product modification

USER ADDRESSABLE CRT READOUT*

For the following TEKTRONIX® Oscilloscopes

Type 5440/R   B090000 and above
Type 5441/R   B080000 and above

For the following serial number ranges use 040-0760-XX:

Type 5440/R   B010100 - B079999
Type 5441/R   B010100 - B069999
Type 5444/R   B010100 - B029999

No provisions have been made for instruments with serial numbers other than those listed.

This modification kit provides parts and instructions to install Option 3. Option 3 allows the operator to program two ten digit words at the lower right hand corner of the crt display.

The words are programmed by adding selected resistors to the plug-in program board. The kit contains one program board but no programming resistors.

*Not applicable to instruments that have Option 3 installed.

PARTS INCLUDED IN MODIFICATION KIT

Quantity	Part Number	Description
1 ea		Cable, User Addressable CRT Readout, consisting of:
1 ea	131-0569-00	Connector, 25 pin female
1 ea	198-2203-00	Wire set, elec
1 ea	020-0109-00	Circuit board, Plug-in Programmer
2 ea	129-0370-00	Spacer, post stud 4-40 x 0.25 hex
2 ea	210-0004-00	Washer, #4 lock
2 ea	210-0406-00	Nut, 4-40 x 3/16
1 ea	333-1889-04	Panel, rear
1 ea		Marker, identification

NOTE: There are twenty two wires connected between the instrument and the User Addressable CRT Readout connector. Pins 4 through 13 and 18 through 21 are used for programming characters in the two Ext word locations. Pins 1 through 4, pin 14, and pins 22 through 25 are added for use with programming devices that will be available soon.
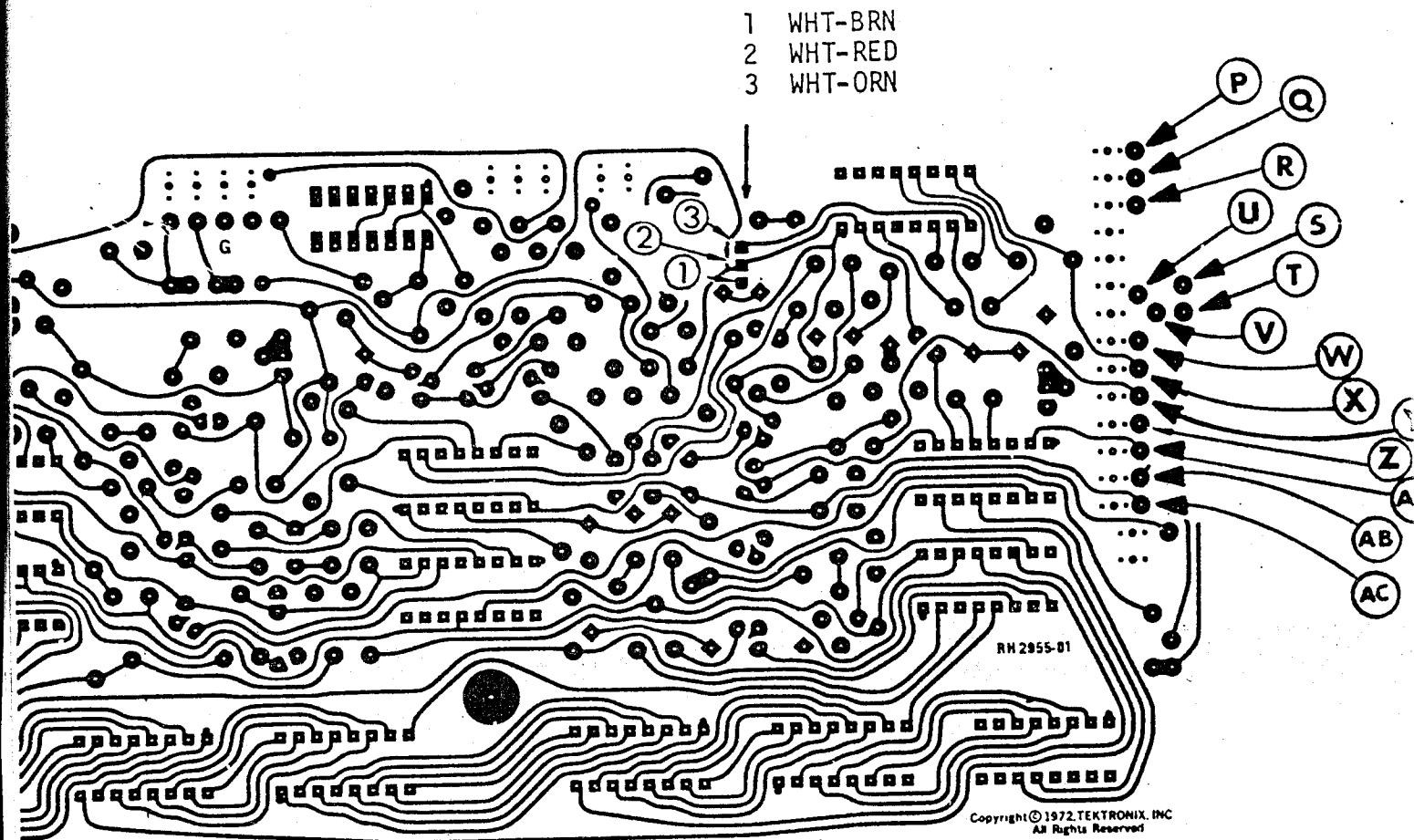
INSTRUCTIONS:

