


TU-100
CODED SQUELCH TEST UNIT
MANUAL

issue 2, JULY 1, 1984

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SPECIFICATION

BASIC SIZE:

Height - 3.5" (88.9 mm)
 Width - 8.5" * (215.9 mm)
 Length - 9.5" * (241.3 mm)

Moulded Plastic (ABS) case.

*Measurements do not include adjustable carrying handle

WEIGHT:

3.75 Lbs. including battery pack. (1.67Kg)

POWER REQUIREMENTS

AC 115V AC 50/60 Hz @ .25A Max.

DC 13.6V DC @ .5 A Max.

BATTERY: 10 Nicad "A" Cells (Provides 1.5 hrs. operation when fully charged)

BATTERY RECHARGE TIME: Approximately 15 hours. (automatic charging with AC Power applied).

ELECTRICAL SPECIFICATIONS

Input Impedance: 100K Ohm Minimum

Output Impedance: Less Than 100 Ohms

Input Sensitivity: 10 mv to 2 V RMS

Temperature Range: 0°C to +50°C for all Electrical specifications.

TONE ENCODE MODE

Encode Time: 25 msec after keying "Encode Set"

Frequency Accuracy: .1% of Set Frequency (50-275Hz Frequency Range)(See Note 1)

Output Level: 0 to 1.6v RMS adjustable (0 to 4.5v pp)

Frequency Selection: 4 Segment 10 Position Push Switch

Reverse Burst: 180° Phase Shift for 120 ms after Release of Encode Switch.

TONE DECODE MODE


Detection Modes: a) 37 Standard EIA Tones (and 97.4 Hz, non-standard)
 b) Frequency Measurement from 50 to 275 Hz. (See Note 1)

Accuracy Resolution: 0.1 % from 50 to 275 Hz.

Response Time: a) EIA Tone Mode: 500 ms Typical
 b) Frequency Mode: 250 ms Typical

Bandwidth (EIA Tones): ± 1 Hz Bandwidth

Display: 4 Digit LED Readout Reads Frequency Directly in Hz.

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CDCSS ENCODE MODE

Code Selection: 3 Segment 10 Position Push Switch
Code Format: 3 Digit Octal, 23 Bit Data Word Length
Data Rate: 134.4 Bits/Second
Turn-Off Code: Nominal, 134.4 Hz Sinewave for 150 ms After ENCODE Release.
Code Polarity: 180° Phase Inversion Selectable by Front Panel Switch.
Encode Time: Instantaneous After Keying "Encode Set" Front Panel Switch.
Output Level: 0 to 5.0V pp Adjustable

CDCSS DECODE MODE

Detection Mode: Unit accepts all valid Motorola & Ferritronics Codes. (Ferritronics Dwg. SP379-18)
Code Polarity: Polarity change may cause displaying of complement code.
Display: 3 Digit LED Readout displays received code in normal or inverted mode.
Display Time: Less than 500 ms from receipt of data with 3 Wordlength Dropout Delay Time.

MONITOR MODE

Selection of MONITOR & DECODE mode causes the unit to display automatically any of the 38 Valid Sub-Audible Tones or any of the Digitally Coded Messages (as listed in Ferritronics Drawing SP379-18 Iss. 2).


NOTES: 1. The unit has extended decode capabilities from 30 Hz to 50 Hz. The extended range may be outside the specified distortion and sensitivity mentioned above.

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#	EIA TONES		DIGITAL CODED SQUELCH			
	GROUP	HZ	CODE	COMPLIMENT**	CODE	COMPLIMENT**
1	C	67.0	023	/047	311	/664
2	B	71.9	025	/244	315	/423
3	C	74.4	026	/464	325	/526
4	A	77.0	031	/627	331	/465
5	C	79.7	032	/051	332	/455
6	B	82.5	036	/172	343	/532
7	C	85.4	043	/445	346	/612
8	A	88.5	047	/023	351	/243
9	C	91.5	051	/032	356	/212
10	B	94.8	053	/452	364	/131
* 11		97.4 *	054	/413	365	/125
12	A	100.0	065	/271	371	/734
13	B	103.5	071	/306	411	/226
14	A	107.2	072	/245	412	/143
15	B	110.9	073	/506	413	/054
16	A	114.3	074	/174	423	/315
17	B	118.8	114	/712	431	/723
18	A	123.0	115	/152	432	/516
19	B	127.3	116	/754	445	/043
20	A	131.8	122	/225	446	/255
21	B	136.5	125	/365	452	/053
22	A	141.3	131	/364	454	/266
23	B	146.2	132	/546	455	/332
24	A	151.4	134	/223	462	/252
25	B	156.7	143	/412	464	/026
26	A	162.2	145	/274	465	/331
27	B	167.9	152	/115	466	/662
28	A	173.8	155	/731	503	/162
29	B	179.9	156	/265	506	/073
30	A	186.2	162	/503	516	/432
31	B	192.8	165	/251	523	/246
32	A	203.5	172	/036	526	/325
33	B	210.7	174	/074	532	/343
34	A	218.1	205	/263	546	/132
35	B	225.7	212	/356	565	/703
36	A	233.6	223	/134	606	/531
37	B	241.8	225	/122	612	/346
38	A	250.3	226	/411	624	/632
			243	/351	627	/031
			244	/025	631	/606
			245	/072	632	/624
			246	/523	654	/743
			251	/165	662	/466
			252	/462	664	/311
			255	/446	703	/565
			261	/732	712	/114
			263	/205	723	/431
			265	/156	731	/155
			266	/454	732	/261
			271	/065	734	/371
			274	/145	743	/654
			306	/071	754	/116

* 97.4 Hz is Not a Standard EIA Specified Tone.

**The Compliment Number (/) represents the octal compliment (180 Phase Inversion) of the listed code. Do NOT use a code and its compliment in the same system.

TITLE LIST OF CURRENT CTCSS & DCS CODES	DRW. BY RSW	APPR. <i>BR</i>	FILE: SP379	
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TEST UNIT - APPLICATION NOTES

SWITCH SELECTION GUIDE

SW1: ON/OFF

Switches DC power only to the test unit circuitry and display .
The switch does not affect charging of the NICAD battery pack
from the AC supply source .

SW2: NORMAL/INVERT

Selects NORMAL (non-inverted) or INVERTED (180° phase shifted)
Encode* or Decode modes for Digital Coded messages. For every
valid Digital Code there is a compliment code which is 180° out
of phase.

SW3: FREQUENCY/EIA

In the Tone Decode mode only, it selects the frequency counter
or the EIA Standard tone display modes. In the FREQUENCY
counter mode the unit displays any incoming frequency between
50 and 275 Hz** to the nearest 0.1%. In the EIA mode, the
unit displays the nearest EIA standard tone*** frequency if
the incoming tone is within ± 1 Hz of the standard tone.

SW4: DIGITAL/TONE


Selects either DIGITAL or TONE modes of operation for both the
Encode* and Decode modes.

SW5: NORMAL/MONITOR

In the Decode modes, it selects whether the unit functions in
the NORMAL mode as specified by switches SW2, SW3 & SW4 or in
the MONITOR mode where the unit automatically scans the input
for a valid Digital or a valid EIA tone message. The received
code will be displayed either as a 3 digit Digital code or as
a 4 digit EIA code frequency.

SW6: ENCODE/DECODE

Sets the unit into the ENCODE (signal generator) or as a DECODE
(signal detector) mode . A change from ENCODE to DECODE mode
causes the unit to generate a 150 ms long turn off code (134.4Hz)
for the end of a Digital message or to send a 120 ms long reversed
frequency burst (180° out of phase) for the end of a Tone coded
message. A change from DECODE to ENCODE mode causes the unit
to scan the control switches SW2 to SW5 and the code select push
switches SW9 to SW12.

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SW7: ENCODE SET (momentary)

Indicates to the unit that the encoding mode has to be interrupted to allow the scanning of the control switches or the code select switches for a change from the previous settings. The unit will not recognize a change unless the ENCODE SET is depressed or if there was a mode change from ENCODE to DECODE and then back to ENCODE again.

SW8: AC POWER ON-OFF

This switches the 115vAC external power source to the unit. Leave this switch ON when NICAD battery pack is to be re-charged overnight. Front panel LED indicates when SW8 is ON. Battery charging time is accelerated if front panel ON-OFF (SW1) is turned off, thus reducing the load on the AC power source.


SW13: OUTPUT INTERRUPT SWITCH

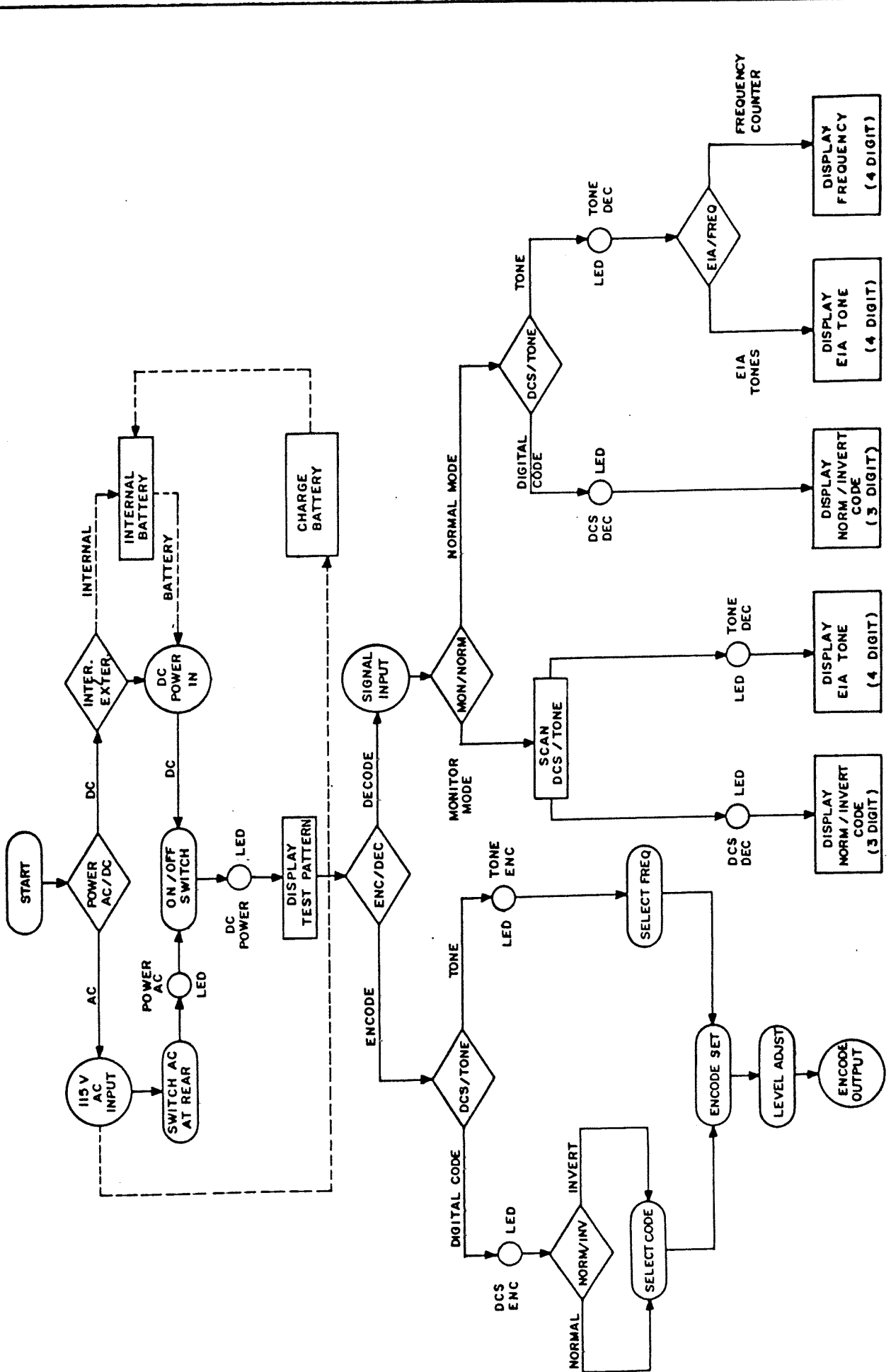
Switch SW13 is a momentary, normally closed, push button switch (located between the level adjust knob and the output jack) provided to allow for instantaneous starting and stopping of encoded data without any start-up delay or reverse burst. This is very useful when accurate timing measurements are made where the gated output can trigger a scope or similar device.

* In the Encode mode of operation, the ENCODE SET needs to be pressed for the unit to recognize any change in the front panel control switches (SW2 to SW4) or on the code select switches (SW9 to SW12).

** For frequencies below 50 Hz see Note 4 in TEST UNIT DESCRIPTION (Dwg: SP379-03).

*** A non-standard 97.4 Hz has been included in the list of tones being decoded in the EIA display mode.

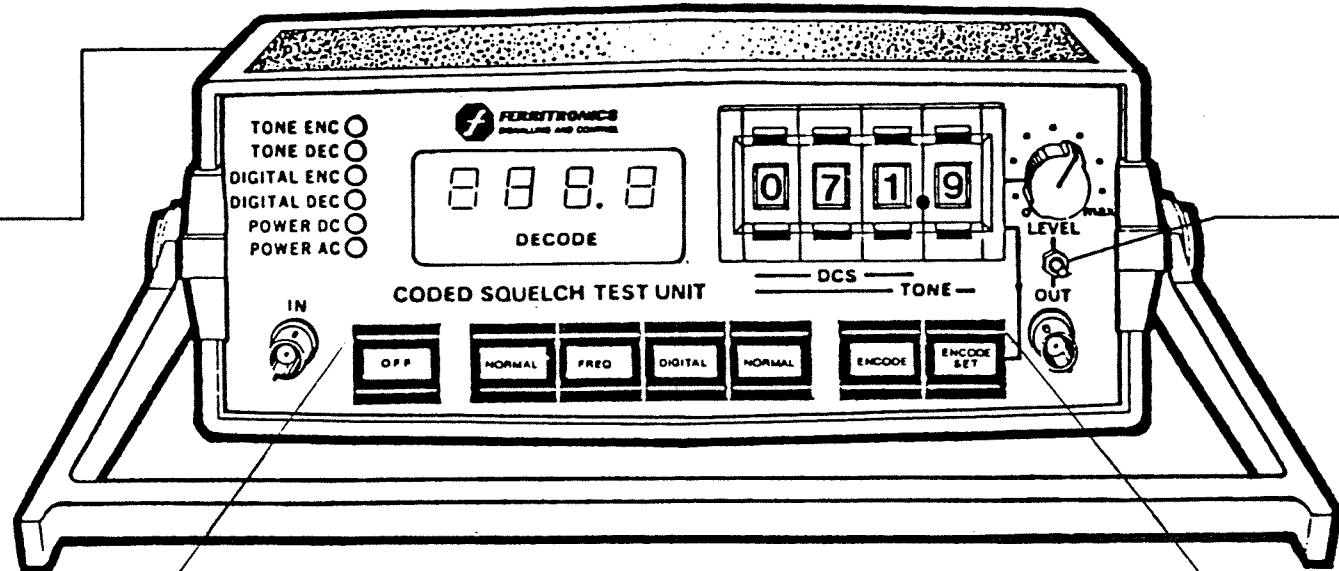
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TITLE		TU-100 TEST UNIT OPERATIONAL FLOW CHART	
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SW8: AC POWER ON-OFF

This switches the 115vAC external power source to the unit. Leave this switch ON when NICAD battery pack is to be recharged overnight. Front panel LED indicates when SW8 is ON. Battery charging time is accelerated if front panel ON-OFF (SW1) is turned off, thus reducing the load on the AC power source.

SW13: OUTPUT INTERRUPT SWITCH

Switch SW13 is a momentary, normally closed, push button switch (located between the level adjust knob and the output jack) provided to allow for instantaneous starting and stopping of encoded data without any start-up delay or reverse burst. This is very useful when accurate timing measurements are made where the gated output can trigger a scope or similar device.

TU-100 CODED SQUELCH TEST UNIT

SWITCH SELECTION GUIDE

SW1: ON/OFF
Switches DC power only to the test unit circuitry and displays. The switch does not affect charging of the NICAD battery pack from the AC supply source.

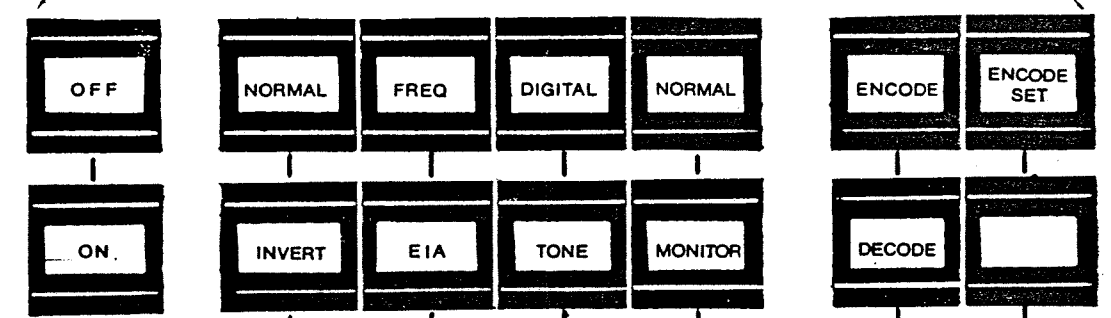
SW2: NORMAL/INVERT
Selects NORMAL (non-inverted) or INVERTED (180° phase shifted) Encode* or Decode modes for Digital Coded messages. For every valid Digital Code there is a compliment code which is 180° out of phase.

SW3: FREQUENCY/EIA
In the Tone Decode mode only, it selects the frequency counter or the EIA Standard tone display modes. In the FREQUENCY counter mode the unit displays any incoming frequency between 50 and 275 Hz** to the nearest 0.1%. In the EIA mode, the unit displays the nearest EIA standard tone*** frequency if the incoming tone is within ± 1 Hz of the standard tone.

SW4: DIGITAL/TONE
Selects either DIGITAL or TONE modes of operation for both the Encode* and Decode modes.

SW5: NORMAL/MONITOR
In the Decode modes, it selects whether the unit functions in the NORMAL mode as specified by switches SW2, SW3 & SW4 or in the MONITOR mode where the unit automatically scans the input for a valid Digital or a valid EIA tone message. The received code will be displayed either as a 3 digit Digital code or as a 4 digit EIA code frequency.

SW6: ENCODE/DECODE
Sets the unit into the ENCODE (signal generator) or as a DECODE (signal detector) mode. A change from ENCODE to DECODE mode causes the unit to generate a 150 ms long turn of code (134.4Hz) for the end of a Digital message or to send a 120 ms long reversed frequency burst (180° out of phase) for the end of a Tone coded message. A change from DECODE to ENCODE mode causes the unit to scan the control switches SW2 to SW5 and the code select push switches SW9 to SW12.



SW7: ENCODE SET (momentary)

Indicates to the unit that the encoding mode has to be interrupted to allow the scanning of the control switches or the code select switches for a change from the previous settings. The unit will not recognize a change unless the ENCODE SET is depressed or if there was a mode change from ENCODE to DECODE and then back to ENCODE again.

NOTES:

- * In the Encode mode of operation, the ENCODE SET needs to be pressed for the unit to recognize any change in the front panel control switches (SW2 to SW4) or on the code select switches (SW9 to SW12).
- ** For frequencies below 50 Hz see Note 4 in TEST UNIT DESCRIPTION (Dwg: SP379-03).
- *** A non-standard 97.4 Hz has been included in the list of tones being decoded in the EIA display mode.

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DRW. BY J.A.C	APPR. BZ	FILE
DATE 82-7-8	DATE 82-07-08	
FERRITRONICS LIMITED		DWG. NO. XB- 0295-01
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TU-100 CODED SQUELCH TEST UNIT

GENERAL DESCRIPTION

The TU-100 Test Unit can be used to Encode or Decode sub-audible tone (CTCSS) or sub-audible Digital Coded Squelch (CDCSS) signals. The functions are selectable on the seven front panel push button switches.

The unit provides a 4 digit 7 segment LED display to indicate the received CTCSS frequencies or the incoming CDCSS code. A four digit programmable selector switch selects the required frequency or CDCSS code for the encode mode.

