

I. INTRODUCTION

This Tech Tip is intended to serve as a guide for installation and maintenance of the DECScope. The sections are brief to enable the reader to find and absorb all relevant information in the shortest possible time. Anyone installing the DECScope or performing corrective maintenance will find it beneficial to read the respective section in its entirety and follow the outlined procedures very closely. When procedures differ from previously common standards, it is done to provide the customer with the most efficient service.

1. GENERAL DESCRIPTION OF DECSCOPE

The VT50 is an A/N (alpha-numeric) terminal displaying 64 ASCII characters on a 220mm by 110mm (8.7 inch X 4.3 inch) CRT (Cathode Ray Tube). It has an underscore cursor and displays 12 lines with eighty characters each.

The terminal can be operated in local (off-line) or remote mode in full duplex. There is also a simulated half duplex feature which provides a local copy of the data which is transmitted to the host computer. There are transmission speeds up to 9600 baud. The terminal communicates by means of a standard 20m Amp current loop or an optional EIA (Electronic Industries Association) interface.

1. PHYSICAL DETAILS

The VT50 DECSCOPE terminal weighs about 19.4KG (43 lbs.). The dimensions are as follows:

Height: 36 cm (14.1 in.)

Width: 53 cm (20.9 in.)

Depth: 69 cm (27.2 in.)

The on/off switch is located on the metal plate in the center of the right side of the unit. The Local/Remote switch^(S1) is located under the unit on the front right hand side, it is the right one of the two rotary switches^(S1 and S2) at this location. To operate in local or off-line mode this switch must be turned to its fully counter-clockwise position. This same switch together with^(S2) the one on the left next to it is used to select the Baud rate and full or simulated half duplex operation. Refer to Programmers Manual or label under each VT50 unit.

The outer shell of the VT50 is made of injection moulded plastic. The first units were made of expanded ABS plastic.

The logic and analog circuits are on 3 printed circuit boards and the keyboard. Two of the p.c. boards are mounted flat against the underside of the upper case (shell) which can be considered the chassis. The base serves as a cover. The third p.c. board is mounted to the rear of the case in a vertical position. A louvered metal panel is screwed to a large heat sink on that third board, which accommodates both the power supply for the whole unit and the analog video section.

The two boards on the underside make up the microprocessor and interconnect directly by means of two rows of "F" pins, which are widely used in the VT industry. The keyboard located above the forward microprocessor board has a small cable connecting to "F" pins on that microprocessor board. That same forward board accommodates the ROM's and UART. The rearward microprocessor board is the DATAPATH board and connects to the power supply/video board by means of two small cables and "F" pin connectors.

The optional EIA board is mounted on two rows of "F" pins on the ROM/UART board. On the same board the slide switch found between the two rotary switches is to select (20 mA) current loop operation on the optional EIA operation. For current loop operation (NORMAL) slide the switch towards the Terminal Strip. The slide switch near S1 (Local/Remote rotary switch) is the key click ON/OFF switch. It is ON when set to the rear towards the rotary switch.

The third slide switch on this board located near S2 (Speed switch) is used to select even parity or no parity. For even parity slide switch to the rear towards S2.

S1 of the rearward microprocessor board, which is the only switch (sliding type) on this board is used to select a test pattern for troubleshooting purposes.

Video adjustments can be made with the louvered rear panel removed to expose the control. (This should only be necessary after CR tube or board replacements.)

The only operator control affecting the display is the INTENSITY CONTROL, which is located at the back on the right near the top of the VT50. It can be reached with your right hand while viewing the display screen.

There are no fans or blowers employed in the unit.

The unused space above and to the right of the neck of the CRT is intended for future additions to the VT50. This unused space has a special cover to prevent any matter from getting inside the unit.

The part numbers for the p.c. and keyboards are:

	<u>Part Number</u>
DATA PATH	54-10906
ROM/UART	54-10902
Power Supply/Monitor	54-10886
Keyboard	54-10893

IV. INSTALLATION

1. Unpacking

Remove free flow material from polybag containing VT50.

Lift out VT50 with bag and remove unit from bag.

Remove tape and keyboard protector.

Set VT50 in a place big enough to permit tipping the terminal on its back to gain access to the terminal strip and operation mode and transmission speed switches located underneath the base.

2. Testing

Inspect the whole unit for physical damage.

