

NOTE

This manual documents the Model 1912A Multi-Counter and its assemblies at the revision levels shown in Appendix 7A, Table 7A-1. If your instrument contains assemblies with different revision letters it will be necessary to either update or backdate this manual. Refer to the supplemental change/errata sheet for newer assemblies, or the backdating sheet in Appendix 7A for older assemblies.

1912A Multi-Counter

Instruction Manual

P/N 467746
September 1977
Rev. 1 2/79



CHANGE/ERRATA INFORMATION

ISSUE NO: 1 7/79

This change/errata contains information necessary to ensure the accuracy of the following manual. Enter the corrections in the manual if either one of the following conditions exist:

1. The revision letter stamped on the indicated PCB is equal to or higher than that given with each change.
2. No revision letter is indicated at the beginning of the change/errata.

MANUAL

Title: 1912A MULTI-COUNTER
Print Date: September 1977
Rev. and Date: 1 - 2/79

C/E PAGE EFFECTIVITY

Page No.	Print Date
1	7/79
2	7/79

CHANGE #1 - 12487

Rev.- D, AC PCB Assembly, 115V, 58-62 Hz (1910A-4006)

On page 601-12, Table 601-4, make the following changes to C601:

FROM: 6 uF $\pm 5\%$, 115V (100V/60 Hz Source)|393546|98536|393546-D2-505D
 TO: 8 uF $\pm 5\%$, 135V (100V/48-52 Hz Source)|380261|89536|380621|1

On page 8-11, Figure 8-5, make the following changes:

FROM:

LINE FREQUENCY Hz	VOLTAGE	CAPACITOR		DRAWING NUMBER
		uF	P/N	
58-62	115/60 Hz	6	393546	1912A-1006
48-52	100/50 Hz	6.6	394189	1912A-1012
48-52	230/50 Hz	3.3	380253	1912A-1013
58-62	100/60 Hz	6	393546	1912A-1014

TO:

LINE FREQUENCY Hz	VOLTAGE	CAPACITOR		DRAWING NUMBER
		uF	P/N	
58-62	115/60 Hz	6	393546	1912A-1006
48-52	100/50 Hz	8	380261	1912A-1012
48-52	230/50 Hz	3.3	380253	1912A-1013
58-62	100/60 Hz	6.6	394189	1912A-1014

CHANGE #2 - 12516

Rev.- R, A1 Main PCB Assembly (1912A-4001)

Rev.- R, A1 Main PCB Assembly, Battery (1912A-4011)

On page 5-7, Table 5-2 and page 601-6, Table 601-2, make the following changes:

FROM: R20|Res, Var, Cermet, 10K $\pm 10\%$, 1/2W|309674|89536|309674|1
 TO: R20|Res, Var, Cermet, 20K $\pm 10\%$, 1/2W|335760|71450|360T203A|1

On page 8-4, Figure 8-1, make the following changes:

Change the value of R20 FROM: 10K TO: 20K

CHANGE #3 - 12439

Rev.- S, A1 Main PCB Assembly (1912A-4001)

Rev.- S, A1 Main PCB Assembly (1912A-4011)

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

ADD: R58|Res, dep. car. 300K $\pm 5\%$, 1/4W|441535|80031|CR251-4-5P300K|

On page 5-8, Table 5-2, and page 601-7, Table 601-2, make the following changes:

ADD: U16|IC Lin, 3-term neg volt reg.|454793|99515|MC79L05ACG|1

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

DELETE: CR11|Diode, Zener, 6.8V|260695|07910|1N754A|1|1




FROM: C15|Cap, Cer, 0.001 uF +20%,
 100V|402966|72982|8121-A100-W5R-102M|6
 TO: C15|Cap, TA, 10 uF +20%, 15V|193623|56289|196D106X0014A1|REF

Change TOT QTY of C18 FROM: REF TO: 5

On page 5-5, Table 5-2, make the following changes:
 Change TOT QTY of C3 FROM: 7 TO: 8

On page 601-4, Table 601-2, make the following changes:
 Change TOT QTY of C13, FROM: 6 TO: 7

On page 5-9, Figure 5-2, and page 601-8, Figure 601-2, make the following changes:

Replace: "  " with: "  " and squeeze: "  " between U16 and U1.

On page 8-4, Figure 8-1, make the following changes:

FROM:

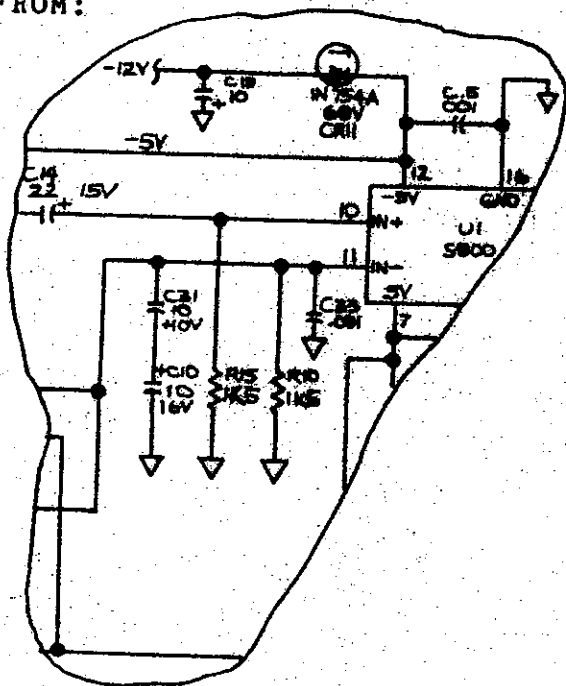


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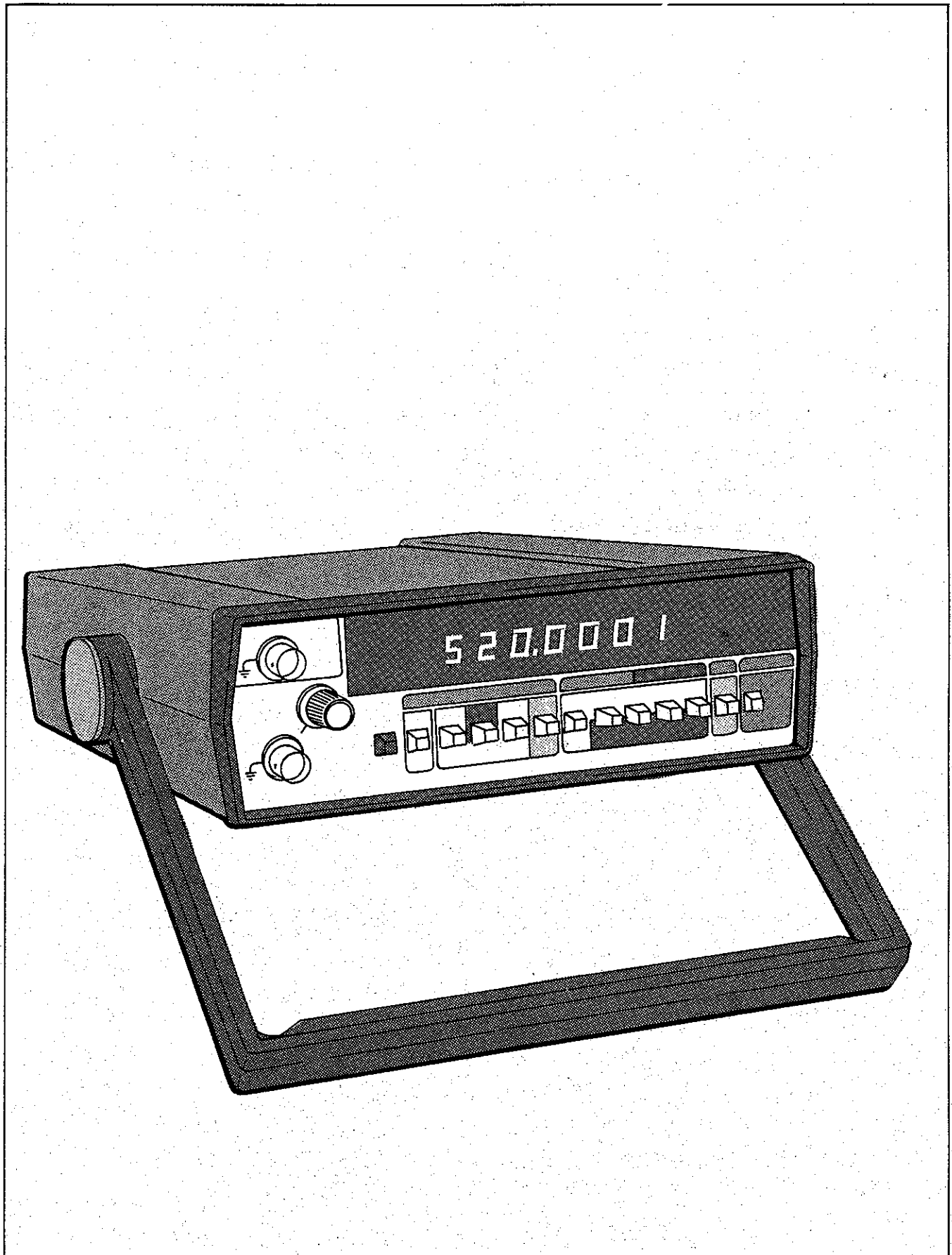
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1912A Multi-Counter

Section 1

Introduction & Specifications

NOTE

The 1912A Multi-Counter may be ordered with a variety of options and accessories. To determine if any options have been installed on your instrument, and if the installation will affect the specifications of the instrument, see the specification decal on the bottom of the instrument case.

1-1. INTRODUCTION

1-2. The Model 1912A is a digital multi-counter capable of making measurements in three modes of operation on two input channels, over a wide range of input frequencies (5 Hz to 520 MHz). The three modes of operation are; frequency (may be obtained on both channels A & B, valid for the entire input range), period (input on channel A only, valid for input frequencies of up to 2 MHz) and totalize (also obtainable on channel A only, will accumulate input frequencies to 9999999 before overflowing and resetting).

1-3. In addition to the three modes of operation the 1912A incorporates the following front panel push button features; channel A attenuator (for high level inputs), self-check (for verifying overall circuit operation), autorange (automatically selects optimum resolution), four resolution switches (manually selects optimum resolution), reset (enables operator to manually clear the display and initiate a new count), and the power switch (standard units have an on/off position, and battery units have a

standby mode replacing the off position). In conjunction with these controls there is the trigger level potentiometer (located on front panel, adjust channel A trigger level) and the clock switch (selects internal/external time base located on rear panel).

NOTE

Unless an external timebase is to be used the clock switch must be left in the internal position.

1-4. The overall operation of the 1912A is simplified by allowing the following features to be fully regulated by the control circuitry. These features are: decimal positioning (the position of the decimal is a function of the selected range, autoreset (initiates a new count when any front panel switch other than the attenuator is activated), hysteresis circuit (prevents unnecessary up down ranging in the auto mode), range annunciators (displays the appropriate units, kHz, MHz, usec, msec, for which ever resolution has been selected) and overflow annunciator (indicates that the display has exceeded its capacity).

1-5. The Model 1912A includes fused protection for the input power on the Main PCB and for the channel B input on the Prescaler PCB. The 1912A may be ordered in one of three input power versions, these are: 100, 115 or 230 volt all compatible with line frequencies from 48 to 440 Hz. When the -01 Battery Option is installed, the unit may be operated and/or charged from the following line voltages and frequencies; 100V 48-52 Hz, and 58-62 Hz, 115V 58-62 Hz, or 230V 48-52 Hz.

1-6. Several options and accessories are available for use with the 1912A. The options are listed and described in Table 1-1. No options are field installable, therefore all options must be specified at time of order, also due to space limitations, Options -01 and -02 are mutually exclusive. The accessories are listed and described in Table 1-2. These accessories are compatible with all options and can be ordered at time of purchase or after purchase. Detailed information concerning each option and accessory is given in Section 6 of this manual.

Table 1-1. 1912A Options

OPTION NO.	DESCRIPTION
-01	Battery Power Supply
-02	Data Output Unit
-03	TCXO, 10 MHz, 2 PPM
-04	TCXO, 10 MHz, 0.5 PPM

Table 1-2. 1912A Accessories

ACCESSORY MODEL NO.	DESCRIPTION
MOO-100-714	Dust Cover
MOO-200-611	Offset Rack Adapter
MOO-200-612	Center Rack Adapter
MOO-200-613	Dual Rack Adapter (For two 1912A's or one 1912A with either an 8000A or 8600A).
C-80	Vinyl Case Cover with Accessory Pouch
C-86	Carrying Case (For a single 1912A)
C-85	Dual Carrying Case (For two 1912A's or a 8000A or 8600A)
A-53	Telescope Whip Antenna

1-7. SPECIFICATIONS

1-8. Specifications for the 1912A Multi-Counter are presented in Table 1-3. Table 1-3 lists first (under operating Range and Time Base) the 1912A's inherent characteristics and secondly, Table 1-3 identifies the instrument's electrical and general characteristics under the heading of the same name.

Table 1-3. 1912A Specifications

OPERATING RANGES			
FREQUENCY CHANNEL A			5 Hz - 125 MHz
FREQUENCY CHANNEL B			50 MHz - 520 MHz
PERIOD CHANNEL A			5 Hz - 2 MHz
TOTALIZE CHANNEL A			1 COUNT TO 9999999
TIME BASE			
	Standard	-03 Option	-04 Option
FREQUENCY	10 MHz	(2 ppm TCXO) 10 MHz	(0.5 ppm TCXO) 10 MHz
AGING RATE	$\pm 5 \times 10^{-7}/\text{mo}$	$\pm 3 \times 10^{-7}/\text{mo}$	$\pm 3 \times 10^{-7}/\text{mo}$
TEMPERATURE DEPENDENCE	0 to 50°C	$\pm 2 \times 10^{-6}$	$\pm 5 \times 10^{-7}$
	$\pm 5 \times 10^{-6}$		
LINE VOLTAGE DEPENDENCE $\pm 10\%$ CHANGE	20 to 30°C	$+1 \times 10^{-6}$	
	$\pm 1 \times 10^{-7}$	$\pm 2 \times 10^{-8}$	$\pm 2 \times 10^{-8}$
CHARACTERISTICS (ELECTRICAL)			
CHANNEL A			
INPUT IMPEDANCE	1M ohm shunted by less than 30 pf, AC coupled.		
SENSITIVITY	15 mV rms: 5 Hz to 100 MHz		
	25 mV rms: 100 MHz to 125 MHz		
ATTENUATOR	Decreases sensitivity by approximately 10.		

Table 1-3. 1912A Specifications (Continued)

TRIGGER LEVEL	$\pm 0.5V$ range
OVERLOAD LEVEL	DC + AC: Less than 360V peak AC: 250V rms 5 Hz to 1 kHz. 5V rms above 1 kHz. (30V peak when operating from batteries.)
CHANNEL B	
INPUT IMPEDANCE	50 ohms nominal. VSWR less than 2.5:1
SENSITIVITY	Less than 15 mV rms: 50 MHz to 175 MHz Less than 30 mV rms: 175 MHz to 250 MHz Less than 25 mV rms: 50 MHz to 520 MHz
OVERLOAD	DC + AC: Less than 100V Peak (30 V Peak when operating from batteries). AC: 5V rms, fuse protected.
EXTERNAL TIMEBASE INPUT	
FREQUENCY REQUIRED	10 MHz
SENSITIVITY	300 mV rms
INPUT IMPEDANCE	Greater than 1k ohm
MAXIMUM INPUT	5V pk-pk
RESOLUTION	
FREQUENCY	Four manually selected resolutions of 100 Hz, 10 Hz, 1 Hz and .1 Hz. Autorange will automatically seek to fill all seven digits but will not select a resolution better than 1 Hz.
PERIOD	Manual selection provides single period measurement, or the averaging of 10^1 , 10^2 , or 10^3 periods. 10^0 single period (100 ns resolution) 10^1 periods averaged (10 ns resolution) 10^2 periods averaged (1 ns resolution) 10^3 periods averaged (100 ps resolution) Autorange will automatically seek to fill all seven digits and, if the input frequency is high enough, may select 10^4 periods averaged (10 ps resolution), but will not select a gate time greater than 1 sec.
TOTALIZE	Accumulates up to 9999999 counts then resets to zero and activates overflow indicator.
GENERAL	
DISPLAY	7 digit LED, Leading zero suppression.
ANNUNCIATION	MHz, kHz, msec, usec, overflow
	Time between successive measurements is 200 ms nominal plus measurement time.
AUTORANGE	In both frequency and period modes autoranging includes a unique 20% hysteresis in its switching thresholds to eliminate redundant up range/down range commands. This allows measurements to be made on signals containing large amounts of FM or PM. Hysteresis can be reset by depressing reset button.

Table 1-3. 1912A Specifications (Concluded)

AUTORESET	A new measurement sequence is started every time a front panel push button is activated except the attenuator.	
OPERATING TEMPERATURE	1912A:	0° C to 50° C
	1912A-01:	0° C to 40° C if operating from line.
STORAGE TEMPERATURE	1912A	-40° C to +70° C
	1912A-01	-40° C to +60° C
POWER REQUIREMENTS	1912A:	100/115/230±10%, 48 - 440 Hz, 8W max.
	1912A-01:	100V ± 10%, 48 - 52 Hz
		100V ± 10%, 58 - 62 Hz
		115V ± 10%, 58 - 62 Hz
	230V ± 10%, 48 - 52 Hz, 8.5W max.	

NOTE! Voltage and frequency must be specified at time of order.

DIMENSIONS Width: 8.55 inches 217.2 mm
 Height: 2.52 inches 64 mm
 Depth: 10.65 inches 270.5 mm

WEIGHT 1912A: 3.2 lbs max 1.5 kgm max.
 1912A-01: 4.8 lbs max. 2.2 kgm max.

OPTION —01 (BATTERY)*

TYPE Rechargeable Nicad

CHARGE TIME 16 hrs with power switch off at less than 30° C.

OPERATING TIME 4 hrs minimum (Battery capacity reduced if charged at greater than 30° C.)

OPTION —02 (DATA OUTPUT)*

DATA OUTPUTS 7 digits with overflow decimal and units information in BCD parallel/digit serial format at CMOS levels.

OTHER OUTPUTS 7 digit strobe signals. Update signal, leading zero suppression signal.

TCXO

TIMEBASES (See timebase characteristics for detailed specifications)

OPTION —03 2 ppm TCXO

OPTION —04 0.5 ppm TCXO

NOTE

All options must be installed at time of ordering. No options are field installable.

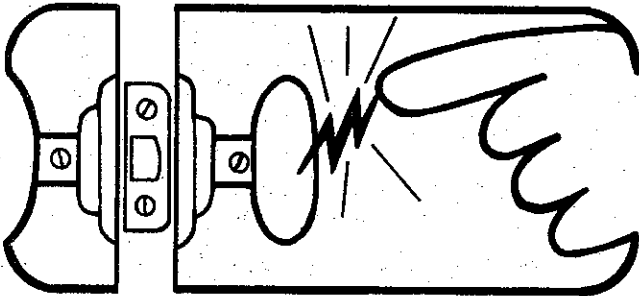
**Due to space limitations within the instrument the 1912A may be ordered with either Option, -01 or -02, but not both.*



static awareness



A Message From
John Fluke Mfg. Co., Inc.

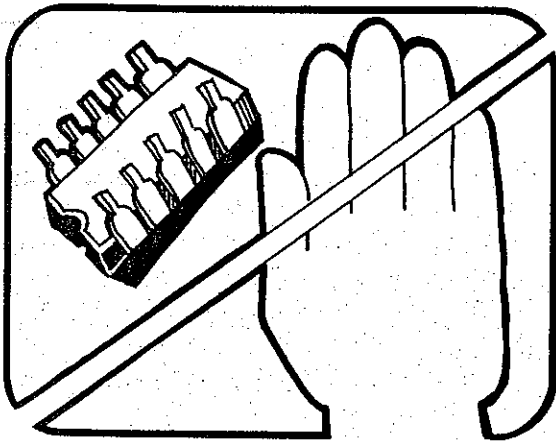


Some semiconductors and custom IC's can be damaged by electrostatic discharge during handling. This notice explains how you can minimize the chances of destroying such devices by:

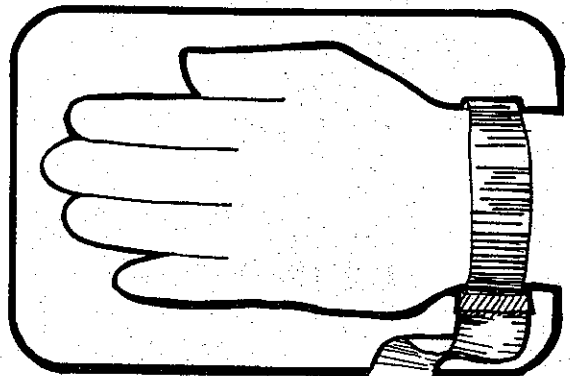
1. Knowing that there is a problem.
2. Learning the guidelines for handling them.
3. Using the procedures, and packaging and bench techniques that are recommended.