MODES OF OPERATION

MONITOR

The selection of Monitor and Decode mode causes the unit to display automatically any of the 38 valid sub-audible tones or any of the valid digitally coded messages (as listed in Ferritronics Drawing SP379-18).

TONE ENCODE


The TU-100 will encode any frequency between 50 and 300 Hz selectable on the front panel selector switch. After having pushed the "Encode Set" switch, the output appears at the front panel BNC connector subject to the "LEVEL" adjustment control. (Also see Note 1 & 5). For accurate timing measurements the output may be interrupted by the miniature push button switch (NC) mounted above the output BNC connector.

When the ENCODE switch is released (switched to DECODE) the unit sends out a 120 ms long Reverse Burst tone (tone 180° phase shifted for squelch tail elimination).

For a visual reference in the encoding mode, the unit will display the tone frequencies being generated.

TONE DECODE

There are two tone decode modes, the frequency counter or the EIA Standard Tone mode. In the "FREQ" mode, the unit will display any incoming frequency between 50 Hz and 275 Hz to the nearest 1st decimal point after having sampled 15 complete cycles. In the EIA display mode the unit displays the nearest Standard tone frequency if an incoming tone falls within its acceptable decode bandwidth of ± 1 Hz around the specific frequency. (For frequencies below 50 Hz see Note 4).

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CDCSS ENCODE

The TU-100 will encode any 3 digit code that is selected on the three front panel selector switches designated for DIGITAL function. After having selected ENCODE, CDCSS and pushed the "ENCODE SET" switch, the appropriate continuous code will appear at the front panel "Output" BNC connector subject to the level adjustment control. Code phasing can be inverted 180° by depressing the INVERT & SET mode switches. For accurate timing measurements, the output may be interrupted by the miniature push button switch (NC) mounted above the output BNC connector.

When the ENCODE switch is released (switched to DECODE) the unit will send out a 150 ms long Turn-Off Code (a 134.4 Hz sinewave for squelch tail elimination).

For a visual reference in the ENCODE mode, the unit displays the CDCSS code being generated. (For codes other than ones listed on Dwg. SP379-18 see Notes 2 & 3)

CDCSS DECODE

The TU-100 decodes any of the valid CDCSS codes whether the codes are presented to the input in normal or inverted mode. Note that for every valid code, there is an inverse code number among the group of valid codes. The received code is displayed as a 3 digit number on the front panel of the unit in the normal or inverse mode.

POWER REQUIREMENT

The TU-100 Monitor Test Unit can function in 3 separate power supply modes:

AC LINE


The unit runs off 115V AC 50-60 Hz generating all necessary DC voltages. The AC power switch is located at the rear with a LED indicator lighting up on the front panel whenever the AC power switch is enabled. AC operation also provides power to the nicad battery pack for continuous on-line charging. The on-off switch at the front panel controls power to the test circuitry and displays only.

DC LINE

The Test Unit can run off continuous 13.6V external power source connected through a quick disconnect cable harness provided with the unit. The DC input will trickle charge the nicad battery pack while the DC input is connected, irrespective of the front panel on-off switch. The front panel on-off switch controls power to test circuitry and displays only.

INTERNAL BATTERY

The Test Unit has provision for 10 single cell nicad "A" size batteries to provide up to 1.5 hours of continuous battery operation. Batteries are automatically slow charged whenever the Test Unit is connected to 115V AC source with the AC switch turned on.

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NOTES:

1. Tones above the specification of the Test Unit (50 to 275Hz) may be generated but output level will be attenuated at higher frequencies.
2. CDCSS codes other than specified on Ferritronics Dwg. SP379-18 can be generated as long as each number selected is equal or less than 7. (An 8 on the selector switch would be interpreted as a 0 and a 9 as a 1).

Note than non-standard codes are not recommended because of the inherent falsing due to the similarity of the code patterns.

3. The unit will only decode valid CDCSS codes as listed on Dwg. SP379-18.
4. The unit will decode tones as low as 30 Hz but its signal to noise ratio derates to greater than 12 dB SINAD below 50 Hz.

CIRCUIT DESCRIPTION

The TU-100 is a microprocessor based Test Unit designed to encode/decode and display sub-audible tone and digitally coded squelch signals used in two-way communications equipment. The unit has provision for an input/output connector for future interconnection to other microprocessor based accessories. The unit can be powered from 115VAC Mains or an external 13.6VDC supply. Provision has been made for nickel cadmium battery pack for stand alone operation.

COMPUTER BOARD


The Test Unit is based on the CB-100-U Computer Board (File SP457) which integrates the display board DB-04-TU (File SP441A), the encode code selector push switch assembly (Dwg. XB-0150), the AC & DC power supply inputs, and the input/output control lines.

FRONT PANEL

The input signal connector J12, output signal connector J13 and output level adjust pot R110 feed onto the display board through interconnect plug P2 of the display board where the signals are carried on to connector plug P1 of the same board. From there the signals travel via a ribbon cable connector J3-J6 to connector plug P6 of the computer board.

BCD SWITCH ASS'Y.

The Binary Coded Decimal (BCD) bi-directional push switch assembly (Dwg. XB-0150) is used to set the required code to be read by the microprocessor on the computer board. The switches are scanned when there is a mode change from DECODE to ENCODE (Switch SW6 on CB-100-U) or when the ENCODE SET switch (SW7 on CB-100-U) is depressed. The Encode Set switch is used to indicate to the microprocessor that a new code has to be read from the BCD push switch assembly.

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DISPLAY BOARD

The Display Board DB-04-LP is controlled from the CB-100-U Computer Board via a ribbon cable assembly (Dwg. XA-0148). The numerical display is enabled in the DECODE mode (selected on the front panel controls, switch SW6 on CB-100-U) when the incoming code, TONE or DIGITAL, is a valid code and the level is within the range of the Test Unit. For the TONE frequency display mode, the information on display is refreshed after every 33rd cycle of the incoming TONE while in the DIGITAL CODE display mode the refresh cycle is set at 200ms intervals. (Also see Encode Modes).

INDICATOR LED'S

The upper four LED indicators on the display board are lighted according to the mode select switches to indicate TONE or DIGITAL modes of operation. The two lower LED indicators show the mode of energizing of the Test Unit whether the rear mounted AC switch is "ON" and/or when the front DC power switch is activated. Note that the AC switch needs to be left on whenever the NI-CAD battery package is to be left on charge from the AC Mains. For minimum recharge time the front mounted ON-OFF switch should be OFF when the unit is not in use to minimize the current drain on the internal regulating/charging circuitry.

BATTERY PACK

The battery pack is accessible below the large printed circuit board while the battery power is brought on to the main PC board through connector jack J7. The Test Unit is designed to accept rechargeable NI-CAD batteries only.


WARNING: Substitution of non-rechargeable batteries may cause the batteries to explode due to the automatic charging of the batteries whenever an external AC supply is connected.

DC SUPPLY

External DC supply is brought into the unit via connector plug P11 on the rear plate assembly. Fuse F2 provides the necessary protection before power is applied on to the main PC board through connector jack J1.

AC SUPPLY

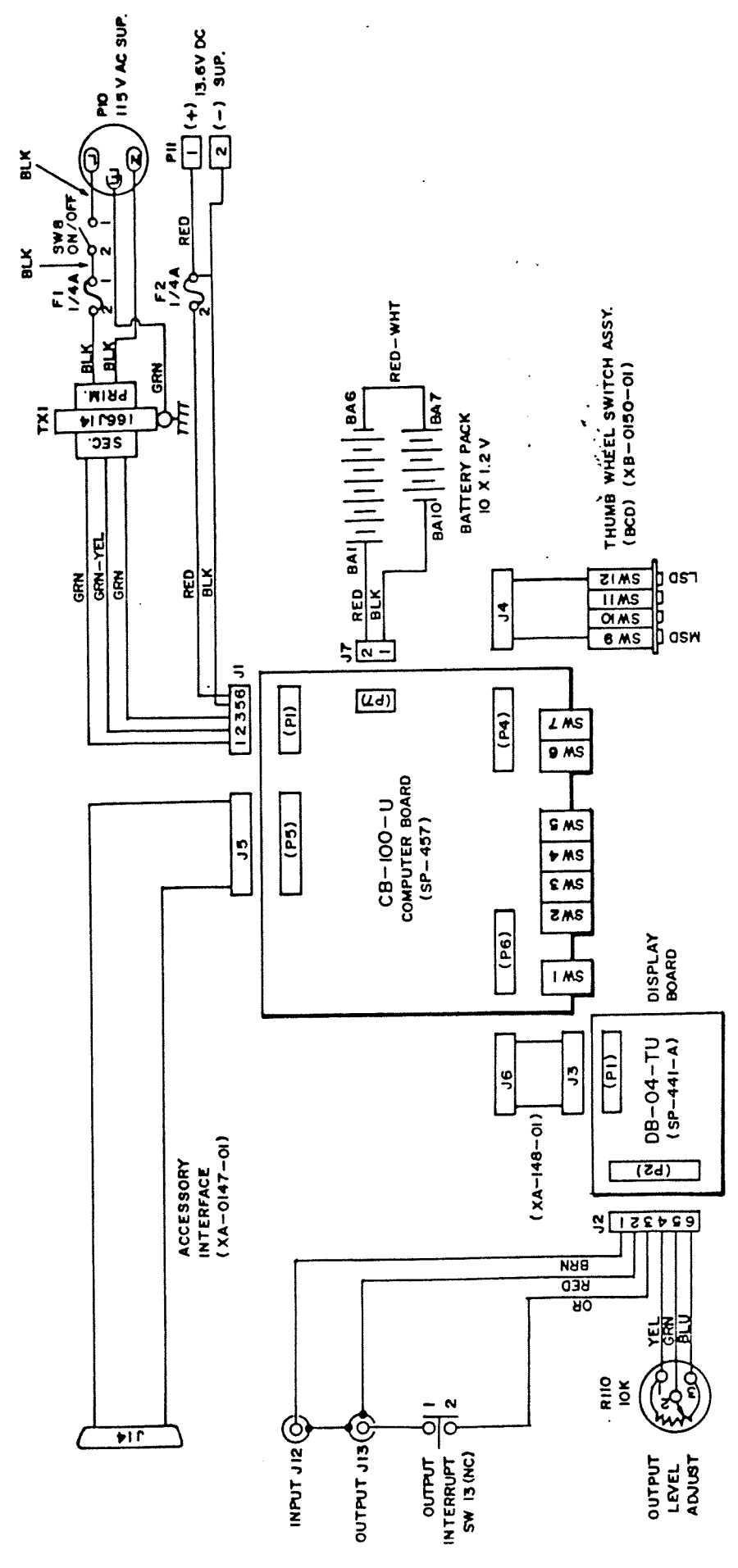
External AC supply is brought into the unit via AC connector plug P10 and then it is routed to the low voltage transformer TX1 through AC ON-OFF switch, SW8, and Fuse F1. All high voltage AC connections are isolated to minimize accidental electrical shock when servicing the unit.

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TITLE		TU-100-U BLOCK SCHEMATIC		DESIGNED BY	REG'D BY	DATE	FILE
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				82.4.2			
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DESIGNAT.	DESCRIPTION		PART/DW. NO.	MANUFACTURER
CB-100-U	COMPUTER BOARD	FILE:	SP452	FERRITRONICS
DB-04-TU	DISPLAY BOARD	FILE:	SP441	"
SW9,10,11,12	THUMBWHEEL ASSY	ASSY:	XB0150	"
SW 13	SWITCH, SPST	NC,MOM	39-2	GRAYHILL
TX1	TRANSFORMER	14 VCT	T66J14	HAMMOND
R 108	POTENTIOMETER	10K Ohm	RV6-SW 103	P.E.C.
SW 8	SWITCH, ROCKER	SPDT	1801 1102	MARQUARDT
F1	FUSE (AC)	1/4 A		BUSS
F2	FUSE (DC)	1/2 A		BUSS
(F1,F2)	FUSE HOLDER		HKP	BUSS
J1	CONNECTOR SOCKET	6 POS.	2139N	MOLEX
J2	CONNECTOR SOCKET	6 POS.	22-01-2061	MOLEX
J3	CONNECTOR SOCKET	26 POS.	609-2600M	ANSLEY
J4	CONNECTOR SOCKET	26 POS.	609-2600M	ANSLEY
J5	CONNECTOR SOCKET	26 POS.	609-2600M	ANSLEY
J6	CONNECTOR SOCKET	26 POS.	609-2600M	ANSLEY
J7	CONNECTOR SOCKET	2 POS.	22-01-2025	MOLEX
J12	CONNECTOR SOCKET	BNC	UG 1094/U	AMPHENOL
J13	CONNECTOR SOCKET	BNC	UG 1094/U	AMPHENOL
J14	CONNECTOR SOCKET	"D" 25 PIN	DB-25-S	CANNON
P10	CONNECTOR PLUG	AC	17252	BELDON
P11	CONNECTOR PLUG	DC	5025-02P	MOLEX
	POWER CORD, AC		17250	BELDON
	POWER CORD, DC	ASSY:	2A-0149	FERRITRONICS
BA1-BA10	BATTERY (OPTIONAL)	NICAD "AA"	CH15	EVEREADY

TITLE TU-100-U MONITOR TEST UNIT PARTS LIST	DRW. BY RSW	APPR.	FILE: SP379	
	DATE 81.10.5	DATE	DWG. NO. 04	ISSUE 1
 FERRITRONICS LIMITED		SCALE		
		SHT. 1 OF 1		

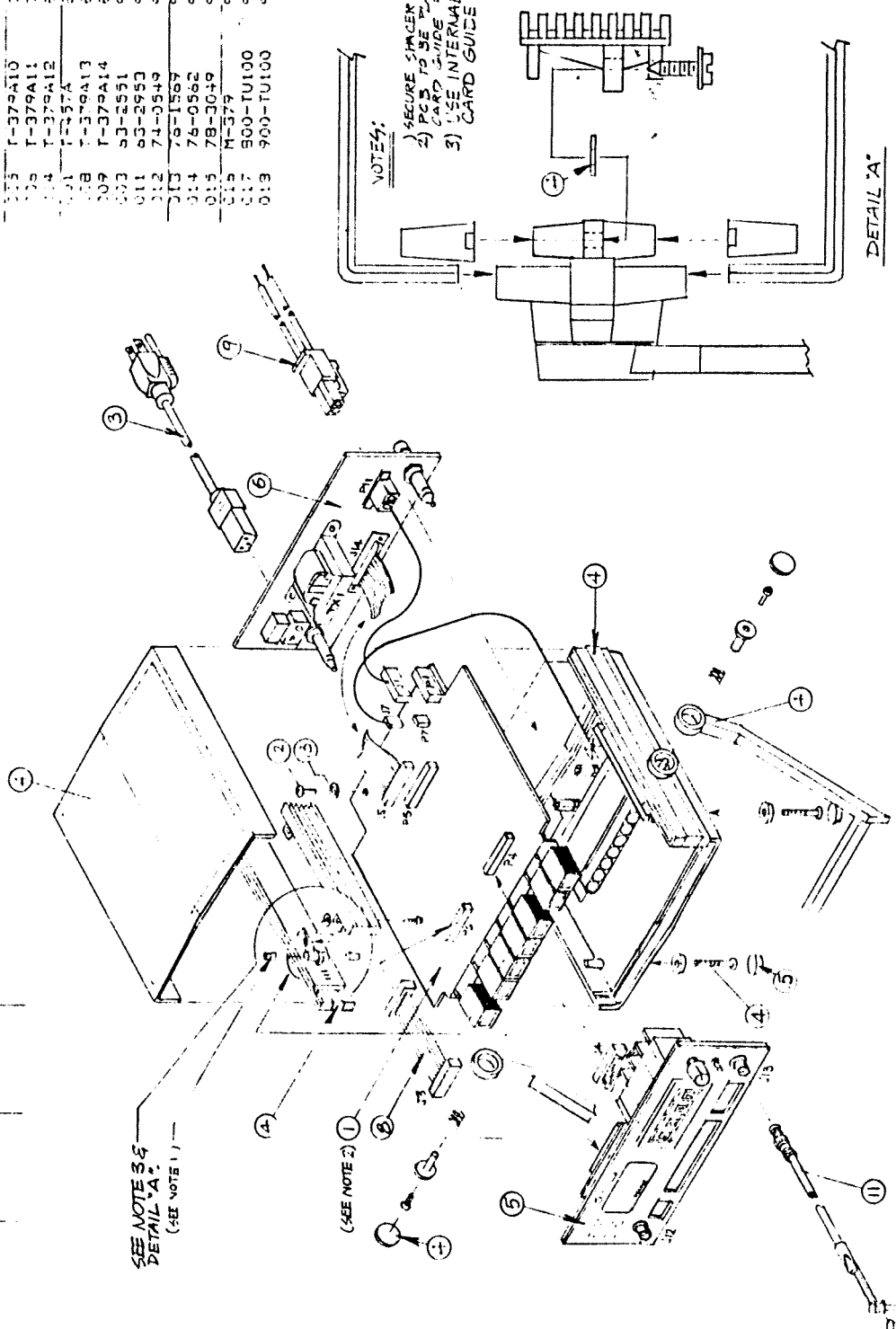
CHANGE

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XB-0120-01

NEXT ASSY: TU-100-U
 PRODUCT FILE No: SP-379

ITEM NO	PART NO	DESCRIPTION	UNIT REQ
013	F-379A10	7 FRONT PLATE ASSEMBLY	EA 1
014	F-379A11	7 REAR PLATE ASSEMBLY	EA 1
015	F-379A12	3 CABINET ASSEMBLY (TU-100)	EA 1
016	F-379A	3 CS-TU-100 COMPUTER BOARD	EA 1
017	F-379A13	3 CABLE SUB-ASSEMBLY	EA 1
018	F-379A14	3 DC CORD ASSEMBLY	EA 1
019	53-2551	9 CORD LINE #1250 BELDCH	EA 1
020	53-2553	9 CORD PATCH PANOVA	EA 1
021	74-0549	9 SCREW 6/32 X 1.4 BHMS	EA 2
022	75-1569	9 WASHER 5 FLAT WILCN	EA 2
023	75-0562	9 WASHER #6 INTERNAL STAR	EA 4
024	78-3049	9 RUBBER BUMPER 5" DIA X 120"H	EA 4
025	M-379	9 TU-100 INSTRUCTION MANUAL	EA 1
026	500-TU100	9 PACKING FOAM SET	EA 1
027	900-TU100	9 CARTON 13 X 13 X 6 175# TEST	EA 1