Tip the unit on its back. The VT50 is being shipped with a 4 meter (12 foot) interface cable. Check for the wires to be connected to the terminal strip and the cable fastened to the base by a strain relief. Set the mode switch S1 to Off-Line (Local Mode). This is all the way counter clockwise. The speed switch S2 may be in any position except fully clockwise (an unused position) or fully counter clockwise (Bell 103 position). Check for line voltage to correspond with VT50 power requirements by looking for descriptive plate around power ON-OFF switch. Only 50/60 Hz, 220/240 volt units have this plate.

Connect power cable to wall outlet and turn VT50 power on. After a one minute warmup period, a flashing cursor should appear on the screen. Adjust intensity down for most comfortable viewing using slide control on the rear near the

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top on the right of the unit. Slide control to the left, towards the center to reduce intensity.

Now test the unit by depressing keys and checking for corresponding characters on the screen.

Connect the VT50 to computer interface by following procedure outlined in next section (IV.3).

Set mode switch S1 for Half-Duplex operation. Check label under VT50 for switch setting. The computer does not require any program for the following test since the data transmitted out by the VT50 is looped right back to the receiver by way of VT50 internal connection. The reason why the interface cable must be connected to the computer interface is to condition the optical couplers. Therefore, the interface must be powered up.

Test VT50 by depressing keys and checking for corresponding characters on the screen. Then check the following functions:

Erase Functions:

- a. Type some characters on all 12 lines.
- b. With cursor on the bottom line, press "CTRL M"; check for cursor to move to the left-most position on that line.
- c. Press "ESC K"; check for all characters on the bottom line to be erased.
- d. Press "ESC H"; check for cursor to go to the top left of screen.
- e. Press "ESC J"; check for all characters on the screen to be erased.

Move Cursor Functions:

- a. Press "ESC C"; cursor should move to right, repeat until cursor is in the center of screen.
- b. Press "CTRL J"; cursor should move down one line.
- c. Press "ESC A"; cursor should move up one line.
- d. Press "CTRL H"; cursor should move left one position.
- e. Press "CTRL I"; cursor should move to the next TAB stop.

- f. Press "Back Space"; cursor should move left one position.
- g. Press "TAB"; cursor should move to the next TAB stop.
- h. Press "LF"; cursor should move down one line.
- i. Press "RETURN"; cursor should move to leftmost position on line.
- j. Press "CTRL M"; cursor should move to leftmost position on line.

Hold Screen Mode Function:

- a. Place cursor on bottom line.
- b. Press "ESC ["; Hold Screen Mode.
- c. Press "LF" key.
- d. Type "VT50" - check characters do not appear on the screen.
- e. Press "SCROLL" key - the message "VT50" should now appear on the screen. (On early keyboards the SCROLL key was called PAGE CON'T key.)
- f. Press "ESC \ "; exit Hold Screen Mode".
- g. Press "LF" key - check for message to scroll up.

Miscellaneous Functions:

- a. Press "CTRL G"; check for buzzer to ring.
- b. Press "ESC Z"; check for the character "A" to appear on the screen.

NOTE:

When using the CTRL (Control) key, both the CTRL key and the character key should be depressed simultaneously.

When using the ESC (Escape) functions, the ESC key and character or symbol may be depressed sequentially; in fact, for every ESC function the ESC key must be depressed again;

If all functions work, any program that operates a terminal may be run to verify the VT50 performance.

At speeds faster than 300 baud, outputted data should not be more than 12 lines at a time unless the program utilizes the VT50 XOFF/XON feature. The following

DEC programs will be available to test the VT50:

On PDP-8 family computers use MAINDEC-08-DHVTA-A.

On PDP-11 family computers use MAINDEC-11-DZVTC-A. (12/01/74).

On PDP-15 family computers use MAINDEC-

If more off-line testing is to be done, the interface cable may be disconnected from the VT50 terminal strip. Install jumpers from terminals 1 to 2, and 3 to 4, and 5 to 6. With these jumpers installed, both modes full duplex and half-duplex may be tested without tying up any computer.

3. Connecting to Interface

For 20mA Ampere current loop operation, connect 8 pin MATE-N-LOCK connector of interface cable which is supplied with VT50 to computer interface. The connector may be cut off and exchanged if desired or a customer supplied cable may be hooked up directly to the terminal strip under the VT50.