WARNING

Dangerous electrical potentials are present at several points throughout the instrument. Disconnect the instrument from its power source before proceeding.

( )   1.   Remove the left cabinet side from cabinet model instrument only and remove the right cabinet side from all instruments.

( )   2.   Temporarily disconnect the single wire connector and the five wire connector holder from the Readout circuit board.

PERFORM STEP 3 ON CABINET MODEL INSTRUMENTS ONLY.

( )   3.   Temporarily remove the two 8-32 x 0.500 inch screws that fasten the Display Unit and the Mainframe together at the back. It is not necessary to remove the front screws.

( )   4.   Remove the 4-40 x 0.188 inch screw, accessible from the center plug-in compartment, that fastens the bottom of the Readout circuit board to the Main Interface circuit board.

( )   5.   Loosen the screws located at the top corners of the Readout circuit board that fasten the Readout circuit board to the Main Interface circuit board and remove the Readout circuit board as follows:

a) For cabinet model instruments remove the Readout circuit board from the Main Interface circuit board and lift the back end of the Display Unit to provide clearance to remove the Readout circuit board from the instrument.

b) For rackmount instruments remove the Readout circuit board from the Main Interface circuit board and lift the board out the top of the instrument.

1 WHT-BRN
2 WHT-RED
3 WHT-ORN

RH 2955-01

PARTIAL READOUT CIRCUIT BOARD Fig. 1

040-0873-01

110.04

INSTRUCTIONS: (continued)