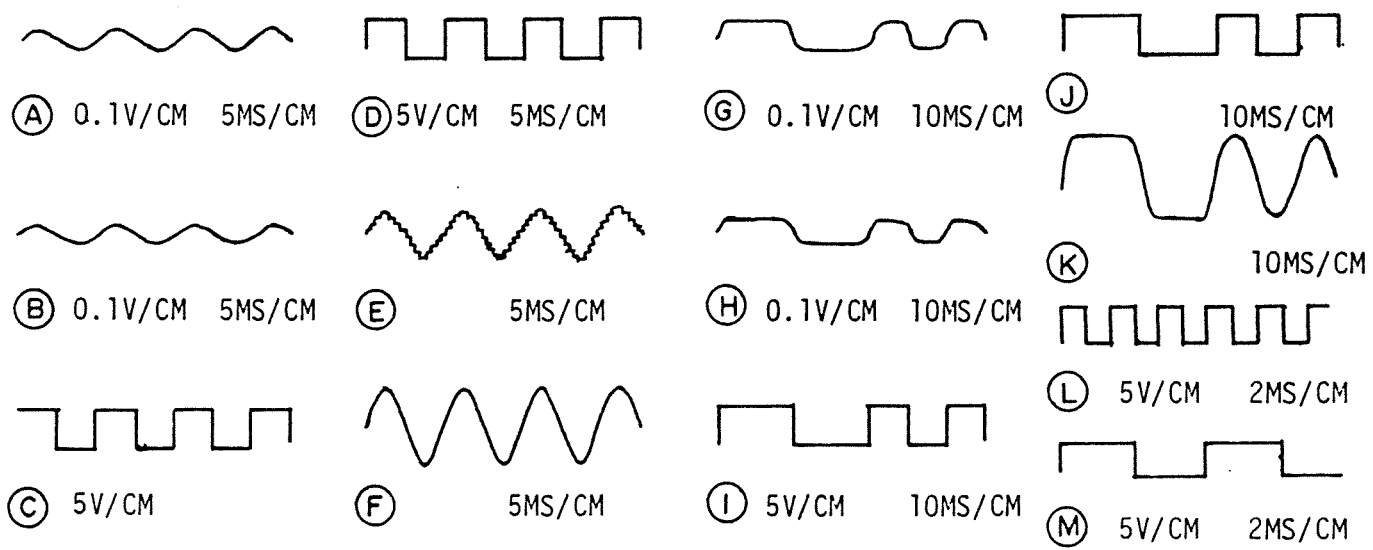
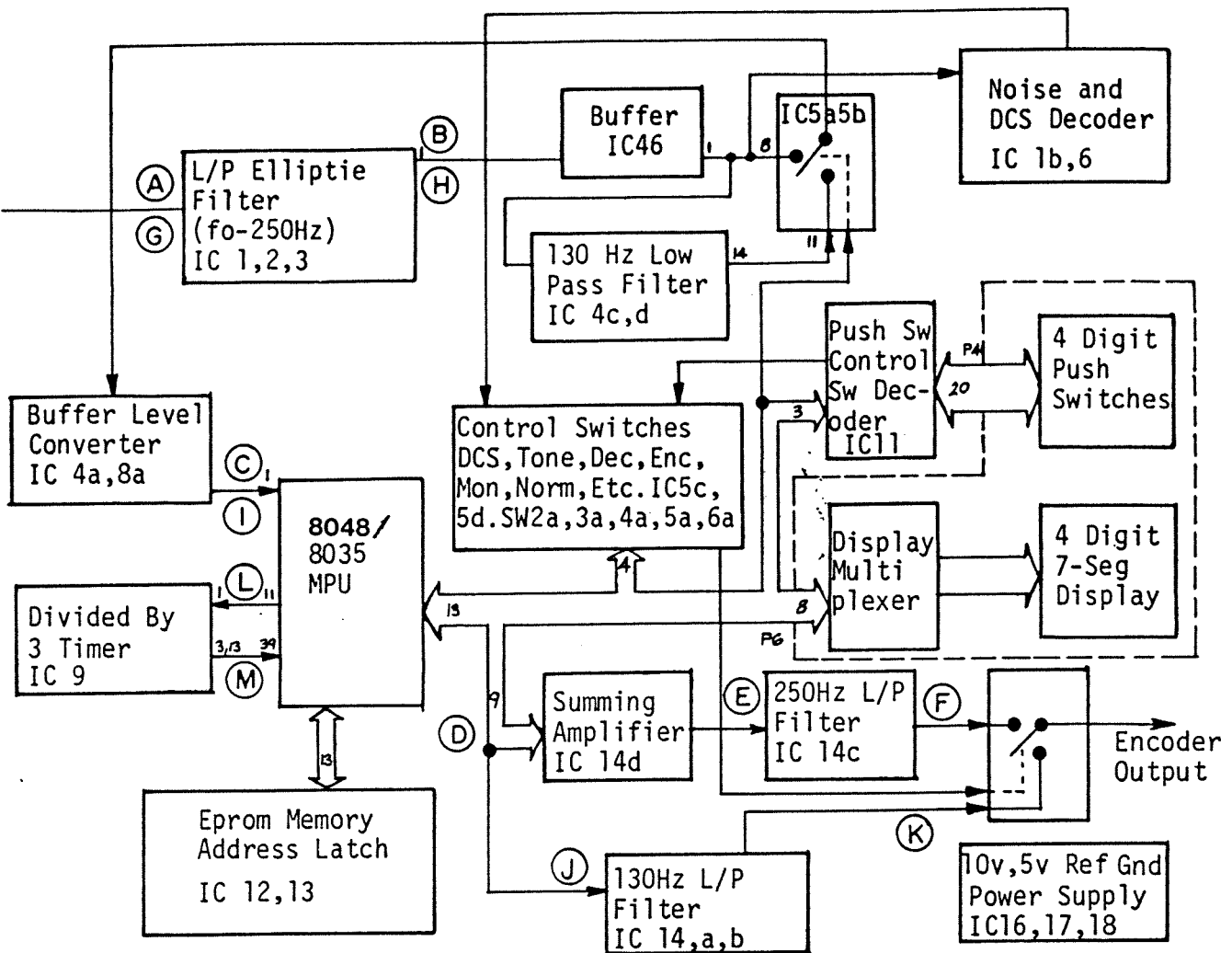



NOTES:
 1) SECURE SPACER CUPS WITH SWASTIC (3 PKG)
 2) PCB TO BE PLACED INTO SWASTIC SLOT OF CARD GUIDE FOR PROPER ALIGNMENT
 3) USE INTERNAL TOOTH LOCK WASHER TO SPACE CARD GUIDE BELOW CENTER (SEE DETAIL 'A')

DETAIL 'A'

ECN 272	REV. 1/74	1	3
CHANGE			
TITLE: TU-100-U UNIT ASSEMBLY			
DESIGNED BY: J.A.C.	DATE: 04/11/68	FILE NO: 379-03	REV. NO: 135
DRAWN BY: [Signature]		DATE: 04/11/68	REV. NO: 135
CHECKED BY: [Signature]		DATE: 04/11/68	REV. NO: 135
APPROVED BY: [Signature]		DATE: 04/11/68	REV. NO: 135
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Signal Input



TITLE TROUBLE SHOOTING BLOCK DIAGRAM	DRW. BY FC	APPR.	FILE: SP379	
	DATE 82.3.10	DATE	DWG. NO. 16	ISSUE 1a
 FERRITRONICS LIMITED	SCALE	SHT. 1 OF 3		

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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
1. DC POWER LIGHT NOT FUNCTIONING	+5V ABSENT	ENSURE SW8 & SW1 ARE "ON". ENSURE THE INPUT POWER SOURCE IS CORRECT AS WELL AS THE OUTPUT VOLTAGE OF REGULATORS IC16, 17 AND 18. ENSURE FUSES ARE INTACT.
2. DISPLAY DOESN'T INITIALIZE TO 8888 ON POWER UP	(a) +5V OR +10V ABSENT. (b) MPU CLOCK ABSENT (c) BAD CONNECTION BETWEEN 8035 MPU (IC7) AND DISPLAY MULTIPLEXER (IC10 OF DISPLAY BOARD) (d) WRONG LOGIC TO IC7 (e) BAD COMPONENTS	SAME AS 1 ABOVE. ENSURE 400K HZ CLOCK ON PIN 11 OF IC7 (REFER TO FIG. L). ENSURE THE SIGNALS ON PIN 10 OF IC7 ARE THE SAME AS PIN 8 OF IC10 OF DISPLAY BOARD. ENSURE PINS 4,7 AND 40 OF IC7 ARE 5V. ENSURE IC7 & IC13 OF THE DISPLAY BOARD ARE FUNCTIONING.
3. TONE NOT PRESENT AT OUTPUT	(a) CONTROL SWITCHES OR PUSH SWITCHES NOT IN CORRECT POSITIONS. (b) MPU (IC7) NOT RUNNING. (c) NO TIMER (d) BAD CONNECTION OR FAULTY IC14 A,C, OR IC20 A.	SET PUSH SWITCHES TO 100.0, SW1 - ON, SW2 - DON'T CARE, SW3 - DON'T CARE, SW4 - TONE, SW5 - DON'T CARE, SW6 - ENC. TURN LEVEL ADJUST POT TO MAX. AND PRESS SW7 (ENC SET), THEN LOOK AT OUTPUT (BNC CONNECTOR J13) ON A SCOPE. A 100.0 HZ SINEWAVE SHOULD APPEAR (REFER TO FIG. F). SAME AS 2 ABOVE. ENSURE PIN 39 OF IC7 HAS 133K HZ CLOCK (REFER TO FIG. M). AT PIN 27 OF IC7 THERE SHOULD BE A 100.0 HZ SQUAREWAVE (REFER TO FIG. D). AT TP4 (PIN 14 OF IC14) THERE SHOULD BE A 100.0 HZ DIGITAL SINEWAVE (REFER TO FIG. E).

TITLE TU-100 TROUBLE SHOOTING CHART		DRW. BY DATE	APPR. DATE	FILE: SP379	
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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
<p>4. DIGITAL CODE WAVEFORM (DCS) NOT PRESENT AT OUTPUT.</p>	<p>(a) CONTROL SWITCHES OR PUSH SWITCHES NOT IN CORRECT POSITIONS.</p> <p>(b) MPU (IC7) NOT RUNNING.</p> <p>(c) BAD CONNECTION OR FAULTY IC14 A, B, OR 20 A.</p>	<p>SET PUSH SWITCHES TO 172.0. SW1 - ON, SW2- NORM, SW3 - DON'T CARE, SW6 - ENC, TURN LEVEL ADJUST POT TO MAX. PRESS SW7 (ENC SET), DIGITAL CODE 172 WAVEFORM SHOULD APPEAR AT OUTPUT. (REFER TO FIG. B).</p> <p>SAME AS 2 ABOVE.</p> <p>DIGITAL CODE 172 WAVEFORM SHOULD APPEAR AT TP5. (REFER TO FIG. J).</p>
<p>5. DECODED TONE INPUT NOT APPEARING ON DISPLAY.</p>	<p>(a) INPUT TONE IS NOT WITHIN DECODE RANGE (50 TO 275 HZ.)</p> <p>(b) CONTROL SWITCHES NOT IN CORRECT POSITIONS.</p> <p>(c) MPU (IC7) NOT RUNNING.</p> <p>(d) TONE IS NOT GETTING TO PIN 1 OF IC7.</p>	<p>ENSURE INPUT FREQUENCY IS WITHIN THE RANGE 50 TO 275 HZ AND OVER 20 MV RMS (USE 100.0 HZ FOR TESTING).</p> <p>SET SW1 - ON, SW2 - DON'T CARE, SW3 - FREQ, SW4 - TONE, SW5 - NORM, SW6 - DEC, PRESS SW7 (ENC SET).</p> <p>SAME AS 2 ABOVE.</p> <p>ENSURE 100.0 HZ SINEWAVE IS PRESENT AT PIN 5 OF IC1 (IF INPUT 100.0 HZ) WITH INPUT MORE THAN 20 MV RMS. (REFER TO FIG. A).</p> <p>ENSURE 100.0 HZ SINEWAVE IS PRESENT AT PIN 1 OF IC3 (REFER TO FIG. B).</p> <p>ENSURE 100.0 HZ SQUAREWAVE IS PRESENT AT PIN 1 OF IC7.</p>
<p>6. DECODED DIGITAL CODE (DCS) INPUT NOT APPEARING ON DISPLAY.</p>	<p>(a) THE INPUT OF DIGITAL CODE IS NOT A STANDARD CODE.</p> <p>(b) CONTROL SWITCHES NOT IN CORRECT POSITIONS.</p> <p>(c) MPU (IC7) NOT RUNNING.</p> <p>(d) THE DCS SIGNAL IS NOT GETTING TO PIN 1 OF IC7.</p>	<p>CHECK THE LIST OF CURRENT DCS CODES. DWG: 18. SHT. 2 (SP379).</p> <p>SW1 - ON, SW2 - NORM, SW3 - DON'T CARE, SW4 - DCS, SW5 - NORM, SW6 - DEC, PRESS SW7 (ENC SET).</p> <p>SAME AS 2 ABOVE.</p> <p>ENSURE DCS SIGNAL OF AT LEAST 20 MV RMS IS PRESENT AT PIN 5 OF IC1 (REFER TO FIG. G). ENSURE DCS SIGNAL IS PRESENT AT PIN 1 OF IC3 (REFER TO FIG. H). ENSURE DCS SIGNAL IS PRESENT AT PIN 1 OF IC7 (REFER TO FIG. I).</p>

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CIRCUIT DESCRIPTION

CB-100-U COMPUTER BOARD

GENERAL DESCRIPTION

The CB-100-U Computer Board is designed to integrate all the hardware and I/O lines used on the TU-100 Test Unit to the on-board 8035 microprocessor. To provide the necessary working voltages, the printed circuit has an on-board multi level power regulator section. Provision has been made for the direct mounting of seven control switches used to select the operational mode of the circuitry. Dual in-line connectors provide in-out lines to interface the unit to a 4 digit (10 position) push switch assembly, a 4 digit (7 segment) multiplexed display board and to an accessory interface port.

The CB-100-U Computer Board can encode or decode sub-audible tone (CTCSS)*or sub-audible Digital Coded Squelch (CDCSS)*signals. The decoded signals are displayed under microprocessor control, on the off-board display board (DB-04-TU). The following description gives a brief description of the Digital Coded Squelch signal format and its requirements.

DIGITAL CODED SQUELCH SIGNAL

The Digitally Coded Squelch signal (CDCSS) is made up of a continuous low frequency digital data train where each unique code is identified by a 3 digit number each of which is a decimal number from 0 to 7. The generated signal is made up of 23 bits, nine of which are the binary equivalent of the identification number, three bits are hard wired "0"s, and the remaining are parity bits. The frequency spectrum utilized by the continuous digital code is 10 Hz to 70 Hz while the turn-off code at the end of the message is a 134.4 Hoz tone burst. Thus the test equipment used to generate or to detect the DCSS code format has to be able to respond to the low frequencies involved.


CIRCUIT DESCRIPTION

To aid the overall functional description of the circuitry, refer to the simplified block schematic of the CB-100-U contained in this drawing set.

DECODE CIRCUITRY

The input signal to be decoded is applied through a buffer amplifier stage, IC1A, to the 7th order elliptic Low Pass Filter (IC1,2,3) with a 3 dB cut-off frequency of 250 Hz and an overall signal loss of 6 dB. This filter will reject all frequencies above the range of the test unit such that the signal arriving at the microprocessor has no unwanted high frequency components. From the Low Pass Filter, the signal passes through to the buffer amplifier (IC4B). This stage has a gain of 20 to compensate for the loss incurred in the preceding Low Pass Filter and to boost low level incoming signals.

- * CTCSS - CONTINUOUS TONE CODED SQUELCH SYSTEM
- CDCSS - CONTINUOUS DIGITAL CODED SQUELCH SYSTEM

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			CIRCUIT DESCRIPTION CB-100-U COMPUTER BOARD	R.S.W.		SP457	
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				82.7.7			
			FERRITRONICS LIMITED		SCALE	DWG. NO.	ISSUE
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From the buffer amplifier (IC4B) the signal takes parallel paths to the analog switch (IC5A & B). The switch selects under microprocessor control, a direct path for Tone Decode mode or the alternate path through a low pass filter with 130 Hz cut-off frequency for digital coded messages.

From the analog switch, the signal is routed into a high gain limiter circuit (IC4A & Q1) where the signal is transformed from a 10v signal level to a 5v pp square wave data train. IC8A is an exclusive OR Gate used by the microprocessor to generate proper control signals when operating in the DCS decode mode.

MICROPROCESSOR CIRCUITRY

The microprocessor, IC7, is the overall controlling device making calculations and decisions to operate the circuit in its different operational modes. A 6.0 MHz crystal, X1, provides the working 400KHz frequency while a divide by 3 timer, IC9, is used to provide the reference timing for the staircase sinewave generation.

Programmable memory is made available through the on-board EPROM, IC13, and its associated address latch chip, IC12. Additional circuitry has been provided to accommodate an 8748 microprocessor with on-chip memory or to use an 8035 micro processor with external memory via the data buss. See program jumpers J1, J2 and J3 for specific jumper configurations to select memory utilization modes.

The microprocessor uses its I/O Port P1 in a multi functional mode depending on the setting of the control switches SW4 to SW6. This allows Port P1 to be used as an I/O Port for the generation of both the digital and tone coded signals, for the reading of the push switch assembly or for the controlling of the display board.


The 3 to 8 line decoder, IC11, decides under microprocessor control, whether the microprocessor reads the control switches, SW2 to SW6 or it reads the push switch assembly through output connector P4. Timer IC10 is used to provide the necessary timing pulses required when the accessory interface, connector P5, is used.

ENCODE CIRCUITRY

In the tone encode mode, the microprocessor generates 9 identical square waves of the fundamental frequency but of differing phases. These waveforms are then summed together in a summing amplifier IC14D to result in a staircase sinewave of the fundamental frequency. The signal then is passed through a low pass filter, IC14C, to remove the high frequency ripple from the staircase sinewave.

In the digital encode mode, the microprocessor uses only one output line, P25, to generate the required continuous digital squarewave which is passed through a two stage LP Filter to remove all frequency components above 130 Hz.

Switch SW4B selects either the tone or digital data line and feeds the resulting tone to connector P6-26 for off-board level adjustment. The signal returns from the adjustment pot on P6-25 to be gated by Transistor Q7 and then buffered by IC20A for a final output from the PC Board on P6-23. Transistor Q7 is used to disable the output line when the circuit is not in the encode mode.

TITLE	CIRCUIT DESCRIPTION		DRW. BY	APPR.	FILE:	
	CB-100-U COMPUTER BOARD		R.S.W		SP457	
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PROGRAM JUMPERS J1, J2 & J3

The following table gives the jumper arrangement for the use of various microprocessors and the different memory capacities each provide.

<u>Microprocessor</u>	<u>Memory Capacity</u>	<u>Jumper Selection</u>		
		J1	J2	J3
8748	Internal 1K	1-2	N/C	N/C
8035	External 1K	2-3	2-3	2-3
8035	External 2K	2-3	1-2	2-3
8035	External 4	2-3	1-2	1-2

PROGRAM JUMPERS J4 & J5

J4 - Selects the sourcing of the write enable pulse either directly from the micro processor, J4 (2-3), or indirectly through software control of pin 7 of IC11. For indirect mode, use jumper J4 (1-2). In the indirect mode the microprocessor data selectively controls timer IC10 which in turn provides the timing pulse used through inverting exclusive OR Gates IC8B and IC8C for the display write enable or the accessory enable pulses.

J5 - Enables the phase locked loop circuitry IC6. This circuit may be used to control the decoding of the digital coded signals depending on the presence of a valid signal falling into the phase-lock-loop circuit's frequency capture range.


POWER REGULATOR CIRCUITS

The circuit board has facility to receive power from three different sources.

The power input sources are 14v AC through connector P1 (1 & 2) into rectifier bridge IC19; 13.6VDC through connector P1 (5 & 6) into blocking diode D40; or from a 12VDC NICAD battery source through connector P7 (1 & 2).

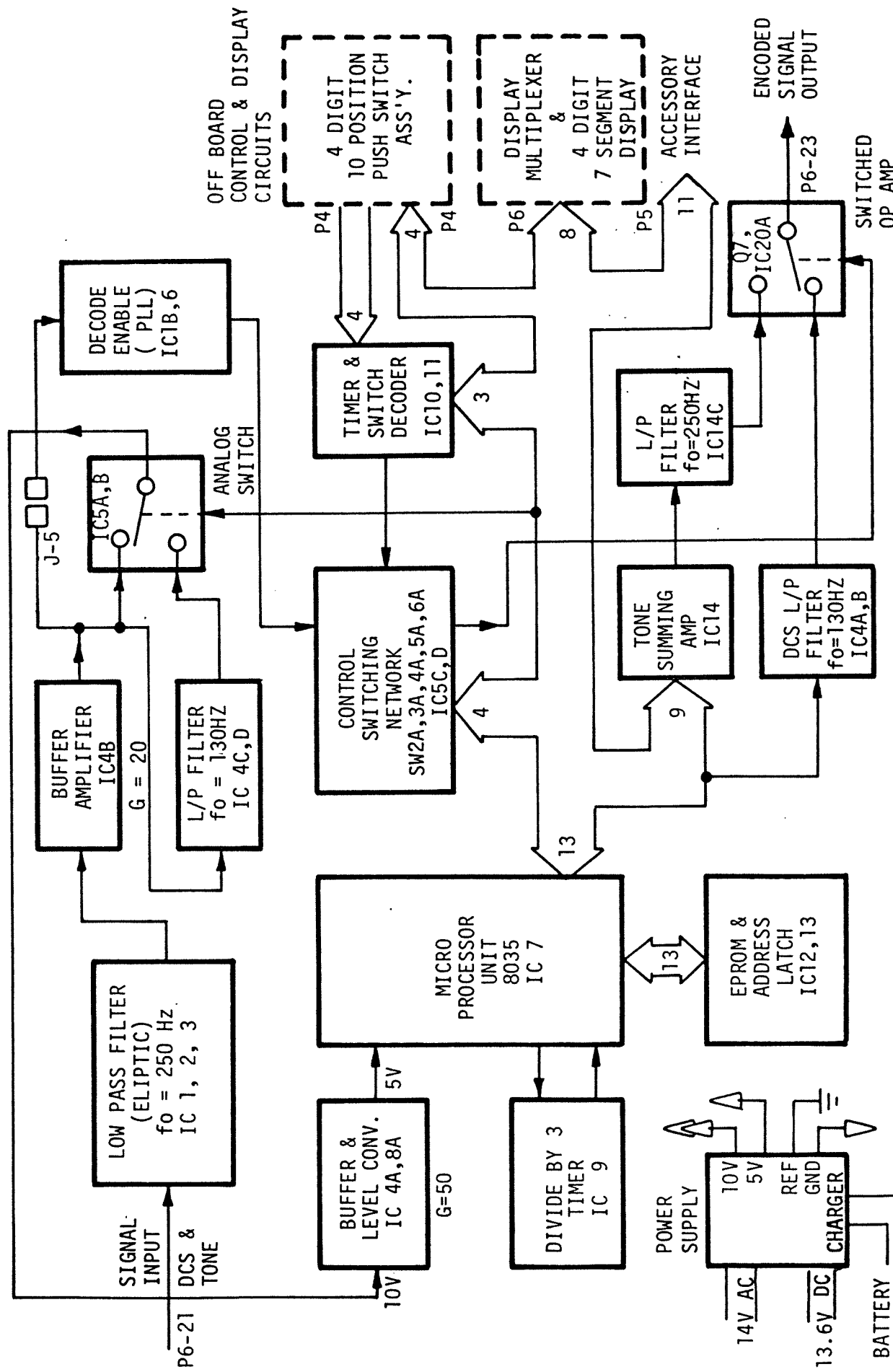
IC15, a 5V regulator, is used as a constant current source for the NICAD battery charging whenever an AC external power source is connected.