The Static Sensitive (S.S.) devices are identified in the Fluke technical manual parts list with the symbol "⊗".

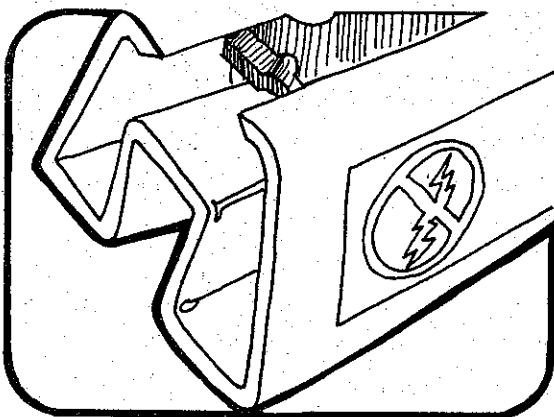
The following practices should be followed to minimize damage to S.S. devices.



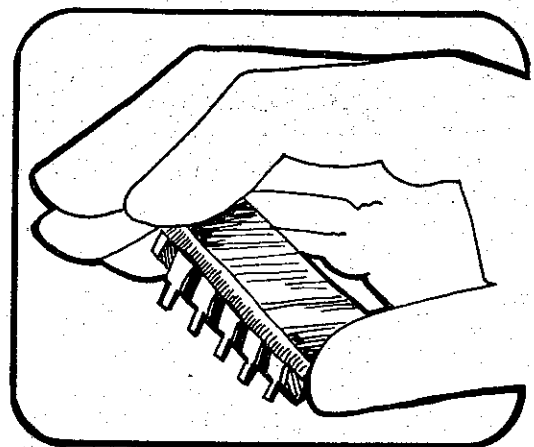
1. MINIMIZE HANDLING



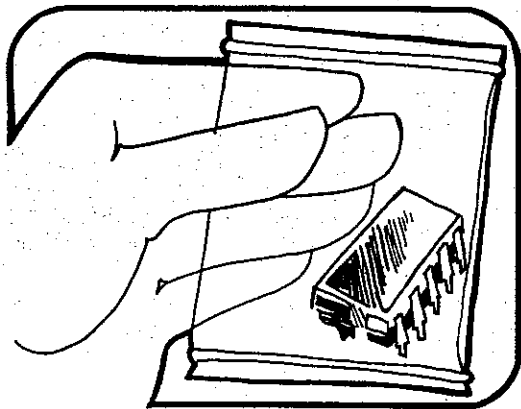
3. DISCHARGE PERSONAL STATIC BEFORE HANDLING DEVICES



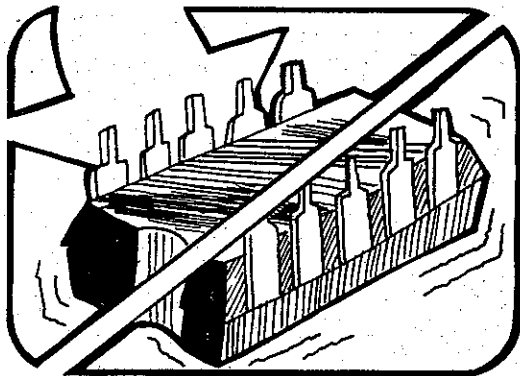
KEEP PARTS IN ORIGINAL CONTAINERS UNTIL READY FOR USE.



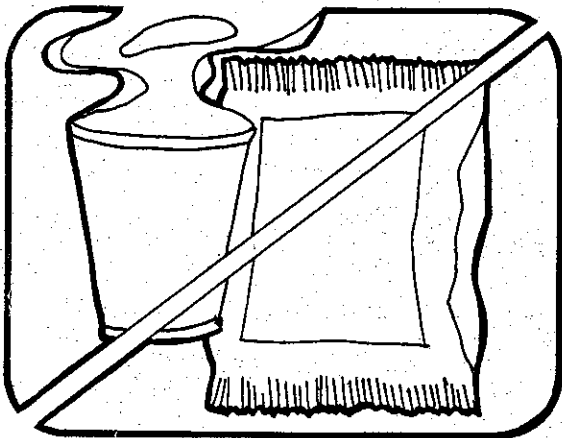
4. HANDLE S.S. DEVICES BY THE BODY



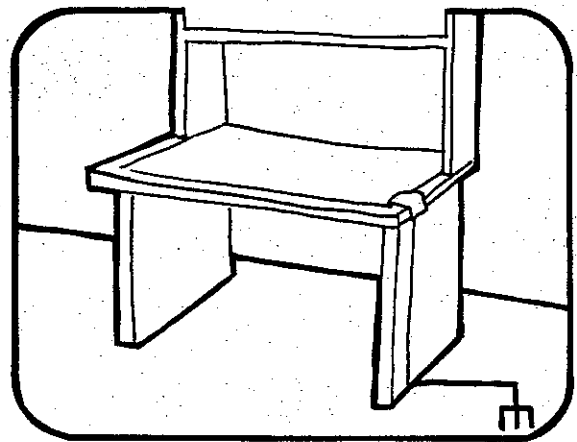
5. USE ANTI-STATIC CONTAINERS FOR HANDLING AND TRANSPORT



6. DO NOT SLIDE S.S. DEVICES OVER ANY SURFACE



7. AVOID PLASTIC, VINYL AND STYROFOAM IN WORK AREA



8. HANDLE S.S. DEVICES ONLY AT A STATIC-FREE WORK STATION

9. ONLY ANTI-STATIC TYPE SOLDER-SUCKERS SHOULD BE USED.

10. ONLY GROUNDED TIP SOLDERING IRONS SHOULD BE USED.

Anti-static bags, for storing S.S. devices or pcbs with these devices on them, can be ordered from the John Fluke Mfg. Co., Inc.. See section 5 in any Fluke technical manual for ordering instructions. Use the following part numbers when ordering these special bags.

John Fluke Part No.	Bag Size
453522	6" x 8"
453530	8" x 12"
453548	16" x 24"
454025	12" x 15"

Section 2

Operating Instructions

2-1. INTRODUCTION

2-2. This section of the manual contains information regarding the installation and operation of the Model 1912A. Should any difficulty be encountered during the operation please contact your nearest John Fluke sales representative or the John Fluke Mfg. Co., Inc., P.O. Box 43210, Mountlake Terrace, Washington 98043, telephone: (206) 774-2211. A list of sales representatives is located in Section 7 of this manual.

2-3. SHIPPING INFORMATION

2-4. The Model 1912A is packaged and shipped in a protective container. Upon receipt of the instrument, a thorough inspection should be made to reveal any possible shipping damage. Section 4 contains an initial procedure check (Table 4-2) that lists the correct display reading for all possible modes of operation. This check should be completed as part of the inspection.

2-5. If reshipment of the equipment is necessary the original container should be used. If the original container is not available, a new container may be obtained from the John Fluke Mfg. Co. Please reference the instrument model number (1912A) when requesting a new shipping container.

2-6. INPUT POWER (LINE)

2-7. The Model 1912A has three available input power configurations; 100V, 115V and 230V, all compatible with line frequencies of 48 Hz to 440 Hz. The Main PCB parts list in Section 5 lists the component changes for each input power configuration.

NOTE

A decal located on the bottom of the instrument, specifies the input power the unit has been configured to operate from.

2-8. INPUT POWER —01 OPTION (BATTERY)

2-9. The Model 1912A-01 may be operated and recharged from the same input voltages as the line model. However, when the —01 Option is installed, the 1912A's operating characteristics, such as maximum input level, change accordingly. For further information see Section 1 and Section 6, —01 Option.

2-10. RACK INSTALLATION

2-11. The 1912A is designed for either bench top use or for installation in a standard 19-inch equipment rack, using an optional accessory rack mounting kit. Rack mounting kits are available for left, right, center, or side-by-side mounting of the 1912A. Installation information of the rack mounting accessories is given in Section 6 under Rack Installation.

2-12. OPERATING FEATURES

2-13. The location of all 1912A controls, indicators and connectors are shown in Figure 2-1, and described in Table 2-1.

2-14. OPERATING NOTES

2-15. The following paragraphs describe various conditions which should be considered before operating the 1912A. These conditions, such as maintenance, fuse, and overload protections, will familiarize the operator with the capabilities and limitations of the 1912A.

2-16. Fuses

2-17. The Model 1912A has two standard fuses. One, the input line fuse located on the rear panel, see Figure 2-1, is a 1/8 watt slow blow for 100V, 115V input voltages, and 1/16 watt slow blow for 230V inputs. The other standard fuse is a 0.2 amp pigtail & plug-in type which is in series with the channel B input connector. This fuse and a spare is located on the Prescaler PCB (see Section 4, Access).

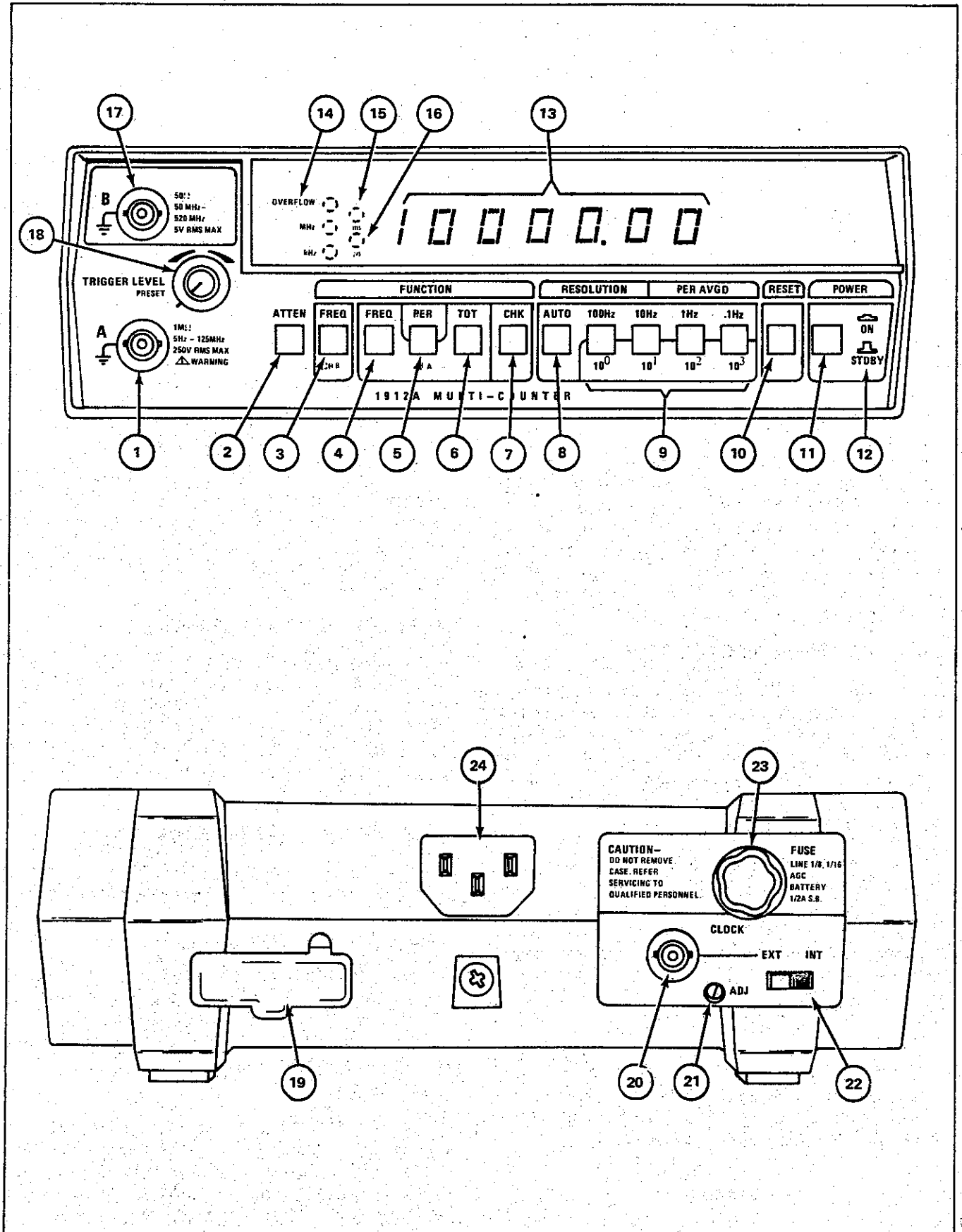


Figure 2-1. 1912A Control and Indicator Locations

Table 2-1. 1912A Control and Indicator Functions

Fig. 2-1. REF. NO.	NAME	FUNCTION
1	BNC Input Connector Front Panel Chan. A	Accepts input freq. of 5 Hz to 125 MHz
2	Attenuator Switch	Selects 10:1 attenuation for high level inputs on channel A.
3	Function Switch Channel B	Selects frequency function 50 MHz to 520 MHz.
4	Function Switch	Selects frequency function, 5 Hz to 125 MHz.
5	Function Switch	Selects period function, 5 Hz to 2 MHz.
6	Function Switch	Selects totalize function, 1 count to 9999999.
7	Function Switch	Selects self-check.
8	Resolution Switch	Selects autorange in frequency and period modes, (channel A only).
9	Resolution Switches	Manually selects gate time; or period resolution.
10	Reset Switch	Manually resets front panel & sequencer, U6.
11	Power Switch	Two position: in (unit on) out (unit off).
12	STDBY —01 Option	When power switch is in this position with the —01 option installed the unit is off but the batteries are still being charged (if unit is connected to the line)
13	Data Display	Seven LED digits with leading zero suppression..
14	Annunciator	Overflow-lights to show count exceeds display capacity.
15	Annunciator	Illuminates to identify display units, MHz/ms
16	Annunciator	Illuminates to identify display units, kHz/us.
17	BNC Input Connector Channel B	Accepts input frequencies of 50 MHz to 520 MHz @ 5V rms max.
18	Triggering Level	Selects manual or preset triggering level of channel A.
19	DOU Output Connector —02 Option	Provides output connector for DOU data (in BCD serial format).
20	Clock Input Connector	Provides input connection for 10 MHz clock signal.
21	Standard Timebase Y1 adjustment	Provides calibration adjustment of Y1 without removing unit from case.
22	Mode Switch	Selects reference frequency, internal or external.
23	Fuse Holder	1/8, 1/16 Amp fuse, slow blow line versions, 1/2 amp fuse slow blow battery version.
24	3 Prong Connector	Provides connection for line voltage.

2-18. Fuse —01 Option

2-19. When the —01 Option is installed the line fuse is changed, and a fuse located on the Main PCB is added to protect the battery charging circuit. For further information see Section 6, -01 Option and Section 4, Fuse Replacement.

2-20. Input Connection

2-21. Signals to be measured by the Model 1912A may be applied to either the channel A BNC connector or the channel B BNC connector. If channel A is to be used, the input frequency must be between 5 Hz and 125 MHz. If channel B is to be used, the input frequency must be between 50 MHz and 520 MHz. Connection to either channel must be via a coaxial cable with a mating BNC connector.

2-22. Operation

2-23. Use the following procedure for initial turn-on of the 1912A:

1. Connect the instrument to the appropriate line power (see bottom decal on instrument).
2. Depress the power switch to the ON position.
3. Select autorange and self-check mode, display should read 100.0000 kHz. If not, refer to Section 4, Troubleshooting.

2-24. Overload Protection

WARNING

THE OUTSIDE CONTACT OF THE BNC CONNECTOR IS TIED DIRECTLY TO EARTH GROUND THROUGH THE POWER PLUG. DO NOT CONNECT THE ACTIVE LEAD OF THE INPUT SIGNAL TO THE OUTSIDE CONTACT OF THE COUNTER, IRREPAIRABLE DAMAGE TO THE COUNTER OR EQUIPMENT UNDER TEST MAY RESULT. TO MEASURE POWER LINE FREQUENCIES IT IS RECOMMENDED TO USE A STEPDOWN TRANSFORMER TO THE COUNTER'S INPUT.

2-25. On channel A the Model 1912A will accept inputs as high as 250V ac between 5 Hz and 1 kHz. At frequencies above 1 kHz, the ac overload protection decreases to 10V ac rms. The 1912A will withstand peak voltages dc and ac up to 360V peak. On channel B the Model 1912A will accept peak input voltages as high as 100V peak dc and ac, or 5V rms ac.

2-26. Option Information

2-27. Supplementary information is necessary when operating a 1912A that is equipped with one or more options. Detailed information regarding the operating of each available option is given in Section 6.

2-28. Frequency Measurement

2-29. Perform frequency measurements as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Depress the frequency measurement switch (channel A) to select the frequency mode of operation.
3. Select the desired resolution, or select the autorange mode. If the input signal is completely unknown the autorange mode will select the optimum range to fill all seven digits.

NOTE

In the frequency mode, automatic selection of the optimum range is made between the three shortest gate times. The 0.1 Hz resolution may be manually selected only.

4. Connect the input signal to the front panel BNC connector channel A. If the display is unstable, due to perhaps noise, the reading may improve by using the attenuator switch, and/or trigger level adjustment.
5. Read the frequency value from the display and observe the unit of measurement indication (kHz or MHz) to the left of the display.

2-30. Period Measurement

2-31. Perform period measurement as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Depress the PER switch to select the period mode of operation.
3. Select the desired number of periods to be averaged, or select the autorange mode. If the input signal is completely unknown the autorange mode will select the optimum range to fill all seven display digits.

NOTE

In the period mode the autorange circuitry may select an additional gate time (10^4) which is not available as a manual selection.

4. Connect the input signal to the front panel channel A BNC input connector.
5. Read the period measurement directly from the display, observe the annunciators (us & ms) and the decimal place.

2-32. Totalize Measurement

2-33. Perform the totalize measurement as follows:

1. Perform the instructions list under OPERATION of this section.
2. Depress the TOT switch to select the totalize mode of operation.
3. Connect the input signal to the front panel BNC connector channel A.
4. Observe that the display shows the total number of events that have occurred.

NOTE

No annunciators are used in the totalize mode other than the overflow, also no decimal point is required.

2-34. Self-Check Mode

2-35. The self-check mode provides a means of verifying proper overall operation of the Model 1912A,

excluding channel A & B input sections and the time base accuracy. To self check the unit proceed as follows:

1. Perform the instructions listed under OPERATION of this section.
2. Press the CHK switch to select the self-check mode.
3. Perform the self-checks listed in Table 3-1.

2-36. Input Conditioners (Channel A)

NOTE

When making low level measurements on channel A, additional input conditioning may be necessary to eliminate input noise. If additional input conditioning is necessary, it is recommended that the Fluke Y7201 Filter and Attenuator be used.

2-37. The Model 1912A employs two input conditioners for channel A located on the front panel. One is the attenuator, which is a two position switch (ON/OFF) that when activated, decreases the input level by approximately a factor of 10. The attenuator obtains this factor by reducing the gain and increasing the hysteresis to the custom chip U1. The other conditioner is an adjustable trigger level used to bias the broadband amplifier contained within U6. The trigger level may be left at the preset value, or may be adjusted manually to compensate for noisy inputs, or for pulse measurements.



Section 3

Theory of Operation

3-1. INTRODUCTION

3-2. This section of the manual contains an overall functional description followed by a block diagram analysis of the Model 1912A Multi-Counter. Both discussions are supported by schematics and simplified block diagrams. The schematics of the individual pcb's may be found in Section 8 of this manual.

3-3. OVERALL FUNCTIONAL DESCRIPTION

3-4. Eight basic sections compose the circuitry of the Model 1912A. They are: input, power supply, time base, main gate, high speed dividers, accumulator (U7), controller (U6), and the display. Figure 3-1 shows the relationship of these functions.

3-5. Frequency Mode (3.8 MHz Test Case)

3-6. To simplify the explanation of the overall circuit functions, assume that a 3.8 MHz signal has been applied to channel A of the 1912A and that the 100Hz resolution and frequency mode switches have been selected. The waveforms shown in Figure 3-1 give an exploded view of the information contained on a particular line for that instant of time. For a complete list of these waveforms see Section 6, Figure 602-1. It should be noted that Figure 3-1 is only an overall block diagram and will not be configured exactly the same for the different modes of operation (see specific circuit function). However, since the frequency mode has been selected for this test case, Figure 3-1 will be referenced to in the following discussion.

