voltage/low-current devices. They are manufactured by National Semiconductors, Inc. and carry the part numbers 92PU45 or 2N6724.

Q12 is the loop keyer and in ASCII service would be expected to operate at 28 VDC and 20 milliamperes. R141 is a 39 ohm, 5%, 1/4 watt resistor that develops voltage across itself when loop current is flowing thru Q12. With 30 to 35 mils flowing thru R141, a sufficient amount of voltage is developed to gate Q18 into conduction, which in turn pulls down the base of Q12, effectively opening the loop and preventing damage to Q12 by an over-current condition. In the event of a failure of Q12, Q18 may be used as a spare. This circuit does not provide protection against high voltage.

RTTY TERMINAL UNIT INTERFACE

Most modern RTTY terminal units contain an internal high level neutral loop supply, and many of these terminal units are neutral loop oriented. That is, the high level loop is used as the most significant input-output port.

When the TBA-1000 is used to interface an ASCII coded device to this type of terminal unit, it is preferable to let the terminal supply the loop current, just as if it were driving a passive loop Baudot teleprinter. The Baudot mode switch in the TBA-1000 would be set for Passive operation. Another advantage of Baudot Passive operation is that the current limiting (and heat generating) components in the terminal unit will run cooler, since the current limiting components in the TBA-1000 are also sharing the load.

When the Baudot Loop in the TBA-1000 is set for Active operation, the TBA-1000 supplies 20, 40 or 60 mils of current at 120 VDC. A switch on the main board selects the two ranges: 20 mils or 40-60 mils, and the loop adjust potentiometer on the rear panel permits exact adjustment of loop current, depending on the impedance load that is being driven.

ASCII teleprinters nominally require 20 mils of loop at 28 VDC. Some have built-in loop supplies to supply the 20 mils of current, in which case the TBA-1000 ASCII Loop will be set for Passive operation. If the ASCII device requires an external loop supply, set the ASCII mode to Active and the TBA-1000 will provide the loop current, which is nominally 21-22 mils. If it is determined that the loop current is too high or too low, change the value of R55 (1K, 2W, 5%) to a slightly higher value (1100 ohms) for less loop current, and to a lower value (910 ohms) to increase the loop current.

Many ASCII teleprinters have polarized inputs (as do some later models of Baudot teleprinters) and for this reason the high level neutral connectors on the rear panel are of opposite polarities.

A milliameter may be plugged into the unused connector for loop monitoring and adjusting purposes. Both connectors are normally closed and the front panel BAUDOT and ASCII Loop LEDs will indicate when loop is flowing in the circuit.

DOVETRON TERMINAL UNIT INTERFACE

The TBA-1000 should be operated in the Baudot Passive mode with the MPC Series terminal unit supplying the loop current.

The ASCII mode may be either Active or Passive, depending on the loop requirements of the ASCII device.

If the Dovetron terminal unit is an E-Series, which requires a + voltage at its rear panel LOCK connector to switch it remotely to SEND, this LOCK connector should be connected to the LOCK 1 connector on the rear of the TBA-1000. The PTT connector on the rear of the TBA-1000 may be connected to the companion transmitter's PTT line.

If the Dovetron terminal unit contains a KOS-100 Keyboard-Operated-Send assembly, it may be switched off and the LOCK 1 & PTT scheme detailed above used. If the KOS function is to be used, the LOCK connector on the rear of the terminal unit becomes the PTT command line.

LOCK 1 and PTT are controlled by the CONTROL-B command from the ASCII keyboard. Sending a CTRL-B command puts the terminal unit into SEND. Sending a <u>second</u> CTRL-B puts the terminal unit back into RECEIVE.

The earlier A, B, C and D series Dovetron terminal units require that the rear panel LOCK connector on the rear of the terminal unit be pulled down to ground.

This can be accomplished by connecting the TBA-1000's LOCK 2 to the terminal unit's LOCK connector. A PTT line can also be connected to this circuit via "diode steering". A CTRL-A puts the terminal unit into SEND and a CTRL-D puts it back into RECEIVE.