The combined power sources are fed on to DC power switch SW1 which controls power going to the rest of the circuitry. Regulators IC16, IC17 and IC18 are the voltage sources for the different supply voltages required by the analog and the digital circuitry on the board. Note the legend indicating all the different symbols used to denote the various voltage levels on the schematic.

TITLE CIRCUIT DESCRIPTION CB-100-U COMPUTER BOARD	DRW. BY	APPR.	FILE:	
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OFF BOARD CONTROL & DISPLAY CIRCUITS

4 DIGIT 10 POSITION PUSH SWITCH ASS'Y.

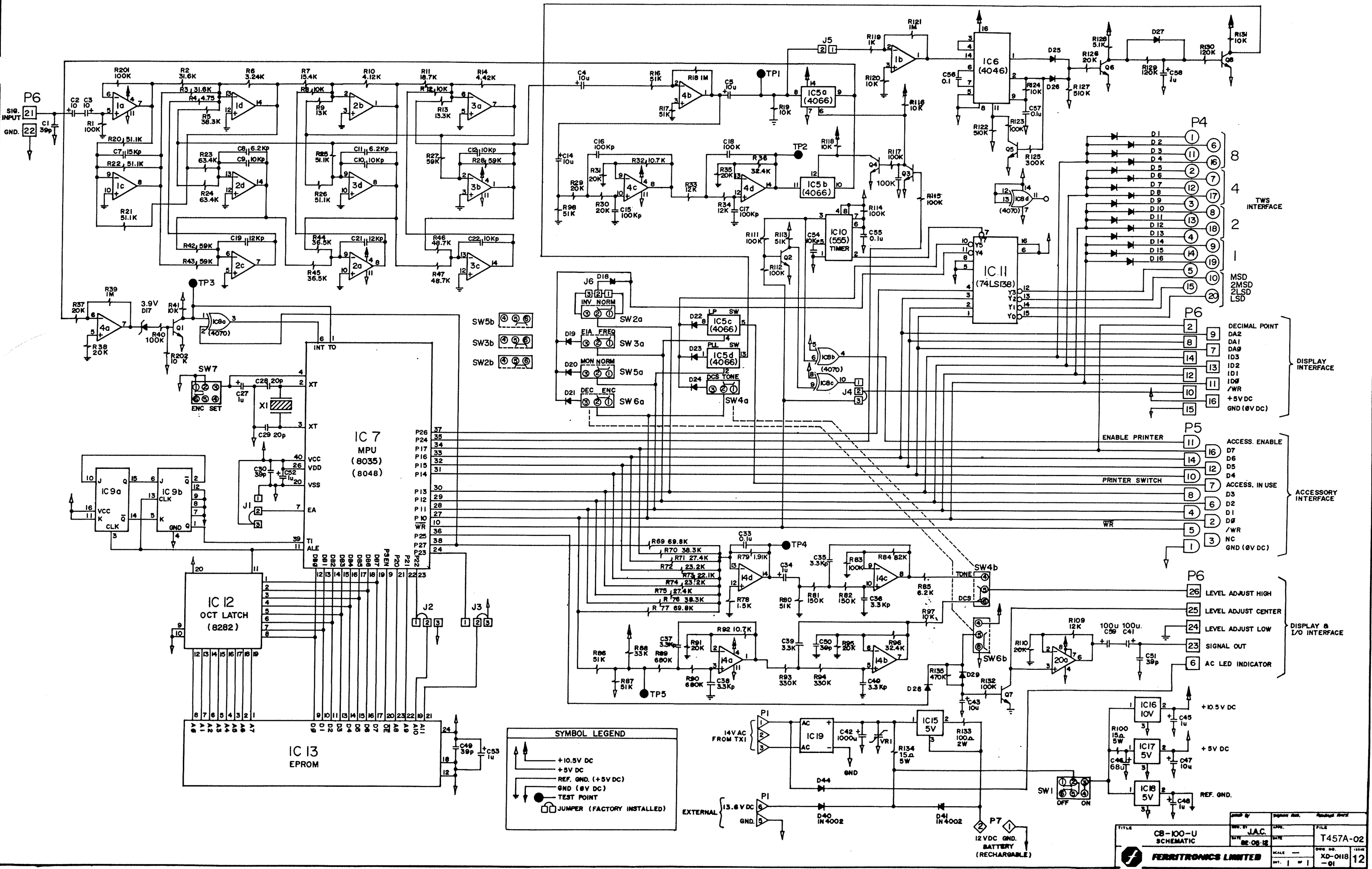
DISPLAY MULTIPLEXER & 4 DIGIT 7 SEGMENT DISPLAY

ACCESSORY INTERFACE

TITLE	CB-100-U BLOCK SCHEMATIC	DRW. BY RSW	DATE 82.4.30	APPR.	FILE SP457
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SYMBOL LEGEND

- +10.5V DC
- +5V DC
- REF. GND. (+5V DC)
- GND. (0V DC)
- TEST POINT
- JUMPER (FACTORY INSTALLED)


TITLE	CB-100-U SCHEMATIC	DESIGNER	J.A.C.	DATE	02-05-82	FILE	T457A-02
SCALE		DWG. NO.		REV.	01	NO.	XD-0118-01
FERRITRONICS LIMITED							

IC 1	QUAD OP AMP		MC3403CP	MOTOROLA
IC 2	QUAD OP AMP		MC3403CP	MOTOROLA
IC 3	QUAD OP AMP		MC3403CP	MOTOROLA
IC 4	QUAD OP AMP		MC3403CP	MOTOROLA
IC 5	QUAD BILAT SWITCH		MC14066CP	MOTOROLA
IC 6	PHASE LOCK LOOP		MC4046	NATIONAL
IC 7	MICRO COMPUTER		P8035/8048	INTEL
IC 8	QUAD EXCL OR		MC14070BCF	MOTOROLA
IC 9	DUAL J-K FLIP FLOP		MC14027	MOTOROLA
IC10	TIMER SINGLE		555	
IC11	3-8 LINE DEC		SN74LS138	T S I
IC12	8 BIT LATCH NON INV.		P8282	INTEL
IC13	E PROM, CUSTOM		PROG. #	FERRITRONICS
IC14	QUAD OP AMP		MC3403CP	MOTOROLA
IC15	VOLTAGE REGULATOR	5 V	LM340T5	NATIONAL
IC16	" "	10 V	78L10	NATIONAL
IC17	" "	5 V	LM340T5	NATIONAL
IC18	" "	5 V	78L05A	NATIONAL
IC19	BRIDGE RECTIFIER		VE27	
IC20	SINGLE OP AMP		LM741	

Q 1	TRANSITOR	NPN	2N3904
Q 2	"	NPN	2N3904
Q 3	"	NPN	2N3904
Q 4	"	NPN	2N3904
Q 5	"	NPN	2N3904
Q 6	"	NPN	2N3904
Q 7	"	NPN	MPSA18
Q 8	"	NPN	2N3904

VR1	VARISTOR		V130LA10A
X 1	CRYSTAL		6.000 MHz

D 1	DIODE	S1	IN914	
D 2	DIODE	S1	IN914	
D 3	"	S1	IN914	
D 4	"	S1	IN914	
D 5	"	S1	IN914	
D 6	"	S1	IN914	
D 7	"	S1	IN914	
D 8	"	S1	IN914	
D 9	"	S1	IN914	
D10	"	S1	IN914	
D11	"	S1	IN914	
D12	"	S1	IN914	
D13	"	S1	IN914	
D14	"	S1	IN914	
D15	"	S1	IN914	
D16	"	S1	IN914	
D17	ZENER DIODE	3.9V	IN748A	400mv
D18	DIODE	S1	IN914	

TITLE CB-100-U COMPUTER BOARD COMPONENT LIST	DRW. BY	APPR.	FILE: T457A	
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D19	DIODE	S1	IN914		
D20	"	S1	IN914		
D21	"	S1	IN914		
D22	"	S1	IN914		
D23	"	S1	IN914		
D24	"	S1	IN914		
D25	"	S1	IN914		
D26	"	S1	IN914		
D27	"	S1	IN914		
D28	"	S1	IN914		
D29	"	S1	IN914		
D40	"	S1	IN4002		IA POWER RECTIFIER
D41	"	S1	IN4002		IA POWER RECTIFIER
D44	"	S1	IN914		
SW1	SWITCH	DPDS	ON/OFF		FERRITRONICS
SW2	"	DPDS	MON/NORM		FERRITRONICS
SW3	"	DPDS	EIA/FREQ.		"
SW4	"	DPDS	TONE/DCS		"
SW5	"	DPDS	INV/NORM		"
SW6	"	DPDS	ENC/DEC		"
SW7	"	DPDS	ENC/SET		"
P 1	CONNECTOR	MALE	POWER		MOLEX 09-65-1061
P 4	CONNECTOR	MALE	TW. SW.		26 POS. WAFFER
P 5	"	MALE	PRINTER		26 POS. WAFFER
P 6	"	MALE	DISPLAY		" " "
P 7	"	MALE	BATTERY		MOLEX 22-27-2021
C 1	CAPACITOR		39	pF	CERAMIC
C 2	CAPACITOR		10	uF	TANTALUM DIP
C 3	"		10	uF	" "
C 5	"		10	uF	" "
C 7	"		15	k pF	POLYSTYRENE
C 8	"		6.2	k pF	"
C 9	"		10	k pF	"
C10	"		10	k pF	"
C11	"		6.2	k pF	"
C12	"		10	k pF	"
C14	"		10	uF	TANTALUM DIP
C15	"		100	k pF	CERAMIC DISC
C16	"		100	k pF	CERAMIC DISC
C17	"		100	k pF	" "
C18	"		100	k pF	" "
C19	"		12	k pF	" "
C21	"		12	k pF	POLYSTYRENE
C22	"		10	k pF	POLYSTYRENE
C27	"		1	uF	TANTALUM DIP
C23	"		20	pF	CERAMIC DISC
C29	"		20	pF	CERAMIC DISC
C 4	"		10	uF	TANTALUM DIP

TITLE	CB-100-U COMPUTER BOARD COMPONENT LIST	DRW. BY	APPR.	FILE:		
		DATE	DATE	T457A		
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C30	CAPACITOR	39		pfd	CERAMIC DISC
C33	CAPACITOR	100	K	pfd	CERAMIC DISC
C34	CAPACITOR	1		ufd	TANTALUM DIP
C35	"	3.3	K	pfd	NPO CERAMIC
C36	"	3.3	K	pfd	" "
C37	"	3.3	K	pfd	" "
C38	"	3.3	K	pfd	" "
C39	"	3.3	K	pfd	" "
C40	"	3.3	K	pfd	" "
C41	"	100		ufd	TANTALUM DIP
C42	"	1000		ufd	ELECTROLYTIC
C43	"	10		ufd	TANTALUM DIP
C45	CAPACITOR	1		ufd	" "
C46	"	68		ufd	" "
C47	"	10		ufd	" "
C48	"	1		ufd	" "
C49	"	39		pfd	CERAMIC DISC
C50	"	39		pfd	CERAMIC DISC
C51	"	39		pfd	" "
C52	"	1		ufd	TANTALUM DIP
C53	"	1		ufd	" "
C54	"	10	K	pfd	CERAMIC DISC
C55	"	100	K	pfd	CERAMIC DISC
C56	"	100	K	pfd	" "
C57	"	100	K	pfd	" "
C58	"	1		ufd	TANTALUM DIP
C59	"	100		ufd	" "
C60	"	100	K	pfd	" "
R 1	RESISTOR	100	K	ohm	1/4 WATT 5%
R 2	RESISTOR	31.6	K	ohm	1/8 WATT 1%
R 3	"	31.6	K	ohm	1/8 WATT 1%
R 4	"	4.75	K	ohm	1/8 WATT 1%
R 5	"	38.3	K	ohm	1/8 WATT 1%
R 6	"	3.24	K	ohm	1/8 WATT 1%
R 7	"	15.4	K	ohm	1/8 WATT 1%
R 8	"	10.0	K	ohm	1/8 WATT 1%
R 9	"	13.0	K	ohm	1/8 WATT 1%
R10	"	4.12	K	ohm	1/8 WATT 1%
R11	"	18.7	K	ohm	1/8 WATT 1%
R12	"	10.0	K	ohm	1/8 WATT 1%
R13	"	13.3	K	ohm	1/8 WATT 1%
R14	"	4.42	K	ohm	1/8 WATT 1%
R15	"				
R16	"	51	K	ohm	1/4 WATT 5%
R17	"	51	K	ohm	1/4 WATT 5%
R18	"	1	M	ohm	1/4 WATT 5%
R19	"	10	K	ohm	1/4 WATT 5%
R20	"	51.1	K	ohm	1/8 WATT 1%
R21	"	51.1	K	ohm	1/8 WATT 1%
R22	"	51.1	K	ohm	1/8 WATT 1%
R23	"	63.4	K	ohm	1/8 WATT 1%


TITLE CB-100-U COMPUTER BOARD COMPONENT LIST	DRW. BY	APPR.	FILE: T457A	
	DATE	DATE		
 FERRITRONICS LIMITED	SCALE	DWG. NO.	ISSUE	
	SHT. 3 OF 5	04	4	

CHANGE

ISS.

R24	RESISTOR	63.4	K	ohm	1/8 WATT	1%
R25	RESISTOR	51.1	K	ohm	1/8 WATT	1%
R26	"	51.1	K	ohm	1/8 WATT	1%
R27	"	59.0	K	ohm	1/8 WATT	1%
R28	"	59.0	K	ohm	1/8 WATT	1%
R29	"	20	K	ohm	1/4 WATT	5%
R30	"	20	K	ohm	1/4 WATT	5%
R31	"	20.0	K	ohm	1/8 WATT	1%
R32	"	10.7	K	ohm	1/8 WATT	1%
R33	"	12	K	ohm	1/4 WATT	5%
R34	"	12	K	ohm	1/4 WATT	5%
R35	"	20.0	K	ohm	1/8 WATT	1%
R36	"	32.4	K	ohm	1/8 WATT	1%
R37	"	20	K	ohm	1/4 WATT	5%
R38	"	20	K	ohm	1/4 WATT	5%
R39	"	1	M	ohm	1/4 WATT	5%
R40	"	10	K	ohm	1/4 WATT	5%
R41	"	10	K	ohm	1/4 WATT	5%
R42	"	59.0	K	ohm	1/8 WATT	1%
R43	"	59.0	K	ohm	1/8 WATT	1%
R44	"	36.5	K	ohm	1/8 WATT	1%
R45	"	36.5	K	ohm	1/8 WATT	1%
R46	"	48.7	K	ohm	1/8 WATT	1%
R47	"	48.7	K	ohm	1/8 WATT	1%


R69	RESISTOR	69.8	K	ohm	1/8 WATT	1%
R70	"	38.3	K	ohm	1/8 WATT	1%
R71	"	27.4	K	ohm	1/8 WATT	1%
R72	"	23.2	K	ohm	1/8 WATT	1%
R73	"	22.1	K	ohm	1/8 WATT	1%
R74	"	23.2	K	ohm	1/8 WATT	1%
R75	"	27.4	K	ohm	1/8 WATT	1%
R76	"	38.3	K	ohm	1/8 WATT	1%
R77	"	69.8	K	ohm	1/8 WATT	1%
R78	"	1.5	K	ohm	1/8 WATT	1%
R79	"	1.91	K	ohm	1/8 WATT	1%
R80	"	51	K	ohm	1/4 WATT	5%
R81	"	150	K	ohm	1/4 WATT	5%
R82	"	150	K	ohm	1/4 WATT	5%
R83	"	100	K	ohm	1/4 WATT	5%
R84	"	82	K	ohm	1/4 WATT	5%
R85	"	6.2	K	ohm	1/4 WATT	5%
R86	"	51	K	ohm	1/4 WATT	5%
R87	"	51	K	ohm	1/4 WATT	5%
R88	"	33	K	ohm	1/4 WATT	5%
R89	"	680	K	ohm	1/4 WATT	5%
R90	"	680	K	ohm	1/4 WATT	5%
R91	"	20.0	K	ohm	1/8 WATT	1%
R92	"	10.7	K	ohm	1/8 WATT	1%
R93	"	330	K	ohm	1/4 WATT	5%
R94	"	330	K	ohm	1/4 WATT	5%

TITLE CB-100-U COMPUTER BOARD COMPONENT LIST	DRW. BY	APPR.	FILE: T457A	
	DATE	DATE		
 FERRITRONICS LIMITED	SCALE	DWG. NO.	ISSUE	
	SHT. 4 OF 5	04	4	

CHANGE

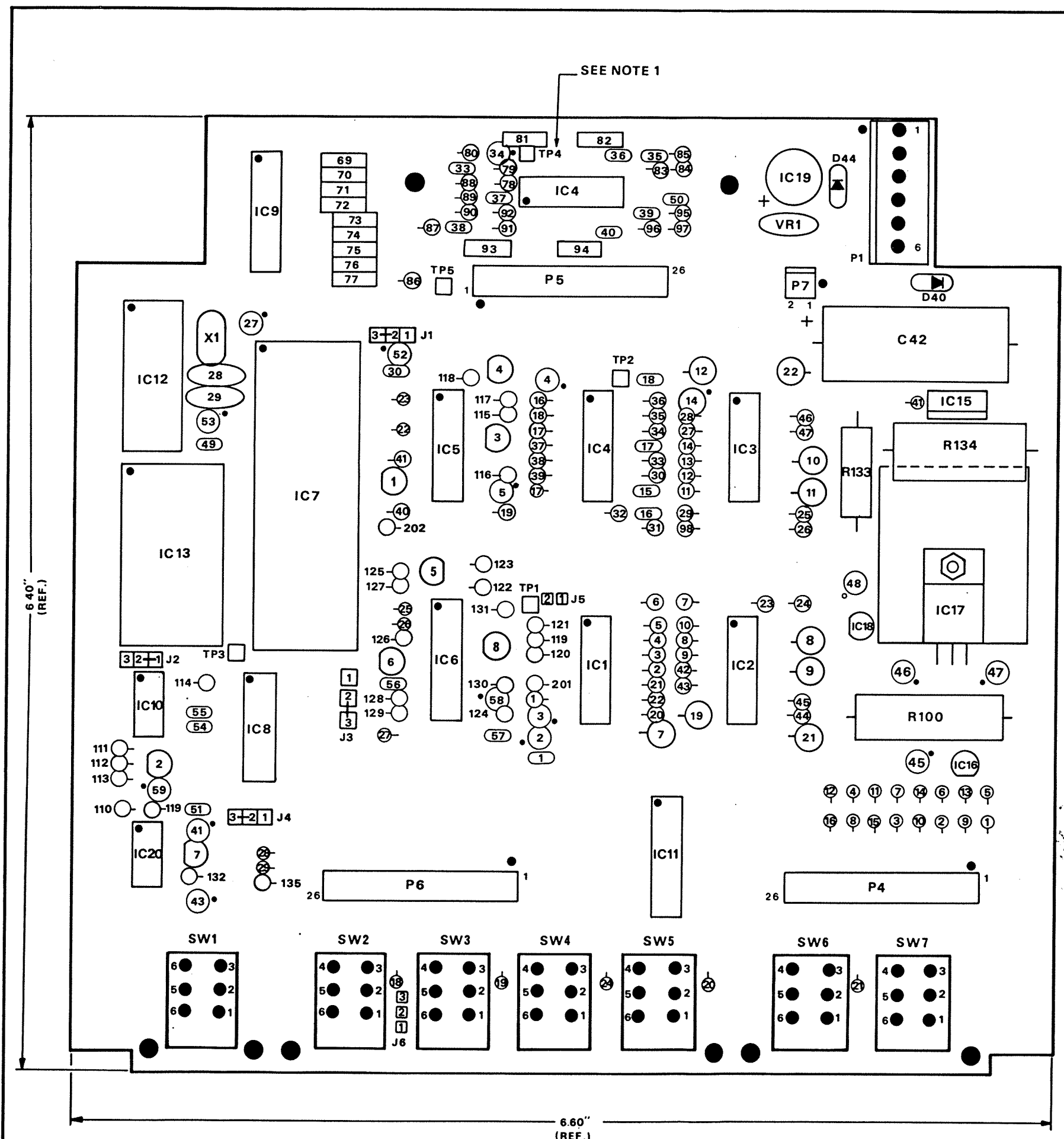
ISS.