Connect the User Addressable CRT Readout cables to the Readout circuit boad as follows: See Fig. 1.
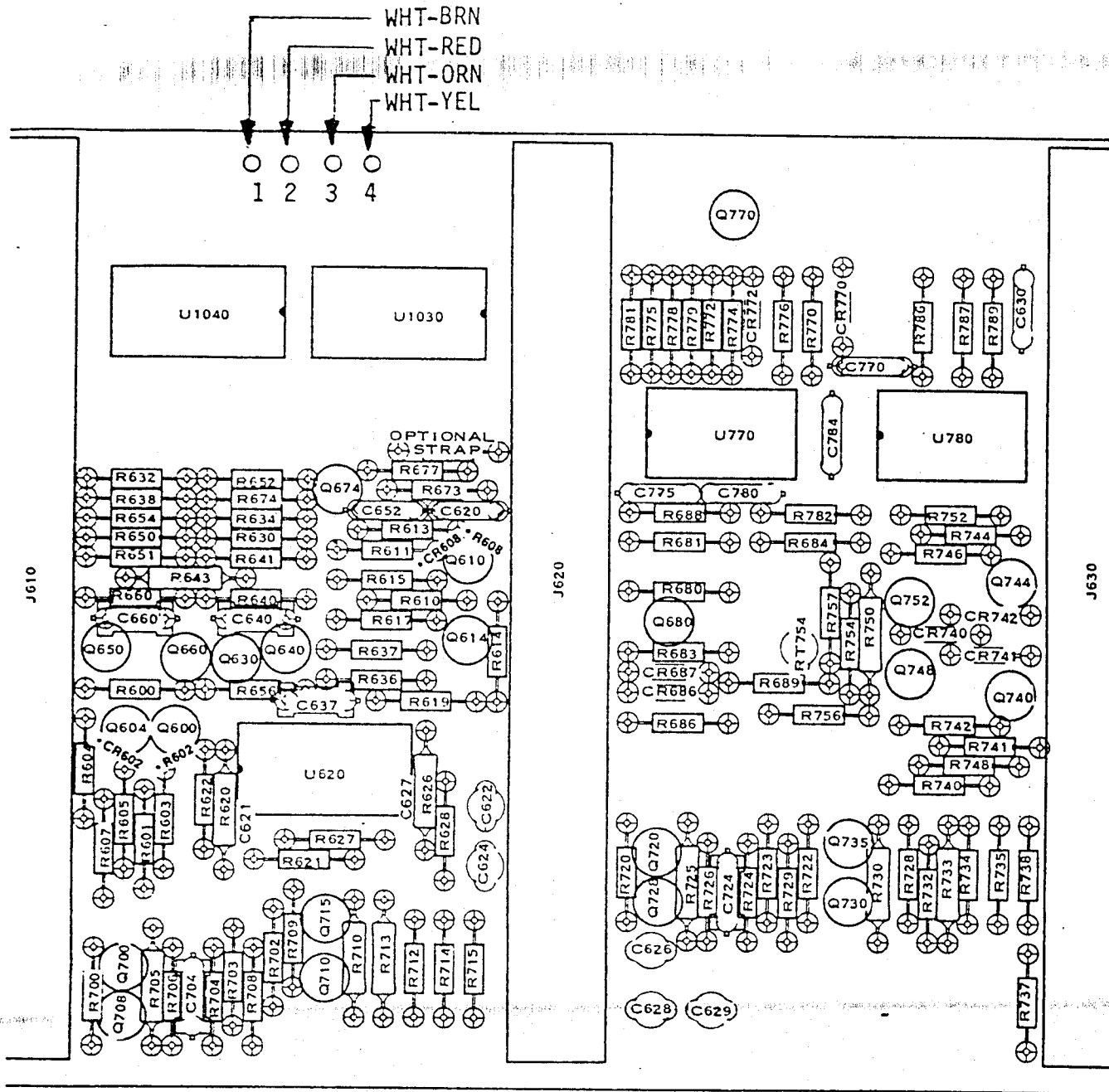
Three wire ribbon cable:

( )   6.   White-brown wire from pin 1 to TRIGGER (1).

( )   7.   White-red wire from pin 2 to END OF WORD (2).

( )   8.   White-orange wire from pin 3 to Trapezoid (3).

Ten wire ribbon cable:

( )   9.   White-brown wire from pin 4 to point Y.

( )   10.   White-red wire from pin 5 to point X.

( )   11.   White-orange wire from pin 6 to point W.

( )   12.   White-yellow wire from pin 7 to point V.

( )   13.   White-green wire from pin 8 to point T.

( )   14.   White-blue wire from pin 9 to point U.

( )   15.   White-violet wire from pin 10 to point S.

( )   16.   White-gray wire from pin 11 to point R.

( )   17.   White wire from pin 12 to point Q.

( )   18.   White-black wire from pin 13 to point P.

Four wire ribbon cable #1:

( )   19.   White-brown wire from pin 22 (-15V) to AC.

( )   20.   White-red wire from pin 23 (+15V) to AB.

( )   21.   White-orange wire from pin 24 (+5V) to AA.

( )   22.   White-yellow wire from pin 25 (Grnd) to Z.

PARTIAL MAIN INTERFACE CIRCUIT BOARD   Fig. 2.

INSTRUCTIONS: (continued)

Connect the #2 four wire ribbon cable from the User Addressable
CRT Readout connector to the Main Interface circuit board.
See Fig. 2.