WIRE COLOR, TERMINAL AND PIN ASSIGNMENTS

Interface Cable* Wire Color	VT50 Terminal #	Assignment	MATE-N-LOCK Pin #
Green	2	transmit pos.	7
Red	3	transmit neg.	3
White	4	receive pos.	5
Black	5	receive neg.	2

*Cable supplied by Digital Equipment Corp.

Filter Capacitor Selection for DL11-A and DL-11C Interface

For DL11-A's and DL11-C's, which operate with 20mA current loops, capacitors are used to filter the receive line and slow the switching time of the transmit line. To avoid excessive distortion above 150 baud, the capacitance in each of these two circuits must be reduced. This is accomplished by clipping C29 (.47 mfd) and C31 (1000 pf), both shown on drawing DL-3 (Ref. Tech Tip DL11-TT-6).

The point to remember is to hook the wires from the positive and negative transmitter line of the interface to the corresponding receiver terminal on the VT50. Also, the wires from the positive and negative receiver line of the interface should be connected to the corresponding transmitter terminal on the VT50 terminal strip.

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V. MAINTENANCE

1. Philosophy

Service in the field is done by replacing complete sub-assemblies and sets of p.c. boards.

Sub-assemblies and board sets will be repaired in specially equipped depots.

There are a number of reasons for this service method. The first one is the fact that the two micro-processor board functions are closely interrelated and are performed by circuits scattered across the two boards. The interaction of the boards is very complex. In fact, it is hoped that eventually the two boards will become one in order to reduce costs. Without the use of the specially designed and programmed XOR testers, one would need very detailed knowledge of the micro-instruction set of the processor to pinpoint a problem. Further, the timing (chains) for the monitor board is developed on the micro-processor boards. The power for the micro-processor boards is regulated on the power supply board.

The simple trial and error swapping of single boards is impossible because failures on one board cause damage on other boards.

All spare board sets are burned-in and tested as a matched set, and they are specially packed. A higher yield (fewer DOA's) will be realized.

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As time goes on cost saving changes can be expected on boards which would render them incompatible with other versions.

The one hundred plus prototypes, which can be identified by the absence of a dark grey overlay around the keyboard, must not be repaired in the field. They should be returned to VT50 production in Westfield, Mass.

2. Corrective Maintenance

Field Service representatives going on VT50 calls should always carry a full set of spares; that is, the keyboard and the set of three matched boards consisting of the video/power supply board and the two micro-processor boards. The boards must be carried in the original package. With these spares about 85% of any malfunction can be fixed.

Should the replacement of the (CRT) tube become necessary, the terminal has to be returned to the nearest DEC service depot. Tubes should not be replaced at the customer site because of the safety hazard.

At the service depots anyone handling (CRT) tubes should wear safety goggles and protective gloves. The DEC part number for goggles is 29-16141.

CRT's, yokes, and main transformers will be stocked only at the regional level.

WARNING - Be sure to take extra caution when working near the power supply and video section. The high voltage circuits and CRT operate on eleven thousand volts.

An imploding cathode ray tube (CRT) can cause serious injury. When removing back panel and any time the thermo compound is used, avoid getting compound in contact with clothing as compound is not easily removed.

If a VT50 does not function right, be sure the transmission speed and mode (local/half-duplex/full duplex) switches are set correctly.

To troubleshoot, turn power off, tip the unit on its top.

Rest it on a clean, smooth surface to avoid scratching the top surface. Remove base and disconnect keyboard connector from the forward board on the left (unit upside down).

Place the good, spare keyboard on a piece of cardboard on top of the forward p.c. board and connect to that board in place of the internal keyboard. Turn power on and check if problem is gone. If yes, replace the keyboard with the spare one. To do this the front p.c. board must be removed first.

If the test with the spare keyboard did not eliminate the problem, pack the spare keyboard back into the package. The three remaining boards will have to be replaced by following the "Unpacking Spare P.C. Boards" procedure in Section v.3. and to remove the questionable boards from the unit first unscrew the forward (ROM/UART) micro-processor board by removing the screws and then easing the two boards apart taking care not to bend any pins along the edge of the front board. A screwdriver may be used first to pry the two boards apart on one side. After removal right away, pack the board in the appropriate package. Refer to Section

Next remove screws from second micro-processor (DATAPATH) board and unplug interconnecting wires. Remove board and pack.