R95	RESISTOR	20.0	K	ohm	1/8 WATT	1%
R96	RESISTOR	32.4	K	ohm	1/8 WATT	1%
R97	"	10	K	ohm	1/4 WATT	5%
R98	"	51	K	ohm	1/4 WATT	5%
R99	"	NOT USED				
R100	"	15		ohm	5 WATT	5%
R109	"	12	K	ohm	1/4 WATT	5%
R110	"	20	K	ohm	1/4 WATT	5%
R111	"	100	K	ohm	1/4 WATT	5%
R112	"	100	K	ohm	1/4 WATT	5%
R113	"	51	K	ohm	1/4 WATT	5%
R114	"	100	K	ohm	1/4 WATT	5%
R115	"	100	K	ohm	1/4 WATT	5%
R116	"	10	K	ohm	1/4 WATT	5%
R117	"	100	K	ohm	1/4 WATT	5%
R118	"	10	K	ohm	1/4 WATT	5%
R119	"	1	K	ohm	1/4 WATT	5%
R120	"	10	K	ohm	1/4 WATT	5%
R121	"	1	M	ohm	1/4 WATT	5%
R122	"	510	K	ohm	1/4 WATT	5%
R123	"	100	K	ohm	1/4 WATT	5%
R124	"	10	K	ohm	1/4 WATT	5%
R125	"	300	K	ohm	1/4 WATT	5%
R126	"	20	K	ohm	1/4 WATT	5%
R127	"	510	K	ohm	1/4 WATT	5%
R128	"	5.1	K	ohm	1/4 WATT	5%
R129	"	120	K	ohm	1/4 WATT	5%
R130	"	120	K	ohm	1/4 WATT	5%
R131	"	10	K	ohm	1/4 WATT	5%
R132	"	100	K	ohm	1/4 WATT	5%
R133	"	100		ohm	2 WATT	5%
R134	"	15		ohm	5 WATT	5%
R135	"	470	K	ohm	1/4 WATT	5%
R201	"	100	K	ohm	1/4 WATT	5%
R202	"	10	K	ohm	1.4 WATT	5%

TITLE CB-100-U COMPUTER BOARD COMPONENT LIST		DRW. BY	APPR.	FILE: T457A	
		DATE	DATE		
 FERRITRONICS LIMITED			SCALE	DWG. NO.	ISSUE
			SHT. 5 OF 5	04	4

CHANGE

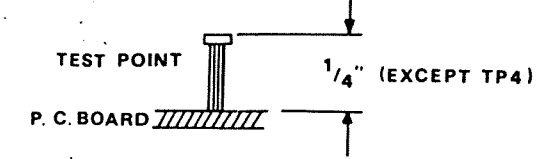
ISS.



LEGEND :

- Q TRANSISTOR
- D DIODE
- C CAPACITOR
- C CAPACITOR
- C CAPACITOR
- C CAPACITOR
- R RESISTOR
- R RESISTOR
- TP TEST POINT (SEE NOTE 1 & 2)
- J JUMPER .25" HIGH

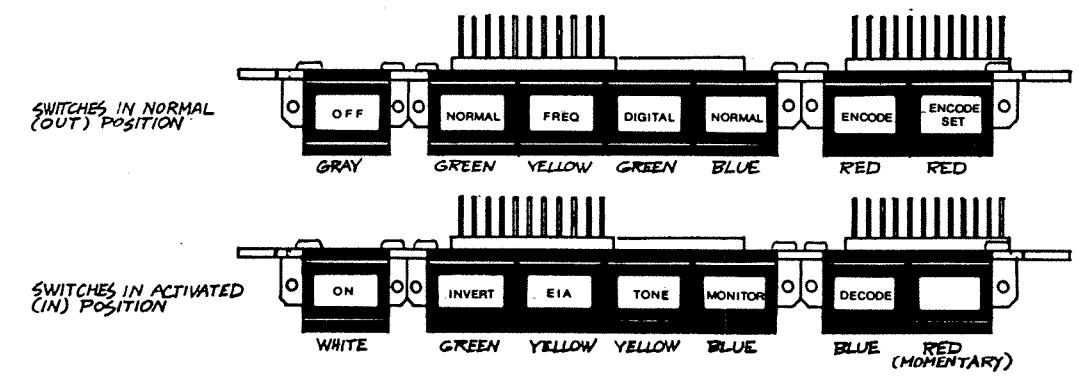
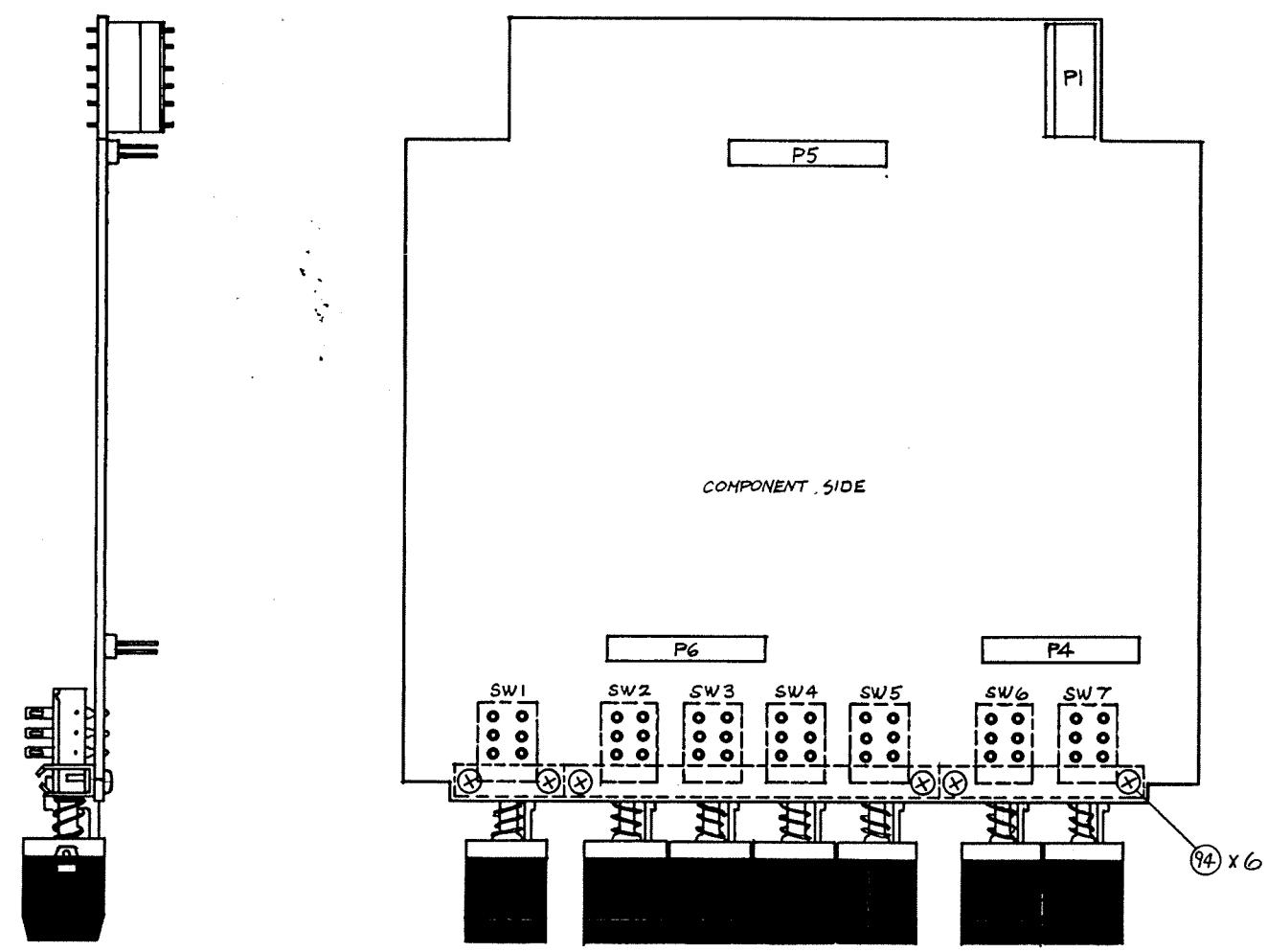
NOTE: 1) TP4 HAS TO BE 1/8" HIGH
 2) OTHER TEST POINTS ARE 1/4" HIGH



TEST POINT DETAIL

CHKD BY		DESIGN ENG	RELEASE DATE
DRW. BY R. BAGLA		APPR. <i>[Signature]</i>	FILE SP457-8
DATE 82-07-07		DATE 22-07-08	SCALE 2:1
DWC. NO. XC-0154-		ISSUE 02	6
SMT. 1 OF 2		FERRITRONICS LIMITED	

B



NOTE
 1) ALL SWITCHES ARE NON-INTERLOCKING, PUSH ON - PUSH OFF EXCEPT SWITCH # 7 WHICH IS A MOMENTARY PUSH SWITCH.

B

DRAWN BY		DESIGN ENG.		RELEASE DATE	
DATE		DATE		DATE	
81/12/16		82.07.08		81/12/16	
DRAW. BY J.A.C.		APP. J.A.C.		FILE SP-457-8	
TITLE CB-100-U SWITCH ASSEMBLY		SCALE N.T.S.		DWG. NO. XC-0154-02	
FERRITRONICS LIMITED		SHT. 2 OF 2		ISSUE 6	

SPECIFICATION

OPERATING VOLTAGE : 5V DC \pm 1V (Regulated)
(Data Retention to 2V DC)

OPERATING CURRENT : Typical @ 5V DC

1. Stand By 1 ma
2. 4 Displays (all segments) 60 ma
3. 4 Displays & Indicator LED's 80 ma

OPERATING TEMPERATURE RANGE : -20^oC to +70^oC

LOGIC "1" INPUT VOLTAGE : \geq 2.4V

LOGIC "0" INPUT VOLTAGE : \leq 0.8V

INPUT IMPEDANCE : 100K Ohm (all 3 levels)

MODE OF DISPLAY : Multiplexed LED Driver-Decoder,
CMOS, based on INTERSIL ICM7218D

DISPLAY SCAN RATE : 250 Hz


DISPLAYS : 4 seven segment red LED c/w right hand decimal
point.

INDICATORS : 4 red LED, software controlled
1 red LED, off-board controlled
1 red LED, on-board power indicator

INPUT DECODE MODES : 1) Code 'B' (binary input)
2) Hexadecimal (binary input)

For further information on decode modes see circuit
description (Ferritronics File SP441, Dwg: 03)
or refer to INTERSIL Databook for ICM7218D.

PROGRAMMING OPTIONS : 1. Decimal point; hardware or software
control (jumpers JU1 & JU3)
2. Decode mode selection (jumper JU2)
3. Indicator LED Control; hardware or
software mode (jumpers JU5, JU6 & JU8)

TITLE DB-04-LP - LOW POWER FOUR DIGIT DISPLAY BOARD	DRW. BY RSW	APPR.	FILE: SP441	
	DATE 82.4.28	DATE	DWG. NO. 01	ISSUE 1
 FERRITRONICS LIMITED		SCALE -		
		SHT. 1 OF 1		

CHANGE

ISS.

DB-04-LP

LOW POWER DISPLAY BOARD

The DB-04-LP Display Board consists of a CMOS Universal 8 Digit Multiplexed LED Driver, IC10, and four seven segment LED Displays, IC1 to IC4.

Added features are selective control of the decimal points and additional circuitry to drive six indicator LED's either under software or hardware control. To facilitate signal and power supply routing via the Display Board, lines are provided on the I/O Cable Connector, P1, going to on-board six position connectors P2 and P3.

The ICM7218D Universal LED Driver provides, in a single package, all the circuitry necessary to interface most common microprocessors or digital systems and LED displays. Included on the chip is an 8 X 8 static memory array providing storage for the displayed information, two types of 7 segment decoders, all the multiplex scan circuitry and the high power digit and segment drivers.

The DB-04-LP Board has 3 address lines, one write line and four data lines coming on-board through connector P1 to transfer control and data information to the 7218D Display Interface IC on successive write pulses. Data can be written into memory by setting up a 3 Bit Binary Code (one of eight) on the digit address inputs, which define the digit where the data is to be written into the memory, and apply a negative going Write pulse. It is possible to change only one digit, if necessary, without refreshing data for all the other digits.

Decoding of the stored data in memory is defined by the control word and may be decoded in hexadecimal, Code B or No-Decode Format. For further detailed description of the LED Driver, IC10, refer to the appropriate INTERSIL DATA BOOK.

DECIMAL MODE SELECTION


For the Decimal Point Mode selection, both jumpers JU1 and JU2 have to be considered. To select the software control for all four digits install jumpers JU1 (1 & 2) and JU2 (1 & 2).

In the hardware control mode, the decimal point control is limited to IC2 only (the D.P. between the third and fourth displays). To select hardware control remove jumper JU1 and install jumper JU3 (2 to 3).

INDICATOR LED SELECTION

The six indicator LED's D1 to D6 are provided to facilitate status indication. Only LED's D1 to D4 are software/hardware selectable. Indicator LED D5 is a DC Power ON indicator, while LED D6 is a hardware controlled indicator available for off-board voltage indication.

For hardware control of LED's D1 to D4 install limiting resistors R1 to R4 and install jumpers JU5 (2 to 3) and JU6 (2 to 3) and remove all jumpers from JU8 location.

TITLE	DB-04-LP	DRW. BY	R.S.W.	APPR.	FILE:	
	CIRCUIT DESCRIPTION	DATE	82.06.09	<i>[Signature]</i>	SP441	
CHANGE	ISS.	 FERRITRONICS LIMITED		SCALE	DWG. NO.	ISSUE
				SHT.	1 OF 2	03

For software control of LED's D1 to D4 remove resistors R1 to R4 and install jumpers JU8 (1 to 2, 3 to 4, 5 to 6 and 7 to 8) and install jumpers JU5 (1 to 2) and JU6 (1 to 2).

To light D1 select digit 5 and write a one into digit location 5 (pin 26 on IC10) and to light D2 write a 2 into digit location 5. To light D3 write a one into digit location 6 (pin 2 of IC10) and to light D4 write a 2 into digit location 6.


DECODING MODE

The ICM7218D LED Driver (IC10) can operate in two modes depending on Jumper JU2.

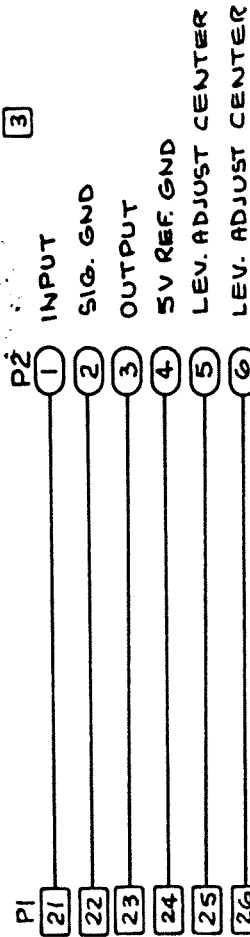
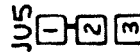
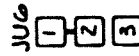
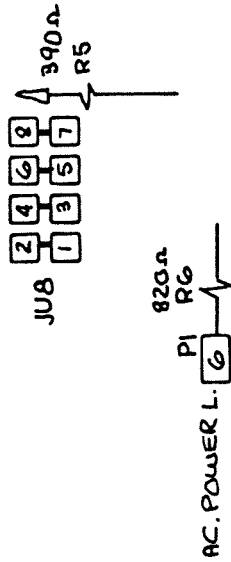
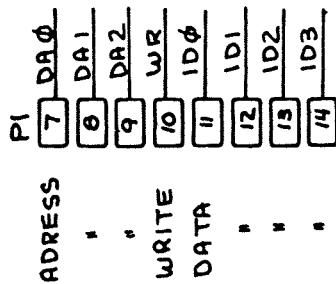
1. If JU2-2 is left floating then Code B is selected.
2. If jumper JU2 (2 to 3) is installed then hexadecimal decode mode is selected.