3-7. For the frequency mode of operation the signal to be measured is applied to U1 which basically transforms it to standard ECL levels for application to the main gate. The ECL level will be passed to the high speed counters for a time determined by the selected range. The high speed decade counters then divide the unknown input to obtain the first and second digit

information. This information is applied to the counters within U7 to obtain the rest of the digit information. The high speed counters are necessary because the maximum toggle speed of the counters within U7 is 2 MHz. The digit information is strobed into the latches by a memory update signal (MUP) generated by the controller U6. U6 also applies a pulse simultaneously with the digit strobe to position the decimal and to light the appropriate annunciators. The latches (within U7) will hold and present the entire digit information to the display on a common data bus. U7 also generates the strobe cycle to enable the correct LED to light. Each LED is strobed individually for a period of 90 usecs. this individual strobe scheme increases the LED life and decreases the energy consumption, persistence of the eye eliminates any flicker.

3-8. In review of this test case it can be seen that to obtain a count in the frequency mode the 1912A has utilized all seven of it's basic sections. Each of these sections will be discussed in detail under the block diagram analysis. However because one section, the controller, is basic to every other section and is essential to the operation of the 1912A in each mode of operation, it will be discussed now.

3-9. Controller (U6)

3-10. The controller is capable of performing numerous logic steps, see Figure 3-2, the first of which is start (step-1). Step-1 will be initiated whenever power is first applied to the counter, or if a new range, mode, or the reset switch has been actuated. Step-1 will initialize the counter to accept a new measurement. Step-2 is skipped as only odd numbered steps are used to order events. The next events in the controllers logic (step-3) enables the decade counters, contained within the accumulator, to count the frequency of the unknown signal in the frequency mode or the 10 MHz reference clock in the period mode.

3-11. Step-5 enables the autorange circuit. In this step the controller decides whether or not the range is adequate for optimum resolution. If the most significant digit (MSD) is less than one, then the optimum range has not been achieved and the controller will increase the gate time by a factor of 10. The controller will cycle through this until the MSD is one or greater, or until the longest gate time possible has been reached. If a range has been manually selected, then the resolution of the display (gate time) will be determined by the selected range, not the value of the MSD.

3-12. When in the autoranging mode the controller provides a hysteresis circuit which prevents a shift in range when the frequency of the input signal changes by up to 20%. To activate the hysteresis circuit, the MSD must first be equal to one which sets the hysteresis flip-flop (HFF) high. The hysteresis then introduced by the controller will tend to hold the present range until the second significant digit (2SD) falls below eight.

3-13. Step-7 is called memory update (MUP). This step enables the controller to shift the count obtained in

step-3 to the display. The next step, step-9, is a wait period of 200 msec which limits the controller to a maximum of five readings per second.

3-14. The controller's logic will continue to cycle from step -3 through step -9 once every 200 msec plus the selected gate time and will go to step -1 if the instrument is first turned off and then back on again, or if a new mode, range or the reset switch is actuated.

3-15. Period Mode

3-16. The period of an unknown signal is measured by counting a reference frequency during a specified number of input periods (see Figure 3-3). The Model 1912A obtains its period measurement by applying the unknown input to the range control, using that count to derive the gate time and then counting the 10 MHz signal supplied by the time base. Selection of the range control will directly determine the resolution of the period measurement. The longer the gate time, the more periods averaged and consequently, better resolution.

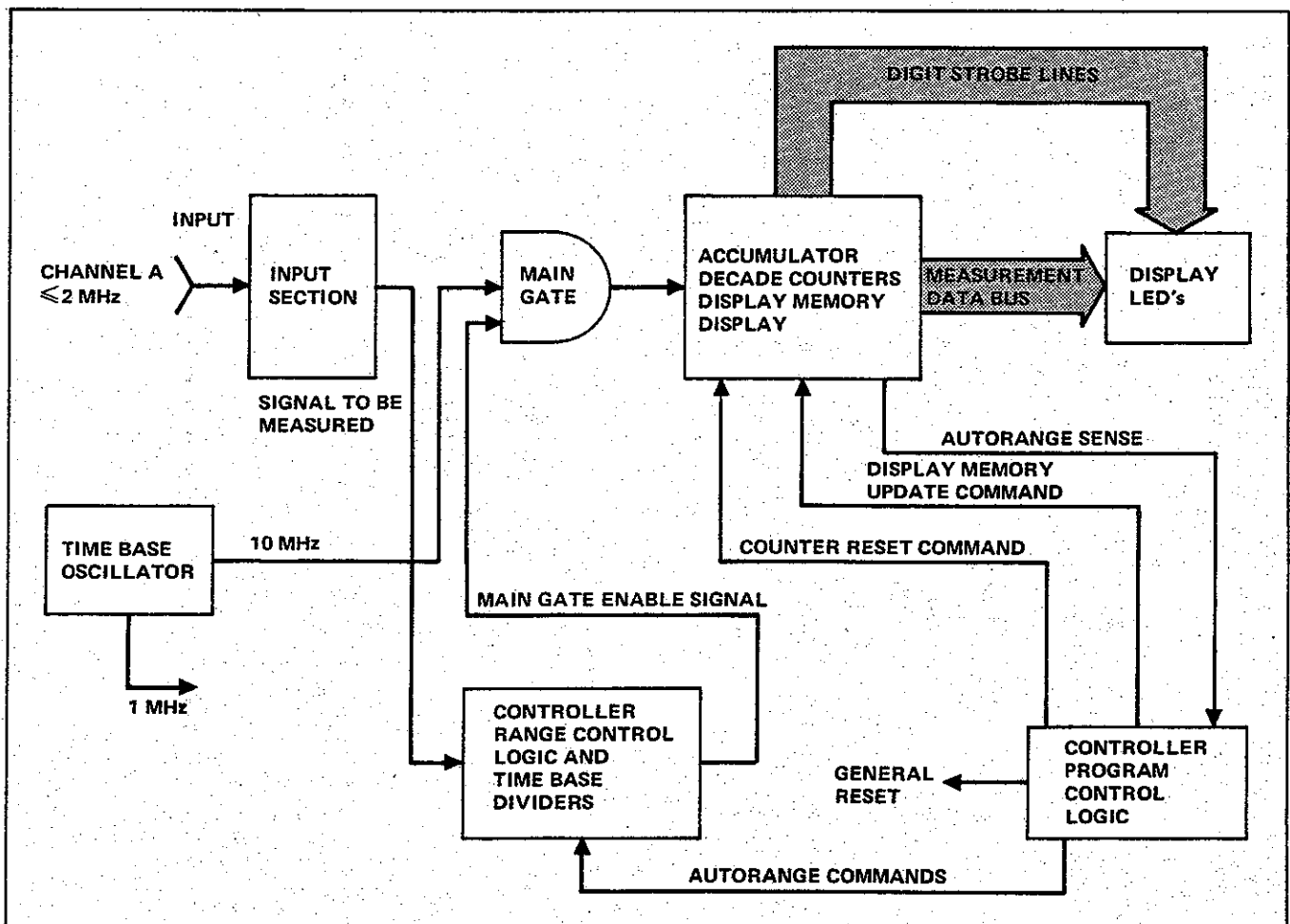


Figure 3-3. Period Mode

3-17. Totalize Mode

3-18. The totalize mode is used to count the total number of events as they happen (see Figure 3-4). This is achieved by completely bypassing the range and controller functions and continuously enabling the main gate. The totalize mode will count up to 9999999 at which time the overflow indicator will light and the display will reset itself to zero. The overflow indicator is the only annunciator used in the totalize mode. A new count may be manually initiated by depressing the reset button, or by selecting a new range.

3-19. Self Check Mode

3-20. The self-check mode is an internal verification system that uses the 10 MHz signal from the time base as a reference (see Figure 3-5). When in the self-check mode manual selection of each range and the reset switch will verify that all sections of the counter, other than the input and time base itself, are working properly (see Table 3-1 for correct display readings).

Table 3-1. Display Readout in Self Check Mode

MODE	DISPLAY	ANNUNCIATOR
Auto	10000.00	kHz
100 Hz	10.0000	kHz
10 Hz	10000.00	kHz
1 Hz	0000.000	Overflow kHz
0.1 Hz	000.0000	Overflow kHz
Reset	888.8888	kHz

3-21. Block Diagram Description

3-22. The following block diagram description will detail each individual function that the 1912A is capable of performing in a logical input to output order. Each individual function is keyed to a corresponding block diagram and/or supported in part by the schematics located in Section 8.

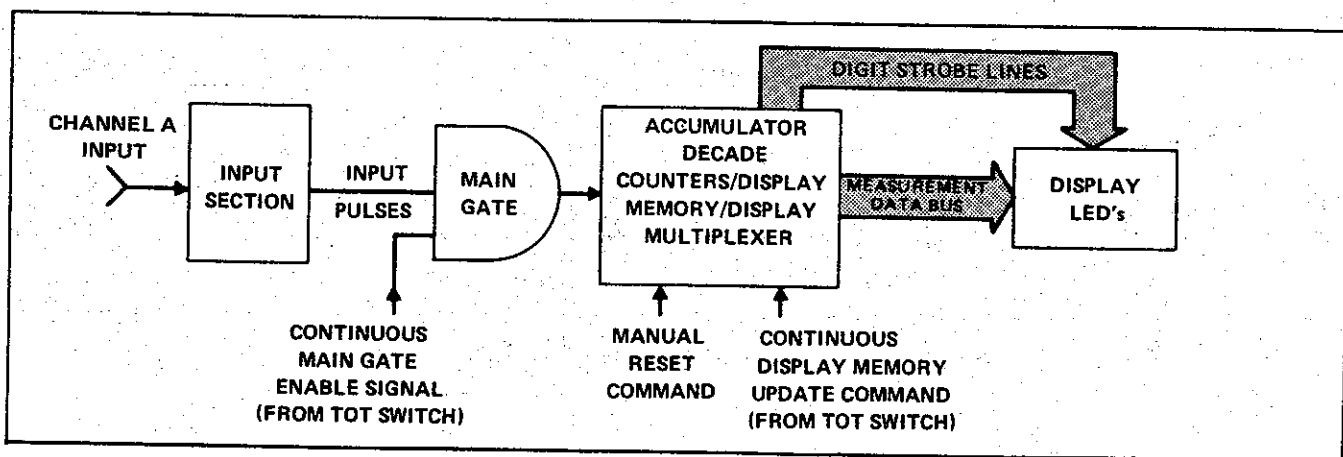


Figure 3-4. Totalize Mode

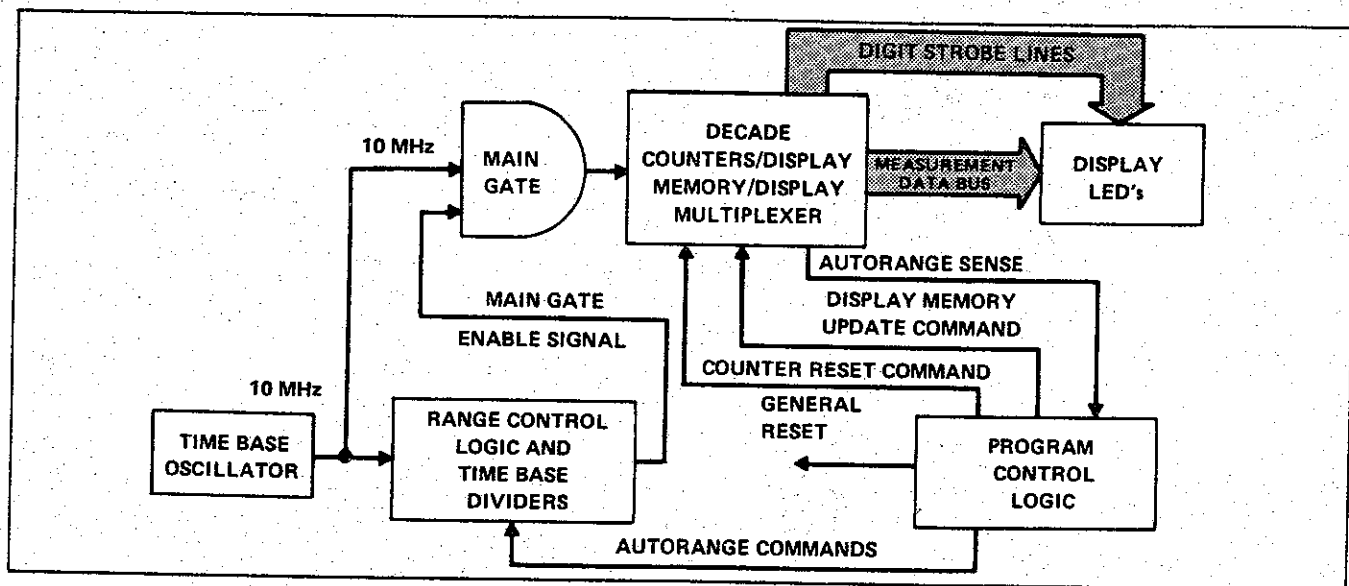


Figure 3-5. Self Check Mode

3-23. Input Section Channel A

3-24. An Input signal from the BNC connector is coupled through C1 to the buffer amplifier, Q1 (see Figure 3-6). It is then applied to the custom IC U1, which includes in part a broadband amplifier, schmitt trigger, and output amplifier. The first section of U1, the broadband amplifier provides gain over the wide range of input frequencies. The second section of U1 is a schmitt trigger used to square the output to obtain fast, clean transitions and the third section, the output amplifier, translates the input signal to the standard ECL and TTL levels for application to the main gate (U2) and the controller (U6) respectively.

3-25. Input Section Channel B

3-26. For channel B inputs (see Figure 3-7) the signal is amplified and fed to a dual high speed flip-flop where it is effectively divided by four to bring it within the range of the high speed decade counters. The prescaler also contains a level detector which blocks the prescalers operation when the input levels drop below a preset value (drop out). The manual selection of channel B, simultaneously inputs a prescaler code to the controller, U6. This code will cause the controller to quadruple the gate time to compensate for the reduction of the input frequency by the prescaler.

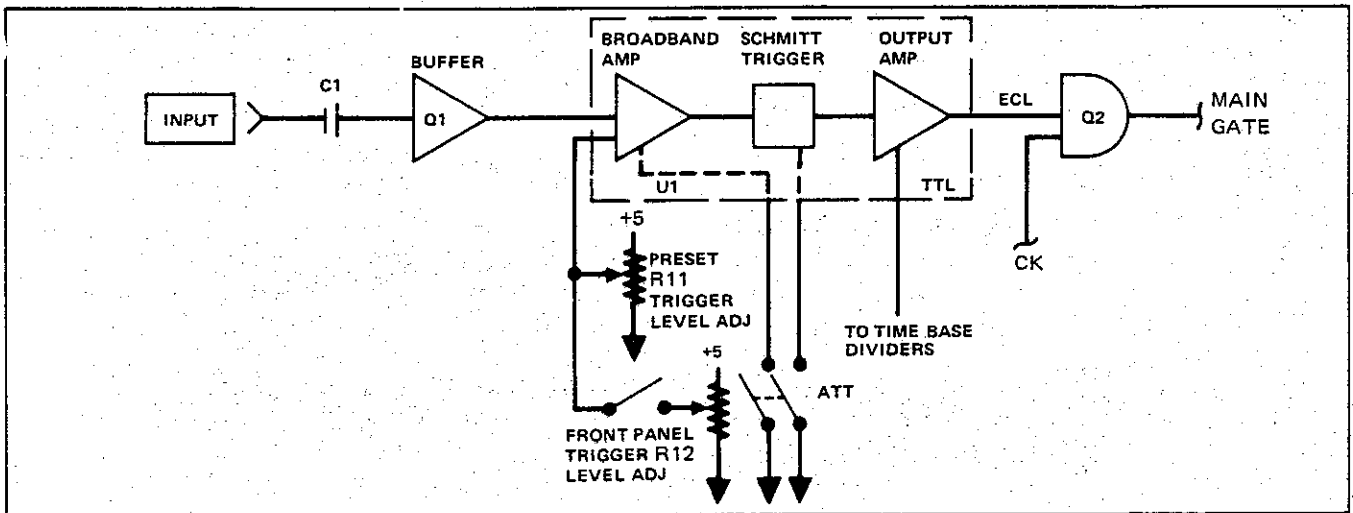


Figure 3-6. Input Section Channel A

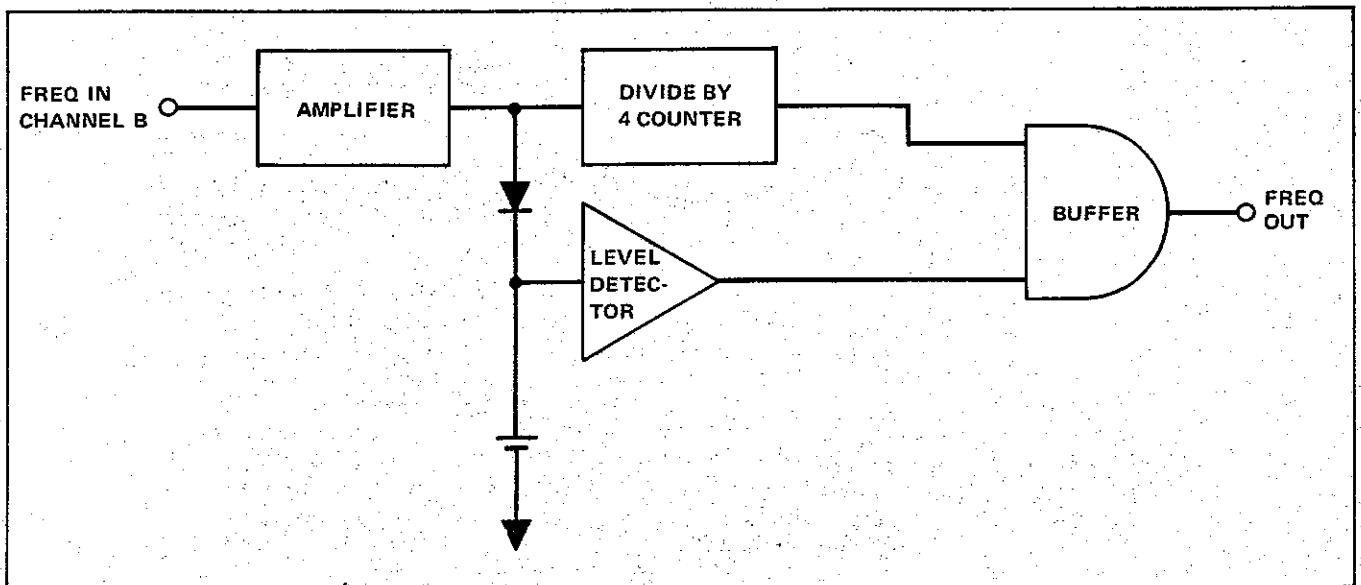


Figure 3-7. Input Section Channel B

3-27. Main Gate High Speed Counters

3-28. The high speed counters, U2, U3B, U4A, U4B, (first digit) and U8 (second digit) are used to supply the digit information for the LSD and 6SD, respectively. These counters are separate from the rest of the counters contained within the accumulator U7 because of the toggle speed they must handle.

3-29. At step-3c in the controllers logic (see Figure 3-2) a gate pulse is generated and applied to the J & K inputs of the main gate, U2. The unknown input, refer to schematic 8-2, is then applied to the clock input of U2 and toggles it on the negative going edge. U2's output and the outputs from U3, U4A, and U4B combine to make up the bcd information for the first digit. The bcd information for the second digit is derived solely from U8.

3-30. At step -3d in the controller's logic, the gate pulse (GATE) goes high and with a logic 1 applied to the J & K input of the U2 the clocking input is ignored and the counting of the unknown input is stopped. The digit information will now be held by the latches contained within U7 until step -7 (MUP) of the controller's logic.

3-31. Time Base

3-32. The time base consists of a 10MHz crystal (Y1) a buffer amplifier (Q2), a nor gate (U5) and a decade counter (U9). The time base is configured as a Colpitts oscillator, see schematic 8-2, whose frequency is controlled by the crystal Y1. The amplifier Q7 and Nor gate U5 combine to provide a buffered output and the decade counter divides the 10MHz crystal frequency to obtain the 1MHz time base. In the frequency mode the 1MHz signal is applied to U6 to obtain the range control logic. In the period and self-check modes the 10MHz signal is applied to the main gate and counted as the unknown while the actual unknown signal is used to derive the gate time.