The IDENT connector on the rear panel of the TBA-1000 may be connected to the CW ID connector on the rear panel of the terminal unit.

Sending a CTRL-E from the ASCII keyboard will initiate a CW ID sequence in the terminal unit.

Sending a CTRL-F also sends the CW ID "start" command and simultaneously puts the TBA-1000 into Preload, allowing data to be entered into the TBA-1000 during the CW ID sequence.

When used with an MPC/KOS combination, the IDENT command from either CTRL-E or CTRL-F will also force the memory section of the TSR-500D in the MPC into Preload while the IDer is sequencing.

The RUBOUT (DEL) key on the ASCII keyboard generates an internal command in the TBA-1000 that resets the Baudot and ASCII UARTS and clears the 192 character memory.

The ESCAPE (ESC) key on the ASCII keyboard generates a Baudot BLANK character that will (via the Word Correction circuit in a TSR-500D) erase the contents of the Word Storage FIFO on the TSR-500D assembly.

Whenever a CONTROL character has been generated from the ASCII keyboard to provide a Control function, the internal Control Character decode logic of the TBA-1000 is "set". Generating a sequential non-Control character will "clear" this logic. For this reason, it is a good idea to train yourself to send a Space, Blank or some other character after generating the wanted Control Character.

The ASCII LOCAL CONTROL card supplied with the TBA-1000 should be placed near the operating position for quick reference to the various functions of the ASCII CONTROL characters.

DUAL CLOCK ASSEMBLY

The Dual Clock Assembly consists of two crystal-controlled oscillators and two divider sections. The entire assembly mounts above the left front portion of the TBA-1000 main board and interconnects via a 14-pin header and socket.

The Baudot Clock uses a 60.000 KHz crystal and the frequency divider section is controlled by the front panel-mounted Baudot speed switch. This switch has five positions: 45, 50, 57, 75 and 110 Baud, which correspond to the Baudot speeds of 60, 66, 75 and 100/106 WPM and the ASCII speed of 100 WPM.

The Dovetron SBR-100 Selectable Baud Rate module may be plugged into the dual clock assembly to provide a non-standard baud rate when the front panel switch is in the 110 baud position.

The ASCII Clock uses a 153.6 KHz crystal and the frequency divider section is controlled by an 8PST DIP switch mounted on the dual clock assembly. ASCII baud rates of 110, 150, 300, 600, 1200, 2400, 4800 and 9600 baud may be programmed by selecting the proper BCD Divisor number and entering it via the DIP switch. To determine the proper BCD divisor for a non-standard baud rate, use the formulae:

1) BAUD RATE X 16 = CLOCK FREQUENCY

2) $$\frac{153{,}600}{\text{CLOCK FREQUENCY}} = \text{BCD DIVISOR}$$

As an example, to determine the correct BCD divisor for 110 baud operation: 110 X 16 = 1760 Hz. and 153,600/1760 = 87.29. Programming the DIP switch to the closest available divisor (87) produces a clock frequency of 153,600/87, which is 1758.6 Hz. The difference between an ideal frequency of 1760 and 1758.6 is insignificant.

The proper BCD divisor numbers for the standard baud rates between 150 and 9600 baud are permanently etched on the dual clock board, just to the right of the DIP programming switch.

To remove the clock board for service, remove the three nuts that secure the board in place and raise the board straight up. When reinstalling the board, check that the pins of the socket on the main board are lined up with the extended header of the dual clock assembly.

To check the dual clock for proper operation, measure the voltage at pin 14 of any chip. It should be +5 VDC regulated. If voltage is available, but the oscillator(s) are not oscillating, replace the oscillator integrated circuit. The RCA CD4007 is a preferred replacement. Although the MC14007 (Motorola) may be used, it has been suggested by the crystal manufacturer that the CD4007 version of the chip is a better choice.

TROUBLE SHOOTING SUGGESTIONS

If trouble is encountered in connecting the TBA-1000 to the outside world, double check the logic of all the connections. Most problems result from operator-error, i.e., selecting an incorrect mode of operation or from incorrectly wired or defective interconnecting cables.

Infant mortality of the internal components is also a possibility and generally is restricted to the low-cost ICs. The higher priced items have a much longer, useful life.