DISPLAY MODES

BINARY INPUT DATA:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. CODE B MODE DISPLAY:	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2. HEXADECIMAL MODE DISPLAY:	0	1	2	3	4	5	6	7	8	9	-	E	H	L	P	Blank

CHANGE	ISS.	TITLE	DB-04-LP	DRW. BY	RSW	APPR.	FILE:
		CIRCUIT DESCRIPTION		DATE	82.6.9	DATE	SP441
		 FERRITRONICS LIMITED	SCALE			DWG. NO.	ISSUE
			SHT.	2	OF	2	03

NOTES:
 1.) THIS DWG SHOWS I/O LINES USED & MODIFICATIONS MADE TO THE DB-04-LP UNIVERSAL DISPLAY BOARD
 2.) FOR FULL SCHEMATIC SEE FILE: SP441 DWG: 02

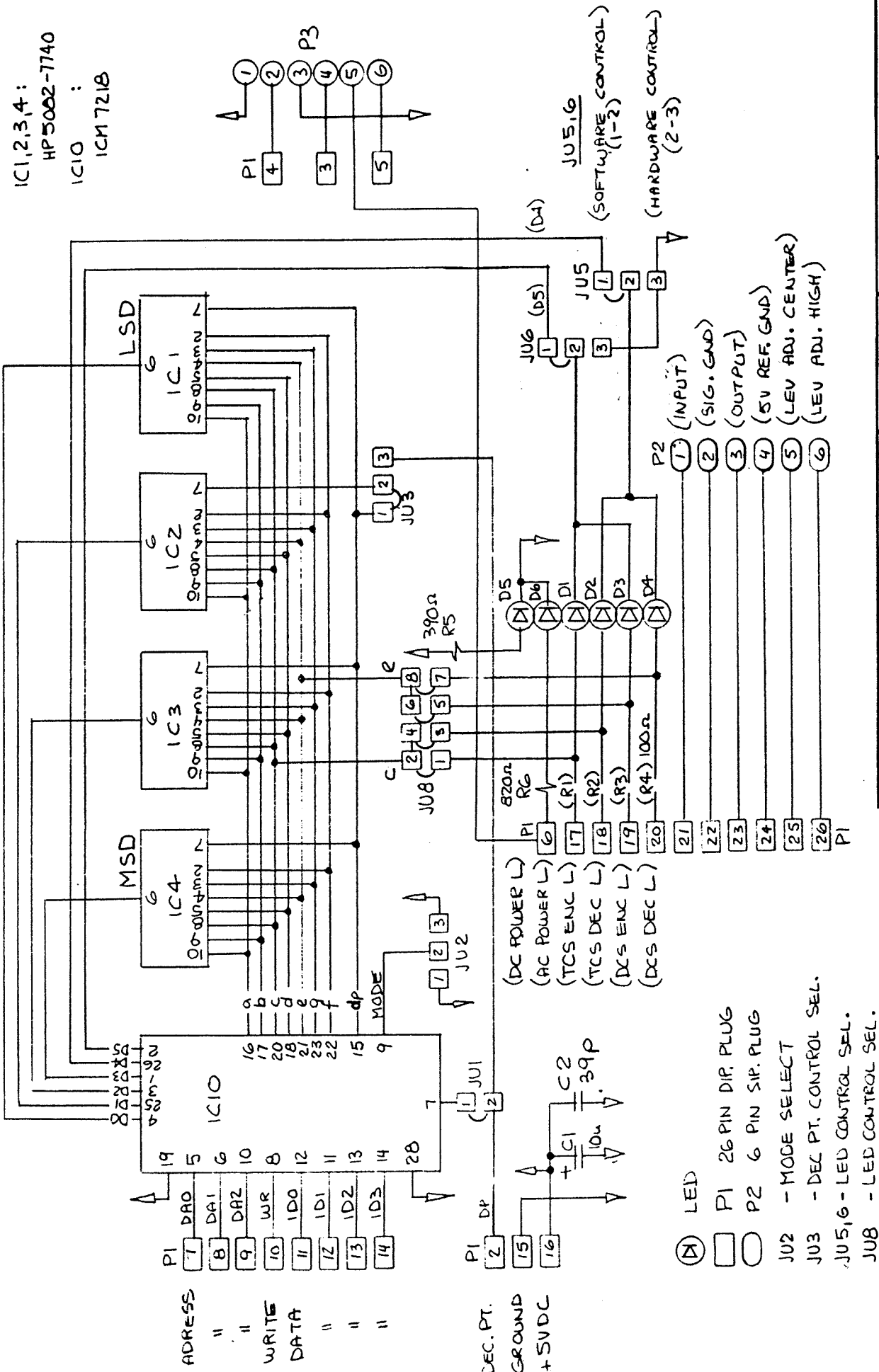


TITLE	DB-04 -TU	DRW. BY	RSW	FILE	SP441-A
	TEST UNIT DISPLAY BOARD	DATE	81-10-8		
		SCALE	—	DWG. NO.	02
		SHT. 1	OF 1	ISSUE	1



FERRITRONICS LIMITED

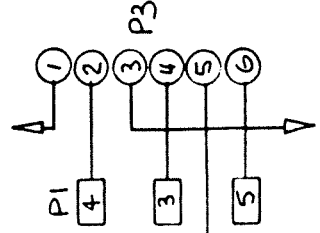
IC1,2,3,4:
HP 5002-7740
IC10:
ICM721B



ADDRESS
P1 7 DAD
P1 8 DAI
P1 9 DAZ
WRITE
P1 10 WR
DATA
P1 11 ID0
P1 12 ID1
P1 13 ID2
P1 14 ID3

DEC. PT.
P1 2 DP
GROUND
P1 15
+5VDC
P1 16

- (D) LED
- P1 26 PIN DIP PLUG
- P2 6 PIN SIP PLUG
- JU2 - MODE SELECT
- JU3 - DEC PT. CONTROL SEL.
- JU5,6 - LED CONTROL SEL.
- JU8 - LED CONTROL SEL.




JU5,6
(SOFTWARE CONTROL)
(1-2)
(HARDWARE CONTROL)
(2-3)

TITLE	DB-04-LP	DRW. BY	RSW	APPR.	FILE	SP441	
	LOW POWER DISPLAY BOARD	DATE		DATE			
FERRITRONICS LIMITED						DWG. NO.	02
						ISSUE	2

159.	CHANGE
------	--------

○	IC1	7 SEGMENT DISPLAY		HP5082-7740	H.P.
○	IC2	" "		HP5082-7740	H.P.
○	IC3	" "		HP5082-7740	H.P.
○	IC4	" "		HP5082-7740	H.P.
○	IC10	8 DIGIT LED DRIVER		ICM7218D	INTERSIL
○	D1	LIGHT EMITTING DIODE	RED	LD301	SIEMENS
○	D2	" " "	RED	LD301	"
○	D3	" " "	RED	LD301	"
○	D4	" " "	RED	LD301	"
○	D5	" " "	RED	LD301	"
○	D6	" " "	RED	LD301	"
○	C1	CAPACITOR		10	UFD TANTALUM
○	C2	"		39	PFD CERAMIC
	R1	RESISTOR		100	OHM 1/4 W 5%
	R2	"		100	OHM 1/4 W 5%
	R3	"		100	OHM 1/4 W 5%
	R4	"		100	OHM 1/4 W 5%
○	R5	"		390	OHM 1/4 W 5%
○	R6	"		820	OHM 1/4 W 5%
○	COMPONENTS INSTALLED FOR DB-04-TU				

TITLE DB-04-TU DISPLAY BOARD PARTS LIST	DRW. BY RSW	APPR.	FILE: SP441-A	
	DATE 7.10.81	DATE	DWG. NO. 04	ISSUE 1
 FERRITRONICS LIMITED		SCALE		
		SHT. 1 of 1		

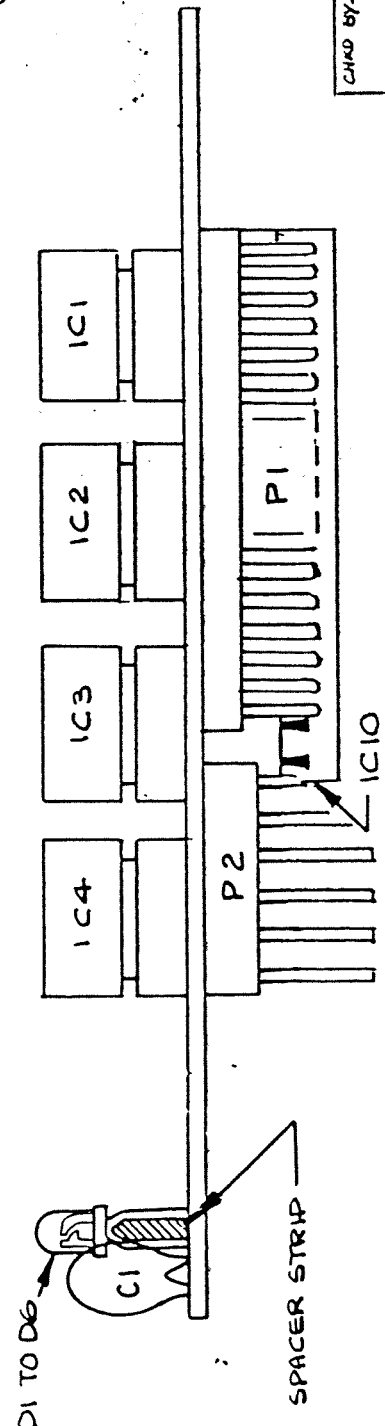
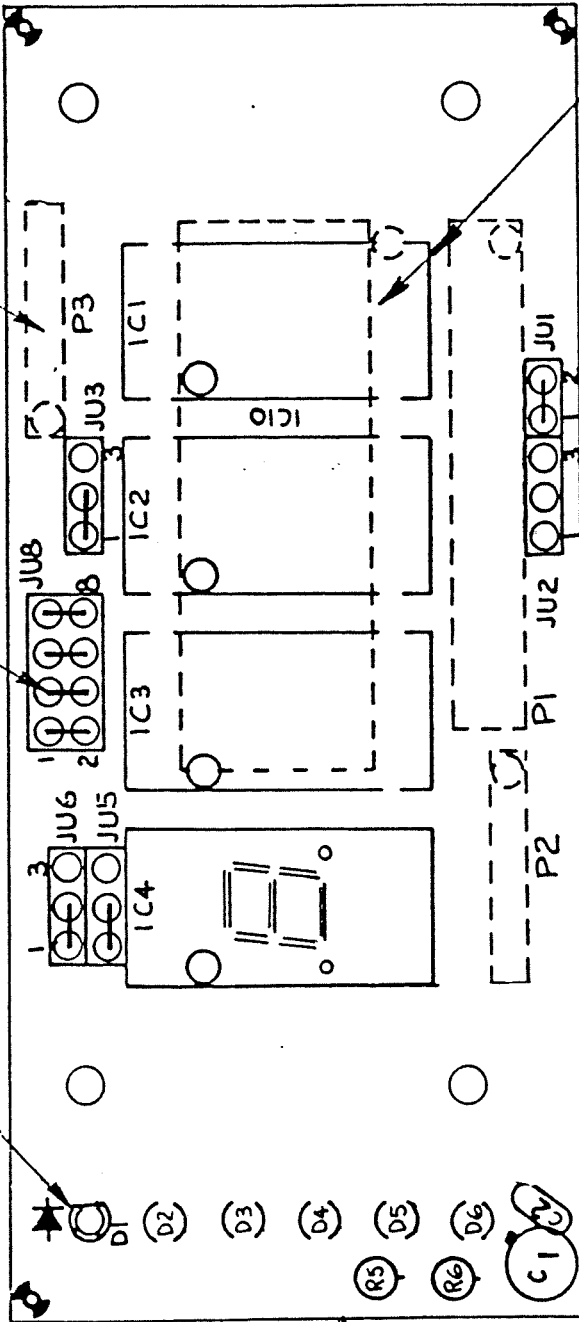
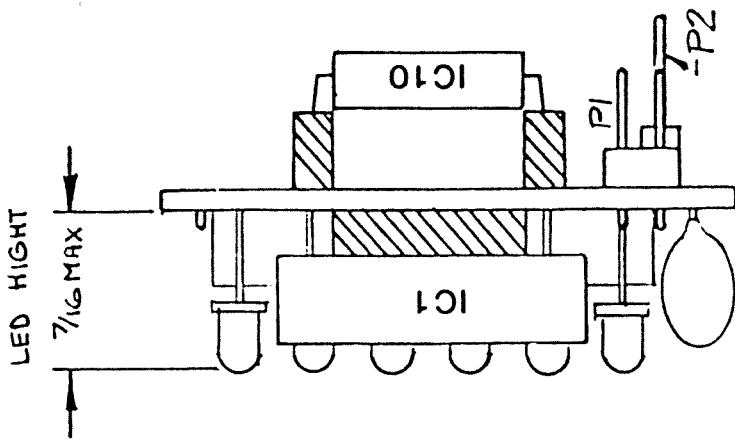
CHANGE

ISS.

MAX. HEIGHT FOR DIODE IS 7/16 IN.

PROG. JUMPER'S 1/4" HIGH.

CONN. P3 NOT INSTALLED.



CHD BY: RSW	DESIGN ENG	RELEASE DATE
DRW BY: RSW	APPR.	FILE
DATE: 8-10-8	DATE	T441A
	SCALE	DWG. NO. 08
	SHT. 1 OF 1	ISSUE 6

TITLE DB-04-TU
DISPLAY BOARD ASS'Y



FERRITRONICS LIMITED

ECN 273	1	6
CHANGE	REV	ISS.

XB-0150-01

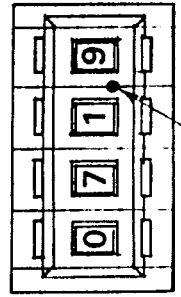
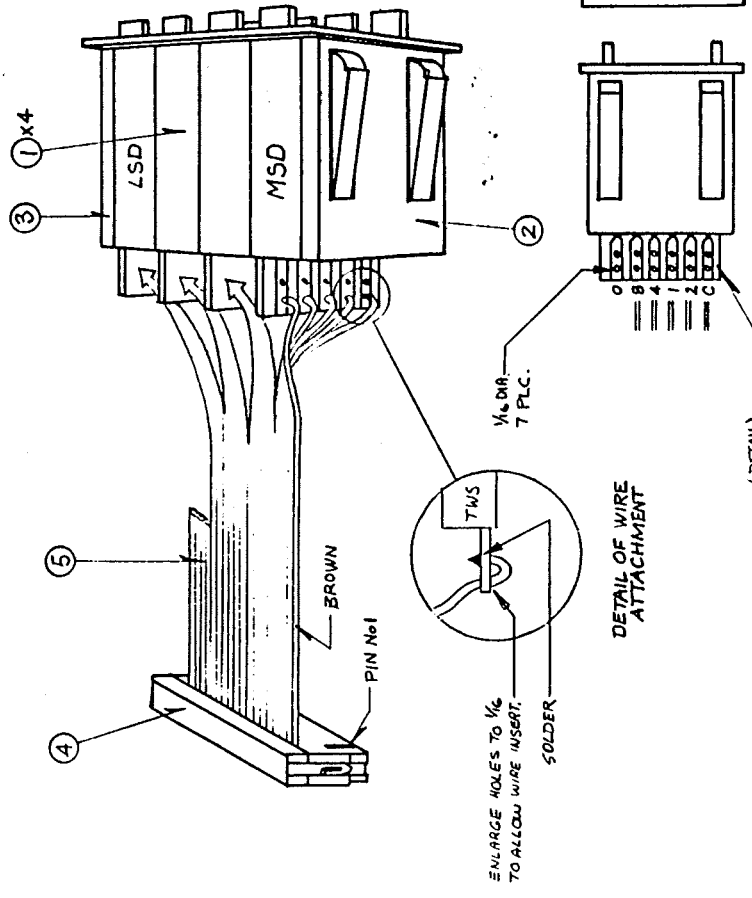
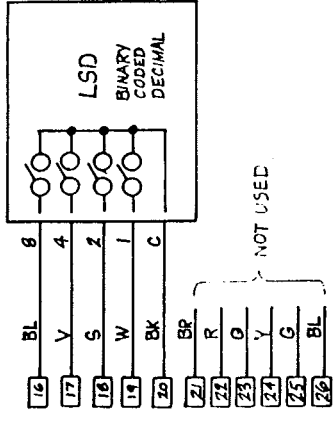
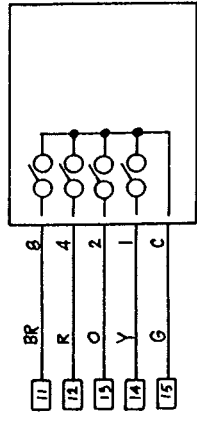
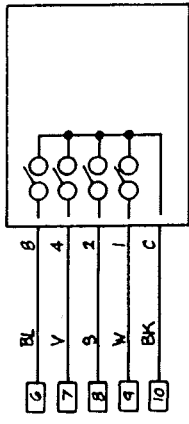
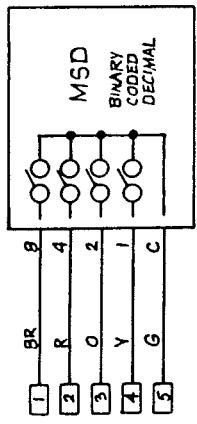
NEXT ASSY.	USED ON	FILE NO.
XB-0120	TU-100	SP 379

PG 1

THUMBWHEEL SWITCH ASSEMBLY

REV. ECN NO. EFFECTIVE DATE

ITEM NO	PART NO	L	V	DESCRIPTION	QTY	UNIT	REMARKS
001	41-2843	9		SWITCH THUMBWHEEL DURANT	EA	4.	
002	41-2844	9		END CAP 41707-20 DURANT	EA	1.	
003	41-2845	9		END CAP 41708-20 DURANT	EA	1.	
004	69-2023	9		CONN RIBBON 26 POS. SOCKET	EA	1.	
005	85-2031	9		RIBBON CABLE ALPHA #3581/26	FT	4.	



TITLE	TWS-01	DATE	8/12/10	SCALE	N.T.S.	DRG. NO.	XB-0150-01
SCHEMATIC & ASSY. DETAIL	J.A.C.	DATE	8/12/10	SCALE	N.T.S.	DRG. NO.	XB-0150-01
FERRITRONICS LIMITED		REVISION	01-12-10	CHANGE	2	ISS.	

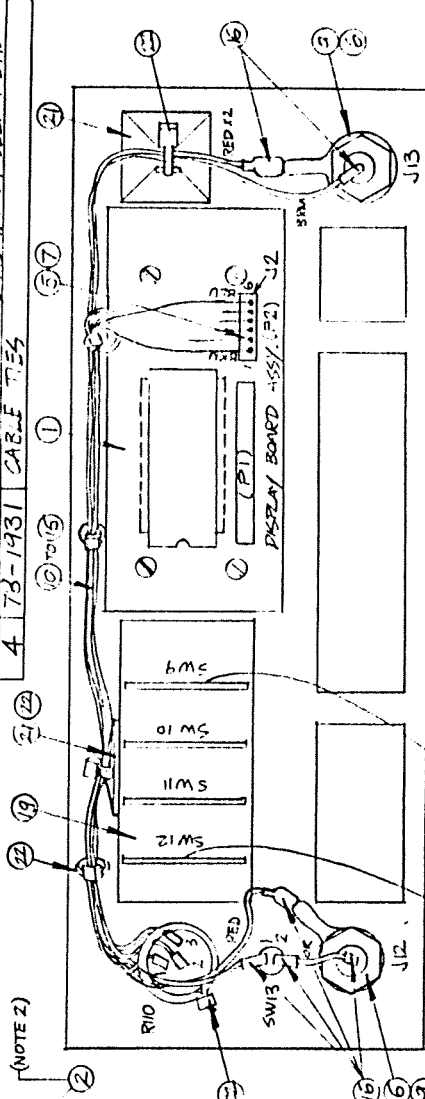
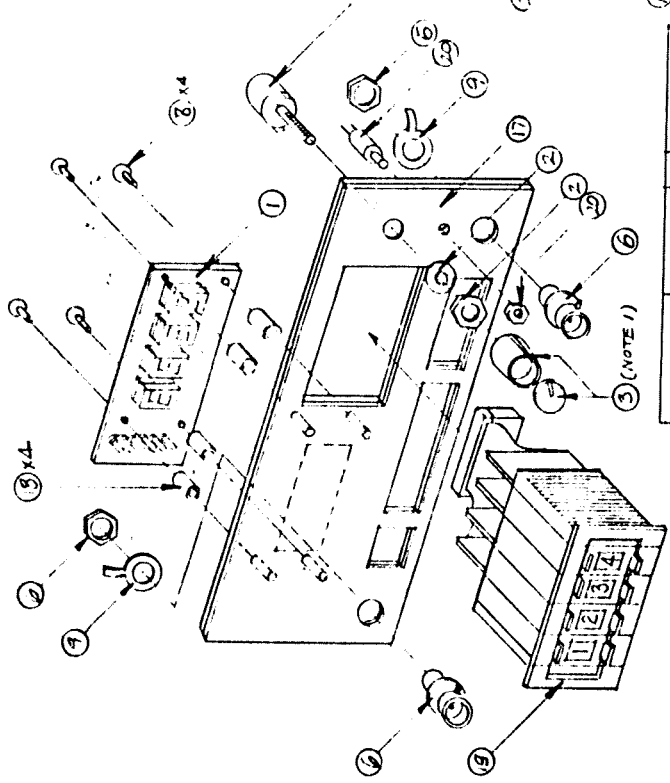
XB-0121-01

EXT. MAX. PRODUCT	FILE NO.
'8-0120-01 TU-100-U	SP-379

NOTES:

- 1) ALIGN POINTER TO ROTATE FROM '0' TO 'MAX' - AT ITS ADJUSTMENT LIMITS.
- 2) CUT POTENTIOMETER SHAFT TO SUIT.