3-33. Decimal Point Logic

3-34. The Model 1912A uses a scheme to position the decimal which is synchronous with the appropriate digit strobe. An encoded input generated by the selection of a resolution switch (see Table 3-2) will enable one of the six possible AND gates contained within U6. A decimal positioning strobe (DP) will then be generated by U6 simultaneously with one of the six digit strobes, which will light the corresponding decimal. If autoranging has been selected, the encoded range input to the AND gates will change as the value of the signal being measured changes. This effectively shifts the decimal position as the input changes to ensure maximum display capacity. The annunciators, kHz/msec, MHz/used, are lit by the same scheme as the decimal, however, the enabling strobe generated by U6 is now UX (see Figure 8-2, sheet 3 of 3).

Table 3-2. Range Encoding (Frequency)

INPUT TO RANGE SWITCH ENCODING a) FREQUENCY A MODE					
Input to U6 Pin			Gate Time	Decimal Location Output	Annunciated Units Output
22	23	24			
0	1	0	10 msec*	D5	MHz
1	1	0	0.1 sec*	D3	KHz
0	0	1	1.0 sec*	D4	KHz
1	0	1	10 sec	D5	KHz
1	1	1	Autorange	■	■

*Obtainable gate times in autorange mode.

■ Not a fixed value.

3-35. Range Control Logic (Frequency Mode)

3-36. Selection of a range may be determined manually by one of the front panel range switches or automatically by selecting the autorange mode. If the range is manually selected, a predetermined range command will be applied to U6 (see Table 3-2) which determines the division ratio of the 1MHz clock pulse. The 1MHz clock pulse enables the main gate for a length of time directly proportional to the division ratio. The same scheme is used when the autorange mode is selected, however, in this case the range command is not a set value. The encoded range command in the autorange mode will change, causing the division of the 1MHz signal to change which will enable the gate time to increase or decrease depending upon the value of the signal being measured.

3-37. Range Control Logic (Period Mode)

3-38. The range control logic for the period mode is similar to that used in the frequency mode except that the 1MHz clock input is replaced with the channel A, TTL level input (XA). The XA signal is divided by the decade counters within U6 and like the 1MHz signal it's division ratio is determined by the encoded range command (see Table 3-3). The divided XA signal is then however, applied to the main gate and used as the enable signal to allow the 10MHz time base output to be counted and stored by the latches contained within U7, and then displayed as the period measurement.

3-39. Autorange Logic

3-40. When used, the autorange logic will ensure maximum display limits by automatically increasing the gate time until all seven digits are filled or until the longest gate time has been reached. The operation of the autoranging logic is similar to the manual resolution selection, however the range encoding lines, input to U6 on

pins 22, 23, and 24, are placed by the interation counter internal to U6. The interation counter will then select one of the 3 shortest gate times in the frequency mode (see Table 3-2) or if the period mode has been selected the autorange logic may pick from any of the manually selectable gate times with the addition of 10^4 periods averaged which is not manually selectable (see Table 3-3).

Table 3-3. Range Encoding (Period)

INPUT TO RANGE SWITCH ENCODING (PERIOD MODE)						
Input to U6 Pin			Gate Time	Period	Decimal Location Output	Annunciated Units Output
22	23	24				
0	0	0	■	10^0	D5	msec
1	0	0	■	10^1	D6	msec
0	1	0	■	10^2	D4	μ sec
1	1	0	■	10^3	D5	μ sec
0*	0*	1*	■	10^4	D6	μ sec
1	1	1	■	**	**	**

* Obtainable only in the period mode of operation when using the autorange resolution.

** Not applicable. ■ Not a fixed value.

3-41. Display Memory and Multiplexer

3-42. The display memory and multiplexer consist of counters, latches and gates, all internal to U7 (see Figure 3-8) used to accumulate, hold and present the digit information to the display. When step -7 is reached (see Figure 3-2) the controller generates a memory update signal (MUP). At that time the contents of the decade counters are shifted into a series of four bit latches. A 10kHz oscillator and a 10 stage ring counter internal to U7 generate strobe signals to apply the contents of the four bit latches onto the common display data bus in parallel. Information on the data bus is decoded by a seven segment decoder for application to the display.

3-43. Display

3-44. The display (see Figure 3-9) consists of seven, seven-segment LEDs, each containing its own decimal point. The appropriate LED is enabled simultaneously with the enabling of a gate in the display multiplexer (U7). This allows the digit information to be applied via the common data bus to all LEDs in parallel. However, only the LED that is enabled by the ten stage ring counter within U7 will accept the data and consequently light.

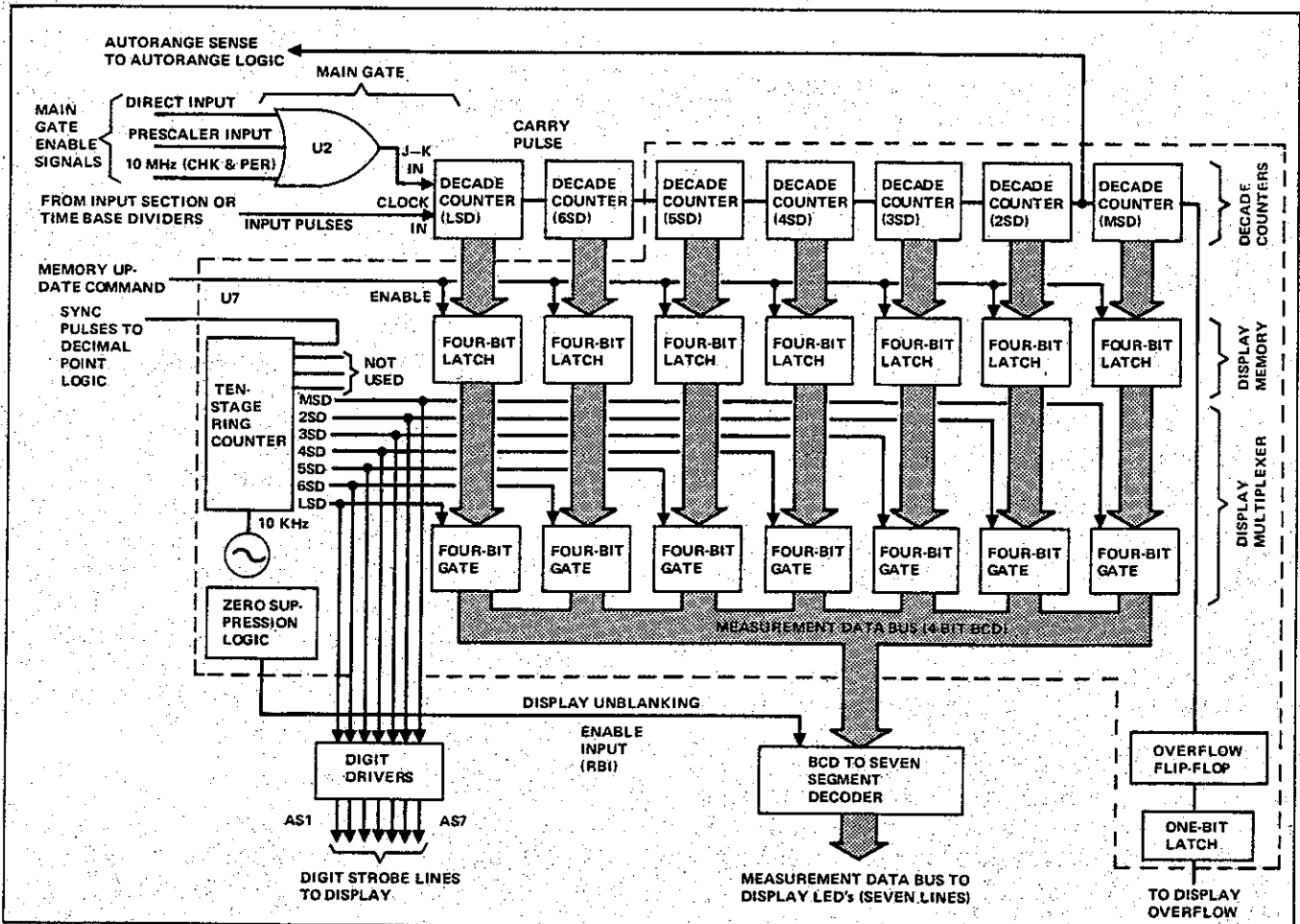


Figure 3-8. Display Memory and Multiplexer

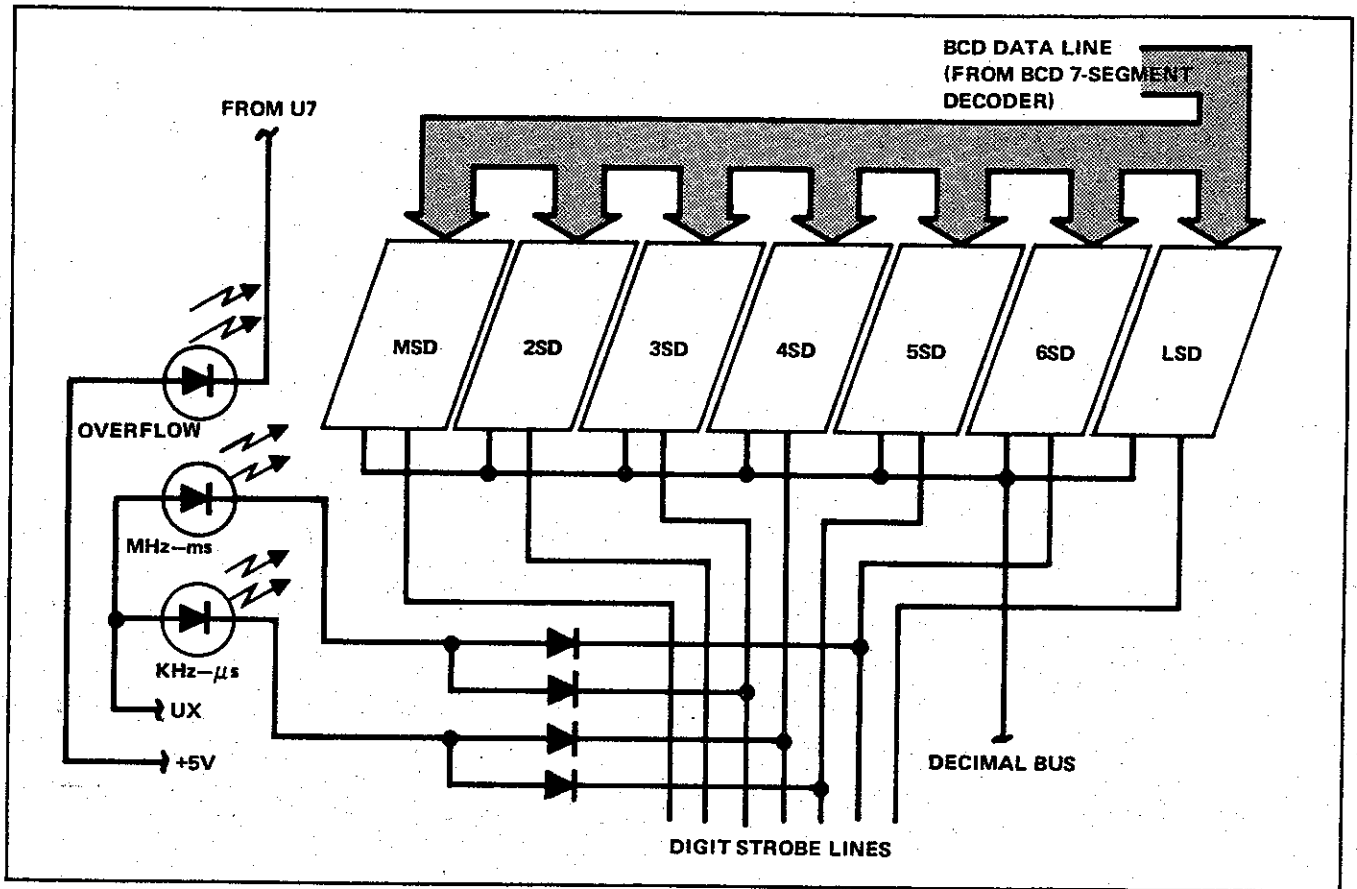


Figure 3-9. Display



Section 4

Maintenance

WARNING

THESE SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID SHOCK, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN THE OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

4-1. INTRODUCTION

4-2. This section has been designed to enable the maintenance personnel to isolate and correct any instrument malfunction in the shortest possible time. This includes Service Information, General Maintenance, Performance Test, Calibration and Troubleshooting (Flow Charts). The Performance Test is recommended as an acceptance test when the unit is first received, it may, however, be used any time that the operator suspects a discrepancy in the overall operation of the instrument.

4-3. Calibration is a separate procedure that requires the unit to be removed from its case. It is recommended that the instrument be calibrated once a year or whenever the instrument fails to meet a performance test.

4-4. Troubleshooting charts located at the end of this section list many possible instrument malfunctions and a corrective procedure for each. The test equipment required for the Performance Test, Calibration and Troubleshooting is listed in Table 4-1. If the recommended equipment is not available, instruments having equivalent specifications may be used.

4-5. SERVICE INFORMATION

4-6. Each instrument that is manufactured by the John Fluke Mfg. Co., Inc. is warranted for a period of one year upon delivery to the original purchaser. The warranty is given on the back of the title page located in the front of this manual.

4-7. Factory authorized calibration and service for each Fluke product is available at various world-wide locations. A complete list of these service centers is included in Section 7 of this manual. If requested, an estimate will be provided to the customer before work is begun on instruments that are beyond the warranty period. However, any malfunctions that do occur within the limits of the warranty will be corrected at no charge.

4-8. GENERAL MAINTENANCE

4-9. Access and Removal Information

WARNING!

FOR SOME MAINTENANCE PROCEDURES IT WILL BE NECESSARY TO APPLY POWER TO THE INSTRUMENT WITH THE SHIELDS REMOVED. FOR THIS CONDITION THE OPERATOR SHOULD BE AWARE THAT THE FOLLOWING POINTS WILL BE AT THE POWER LINE POTENTIAL.

1. Rear panel AC connector
2. Transformer winding (primary)
3. Land pattern on Main PCB (component side) between transformer and front panel power switch, S1.
4. Jumper W7 located on bottom of Main PCB.

Table 4-1. Required Test Equipment

EQUIPMENT NOMENCLATURE	MINIMUM SPECIFICATIONS	RECOMMENDED EQUIPMENT
Quartz oscillator frequency standard with 10 MHz output.	1 x 10 ⁸ ppm stability	HP 105A/B
Low frequency oscillator	5 Hz to 10 MHz 5 mV to 500 mV	Fluke 6010, or Wave Tek 3001
High frequency oscillator	10 MHz to 520 MHz 5 mV to 500 mV	Wave Tek 2001
RF millivoltmeter with 50 Ω terminator, + high impedance terminator	5 mV sensitivity 10 kHz to 520 MHz	Boonton 92B
Multimeter	With at least a 200 mV range in DC & AC functions	Fluke 8000A
Oscilloscope	Greater than 100 mV/div (vertical sensitivity) using FET probes	Tek 465

4-10. Use the following procedure to gain access to the interior of the instrument.

1. With the power switch in the OFF position (out) disconnect the line cord, external clock input and DOU connection (if used).
2. Remove the phillips screw on the rear panel directly below the line connector.
3. Hold rear of instrument case firmly and pull front panel straight out.
4. Top and bottom shields may now be removed by removing six #2-56 screws.
5. All replaceable parts are now visible.
6. Reassemble in the opposite order.

NOTE

To avoid contaminating the pcb with oil from your fingers, handle it by the edges or wear gloves. If the pcb does become contaminated, refer to the cleaning procedure given later in this section.

4-11. Cleaning

CAUTION!

If any solvent is used, such as freon, it should be kept clear of switches, potentiometers, plastics and transformer windings since it removes lubrication and breaks down winding insulation.

4-12. Periodically clean the multi-counter to remove accumulated dust, grease and other contaminants using the following procedure:

NOTE

To avoid hairline scratches on the front panel lens it is recommended to use a very soft cloth such as facial tissues when cleaning the front panel.

1. Clean the front panel and exterior surfaces with ethyl alcohol or soft cloth dampened with a mild solution of detergent and water.
2. If cleaning of the interior is necessary, use clean, dry air at low pressure (20psi). If contaminants remain, individual pcbs can be cleaned using anhydrous ethyl alcohol, however any items likely to be affected by the alcohol (batteries, etc.) should first be removed. Excess alcohol should be blown free with the pressurized air followed by a thorough drying. Do not use drying temperatures in excess of 50°C.

4-13. Fuse Replacement

4-14. The line fuse (F1) is located on the rear panel. If replacement is necessary, use a 1/8 amp slow blow for 100V and 115V line powered units and a 1/16 amp slow blow for 230V line power and a 1/2 amp slow blow for battery powered units. The 1912A also has individual fuses for protection of the channel B prescaler and the

Main PCB battery charging circuit (for battery units only). Each of these fuses are located directly on their respective pcbs (for access and replacement of the Main PCB fuse, see Section 6).

4-15. PERFORMANCE TEST

4-16. The following performance tests are designed to compare the actual operation of the instrument with the specifications given in Section 1. These are sensitivity tests and are suitable for incoming inspection, and periodic checks to verify overall operation. If the instrument fails to meet any of these tests the authorized personnel should proceed to the calibrating procedure.

4-17. Initial Procedure Check

4-18. The following conditions must be met before proceeding to the sensitivity test.

1. All external inputs should be made via a shielded cable with a compatible bnc connector and must not exceed the input limits as specified in Section 1.
2. Internal/external clock switch must be in the internal position.
3. Trigger level must be in the preset position.
4. Attenuator switch should be in the out position.
5. Unit to meet the following checks, see Table 4-2.

4-19. Sensitivity Check (Channel A)

1. Connect the low frequency generator, set to 10Hz at 15 mV to the channel A input. If using the 6010A or 6011A signal generators terminate their outputs into 50Ω.

NOTE

The Wavetek Generator (3001) is an analog frequency selectable instrument whose output is directly proportional to the accuracy of the adjustments made by the operator.

2. Energize the counter and select the frequency function, channel A and auto resolution.
3. Confirm that the display reads 0.010 kHz ± 1 digit.
4. Disconnect the low frequency generator and connect the high frequency source terminated into 50Ω at a T-connector to the channel A input, also connect an RF millivoltmeter to the T-connector.
5. Refer to Table 4-3, and set the generator for 150mV at about 10MHz to obtain a reference reading. Now lower the generator amplitude level until the counters display becomes unstable. Verify that the level at which the display changes is below 15mV.
6. Repeat step -5 for each frequency listed in Table 4-3. Note that at 125 MHz the level must be below 25 mV before the display becomes stable.

Table 4-2. Initial Procedure Check

FUNCTION	RESOLUTION	± 1 COUNT DISPLAY	ANNUNCIATORS
FREQ CH A/CH B	100 Hz	0.0000	MHz
FREQ CH A/CH B	10 Hz	0.00	kHz
FREQ CH A/CH B	1 Hz	0.000	kHz
FREQ CH A/CH B	0.1 Hz	0.0000	kHz
PER	0.1 Hz	0.0000	μ s
PER	1 Hz	0.000	μ s
PER	10 ¹ Hz	0.00000	mS
PER	100 Hz	0.0000	mS
CHK	100 Hz	10.0000	MHz
CHK	10 Hz	10000.00	kHz
CHK	1 Hz	0000.000	kHz Overflow
CHK	0.1 Hz	000.0000	kHz Overflow
CHK & RESET	AUTO	10000.00	kHz
TOT	AUTO	88888.88	kHz
		0	—

**Table 4-3. High Frequency Sensitivity Check
(Channel A)**

GENERATOR SETTING		DISPLAY READING \pm GENERATOR STABILITY
FREQUENCY	LEVEL RMS	
10 MHz	15 mV	10000.00 kHz
50 MHz	15 mV	50000.00 kHz
100 MHz	15 mV	100.0000 MHz
125 MHz	25 mV	125.0000 MHz

4-20. Sensitivity Check (Channel B)

1. Connect the high frequency generator and an RF millivoltmeter to the channel B input via a high impedance T-connector.
2. Set the generator to about 50MHz at 75mV.
3. Energize the counter, depress the frequency B function switch and select 100 Hz resolution.
4. Make a note of the display reading and reduce the amplitude level of the generator until the display goes to zero. Increase the amplitude level until the counter reads correctly, the level at which the counter reads correctly should be less than 25 mV.
5. Repeat step-4 at 100MHz and 175MHz.
6. Repeat step-4 every 50MHz to 520MHz, note that the input level remains at less than or equal to 25mV with a clean dropout (i.e. a maximum of one noisy reading).

4-21. CALIBRATION

4-22. The 1912A Multi-Counter should be calibrated once a year or whenever a sensitivity check indicates that the instrument does not match the specifications. Calibration requires no more than the adjustment of the trigger level (channel A) threshold adjustment (channel B) and the time base adjustment.