( ) 23. White-brown wire from pin 18 (Ext Co. 1) to 1.

( ) 24. White-red wire from pin 19 (Ext Co. 2) to 2.

( ) 25. White-orange wire from pin 20 (Ext Row 1) to 3.

( ) 26. White-yellow wire from pin 21 (Ext Row 2) to 4.

( ) 27. White-brown #26 stranded wire from pin 14 (40V line freq) to
CR875 on the Power Supply circuit board. Solder the white-
brown wire to the circuit pad with the two yellow wires from
T800, the low voltage power transformer.

( ) 28. Re-install the Readout circuit board by performing steps 2 thru 5
in reverse and,

BE CAREFUL NOT TO BEND PINS ON THE MAIN INTEFACE BOARD!

( ) 29. Remove the four 4-40 x 1.5 inch screws that fasten the fan housing
to the rear casting. Remove the four 10-32 x 2.25 inch screws
that fasten the power transformer to the rear panel, replace the
rear panel with the new rear panel from the kit, and re-install
the power transformer and fan housing mounting screws.

( ) 30. Mount the User Addressable CRT Readout cable connector in the
hole on the new rear panel (with pin #1 at the bottom) as
follows:

a) Insert the threaded portion of the spacer stud from the
outside through the rear panel.

b) Place the connector over the threaded end of the spacer
stud, add a #4 lockwasher and fasten with the 4-40 x 3/16
inch nuts.

( ) 31. Refer to the attached Instruction Manual Modification Insert for
information and instructions on programming the User Addressable
CRT Readout.

( ) 32. Refer to the Adjustment Section of your Service Instruction Manual
and make any necessary checks and adjustments.

( ) 33. Install cover(s) removed in step 1.

( ) 34. Remove the protective backing from the identification marker
provided in the kit and place it on a clean, dry area on the rear
panel. The marker indicates this kit has been installed.

For future reference, fasten the Instruction Manual Modification
Insert in your Instruction Manual.

INSTRUCTION
MANUAL
MODIFICATION INSERT

USER ADDRESSABLE CRT READOUT*

Type 5440/R B090000 and above
Type 5441/R B080000 and above

Installed in Type_____SN_____Date_____

This modification insert is provided to supplement the
Instruction Manual for the above listed products. The
information given in this insert supersedes that given
in the Manual.

GENERAL INFORMATION

This modification kit provided parts and instructions
to install Option 3. Option 3 allows the operator to
program two ten digit words at the lower right hand
corner of the crt display.

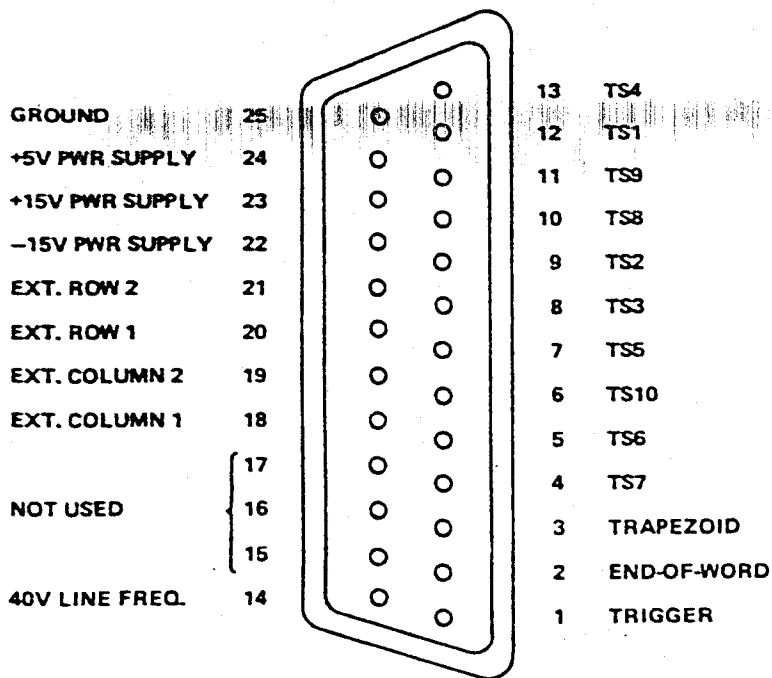*Not applicable to instruments that have Option 3 installed.