ITEM	PART No.	DESCRIPTION	QTY
1	T-241A	DISPLAY BOARD ASSY.	1
2	08-2839	2PT MOLDED COMPOSITION TCK	1
3	61-2200	KNOB AND CAP	1
4	21-269	TERMINAL (35-50-2114 VIOLEX)	2
5	07-289	2MM. ENC (AMPHEMEX No 31-22)	2
6	11-2796	HOUSING 9 POS. MOLEX 26915)	1
7	14-2362	SCREEN 4-40 X 7.6 RHMS SLOT	4
8	77-1224	SOLDER LUG 761	4
9	35-2525	H-UP WIRE STRD PIC 22GA BRUNN	5
10	35-2526	" " " " RED	5
11	35-2527	" " " " ORANGE	11
12	35-2528	" " " " YELLOW	11
13	35-2529	" " " " GREEN	11
14	35-2530	" " " " BLUE	7
15	35-2531	" " " " BLACK 1/8"	2
16	35-2403	SEAT SHUNT TUBING BLACK 1/8"	7
17	35-2494	FRONT PANEL TU-100-U	1
18	79-1506	SPACER 1/4 X 3/8 TUBE, PHENOLIC	1
19	XB-0150	TRUNN-WHEEL SWITCH ASSY.	1
20	41-2926	SWITCH PB RAYHILL 39-2	1
21	78-2177	CABLE ANCHORS ARSYM-A SELF ADH.	2
22	478-1931	CABLE TIES	6



BACK VIEW OF FRONT PLATE
(WHEN ASSEMBLED)

FROM	COLOUR	L	TO
J2-1	BRN	6	J13-CENTER
J2-2	RED	5	J13-GND
J13-SUP	RED	10	J12-GA. D
J2-3	ORG	9	SW13-1
J2-4	YEL	7 1/2	R110-1
J2-5	GRN	7 1/4	R110-2
J2-6	BLU	7	R110-3
SW13-2	ORG	2	J12-CENTER

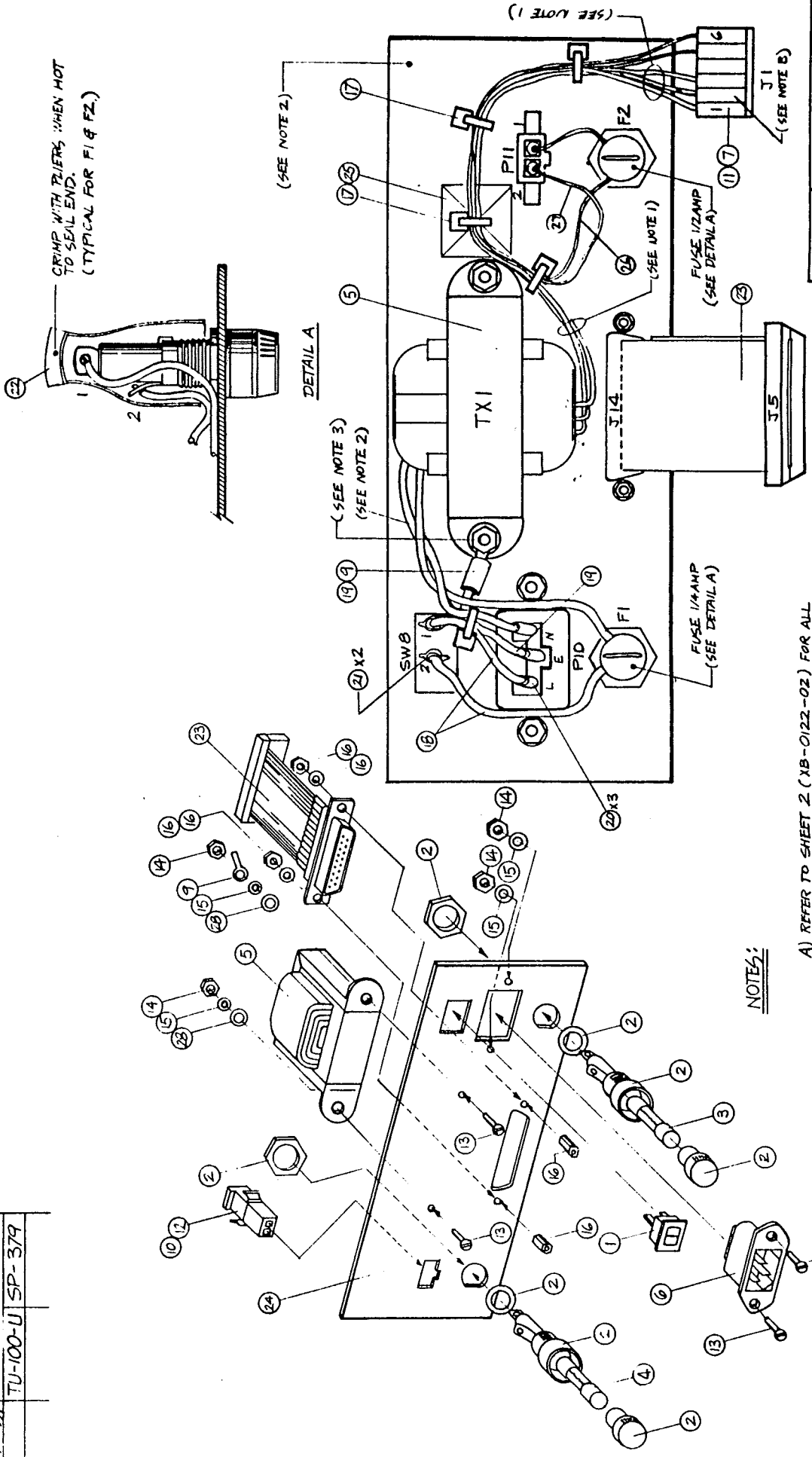
ECN 274	REV 154	1	8
CHANGE			
TITLE		TU-100-U	
FRONT PLATE ASSY.		FILE T379A10	
DESIGNED BY	APPR. BY	DATE	RELEASE DATE
	J.A.C.	30.04.72	
SCALE N.T.S.	DRG. NO.	QTY.	REV.
	XB-	1	0121-01
			3



FERRITRONICS LIMITED

XB-0122-01

NEXT ASSY	PRODUCT	FILE NO.
	TU-100-U	SP-379



NOTES:
 A) REFER TO SHEET 2 (XB-0122-02) FOR ALL DESCRIPTIONS AND INTERCONNECTIONS.
 B) IDENTIFY PIN NUMBERS ON CONNECTOR

DESIGN AND DRAWING DATE	22-1-68
FILE	
APP. DATE	82-03-16
SCALE	N.T.S.
DRG. NO.	XB-0122-01
INT.	1 of 2
MAX	5

TITLE
 TU-100-U
 REAR PANEL ASSEMBLY



FERRITRONICS LIMITED

XB-0122-02

ITEM NO	PART NO	DESCRIPTION	UNIT	QTY	REQ	REMARKS
001	41-2830	SWITCH ROCKER 1PST 0-X-0-	EA	1		SW B
002	42-2465	FUSE HOLDER #HKP BUSS	EA	2		(F1, 2)
003	42-2940	FUSE SLO-BLO 1/4 AMP	EA	1		F 1
004	42-1791	FUSE 1/2 AMP	EA	1		F 2
005	44-1671	TRANSFORMER 166J14	EA	1		TX 1
006	65-2488	PLUG RECEPTACLE #17252 BELDON	EA	1		(J1)
007	64-1961	TERMINAL MODEL 2578TL MOLEX	EA	5		GROUND
009	64-1106	CONN CRIMP INSUL	EA	1		P 11
010	64-2935	TERMINAL CRIMP 02-06-2103	EA	2		P 11
011	71-2207	HOUSING 6 POSITION	EA	1		J 1
012	71-2833	HOUSING 15-31-1021 SERIES 5025	EA	1		P 11
013	74-0632	SCREW 6/32 X 1/2 PHMS	EA	4		
014	79-0559	NUT 6/32 4 BLANK	EA	4		
015	76-0562	WASHER #6 INTERNAL STAR	EA	4		
016	78-2570	FEMALE SCREW LOCK ASSEMBLY	EA	1		
017	78-1931	CABLE TIE PLT-1M-MP	EA	3		
018	85-2927	H-UP WIRE PVC 18GA BLACK	FT	5		
019	85-2829	H-UP WIRE PVC 18GA GREEN	FT	5		
020	96-2404	HEAT SHRINK TUBING BLK 3/16"	FT	3		(P10)
021	96-2405	HEAT SHRINK TUBING BLK 1/4"	FT	3		(SWB, F1)
022	96-2406	HEAT SHRINK TUBING BLK 1/2"	FT	1		(F1)
023	XA-0147	CONNECTOR ASSEMBLY	EA	1		(J5, 6, 7, 8, 9, 10, 13, 14, 11, 12)
024	XB-0126	REAR PLATE	EA	1		
025	78-2177	CABLE ANCHORS ABMM-A SELF ADH	EA	1		
026	85-2818	H-UP WIRE STRD PVC 22GA BLACK	FT	1		
027	85-2526	H-UP WIRE STRD PVC 22GA RED	FT	1		
028	76-1018	WASHER #6 FLAT	EA	2		

SINGLE LEVEL BOM LISTING

REAR PLATE ASSEMBLY

PG 1

REV. ECN NO. EFFECTIVE DATE APR 02/82

INTERCONNECT LIST

BASED ON SCHEMATIC SP379-02

FROM	COLOUR	TO
TX1 (LOW VOLTAGE)	GREEN	J1-1 (NOTE 1)
TX1 "	GREEN-YELLOW	J1-2 (NOTE 1)
TX1 "	GREEN	J1-3 (NOTE 1)
TX1 (HIGH VOLTAGE)	BLACK	F1-2 (NOTE 2)
TX1 "	BLACK	P10-N (NOTE 2)
P10-E	GREEN	TX1-FRAME (NOTE 3)
P10-L	BLACK	SW8-1
SW8-2	BLACK	F1-1
J1-6	RED	F2-2
J1-5	BLACK	P11-2
F2-1	RED	P11-1

NOTE 1. Wires part of Transformer TX1 (Low Voltage Lines)

NOTE 2. Wires part of Transformer TX1 (High Voltage Lines)

NOTE 3. GROUNDED on burnished Mtg. Tab of TX1

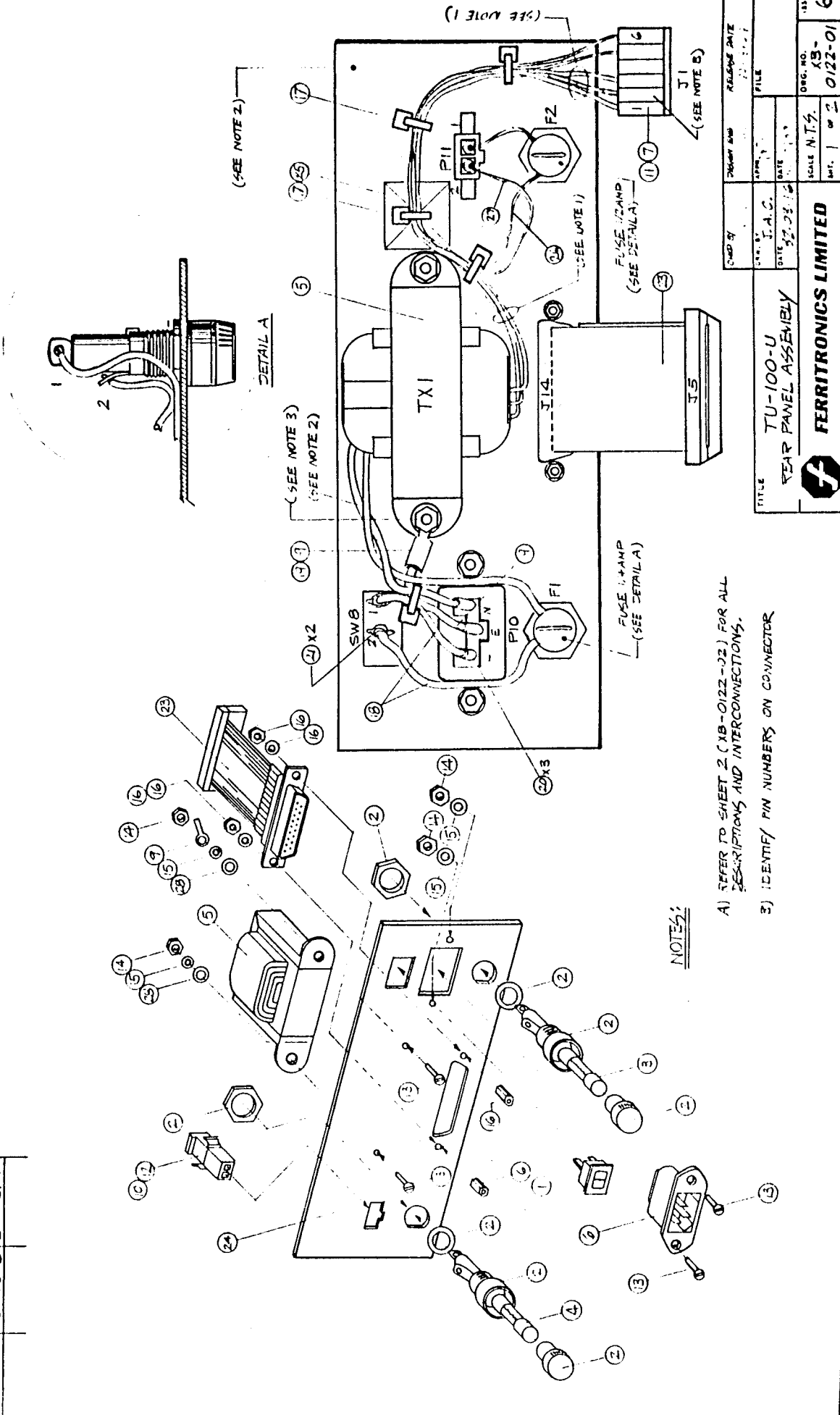
CHG BY	PSJ	DESIGN ENG.	PSJ	RELEASE DATE
CHK BY	J.A.C	APPR.	FILE	
DATE	82-03-16	DATE	01/22/02	ISSUE
SCALE	1	DWG. NO.	XB-	5
SHT. 2	OF 2			

TU-100-U
REAR PANEL ASSEMBLY



FERRITRONICS LIMITED

NEXT SHEET
 PRODUCT FILE No.
 TU-100-U SP-379



NOTES:

- A) REFER TO SHEET 2 (XB-0122-02) FOR ALL DESCRIPTIONS AND INTERCONNECTIONS.
- B) IDENTIFY PIN NUMBERS ON CONNECTOR

DRAWING AND REVISION DATE		FILE	SCALE N.T.S.	SHEET 1 OF 2	0122-01	6
DATE	APPROVED BY					
DATE	J.A.C.	DATE				
DATE	32.03.65					
FERRITRONICS LIMITED 						
TITLE: TU-100-U REAR PANEL ASSEMBLY						

XB-0122-02

S I N G L E L E V E L B O M L I S T I N G

PG 1

06/17/82 07 XB-0122 REAR PLATE ASSEMBLY

REV. ECN NO. EFFECTIVE DATE APR 02/82

ITEM NO	PART NO	DESCRIPTION	UNIT	QTY REQ	REMARKS
001	41-2830	9 SWITCH ROCKER 1PST 0-X-O-	EA	1	SW B
002	42-2465	9 FUSE HOLDER #HKP BUSS	EA	2	(F1,2)
003	42-2940	9 FUSE SLO-BLO 1/4 AMP	EA	1	F 1
004	42-1791	9 FUSE 1/2 AMP	EA	1	F 2
005	44-1671	9 TRANSFORMER 166J14	EA	1	TX 1
006	65-2488	9 PLUG RECEPTACLE #17252 BELOON	EA	1	(J1)
007	64-1961	9 TERMINAL MODEL 2578TL MOLEX	EA	5	GROUND
009	64-1106	9 CONN CRIMP INSUL	EA	1	P 11
010	64-2835	9 TERMINAL CRIMP 02-06-2103	EA	2	J 1
011	71-2207	9 HOUSING 6 POSITION	EA	1	J 1
012	71-2833	9 HOUSING 15-31-1021 SERIES 5025	EA	1	P 11
013	74-0632	9 SCREW #6/32 X 1/2 PHMS	EA	4	
014	75-0559	9 NUT #6/32 4 BLANK	EA	4	
015	75-0562	9 WASHER #6 INTERNAL STAR	EA	4	
016	78-2570	9 FEMALE SCREW LOCK ASSEMBLY	EA	1	
017	78-1931	9 CABLE TIE PLOT-IM-MP	EA	3	
018	85-2327	9 H-UP WIRE PVC 18GA BLACK	FT	5	
019	85-2829	9 H-UP WIRE PVC 18GA GREEN	FT	5	
020	96-2404	9 HEAT SHRINK TUBING BLK 3/16"	FT	3	(P10)
021	96-2405	9 HEAT SHRINK TUBING BLK 1/4"	FT	3	(SWB,F1)
022	96-2406	9 HEAT SHRINK TUBING BLK 1/2"	FT	1	(F1)
023	XA-0147	8 CONNECTOR ASSEMBLY	EA	1	(J5,6,7,8,9,10,13,14,11,12)
024	XB-0126	8 REAR PLATE	EA	1	
025	78-2177	9 CABLE ANCHORS ABMM-A SELF ADH	EA	1	
026	85-2818	9 H-UP WIRE STRD PVC 22GA BLACK	FT	1	
027	85-2526	9 H-UP WIRE STRD PVC 22GA RED	FT	1	
028	75-1018	9 WASHER #6 FLAT	EA	2	

INTERCONNECT LIST

BASED ON SCHEMATIC SP379-02

FROM	COLOUR	TO
TX1 (LOW VOLTAGE)	GREEN	J1-1
TX1 " "	GREEN-YELLOW	J1-2
TX1 " "	GREEN	J1-3
TX1 (HIGH VOLTAGE)	BLACK	F1-2
P10-E	BLACK	P10-N
P10-L	GREEN	TX1-FRAME
SWB-2	BLACK	SWB-1
J1-6	RED	F1-1
J1-5	BLACK	F2-2
F2-1	BLACK	P11-2
	RED	P11-1

NOTE 1. Wires part of Transformer TX1 (Low Voltage Lines)

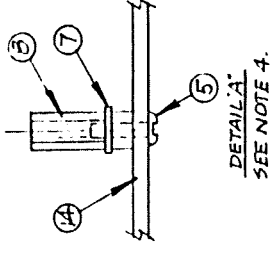
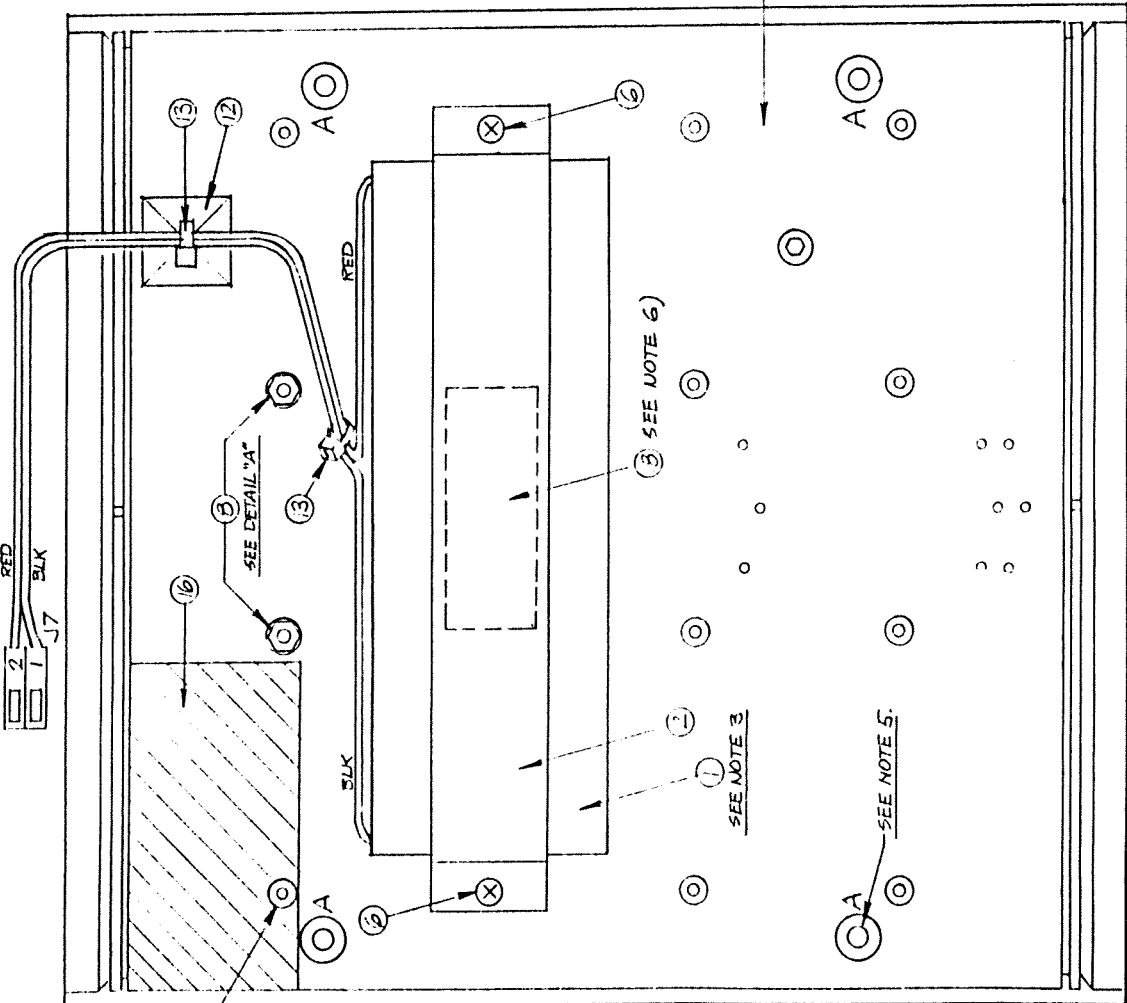
NOTE 2. Wires part of Transformer TX1 (High Voltage Lines)