4-23. Trigger/Hysteresis Level Adjustment (Channel A)

4-24. The trigger level adjustment should be performed whenever repairs have been made to the input section of the counter. Perform the trigger/hysteresis level adjustment as follows:

1. Remove the instrument from its case.
2. Connect the high frequency generator and an RF millivoltmeter via a T-connector terminated in 50 Ω ; energize counter.

3. Set the front panel trigger level control to the preset position.
4. Set the generator to 75 mV output level at about 100 MHz, note the display reading as a reference.
5. Set the hysteresis trimpot (R20) to its maximum clockwise position.
6. Reduce the input level until the display becomes unstable and then try to adjust R11 (internal trigger level, see Figure 4-1) for the reference reading as noted in step-4.
7. Repeat step-6 until no additional sensitivity is possible.
8. Repeat sensitivity check channel A. If counter does not meet this check turn the hysteresis trimpot (R20) counterclockwise until all display limits as listed in Table 4-3 are met.

NOTE

Oscillations of UI's outputs indicate that R20 has been adjusted too far counterclockwise.

4-25. Threshold Adjustment (Channel B)

1. Remove the unit from its case. Refer to warning under General Maintenance.
2. Set function switch to frequency channel B and resolution to 100Hz.
3. Connect a high frequency generator and an RF millivoltmeter via a T-connector to the channel B input.
4. Set the generator to about 250MHz at 20mV
5. Set the threshold trimpot (R19) on the 520 MHz Prescaler PCB to its maximum counterclockwise position.
6. Advance the trimpot (R19) clockwise until the display goes to zero. Then slowly advance the trimpot counterclockwise until the display reads correctly.
7. Reduce the input amplitude and verify that the reading remains stable until going to zero (must be less than or equal to 25mV). Repeat step-6 and-7 until counter meets this specification.

- Change the generator output to 50MHz at about 75mV. Reduce the amplitude level and verify that the display reading remains stable to below 25mV. If the display becomes erratic at a level greater than 25mV then R19 must be readjusted. The correct adjustment for R19 is for a clean dropout of readings when the input level is about 15mV at frequencies from 50MHz to 520MHz.

4-26. Time Base Adjustment (Standard Unit)

- Allow the counter to operate for at least 30 minutes in the case to stabilize the internal temperature.
- Select the frequency-A function and 1 Hz resolution.

- Select a 10MHz output on the quartz oscillator and apply it to the channel A input.
- While observing the display adjust the time base oscillator control (C5) through the rear panel, see Figure 4-1, to obtain a reading of overflow 000000 ± 5 .

4-27. Time Base Calibration (Option -03 & -04)

- Allow the counter to operate for at least 30 minutes in the case to stabilize the internal temperature.
- Select the channel A function at 1 Hz resolution.
- Connect the 10MHz reference frequency to the channel A input.

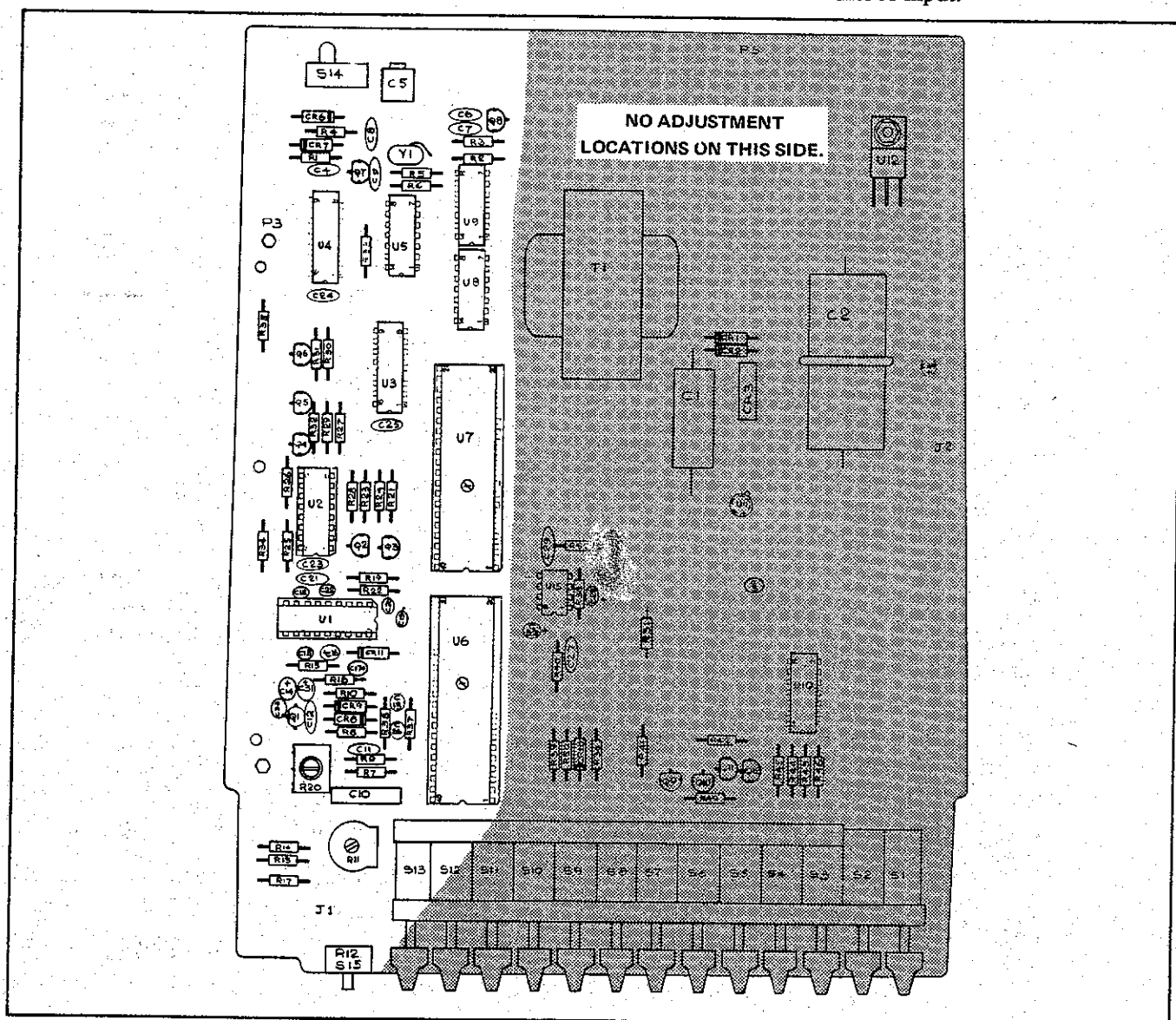


Figure 4-1. Main PCB (Top View)

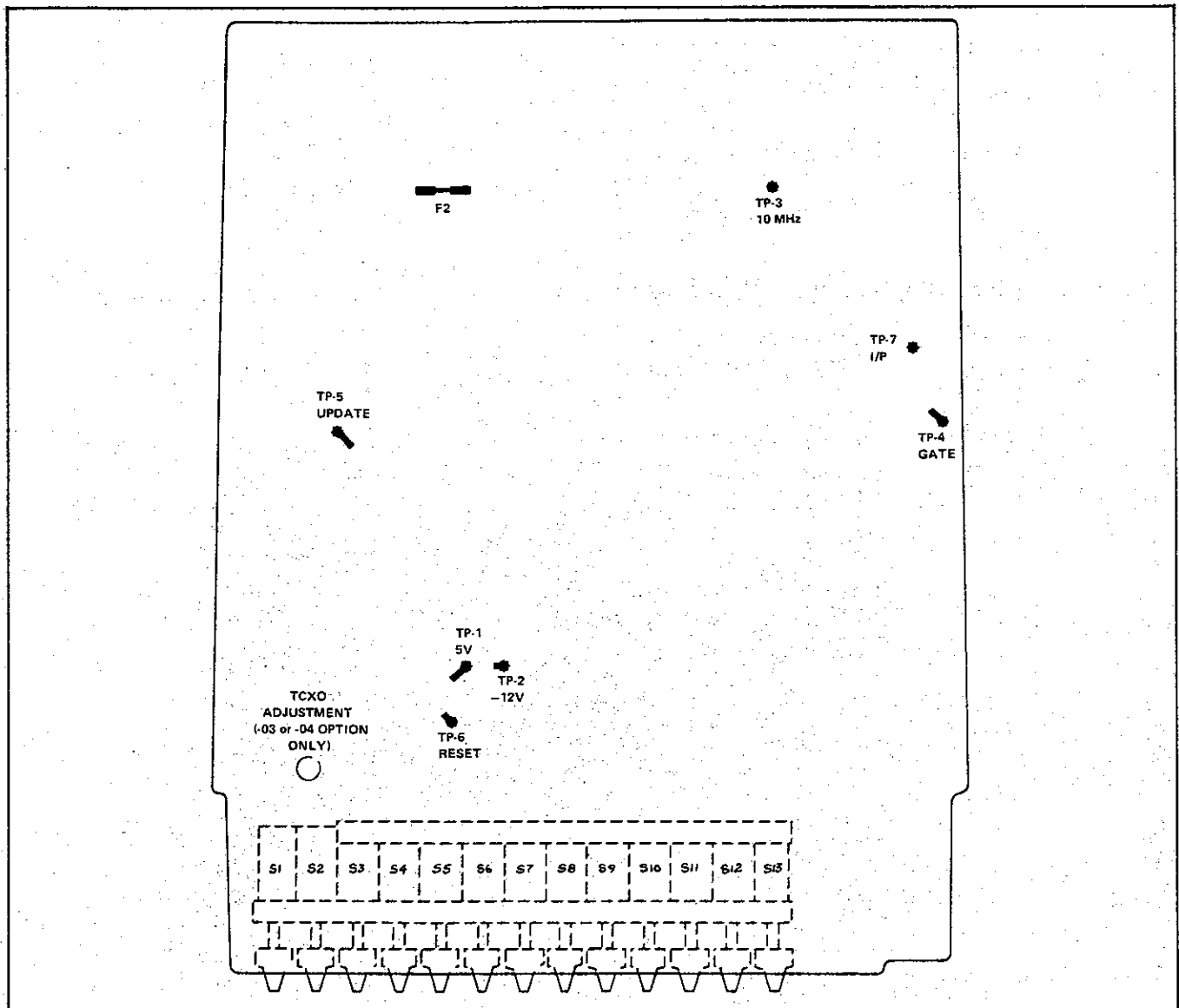



Figure 4-2. Main PCB (Bottom View)

4. Remove the unit from its case and immediately reconnect the line cord. Refer to warning under General Maintenance.
5. Using a nonconductive screwdriver, adjust the TCXO through the Main PCB (see Figure 4-2) to obtain a reading of (overflow) 000.0000 ± 3 counts in the LSD.
6. Return unit to its case, assure that reading remains constant.

4-28. TROUBLESHOOTING

CAUTION

 Static discharge can damage MOS components contained in the 1912A.

4-29. When troubleshooting or repairing the 1912A use the following precautions to prevent damage from static discharge:

1. Never remove, install or otherwise connect or disconnect components without first turning the 1912A power switch to OFF, and disconnecting the line cord.
2. Perform all repairs at a static-free work station.
3. Do not handle ICs or pcbs by their connectors.
4. Use static ground straps to discharge repair personnel.

5. Use conductive foam to store replacement of removed ICs.
6. Remove all plastic, vinyl and styrofoam products from the work area.
7. Use a grounded soldering iron.

4-30. The following discussion shall be used to isolate and correct any problems still existing after completion of the sensitivity and calibration procedures, for explana-

tion of the symbols used see Figure 4-3. The entire troubleshooting procedure for the instrument is contained in four flowcharts. The first flowchart (Figure 4-4) troubleshoots the channel A input section and its associated circuitry. The second procedure (Figure 4-5) troubleshoots the channel B input section (520 MHz Prescaler). The third flow chart (Figure 4-6) details a self-check operation for the gating and divider circuitry. The last procedure (Figure 4-7) debugs the display and the two CMOS chips, U6 & U7.

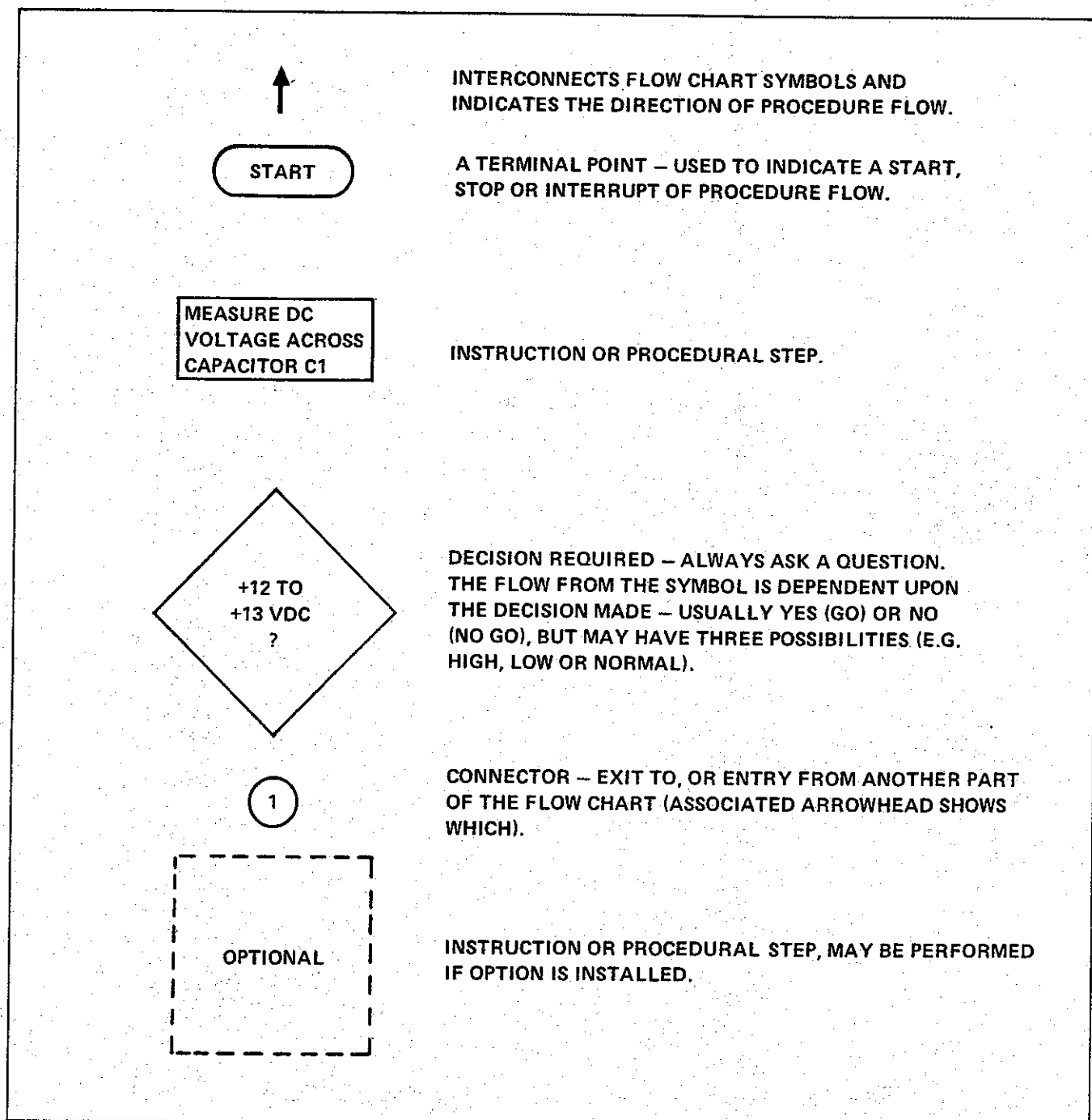


Figure 4-3. Troubleshooting Flow Chart Symbols

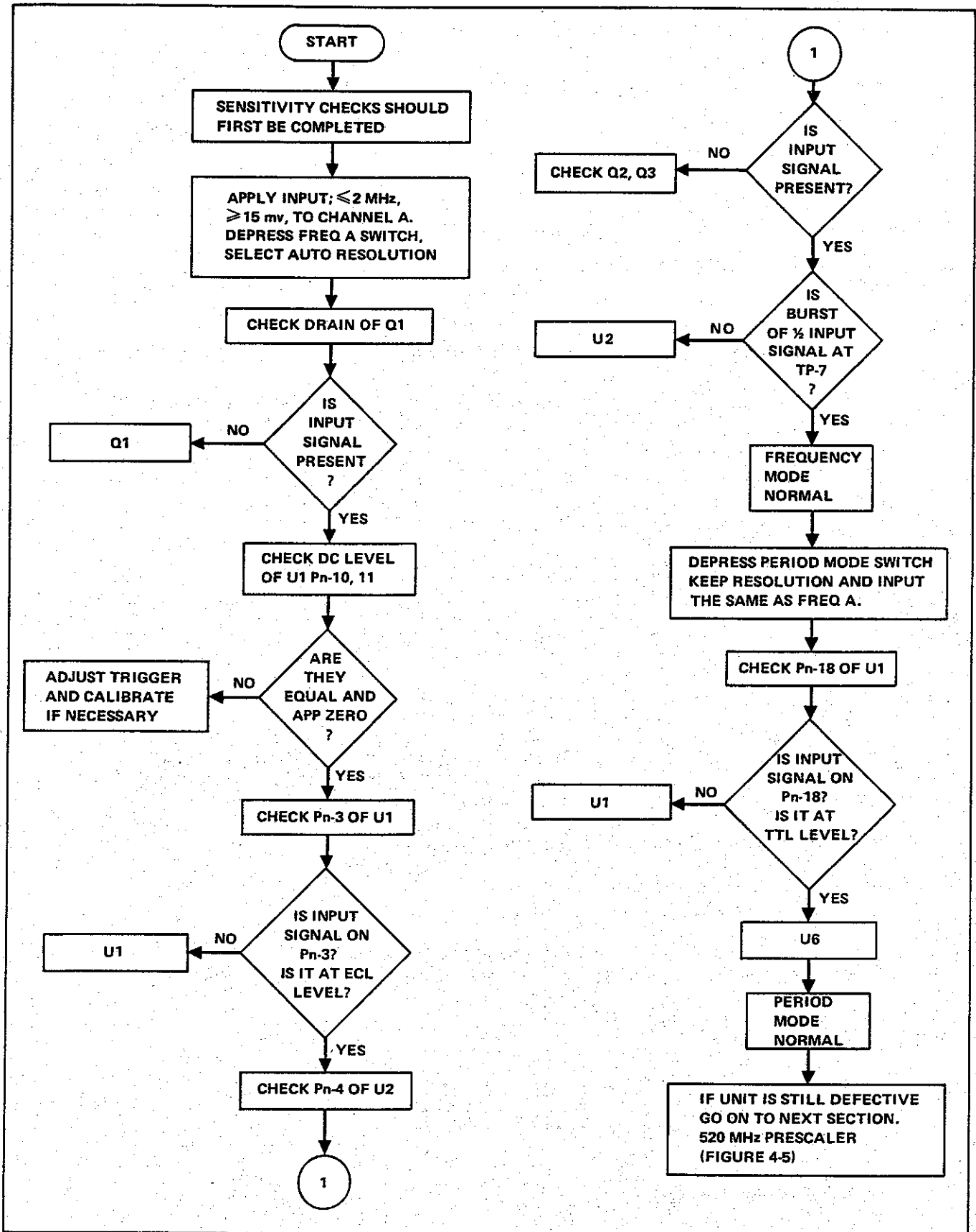


Figure 4-4. Troubleshooting Flow Chart, Input Section

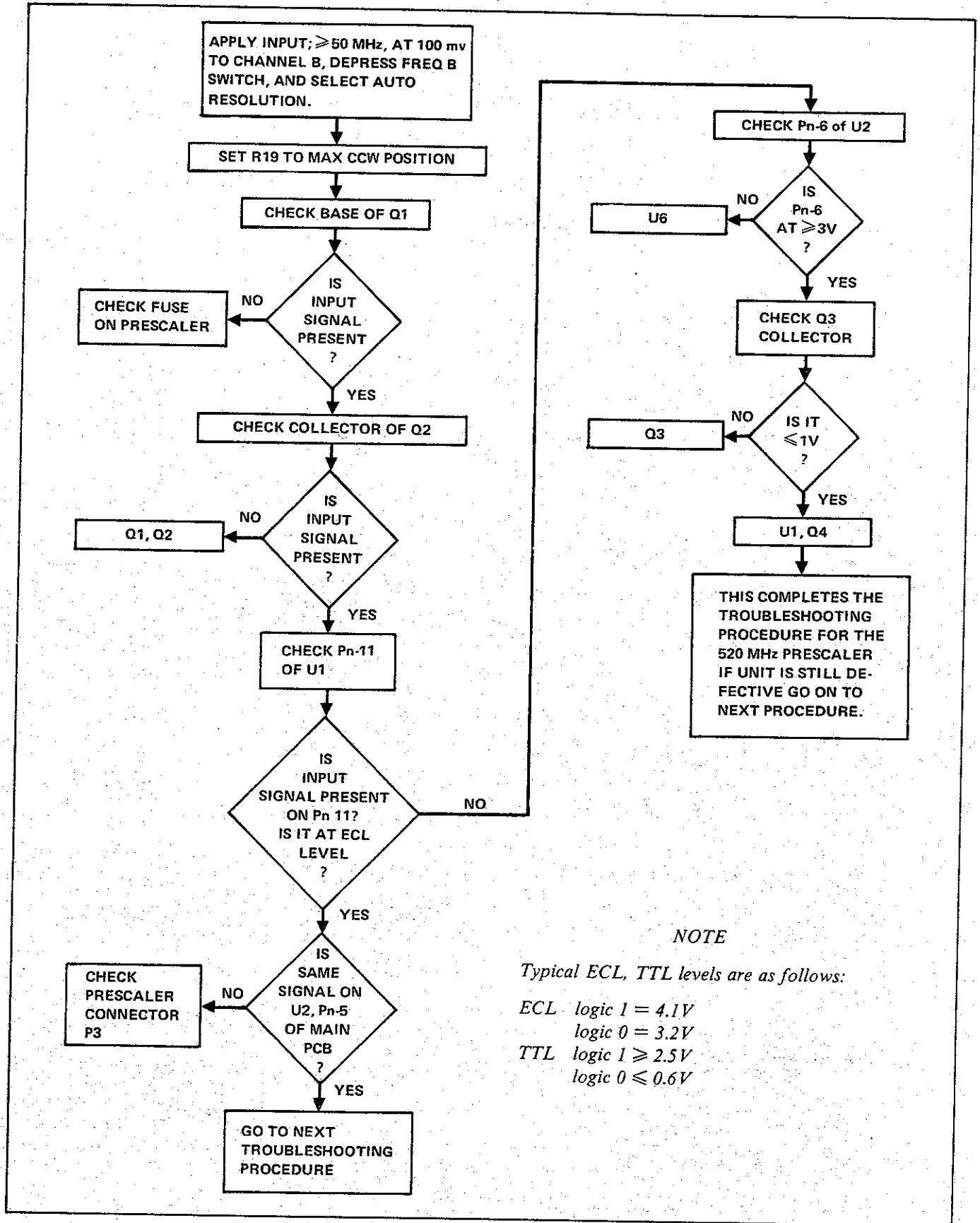


Figure 4-5. Troubleshooting Flow Chart, 520 MHz Prescaler

NOTE

Typical ECL, TTL levels are as follows:

- ECL logic 1 = 4.1V
- logic 0 = 3.2V
- TTL logic 1 ≥ 2.5V
- logic 0 ≤ 0.6V

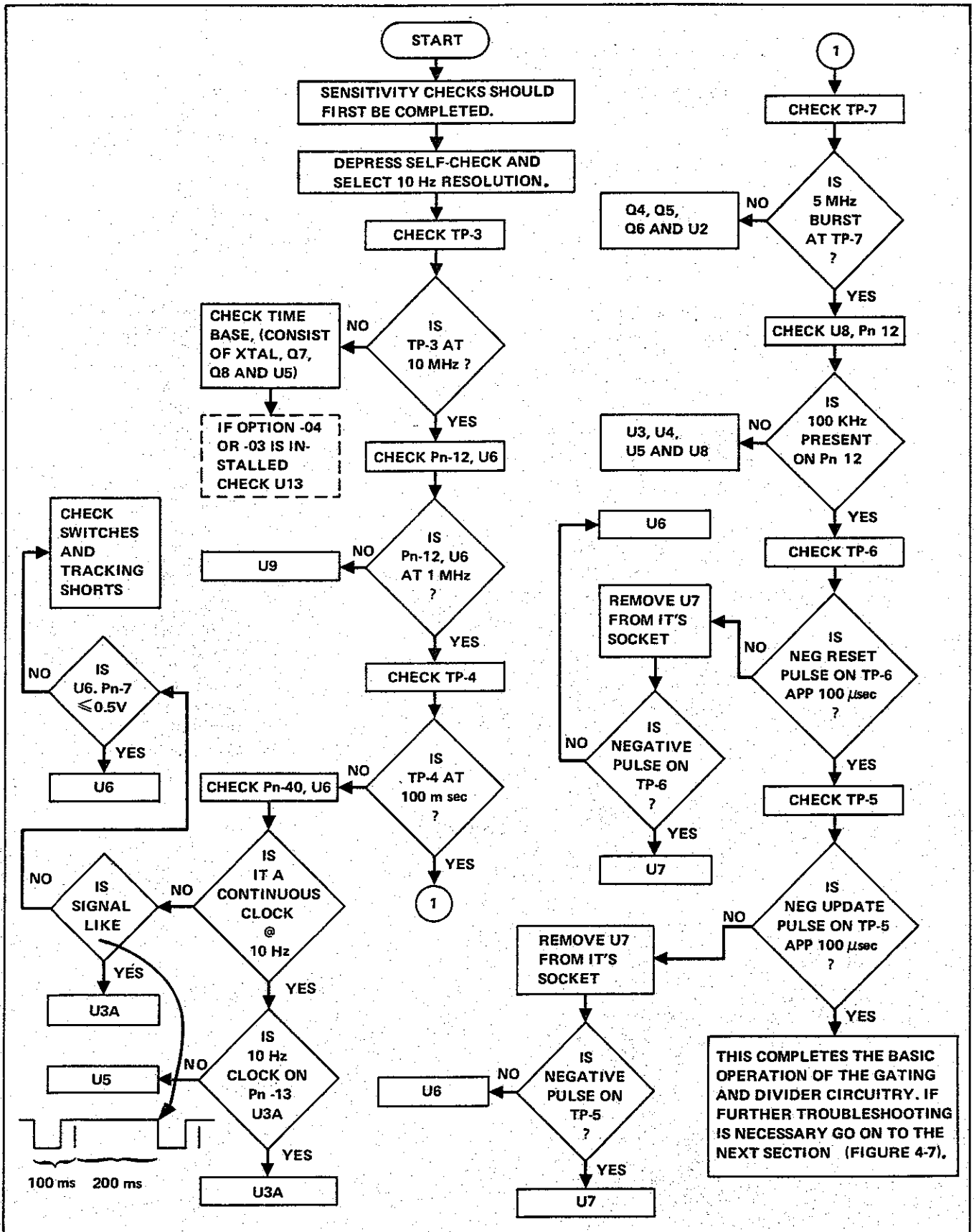


Figure 4-6. Troubleshooting Flow Chart, Time Base

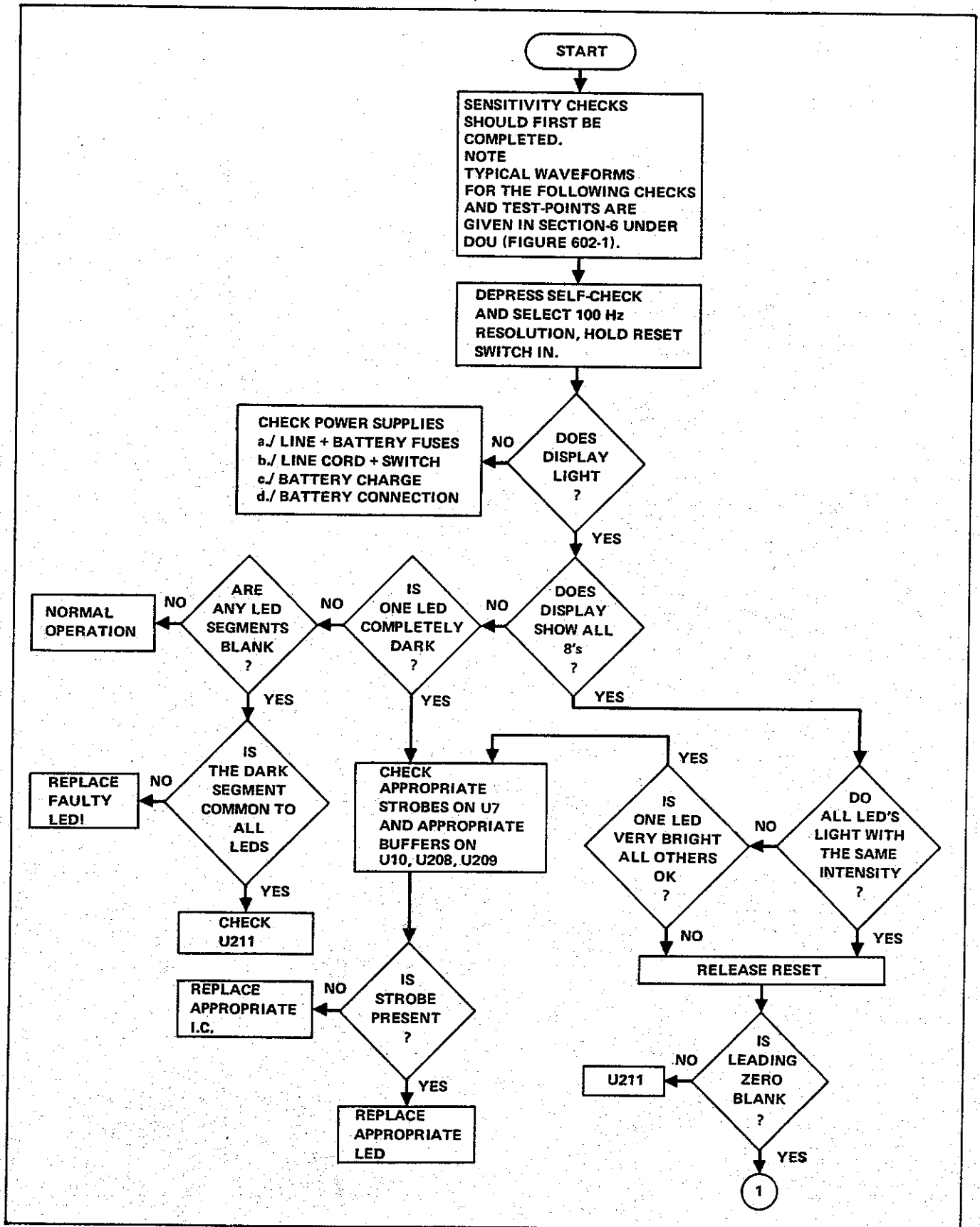


Figure 4-7. Troubleshooting Flow Chart, Display

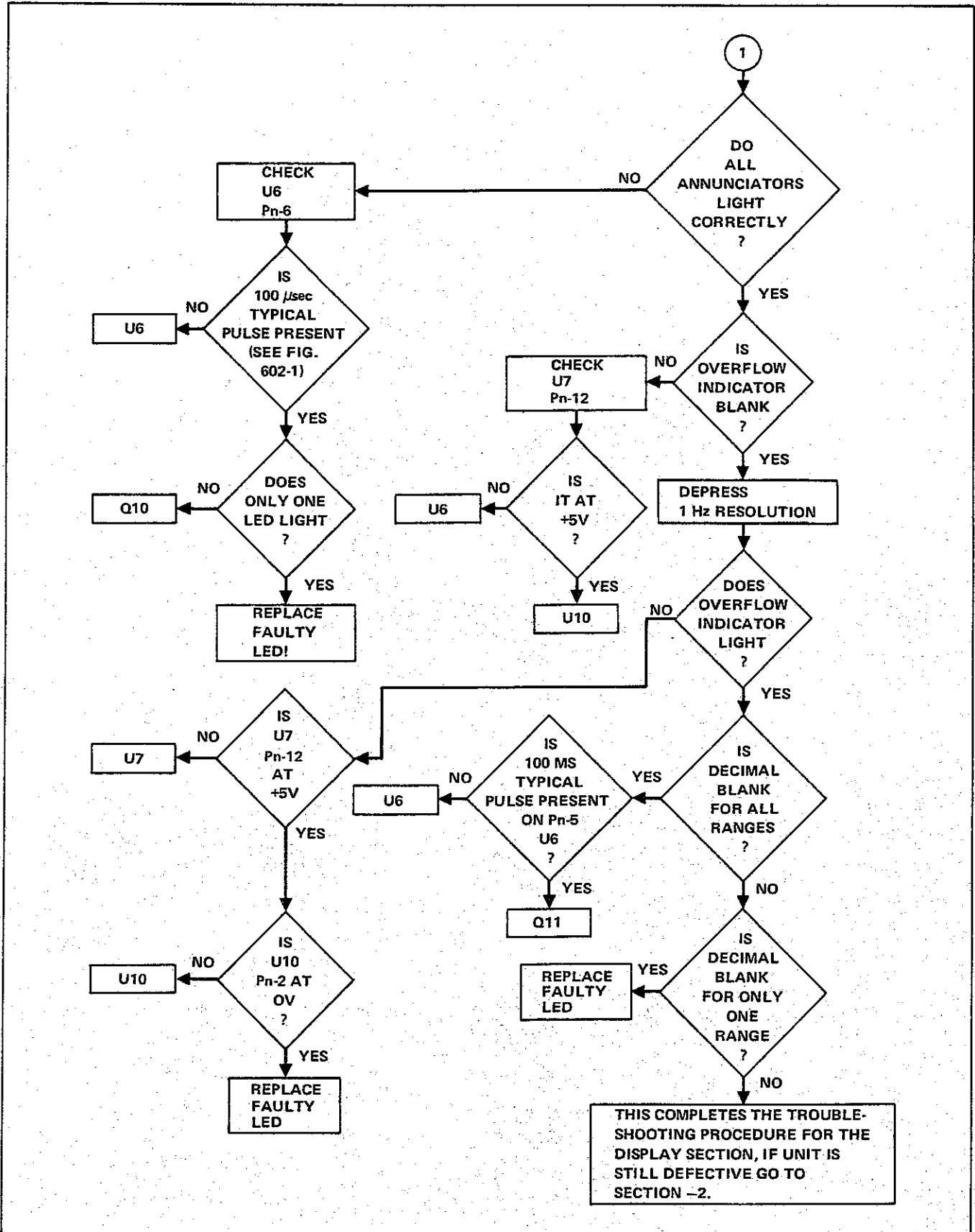


Figure 4-7. Troubleshooting Flow Chart, Display (cont)

Section 5

List of Replaceable Parts

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A1A2 520 MHz Prescaler PCB Assembly	5-4	5-13	5-4	5-15

5-1. INTRODUCTION

5-2. This section contains an illustrated parts breakdown of the instrument. Components are listed alpha-numerically by assembly. Electrical components are listed by item number. Each listed part is shown in an accompanying illustration.

5-3. Parts lists include the following information:

1. Reference Designation or Item Number to meet military specification.
2. Description of each part.
3. Fluke Stock Number.
4. Federal Supply Code for Manufacturers. (See Section 7 for Code-to-Name list).
5. Manufacturer's Part Number or Type.
6. Total Quantity per assembly or component.
7. Recommended Quantity: This entry indicates the recommending number of spare parts necessary to support one to five instruments for a period of two years. This list presumes an availability of common electronic parts at the maintenance site. For maintenance for one year or more at an isolated site, it is recommended that at least one in each assembly in the instrument be stocked. In the case of optional sub-assemblies, plug-ins, etc., that are not always part of the instrument, or are deviations from the basic instru-

ment mode, the REC QTY column lists the recommended quantity of the item in that particular assembly.

5-4. HOW TO OBTAIN PARTS

5-5. Components may be ordered directly from the manufacturer by using the manufacturer's part number, or from the John Fluke Mfg. Co., Inc. factory or authorized representative by using the **FLUKE STOCK NUMBER**. In the event the part you order has been replaced by a new or improved part, the replacement will be accompanied by an explanatory note and installation instructions, if necessary.

5-6. To ensure the prompt and efficient handling of your order, include the following information:

1. Quantity.
2. FLUKE Stock Number
3. Description
4. Reference Designation or Item Number
5. Printed Circuit Board Part Number
6. Instrument Model and Serial Number

CAUTION!

Indicates devices are subject to damage by static discharge.

Table 5-1. Final Assembly, Line Power

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	⊗ FINAL ASSY LINE POWER FIGURE 5-1	ORDER	MODEL	1912A	1		
A1	⊗ MAIN PCB ASSEMBLY FIGURE 5-2 (1912A-4001T)	ORDER	MODEL	1912A	1		
	⊗ 115/230V SOURCE FIGURE 5-2 (1912A-4010T)	ORDER	REQ	SOURCE			
	⊗ 100V SOURCE	ORDER	REQ	SOURCE			
F1	FUSE	ORDER	REQ.	SOURCE	1		
	FUSE 1/8A (100/115V SOURCE)	166488	71400	MDL1-8			10
	FUSE 1/16A (230V SOURCE)	163030	71400	MDL1-16			5
H4	SCREW, PHP, 2.56 X 1/4	149534	89536	149534	6		
H5	SCREW, PHP, 6-32 X 3/8	152165	89536	152165	1		
H6	SCREW, THD, FORMING, 6-20 X 3/8	288266	89536	288266	2		
H7	WASHER, FLAT	340505	89536	340505	2		
H8	WASHER, LOCK, INTRNL TOOTH = 2	110676	89536	110676	2		
H9	KNOB, DECAL	347401	89536	347401	2		
MP1	BASIC CASE	458331	89536	458331	1		
MP2	FOOT PAD	338632	89536	338632	2		
MP3	HANDLE, MOLDED	330092	89536	330092	1		
MP4	SHIELD, BOTTOM	458869	89536	458869	1		
MP5	SHIELD, TOP	459248	89536	459248	1		
MP6	SPECIFICATION DECAL	454199	89536	454199	1		
MP7	ADAPTER, LINE CORD 100V SOURCE ONLY (NOT SHOWN)	100222	89536	100222	1		
U6	⊗ IC, P-MOS (INSTALLED IN TEST)	460063	89536	460063	1		
U7	⊗ IC, MOS (INSTALLED IN TEST)	473215	89536	473215	1		
W10	LINE CORD, W/INT CONN (NOT SHOWN)	343723	89536	343723	1		
XF1	INSERT	460238	89536	460238	1		