GROUND	25	13	TS4
+5V PWR SUPPLY	24	12	TS1
+15V PWR SUPPLY	23	11	TS9
−15V PWR SUPPLY	22	10	TS8
EXT. ROW 2	21	9	TS2
EXT. ROW 1	20	8	TS3
EXT. COLUMN 2	19	7	TS5
EXT. COLUMN 1	18	6	TS10
	17	5	TS6
NOT USED	16	4	TS7
	15	3	TRAPEZOID
		2	END-OF-WORD
40V LINE FREQ.	14	1	TRIGGER

Fig. 1
Connector pin assignments
looking at rear panel
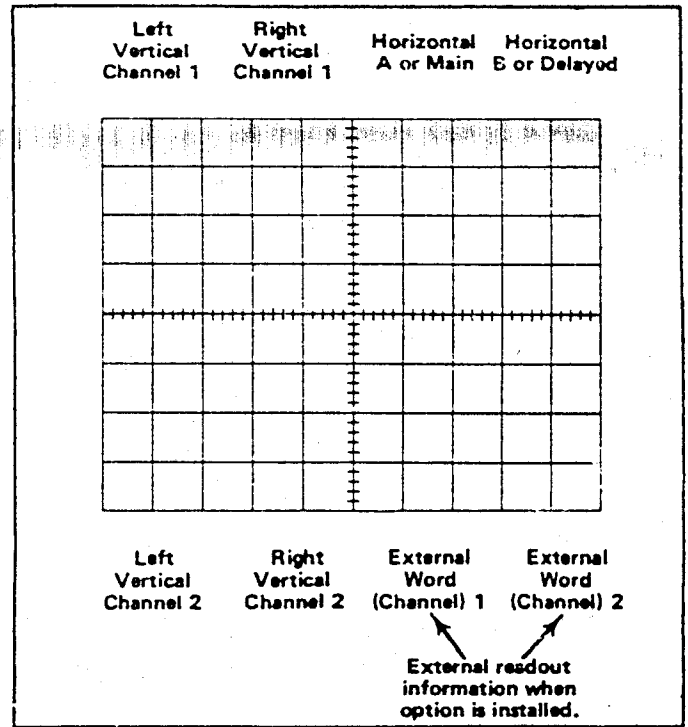
Fig. 2
Location of readout words on the CRT, identifying the
originating plug-in and channel.

GROUND	Readout System Ground.
+5 V, +15 V, −15 V	Power supply connections. Maximum allowable currents; +5: 100 mA; +15: 20 mA; −15: 20 mA.
EXT. COLUMN 1	Column data input for External word 1.
EXT. COLUMN 2	Column data input for External word 2.
EXT. Row 1	Row data input for External word 1.
EXT. Row 2	Row data input for External word 2.
40 V Line FREQ	Line frequency signal approx. 40 V P-P. 10 mA maximum.
TS1-TS10	Time Slot signals.
TRAPEZOID	Trapezoid signal from pin 10 of Timer, U1000, on Readout Board.
END-OF-WORD	End-of-word pulse from pin 2 of Time Slot counter, U1025, on Readout Board.
TRIGGER	Pulse from pin 5 of Timer, U1000, on Readout Board.

PROGRAMMING

The User Addressable CRT Readout is programmed by inserting selected resistors between the Time Slot Counter and the Row and Column Data Switches. The resistors are selected depending on the character or space to be displayed. See chart on page 3.