Remove all screws from back panel and remove panel. Disconnect the two MATE-N-LOCK's and (CRT) tube socket. Note how wires connect to large caps remote from board. The two red wires cross over. Remove all screws from video/power supply board, remove high voltage diode from board, unscrew four wires from large caps, and remove board and pack with spare diode attached.

When installing the new video/power supply board, be sure to apply white thermo compound liberally to heat sink and back panel.

Install these boards in reverse order.

If the video needs to be adjusted, continue below.

Video Adjustments

Display 12 full lines of 80 characters each using the appropriate program or selecting the Test Pattern by switch S1, which is located at the rear of the DATAPATHS board.

This is the rear board of the two mounted horizontally right above the base.

NOTE: Component locations are as viewed from the rear and upside down.

Height

Adjust the 12 lines to a height of 105mm or 4-1/8 inches measuring from upper edge of top line to lower edge of bottom line by varying the V-SIZE (R98) potentiometer, the second one from the right on the Power Supply/Video board. This board is mounted vertically in parallel with the louvered back panel.

Width

Adjust the 80 characters to a width of 210mm or 8-1/4 inches by varying the slug in T3, a coil which can be found just above the large heat sink in the center of the P.S./

Linearity

Adjust (R92) V-LINEARITY potentiometer the rightmost pct
on the board.

Focus

Adjust (R71) the FOCUS pot located about 5cm (2 inches) to
the right from the large heat sink.

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3. Unpacking Spare P.C. Boards

Note: Please save all packing material. It is to be reused to ship boards back to service depots.

Open top of package.

Take out the top package containing the two micro-processor boards.

Turn over the package.

Carefully cut tape along the center and on center edges.

Lift up flaps.

Very carefully remove ROM/UARD board, which has two rotary switches installed near terminal strip by first lifting up edge opposite of long row of pins.

Slide pins out from under center strip of package.

Always support boards by holding with two hands on opposite ends.

Place board in a clean and protected spot until you are ready to install it.

Next remove the second board (DATAPATH) from the flat package following similar precautions to the first one.

Again place this board in a safe and clean place until you are ready to install it.

Now, lift up cover of Power Supply/Monitor board, gently pull cover up and grasp just exposed other edge of P.S./Monitor package. Lift out package.

The H.V. diode and cable extend out under the package.

Take P.S./Monitor out of box by holding large heat sink and slowly easing H.V. diode cable through opening in bottom of

box and taking great care not to bent pins along the edge of the board. Also, be sure to keep wire harnesses and other objects clear of coils.

Remove high voltage diode.

Place board in a clean and safe place.

You are now ready to remove the questionable (defective) boards from the VT50. Follow procedure V2 and right away when you remove micro-processor boards, pack them in flat pack in reverse order from unpacking procedure. Remove P.S./ Monitor board and right away pack into its package.

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4. Packing of DEC Scope

Interim VT50 Shipping Package

Material Requirements

<u>Quantity</u>	<u>Purchase Specifications</u>	<u>Description</u>
1	N/A	Regular Slotted Carton 34-1/2 x 27 x 21-1/2
1	9905639	Key Board Protector
1	9905129-37	Poly Bag
A/R	N/A	Free Flow Material
A/R	N/A	Tape (Scotch Y-8921)
A/R	N/A	Glasflex Tape, 3 inches wide

Packaging Instructions

Step

1. Set up regular slotted carton (34-1/2 x 27 x 21-1/2) using one strip of glasflex tape down the center and one strip on each end.
- 2.MUST: Place three inches of free flow material into the bottom of the regular slotted carton.
3. Place the keyboard protector (9905639) on top of keyboard with the foam side against the keys. Tape in place using one strip of tape (Scotch Y-8921) on each end.
- 4.MUST: Place the VT50 terminal into the polybag (9905129-37) and place it into the outer carton, centered, on top of the free flow material.
5. Stuff free flow material all around the sides and on top of the VT50.
- 6.MUST: Fill the rest of the box with free flow material, shake the whole box assembly and overfill with more free flow material.
7. Close and seal carton using one strip of glasflex tape down the center and one strip on each end.
8. Package assembly can be placed on general purpose skid (#1210569). Do not stack over three high and strap to skid.