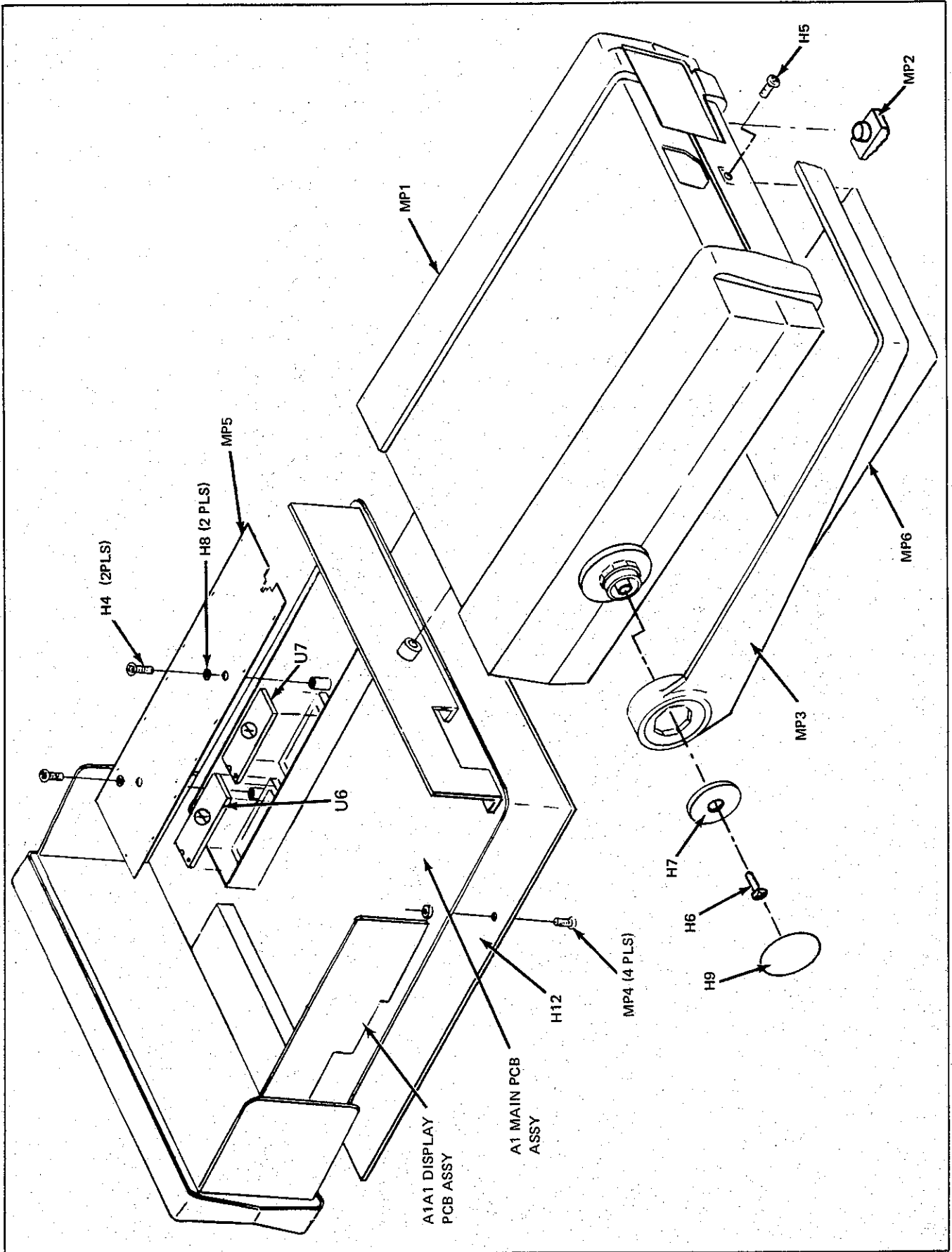


Figure 5-1. Final Assembly, Line Power

Table 5-2. A1 Main PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	⊗ MAIN PCB ASSEMBLY FIGURE 5-2 (1912A-4001)	ORDER	MODEL	1912A	1		
A1A1	⊗ DISPLAY, PCB ASSEMBLY (1910A-4020T)	462648	89536	462648	1		
A1A2	520 MHZ PRESCALER PCB ASSEMBLY (1912A-4007T)	458877	89536	458877	1		
C1	CAP, ELECT, 680 UF, 25V	218172	80031	ET681X025A02	1		
C2	CAP, ELECT, 5000 UF -10/+50%, 15V	379370	25008	B41010-5004/15	1	1	
C3	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015A1	7		
C4	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	5		
C5	CAP, VAR, 7 PF-25 PF, 350V	229948	72982	538-006B7-25	1		
C6	CAP, CER, 22 PF +/-20%, 10 KV	369157	72982	831-000-COGO-220	3		
C7	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C030B102H470J	1		
C8	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C9	CAP, CER, 0.001 UF +/-10%, 1 KV	368621	71590	DD-102	1		
C10	CAP, PLYSTYRN FIM, 0.1 UF +/-10%, 400V	447573	73445	C280M-F/A100K	1		
C11	CAP, CER, 100 PF +/-10%, 1 KV	105593	71590	DD101	1		
C12	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C13	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C14	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	2		
C15	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	6		
C16	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C17	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C18	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C19	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C20	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C21	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C22	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C23	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C24	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C25	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C26	CAP, TA, 1 UF +/-20%, 35V	161919	56289	196D105X0025JA1	2		
C27	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C28	CAP, TA, 1 UF +/-20%, 35V	161919	56289	196D105X0025JA1	REF		
C29	CAP, CER, 0.0012 UF, +/-10%, 500V	106732	71590	CF122	1		
C30	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	REF		
C31	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C32	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C33	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
CR1	DIODE, SILICON, RECTIFIER, 1-AMP	343491	21845	1N4002	2		
CR2	DIODE, SILICON, RECTIFIER, 1-AMP	343491	21845	1N4002	REF		
CR3	RECTIFIER, BRIDGE	296509	09423	FB200	1	1	
CR6	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	4	1	
CR7	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR8	DIODE, LO-CAP	381806	07910	1N3062	2	1	
CR9	DIODE, LO-CAP	381806	07910	1N3062	REF		
CR11	DIODE, ZENER, 6.8 V	260695	07910	1N754A	1	1	
CR12	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR13	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
H5	LUG, SOLDER	151431	79963	326	2		

Table 5-2. A1 Main PCB Assembly (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
H6	LUG, SOLDER	441972	79963	761	1		
H7	NUT, HEX, 1/4-32	110601	73734	1/4-32NEF2B	1		
H8	NUT, HEX, 4-40	110635	73734	8003NF	2		
H9	SCREW, PHP, 4-40 X 1/4	129890	73734	19022	5		
H11	SCREW, PHP, 6-32 X 3/16	381087	73734	19041	2		
H14	WASHER, INT LOCK #4	110403	73734	1302	3		
H15	WASHER, FLAT #5	145391	76854	2-1185-119	1		
H22	TERMINAL PINS	376574	00779	3-87022-1	5		
H23	PIN, GUIDE	375840	89536	375840	2		
J1	CONN, RECPTACLE, BNC	152033	95712	30355-1	1		
J2	CONNECTOR, RECEPTACLE, BNC	414201	02660	31-010	1		
MP3	CABLE CLAMP (NOT SHOWN)	172080	06883	SST-1M	1		
MP4	DECAL, FRONT PANEL	454207	89536	454207	1		
MP5	DECAL, WARNING (NOT SHOWN)	386250	89536	386250	1		
MP12	TRANSIPAD (NOT SHOWN)	152207	07047	10123-DAP			
MP13	RETAINER	352484	77969	9109-E	2		
MP15	CABLE TIE	331157	06383	PLT2M	1		
MP16	KNOB, POINTER ASSY.	448803	89536	448803	1		
MP17	LENS, FRONT	456582	89536	456582	1		
MP18	PANEL, FRONT	443283	89536	443283	1		
MP19	PANEL, REAR	443291	89536	443291	1		
MP21	SHEILD, WALL	459230	89536	459230	1		
Q1	XSTR, FET, JUNCTION, N-CHANNEL	288324	89536	288324	1	1	
Q2	XSTR, FET, JUNCTION, N-CHANNEL	404277	89536	404277	1	1	
Q3	XSTR SI, PNP	195974	04713	2N3906	4	1	
Q4	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q5	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q6	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q7	XSTR SI, NPN	218396	04713	2N3904	5	1	
Q8	XSTR, FET, JUNCTION, N-CHANNEL	386094	89536	386094	1	1	
Q9	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q10	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q11	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q12	XSTR, SI, NPN	218396	04713	2N3904	REF		
R1	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	5		
R2	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	4		
R3	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	3		
R4	RES, DEP. CAR, 180 +/-5%, 1/4W	441436	80031	CR251-45P180E	2		
R5	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	5		
R6	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	10		
R7	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		
R8	RES, DEP. CAR, 150 +/-5%, 1/4W	343442	80031	CR251-45P150E	2		
R9	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		
R10	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	REF		
R11	RES, VAR, CAR, 10K +/-20%, 0.20W	369553	54869	PT10V-10K	1	1	
R12	RES, SWITCH/POT, 10K	443044	89536	443044	1		
R13	RES, DEP. CAR, 22K +/-5%, 1/4W	348870	80031	CR251-45P22K	1		
R14	RES, DEP. CAR, 150K +/-5%, 1/4W	348938	80031	CR251-45P150K	1		
R15	RES, DEP. CAR, 1.5 +/-5%, 1/4W	343418	80031	CR251-45P1K5	2		
R16	RES, DEP. CAR, 1.5 +/-5%, 1/4W	343418	80031	CR251-45P1K5	REF		

Table 5-2. A1 Main PCB Assembly (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R17	RES, DEP. CAR 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R19	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R20	RES, VAR, CERMET, 10K +/-10%, 1/2W	309674	89536	309674	1		
R21	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R22	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	4		
R23	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R24	RES, DEP. CAR, 1.2K +/-5%, 1/4W	441378	80031	CR251-45P1K2	1		
R25	RES, DEP. CAR, 270 +/-5%, 1/4W	348789	80031	CR251-45P270E	1		
R26	RES, DEP. CAR, 220 +/-5%, 1/4W	342626	80031	CR251-45P220E	1		
R27	RES, DEP. CAR 33 +/-5%, 1/4W	414524	80031	CR251-45P33E	1		
R28	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R29	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R30	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	REF		
R31	RES, DEP. CAR, 150 +/-5%, 1/4W	343442	80031	CR251-45P150E	REF		
R32	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R33	RES, DEP. CAR. 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R34	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R35	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R36	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R37	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		
R38	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R39	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R41	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R42	RES, DEP. CAR, 27 +/-5%, 1/4W	348763	80031	CR251-45P27E	2		
R43	RES, DEP. CAR, 27 +/-5%, 1/4W	348763	80031	CR251-45P27E	REF		
R44	RES, DEP. CAR, 4.7K +/-5%, 1/4W	348821	80031	CR251-45P4K7	2		
R45	RES, DEP. CAR, 4.7K +/-5%, 1/4W	348821	80031	CR251-45P4K7	REF		
R46	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R48	RES, DEP. CAR, 180 +/-5%, 1/4W	441436	80031	CR251-45P180E	REF		
R49	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R50	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R51	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R52	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R53	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-455P10K	REF		
R54	RES, COMP, 820 +/-5%, 1/4W	148015	01121	CB8215	1		
R55	RES, DEP. CAR 15K +/-5%, 1/4W	348854	80031	CR251-45P15K	1		
R56	RES, COMP, 3.9K +/-5%, 1/4W	148064	01121	CB3925	1		
S1 - S13	SWITCH ASSY (13 PART W/REMOVEABLE COVER)	429589	89536	429589	1		
S1	SW, BUTTON, GREEN	445197	89536	445197	1		
S2	SW, BUTTON, BLUE	445205	89536	445205	1		
S3	SW, BUTTON, DARK GREY	426759	89536	426759	6		
S4	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S5	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S6	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S7	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S8	SW, BUTTON, LIGHT GREY	425900	89536	425900	5		
S9	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S10	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S11	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S12	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		

Table 5-2. A1 Main PCB Assembly (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
S13	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S14	SWITCH SLIDE	354878	95146	MSS22504	1		
S15	SEE R12						
T1	POWER TRANSFORMER	ORDER	FOR	APPLICABLE SOURCE	1		
	115/230V	491107	89536	491107			
	100V	491159	89536	491159			
U1	IC, DIL, ANA/BIP AMP, SCHMITT/TRIG	429191	89536	429191	1	1	
U2	IC, ECL, EDGE-TRIG JK FLIP-FLOP	402743	07263	F95029DC	1	1	
U3	IC, TTL, DUAL, JK EDGE-TRIG, FLIP-FLOP	363440	01295	SN74S112N	2	1	
U4	IC, TTL, DUAL, JK EDGE-TRIG, FLIP-FLOP	363440	01295	SN74S112N	REF		
U5	IC, QUAD, 2-INPUT, POS NOR GATES	288845	01295	SN7402N	1	1	
U6	SEE FINAL ASSY. ADDED IN TEST						
U7	SEE FINAL ASSY, ADDED IN TEST						
U8	IC, TTL, 50 MHZ DECADE COUNTER	320754	01295	SN74196N	1	1	
U9	IC, TTL, MSI DECADE COUNTER	402545	01295	SN74LS90N	1	1	
U10	⊗ IC, MOS-TO-LED, HEX/DIGIT/DRIVER	429506	12040	DS75492N	1	1	
U11	IC, LINEAR, 3-TERM NEG VOL REGULATOR	429514	07263	79M012HC	1	1	
U12	IC, LINEAR V/REGULATOR	355107	04713	MC7805CP	1	1	
U15	IC, LINEAR TIMER	402610	12040	LM555CN	1		
W1	CABLE ASSEMBLY	398461	89536	398461	1		
XF1	FUSE HOLDER, BAYONET CAP	460329	89536	460329	1		
XU1	SOCKET, IC, 18-PIN	413229	91506	318-AGC39D	1		
XU2	SOCKET, IC, 16-PIN	276535	91506	316-AGC39D	1		
XU6	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	2		
XU7	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	REF		
Y1	CRYSTAL 10 MHZ	385732	89536	385732	1		

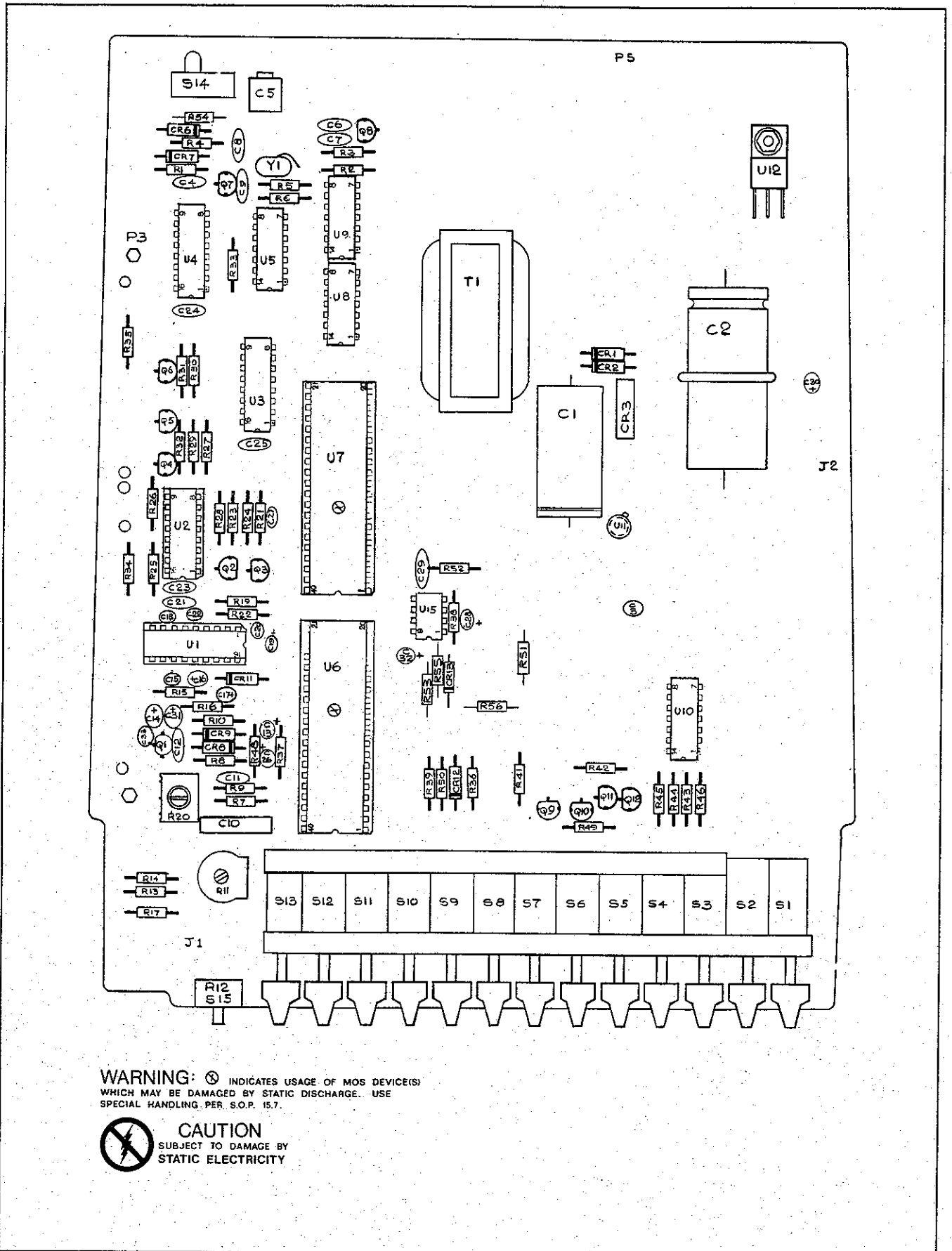


Figure 5-2. A1 Main PCB Assembly

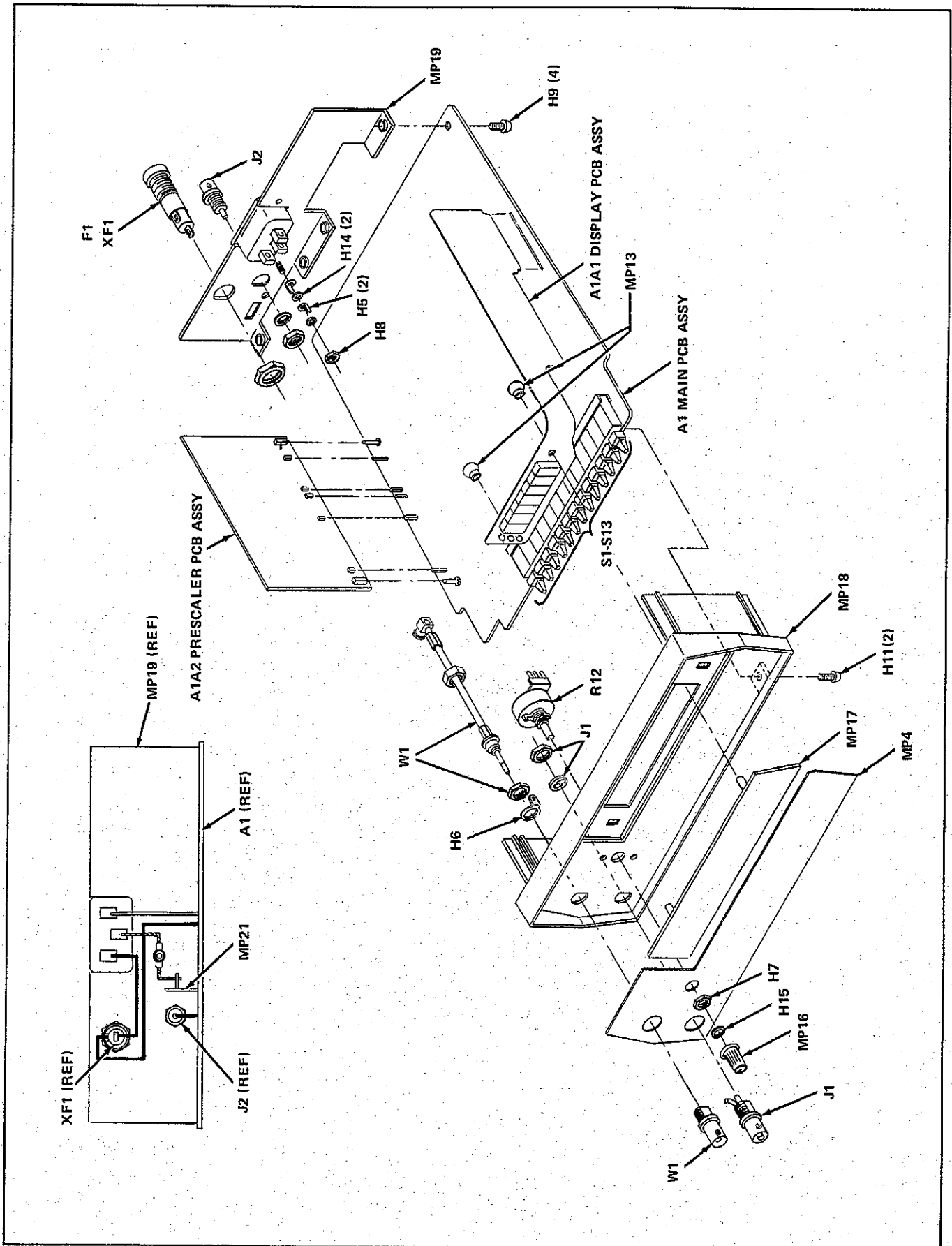


Figure 5-2. A1 Main PCB Assembly (cont)

Table 5-3. A1A1 Display PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1A1	⊗ DISPLAY PCB ASSY (1912A-4020T) FIG. 5-3	ORDER	MODEL	1912A	1		
CR201	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	4	1	
CR202	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
CR203	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
CR204	DIODE, HI-SPEED SWITCHING	203323	07910	2N4448	REF		
DS201	DIODE, LED, CLEAR	385898	28480	5082-4887	3	1	
DS202	DIODE, LED, CLEAR	385898	28480	5082-4887	REF		
DS203	DIODE, LED, CLEAR	385898	28480	5082-4887	REF		
U201	IC DISPLAY LED	472910	28480	QDSP-3017	7		
U202	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U203	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U204	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U205	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U206	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U207	IC DISPLAY LED	472910	28480	QDSP-3017	REF		
U208	⊗ IC, MOS	429506	12040	DS75492N	1	1	
U209	⊗ IC, C-MOS, HEX/BUFF, INVERTER, 16 PIN	381830	02735	CD4050AE	1	1	
U210	IC, RES NETWORK, +/-5%, 14 PIN	412866	89536	412866	1	1	
U211	⊗ IC, C-MOS	429522	04713	MC14511CP	1	1	