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Fig. 3

Character selection matrix for USER ADDRESSABLE CRT READOUT

Ext Col #1 / #2 → Current (Milliamperes) (Resistance)	0 / ∞	0.1 / 150k	0.2 / 75k	0.3 / 51k	0.4 / 37.4k	0.5 / 30.1k	0.6 / 24.9k	0.7 / 21.5k	0.8 / 18.7k	0.9 / 16.5k	≥1.0 / 13k
		0	1	2	3	4	5	6	7	8	9
		↑	<	I	/	+	−	+	C	Δ	>
← SKIP →		Add one zero	Add two zeros	Reduce prefix	Reduce prefix and add one zero						Blank word
		m	μ	n	p	X	K	M	G	T	R
		S	V	A	W	H	d	B	c	Ω	E
		U	N	L	Z	Y	P	F	J	Q	D
				Decimal point location No. 3	Decimal point location No. 4	Decimal point location No. 5	Decimal point location No. 6	Decimal point location No. 7			
Add Space In Display											

▨ Unused locations. Available for future expansion of Readout System

■ Operational address.

• Character selection matrix for USER ADDRESSABLE CRT READOUT

To illustrate resistor selection consider the display "TEST 1" in EXT WORD 1. The required resistor values are shown below and their locations on the Plug-in Program circuit board are shown in Figures 4 and 5 on page 5.

CHARACTER	COLUMN 1 RESISTOR	ROW 1 RESISTOR
T	16.5kΩ	51kΩ
E	13kΩ	37.4kΩ
S	150kΩ	37.4kΩ
T	16.5kΩ	51kΩ
(Space)	Open	16.5kΩ
1	75kΩ	Open

RESISTOR PROGRAM for "TEST 1".

In Fig. 3 the Matrix indicates that the character "T" is programmed by a 16.5kΩ column resistor and a 51kΩ row resistor. To obtain the space before the "1", the "ADD SPACE" operation is used.

The choice of Time Slots depends on the desired position of the character within the word. Programming the first character from TS1 displays that character in the left-most character position of the display word. Similarily, programming the first character from TS2, TS3, or TS4 displays that character in the second, third, or fourth position within the display word respectively. Programming the first character from TS5 to TS10, however, displays the character as if it is programmed from TS4. To move the character further right requires programming "ADD SPACE" in Time Slots after TS3.

Once the Time Slot for the first character is chosen, succeeding characters are programmed in succeeding Time Slots. If, however, a Time Slot other than TS1, TS2, or TS3 is left unprogrammed, character position is unchanged during that Time Slot. For example, if TS6 and TS8 are programmed and TS7 is not, then the character displayed in TS8 is displayed in the same position as if it were programmed in TS7.

To further clarify the programming concepts a complete circuit diagram for programming a word is given in Fig. 6. This circuit displays "TEST n" where "n" is a number from 0 to 99 selectable by the user. Time Slots TS1 to TS5 are programmed "TEST (space)." Time Slot 6 with Switch S1 and R10 through R19 programs the tens digit of the number. S1 selects the number displayed. Similarily, S2 selects the units digit programmed in TS7. There are several choices for the format of the number when the number is less than 10. If it is desirable to display the number "8" as "08", then R10B is used to program a "0" in the tens digit and R10A is not used. If a space is desired in the tens digit (in addition to the space in TS5) so that the location of the units digit does not shift when changing from "9" to "10", then R10A is used and R10B is not. If neither R10A nor R10B is used, the units digit in numbers less than 10 is displayed in the display location of the tens digit.

Column and Row connections are chosen according to the display location of the word on the screen. Connection of programming resistors of Row 1 and Column 1 displays in the location of EXT 1. Likewise, connection to Row 2 and Column 2 displays in the location of EXT 2.

ADDITIONAL CONSIDERATIONS

The connections to the External Readout Input connector are not short-circuit protected. Shorts may damage the Readout System.