NOTE 3. GROUNDED on burnished Mtg. Tab of TX1

CHG BY	DATE	DRYING EMP.	RELEASE DATE
BY J.A.C	DATE 22.03.16		
TITLE		SCALE	DRG. NO.
TU-100-U		1:1	XB-
REAR PANEL ASSEMBLY		SMT. 2 of 2	0122-02
FERRITRONICS LIMITED			6

XB-0123-01

NEXT ASSY: USED ON FILE No.
 XB-0120-01 TU-100 T-379A

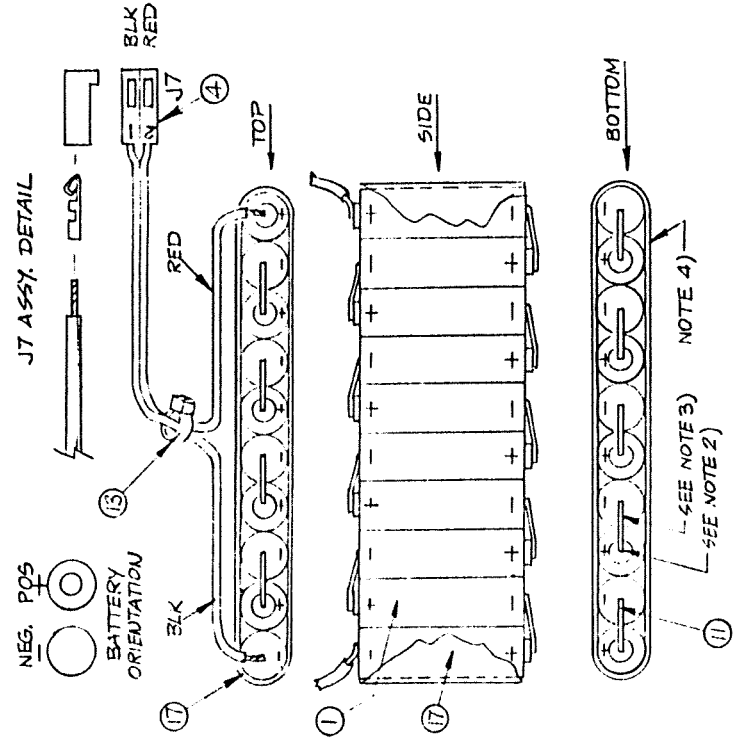


- NOTES:**
- 1) REFER TO B.O.M. T-379A-12 FOR ALL ITEM DESCRIPTIONS.
 - 2) REMOVE MTG. PIN (CUT OFF FLUSH).
 - 3) BATTERY PACK ASSY. FOR DETAILS REFER TO DWG. NO. - XB-0123-01 SHEET 2 OF 2.
 - 4) DRILL THROUGH MTG. PINS @ 2 P.S. .144 DIA. HOLES. ASSEMBLE SPACERS AS SHOWN IN DETAIL 'A'.
 - 5) 4 X 4 THESE MTG. HOLES ARE PART OF BOTTOM PLATE ONLY. (TOP PLATE HAS 4 "A" HOLES WITH THREADED INSERTS.)
 - 6) DOUBLE SIDED TAPE PLACED ON CENTER BETWEEN CASE & BATTERY PACK.

ORD. P.C. NO.	DES. P.N.	REVISION	APP. BY	DATE	FILE
	TU-100		J.A.C.	3/14/62	T-379A
TITLE			SCALE		
BOTTOM PLATE ASSY.			N.T.S.		
FERRITRONICS LIMITED			DWG. NO. XB-0123		
			SHEET 1 OF 2		
ECN	277	1	5		
CHANGE		REV. IN.			

FRONT

XB-0123-01
 NEXT ASSY. USED ON FILE No.
 XB-0120-01 TU-100 T-379A



ITEM NO	PART NO	L V DESCRIPTION	UNIT	QTY REQ
001	47-2832	9 BATTERY NICAD "AA" CH15 EVRDY	EA	10
002	57-3112	9 BRACKET-BATTERY HOLD-DOWN	EA	1
003	64-2169	9 TERMINAL_08-50-0114 MOLEX	EA	2
004	71-2168	9 HOUSING 2 POSITION	EA	1
005	74-1108	9 SCREW 6/32 X 5/8 BHMS	EA	2
006	74-0546	9 SCREW 4-40 X 1/4 TC23	EA	2
007	76-0562	9 WASHER #6 INTERNAL STAR	EA	2
008	79-1862	9 SPACER 1/4 X 5/8 #14SID THREAD	EA	2
009	83-2818	9 HI-UP WIRE STRD PVC 22GA BLACK	FT	9
010	85-2326	9 HI-UP WIRE STRD PVC 22GA RED	FT	9
011	85-2372	9 BUSS WIRE 22 AWG BELDON #8021	FT	7
012	78-2177	9 CABLE ANCHORS ABMM-A SELF ADH	EA	1
013	78-1931	9 CABLE TIE PLT-1M-MP	EA	2
014	80-2831	9 CASE BLACK PLASTIC C/W HANDLE	EA	1

015	80-2986	9 CARD GUIDE SET OF 2-	EA	1
016	82-3110	9 TAPE AL FOIL 1 1/2" WIDE	FT	5
017	82-3111	9 TAPE GREY DUCT 2" WIDE	FT	1
018	89-3078	9 TAPE FOAM DOUB. SIDED SELF ADH	IN	2

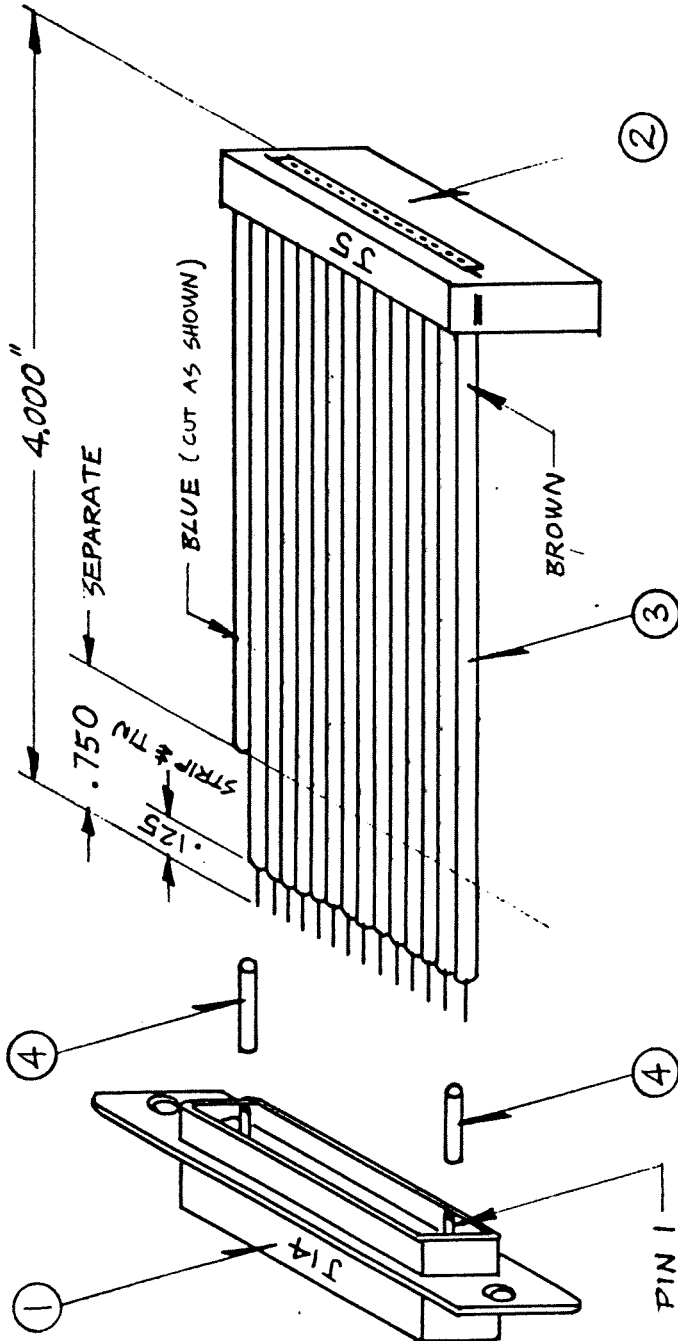
- NOTES:**
- REFER TO B.O.M. T-379A/2 FOR ALL ITEM DESCRIPTIONS.
 - TIN ENDS OF BATTERIES IN CENTRE WITH A SMALL AMOUNT OF SOLDER
 - INTERCONNECT BATTERIES (SOLDER) AS SHOWN HERE. 4 PLS. ON TOP & 5 PLS ON BOTTOM.
 - BATTERY PACK TO BE WRAPPED TOGETHER WITH GRAY DUCT TAPE 12" LONG.

COMP. NO.	DES. ENG.	DATE	REV.	INR.
		3/4/13	1	5
TITLE		FILE	REV. INR.	
TU-100 BATTERY PACK ASSY.		T-379-A		
SCALE N.T.S.		DRG. NO. XB-0123	REV. INR.	
SMT. 2 of 2				
FERRITRONICS LIMITED				

NEXT ASSY. USED ON FILE No.
 ZB-0122-01 TU-100-U SP-379

E. P

CONNECT	J14 COLOR	J5
1	BROWN	1
14	RED	2
2	ORANGE	3
15	YELLOW	4
3	GREEN	5
16	BLUE	6
4	VIOLET	7
17	SLATE	8
5	WHITE	9
18	BLACK	10
6	BROWN	11
19	RED	12
7	ORANGE	13
20	YELLOW	14
8	GREEN	15
21	BLUE	16
9	VIOLET	17
22	SLATE	18
10	WHITE	19
23	BLACK	20
11	BROWN	21
24	RED	22
12	ORANGE	23
25	YELLOW	24
13	GREEN	25
NC	BLUE	26



ITEM NO	PART NO	L	V	DESCRIPTION	UNIT	QTY	REQ
001	69-2128	9		CONN. "D" CANNON	EA	1.	
002	69-2023	9		CONN RIBBON 26 POS. SOCKET	EA	1.	
003	85-2031	9		RIBBON CABLE ALPHA #3581/26	FT	3	
004	96-2404	9		HEAT SHRINK TUBING BLK 3/16"	FT	1.	

REV.	ECN NO.	EFFECTIVE DATE
08	XA-0147	

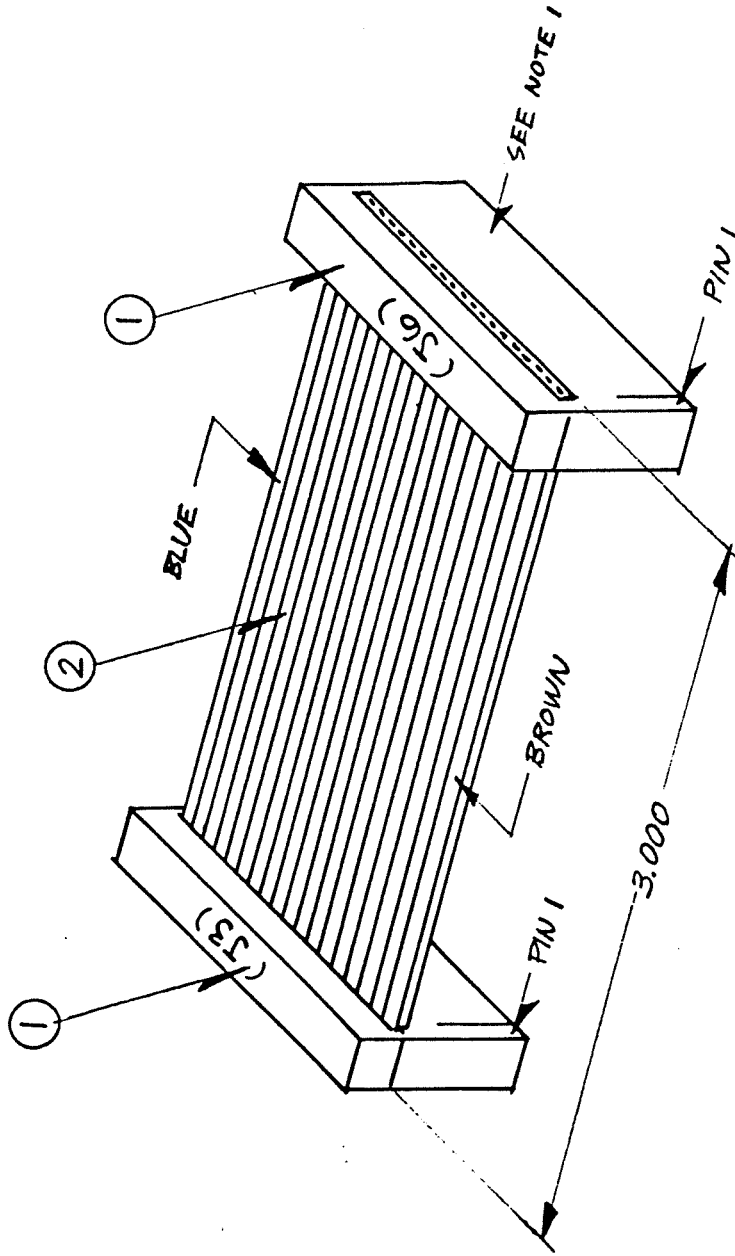
DRW. BY J.A.C	DATE 1981/11/9	APPR. (Signature)	DATE	FILE
TITLE CONNECTOR ASSY.				DWG. NO. XA-0147-01
SCALE N.T.S.				ISSUE 2
CHANGE				SHT. 1 OF 1



FERRITRONICS LIMITED

NEXT ASSY.	USED ON	FILE No.
XB-0129-0	TU-100-U	SP-379

E I P



NOTES:

1) - CONNECTOR DESIGNATIONS (J3) & (J6) APPLY ONLY WHEN USED IN TU-100-U.

08 XA-0148 CABLE ASSEMBLY			
REV.		ECN NO.	EFFECTIVE DATE
ITEM NO	PART NO	DESCRIPTION	QTY REG
001	69-2023	9 CONN RIBBON 26 POS. SOCKET	EA
002	85-2031	9 RIBBON CABLE ALPHA #3581/26	FT
			2.3

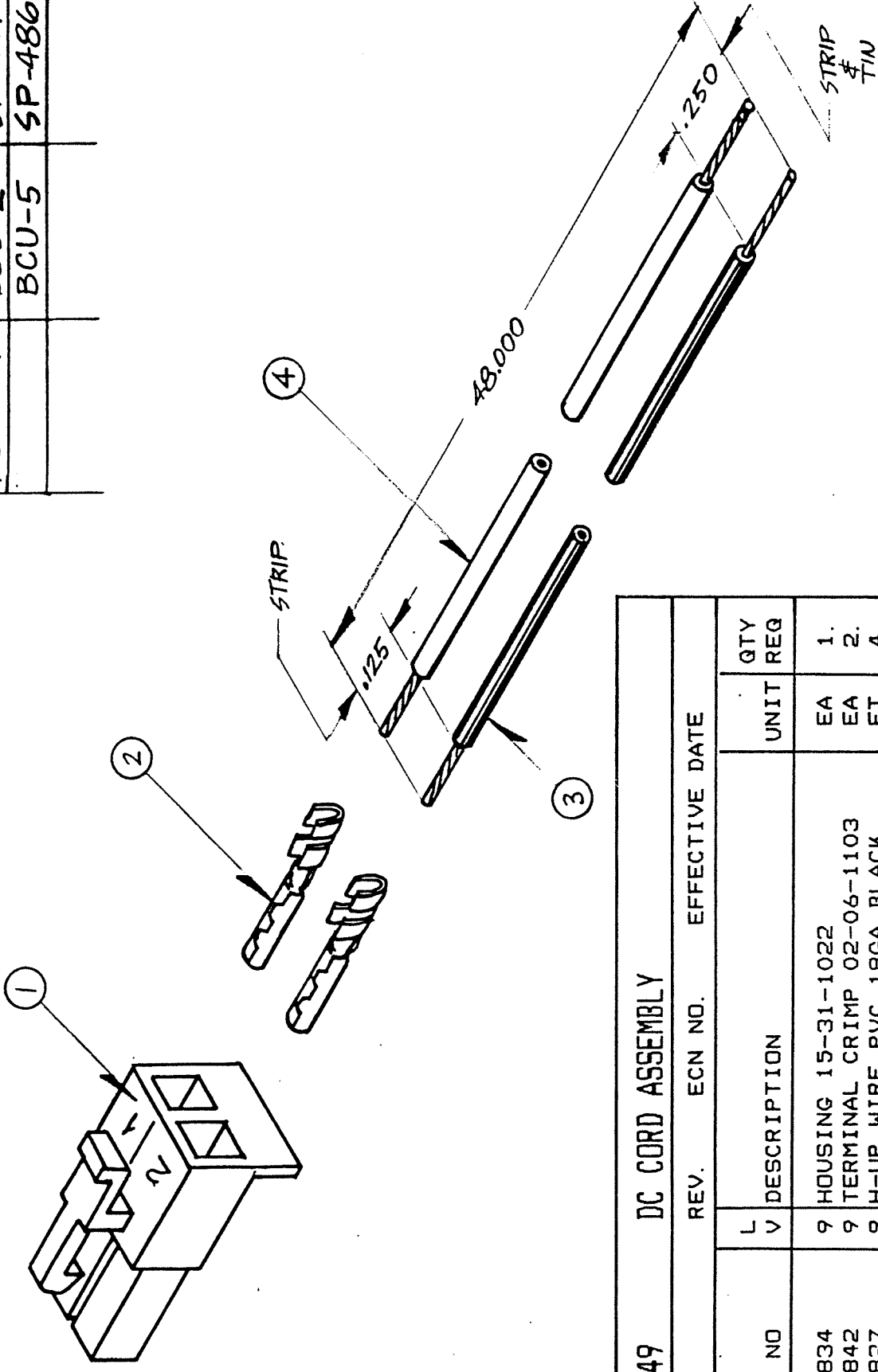
TITLE		CABLE ASSY. (DISPLAY 1/0)	
DRW. BY	J.A.C.	APPR.	1000
DATE	1981/11/9	DATE	
SCALE		N.T.S.	
SHT. 1		OF 1	
CHANGE		ISS.	
DWG. NO.		XA-0148-01	
ISSUE		1	



FERRITRONICS LIMITED

XA-0149-01

NEXT ASSY	USED ON	FILE No.
XB-0129	TU-100	SP-379
XB-0091	BDU-2	SP-437
	BCU-5	SP-486



08 XA-0149		DC CORD ASSEMBLY		REV.	ECN NO.	EFFECTIVE DATE
ITEM NO	PART NO	L	V	DESCRIPTION	UNIT	QTY REQ
001	71-2834	9		HOUSING 15-31-1022	EA	1.
002	64-2842	9		TERMINAL CRIMP 02-06-1103	EA	2.
003	85-2827	9		H-UP WIRE PVC 18GA BLACK	FT	4.
004	85-2828	9		H-UP WIRE PVC 18GA RED	FT	4.

DRW. BY J.A.C.
DATE 1981/11/4

APPR. (Signature)
DATE

FILE

E I P

SCALE N.T.S.
SHT. 1 OF 1

DWG. NO. XA-0149-01
ISSUE 1

TITLE DC' CORD ASSY.

FERRITRONICS LIMITED

CHANGE 155.