OP-AMPS. If an op-amp fails, it will usually smoke, spit-open or run very hot, indicating that it has latched up or shorted internally. The op-amps used in the TBA-1000 are standard μ741, 8 pin, minidip devices and any manufacturers replacement may be used.

INTEGRATED CIRCUITS. The ICs used in the TBA-1000 are CMOS units and do not generate heat. If one of them is running hot, it is probably shorted and should be replaced. Do not confuse a CMOS IC with either the 3341 FIFO memory chips or the IM5610 PROMS, which are not CMOS units, which do consume power and do generate some heat under normal operation. The most likely candidate for early failure is the CD4007 IC used in the crystal oscillators. The CD4007 (RCA) is preferred to the MC14007 (Motorola) in this application.

OPTICAL COUPLERS: Since the optical couplers are connected to the rear panel connectors, it is to be expected that some will be damaged by operator-error.

REGULATORS. Regulators generally do not fail, but automatically shut down when operated at excessive current levels of heat. If a regulator shuts down (no output), the problem is probably not the regulator, but a shorted IC somewhere in the TBA-1000 pulling down the line, which in turn shuts off the regulator. When the short is removed (and the regulator is allowed to cool off), the regulator will power-up normally.

SOCKET CONSIDERATIONS. The sockets used in the TBA-1000 provide various functions. The most obvious is the easy replacement of a defective device. Secondly the socket provides a heat barrier between the IC and the main board. ICs are cheap and boards are expensive. If an IC shorts and catches fire, the socket will "puddle" and protect the main board from damage. Statistically, some ICs are going to be found with a folded over pin. The side wipe nature of the socket will probably pick up the folded over pin and never cause any problems. It is suggested that if an "intermittent" condition is detected, inspect all the ICs for proper insertion in their sockets. Usually a folded over pin only occurs at the end of the IC and is rather easy to spot.

SLIDE SWITCHES. The slide switches have self-cleansing contacts and moving the selector back and forth a few times will clear any contaminants that may accumulate over a period of time. Being mechanical devices, they are not immune to mechanical breakdown and if a switch appears to be operating erratically, it should be replaced.

WARRANTY

The Dovetron TBA-1000 is warranted for 90 days from the date of shipment for parts and replacement labor. Warranty repairs are performed at South Pasadena. All shipping and insurance costs are for the customer's account. If a TBA-1000 is returned for warranty repair, prepayment of $30.00 for shipping and insurance and a letter stating the problem must accompany the instrument. Prior authorization for warranty-return is not required, but returned instruments will not be repaired or returned to the customer until the above stated conditions are met. The warranty is not voided if the customer attempts to repair his own TBA-1000, but Dovetron assumes no liability for customer repairs or modifications.

SPARE PARTS

With the exception of the Proprietary PROMS, Baudot speed switch and the power transformer, all the components used in the TBA-1000 are available at most supply houses. The following items are available postpaid USA from Dovetron. All spares orders must be prepaid. COD shipments are not made.

Proprietary PROMS. 5 each at $6.00:	$30.00
Power Transformer, WTI-8312:	$30.00
FIFO Memory Chip 3341:	$10.00
Package of 10 LEDs:	$ 6.00
PC Board Slide Switch:	$ 3.00
Front panel Toggle Switch:	$ 5.00
DIP 8PST Switch:	$ 6.00
Optical Coupler FCD-810:	$ 1.00
4000 Series Integrated Circuits:	$ 1.00
4500 Series Integrated Circuits:	$ 5.00
Crystal (specify 60 or 153.6 KHz):	$10.00
CMOS UART IM6402 Series:	$10.00
DPDT 110 VAC Relay for Bypass option. Two required:	$30.00 pair.
Baudot Speed Switch with cable:	$25.00
Loop Transistor (2N3439):	$ 2.50
Loop Transistor (92PU45):	$ 2.00
Data Inhibit Relay:	$ 5.00
Instruction manual with prints:	$25.00
Cable/connector assembly for parallel ASCII I/O (24 inches):	$ 6.00 each.

Prices subject to change without prior notice.

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