The Trapezoid, End-of-Word, and Trigger signals are for special processing applications. They have very limited driving capability and should be emitter follower buffered if used for any purpose.
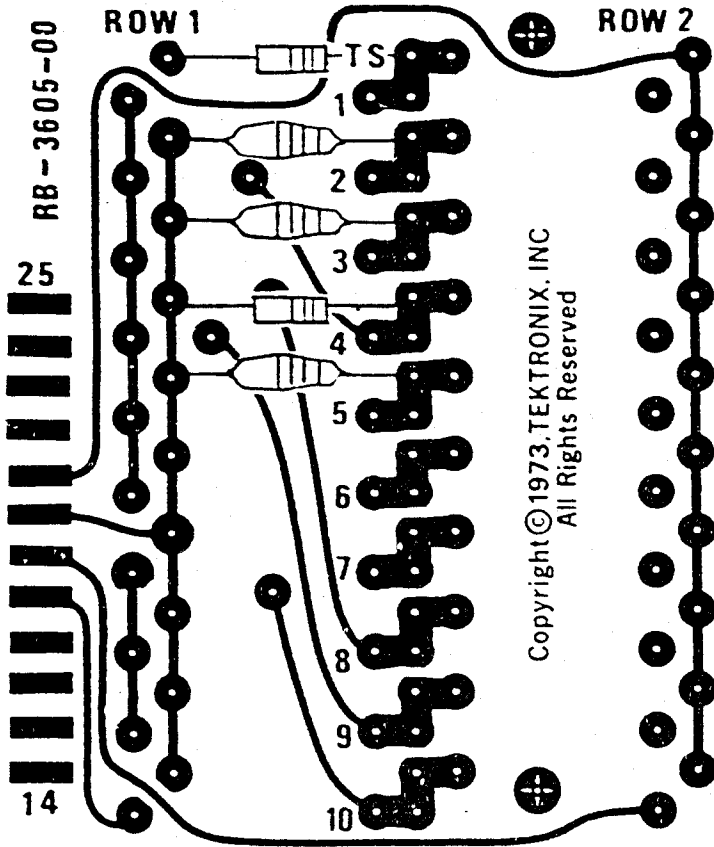
Plug-in Program Board
Front
Fig. 4
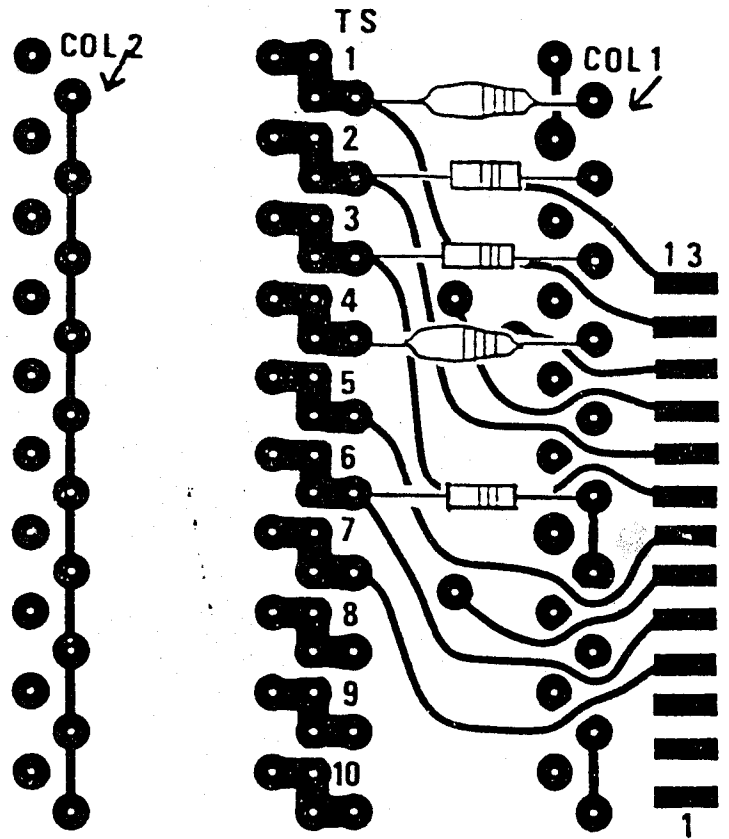
Plug-in Program Board
Back
Fig. 5

The recommended wattage and tolerance rating for the Readout Matrix resistors is as follows:

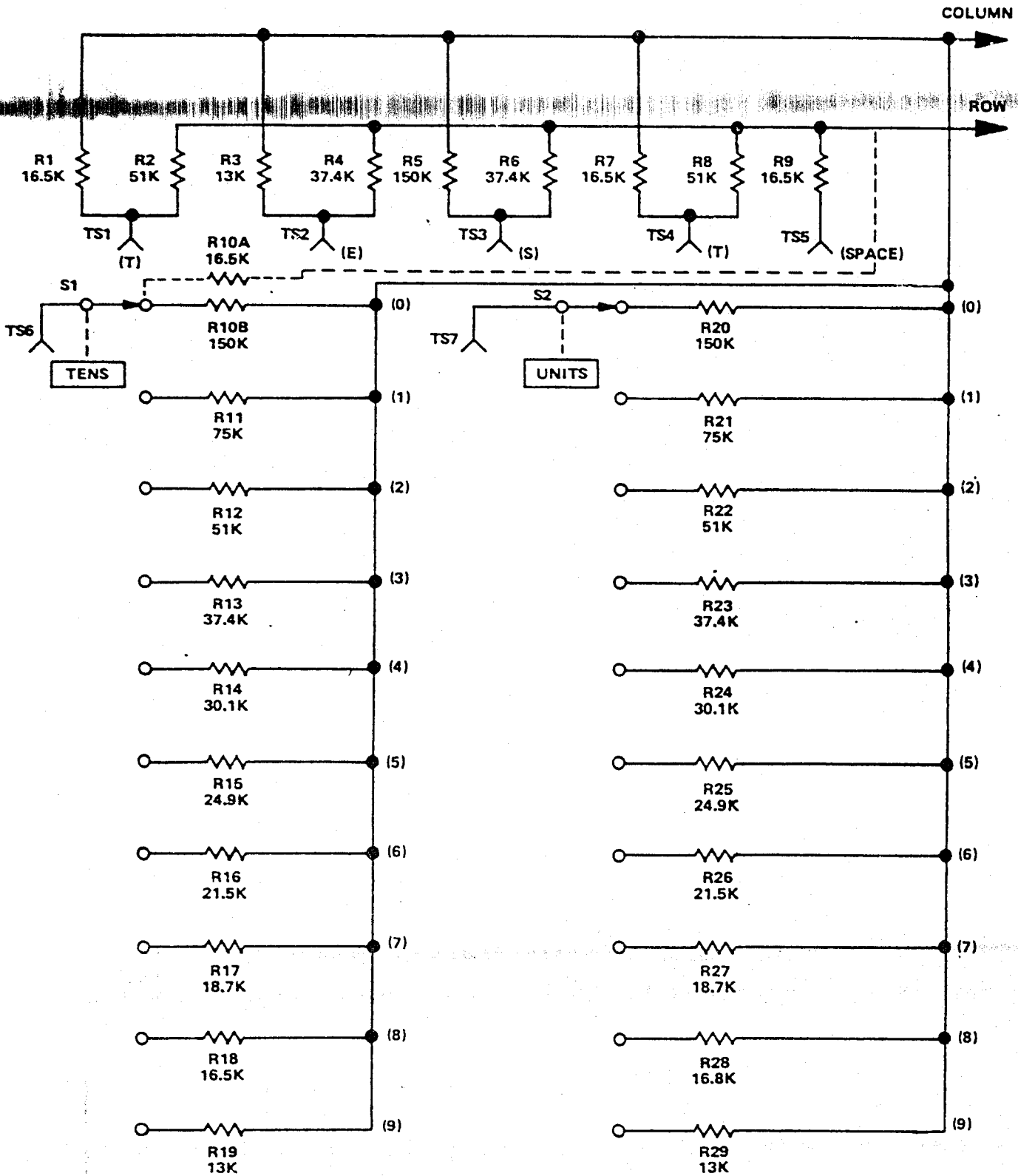|			
150KΩ	1/4W	5%	315-0154-00
75KΩ	1/4W	5%	315-0753-00
51KΩ	1/4W	5%	315-0513-00
13KΩ	1/4W	5%	315-0133-00
37.4KΩ	1/2W	1%	321-0344-00
30.1KΩ	1/2W	1%	321-0335-00
24.9KΩ	1/2W	1%	321-0327-02
21.5KΩ	1/2W	1%	321-0321-07
18.7KΩ	1/2W	1%	321-0315-00
16.5KΩ	1/2W	1%	321-0310-00

Fig. 6
PROGRAMMING "TEST n"

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