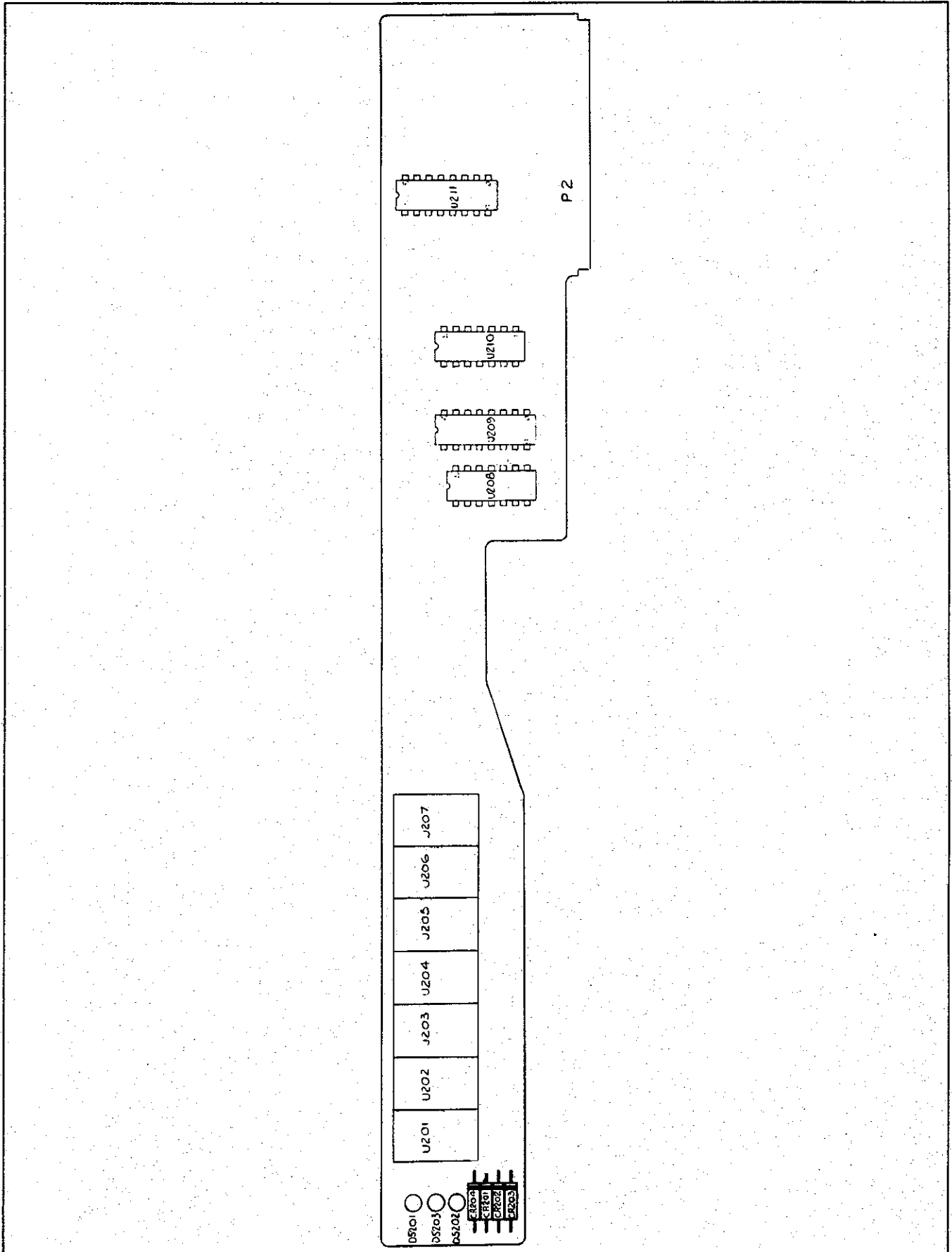


Figure 5-3. A1A1 Display PCB Assembly

Table 5-4. A1A2 520 MHz Prescaler PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1A2	520 MHZ PRESCALER ASSEMBLY FIGURE 5-4 (1912A-4007T)	458877	89536	458877			
C1	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	8		
C2	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C3	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C4	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	7		
C5	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C6	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C7	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C8	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C9	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C10	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C11	CAP, MICA, 2 PF +/-0.5 PF, 500V	175208	72136	15C020K	1		
C12	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C13	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C14	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
C16	CAP, TA, 10 UF +/-20%, 16V	193623	56289	196D106X0015KA1	2		
C17	CAP, TA, 10 UF +/-20%, 16V	193623	56289	196D106X0015KA1	REF		
C18	CAP, CER, 82 PF +/-10%, 500V	105585	72982	ED82	1		
C19	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C20	CAP, CER, 0.01 UF +/-20%, 100V	407361	72982	8121-A100-W5R-103M	REF		
CR1	DIODE, HOT CARRIER	369595	07263	FH1100	4	1	
CR2	DIODE, HOT CARRIER	369595	07263	FH1100	REF		
CR3	DIODE, HOT CARRIER	369595	07263	FH1100	REF		
CR4	DIODE, HOT CARRIER	369595	07263	FH1100	REF		
F1	FUSE, 0.2 AMP	370577	75915	273.200	2	10	
F2	FUSE, 0.2 AMP, SPARE	370577	75915	273.200	REF		
J1	CONN, JACK, BLK	149112	74790	105-0753	2		
J2	CONNECTOR, RECEPTACLE	375329	00779	85863-3	5		
J3	CONNECTOR, RECEPTACLE	375329	00779	85863-3	REF		
J4	CONNECTOR, RECEPTACLE	375329	00779	85863-3	REF		
J5	CONN, JACK, BLK	149112	74790	105-0753	REF		
J6	CONNECTOR, RECEPTACLE	375329	00779	85863-3	REF		
J7	CONNECTOR, RECEPTACLE	375329	00779	85863-3	REF		
J12	CONN, COAX, SNAP-ON	352450	98291	51-051-0000	1		
L1	INDUCTOR, BEAD, 6-TURN	320911	89536	320911	4		
L2	INDUCTOR, BEAD, 6-TURN	320911	89536	320911	REF		
L3	INDUCTOR, BEAD, 6-TURN	320911	89536	320911	REF		
L4	INDUCTOR, BEAD, 6-TURN	320911	89536	320911	REF		
Q1	XSTR, HI-FREQ	454231	89536	454231	2	1	
Q2	XSTR, HI-FREQ	454231	89536	454231	REF		
Q3	XSTR, SI, NPN	218396	04713	2N3904	1	1	
Q4	XSTR, SI, NPN	369645	04713	2N4274	1	1	
R1	RES, DEP. CAR, 180 +/-5%, 1/4W	441436	80031	CR251-4-5P180ETS	1		
R2	RES, COMP, 27 +/-5%, 1/2W	260984	01121	EB2705	1		
R3	RES, DEP. CAR, 6.2K +/-5%, 1/4W	442368	80031	CR251-4-5P6K2TS	2		
R4	RES, DEP. CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	3		
R5	RES, DEP. CAR, 100 +/-5%	348771	80031	CR251-4-5P100ETS	2		
R6	RES, DEP. CAR, 160 +/-5%, 1/4W	441410	80031	CR251-4-5P160ETS	1		
R7	RES, DEP. CAR, 51 +/-5%, 1/4W	414540	80031	CR251-4-5P51ETS	1		

Table 5-4. A1A2 520 MHz Prescaler PCB Assembly(cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R8	RES, DEP. CAR, 270 +/-5%, 1/4W	348789	80031	CR251-4-5P-270ET	1		
R9	RES, DEP. CAR, 6.2K +/-5%, 1/4W	442368	80031	CR251-4-5P6K2TS	REF		
R10	RES, DEP. CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R11	RES, DEP. CAR, 100 +/-5%	348771	80031	CR251-4-5P100ETS	REF		
R12	RES, DEP. CAR, 220 +/-5%, 1/4W	342626	80031	CR251-4-5P220ETS	1		
R13	RES, DEP. CAR, 75 +/-5%, 1/4W	441642	80031	CR251-4-5P75ETS	2		
R15	RES, DEP. CAR, 75 +/-5%, 1/4W	441642	80031	CR251-4-5P75ETS	REF		
R16	RES, DEP. CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-4-5P1K5TS	REF		
R17	RES, COMP, 470 +/-5%, 1/4W	147983	01121	CB4715	2		
R18	RES, COMP, 470 +/-5%, 1/4W	147983	01121	CB4715	REF		
R19	RES, VAR, CAR, 10K +/-20%, 0.20W	385393	54869	PT10H(2.5)10K	1		
R20	RES, DEP. CAR, 18K +/-5%, 1/4W	348862	80031	CR251-4-5P18KTS	1		
R21	RES, DEP. CAR, 3.3K +/-5%, 1/4W	348813	80031	CR251-4-5P3K3TS	1		
R22	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100KTS	2		
R23	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-4-5P100KTS	REF		
R25	RES, COMP, 5.1M +/-5%, 1/4W	296467	01121	CB5155	1		
R26	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-4-5P10KTS	1		
R27	RES, DEP. CAR, 330 +/-5%, 1/4W	368720	80031	CR251-4-5P-330ET	1		
R28	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-4-5P1KTS	1		
U1	IC, DCTL, ECL, DIVIDE-BY-FOUR, COUNTER	402719	12040	11C05DC/11C05PC	1	1	
U2	IC, LIN, OP AMP	402750	12040	LM741CN	1		
XF1	RECEPTACLE, FUSE, SPRINGTYPE	436055	22526	65358-001	2		
XF2	RECEPTACLE, FUSE, SPRINGTYPE	436055	22526	65358-001	REF		
XU1	SOCKET, IC, 14-PIN	276527	91506	314-AG39D	1		

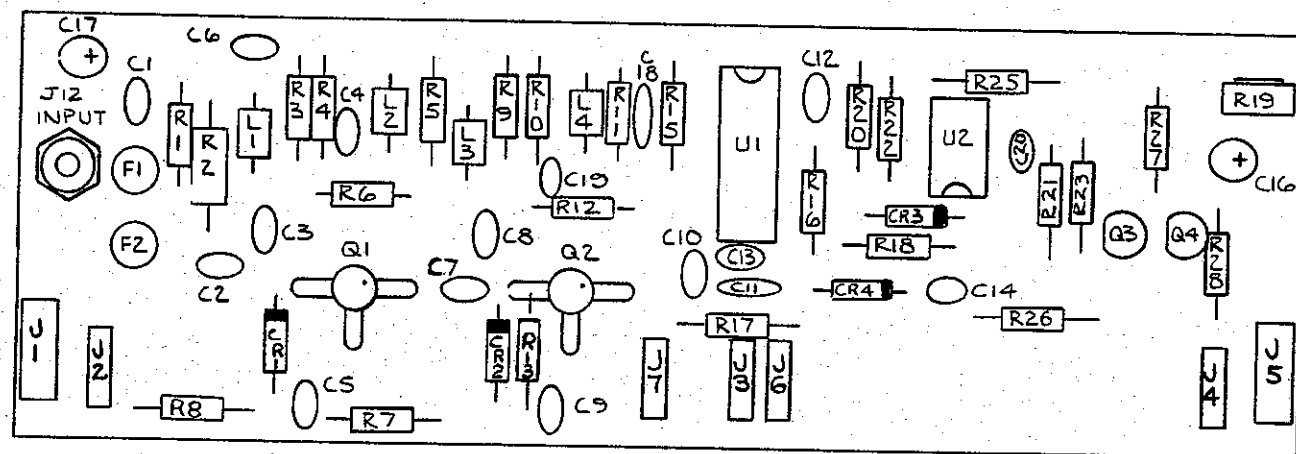


Figure 5-4. A1A2 520 MHz Prescaler PCB Assembly



Section 6 Option & Accessory Information

TABLE OF CONTENTS

OPTION/ MODEL NO.	DESCRIPTION	PAGE
	ACCESSORIES	600-1
-01	Battery Operation	601-1
-02	Data Output Unit	602-1
-03	Temperature Compensated Oscillator (TCXO)	603-1
-04	Superior Temperature Compensated Oscillator (TCXO)	603-1

6-1. INTRODUCTION

6-2. This section of the manual contains information pertaining to the accessories and options available for your instrument.

6-3. ACCESSORY INFORMATION

6-4. The accessory information, if applicable, will contain details concerning accessories that may be used with this particular instrument.

6-5. OPTION INFORMATION

6-6. Each of the options available for this instrument if any, are described separately under headings containing the option number. The option descriptions contain applicable operating and maintenance instructions and field installation procedures. A complete list of replaceable parts for each option is contained at the end of that option description.

Accessories

600-1. ACCESSORIES

600-2. Accessories for the Model 1912A are described in the following paragraphs. Refer to Section 1, Table 1-2, for the list of all accessories.

600-3. CARRYING CASE (C80)

600-4. The Model C80 Carrying Case, Figure 600-1, is a soft vinyl plastic container designed for the storage and transport of the 1912A. The case provides the multi-counter with adequate protection against normal handling and storage conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

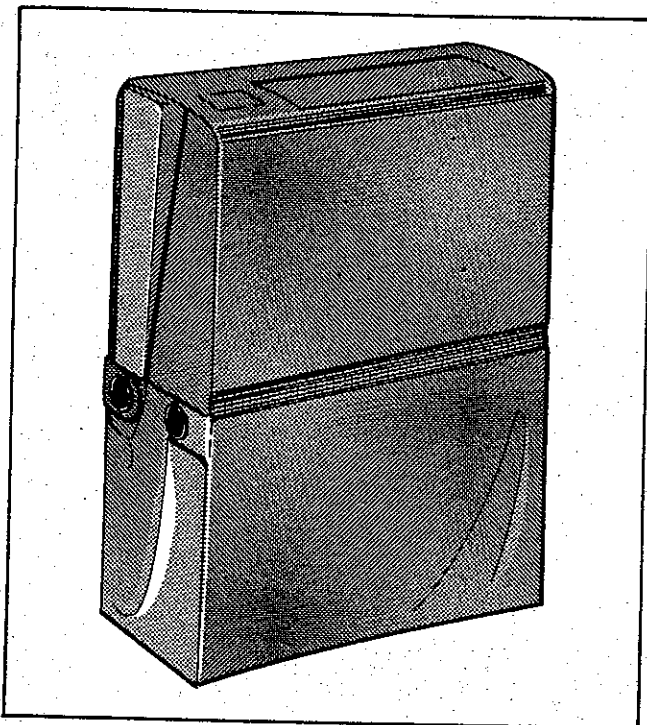


Figure 600-1. Model C80 Carrying Case

600-5. CARRYING CASE (C86)

600-6. The Model C86 Carrying Case, Figure 600-2, is a molded polyethylene container with handle designed for use in transporting the 1912A. This rugged case provides the counter with maximum protection against rough handling and adverse weather conditions. A separate storage compartment is provided for test leads, power cord, and other compact accessories.

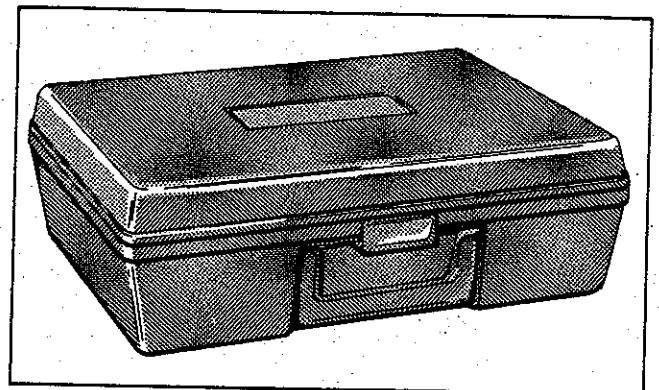


Figure 600-2. Model C86 Carrying Case

600-7. FRONT PANEL DUST COVER (MOO-100-714)

600-8. The front panel dust cover is a molded plastic snap-on accessory which fits over the front panel of the 1912A. The dust cover provides protection for the front panel controls, and is useful when storing or transporting the 1912A.

600-9. RACK MOUNTING KITS

600-10. Introduction

600-11. Three rack mounting kits are available for mounting the 1912A in a standard 19-inch equipment rack. The kits, listed in Table 600-1, provide the option of either offset mounting (left/right), center mounting or side-by-side mounting.

Table 600-1. Rack Mounting Kits

MOUNTING STYLE	MODEL NUMBER
Offset	MOO-200-611
Center	MOO-200-612
Side-By-Side	MOO-200-613

600-12. Installation Procedure

600-13. Installation instructions for each of the rack mounting kits is given in the following paragraphs. Use the procedure which corresponds to the model number of the kit being installed.

600-14. OFFSET AND CENTER MOUNTING KITS (MOO-200-611 & MOO-200-612)

1. Remove the Multi-Counter carrying handle by removing the handle disc decals and the handle mounting screws.
2. Remove screw from rear of case and separate the case from the 1912A unit.
3. Install the side mounting brackets, as shown in Figure 600-3, 600-4 and secure them to the mounting panel using the nuts provided.
4. Insert the front of the Multi-Counter's case through the opening on the back side of the mounting panel.
5. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.
6. Slide the 1912A through the mounting panel and into the case. Install and tighten the retaining screw at the rear of the case.

600-15. SIDE-BY-SIDE MOUNTING KIT (MOO-200-613)

1. Remove the carrying handles from both instruments by removing the handle disc decals and the handle mounting screws (Figure 600-5).
2. Remove the retaining screw from the rear of the cases and separate the instruments from their cases.
3. Install the center mounting bracket, as shown in Figure 600-5, and secure it to the mounting panel using the nuts provided.
4. Install the clamp screw in the center mounting bracket using the nuts and washers provided.
5. Insert the front of the instrument cases through the openings on the back side of the mounting panel. Make sure the case's handle mounting bosses are inserted into the clamp hole of the center mounting bracket.
6. Tighten the clamp screw.
7. Install the side mounting brackets and secure them to the front panel using the nuts provided.
8. Install the handle mounting screws through the side brackets into the handle mounting bosses. Don't over tighten these screws.
9. Slide the instruments through the mounting panel and into their cases. Install and tighten the retaining screw at the rear of both cases.

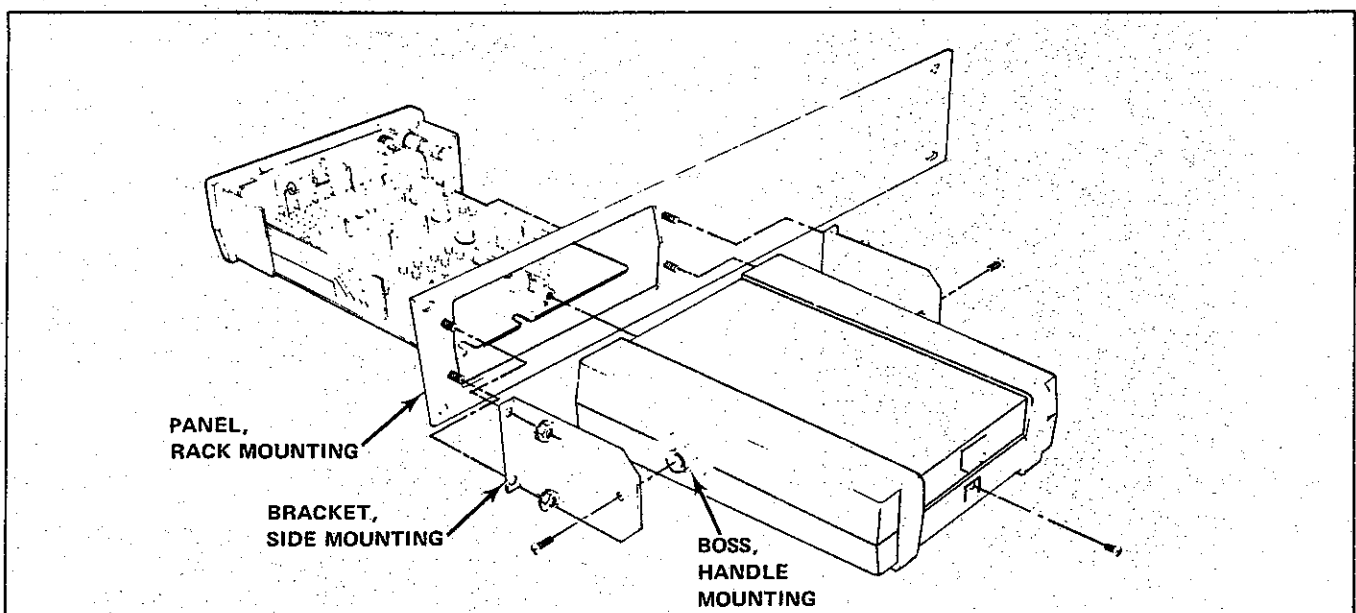


Figure 600-3. Rack Mounting Kit, Offset Mounting

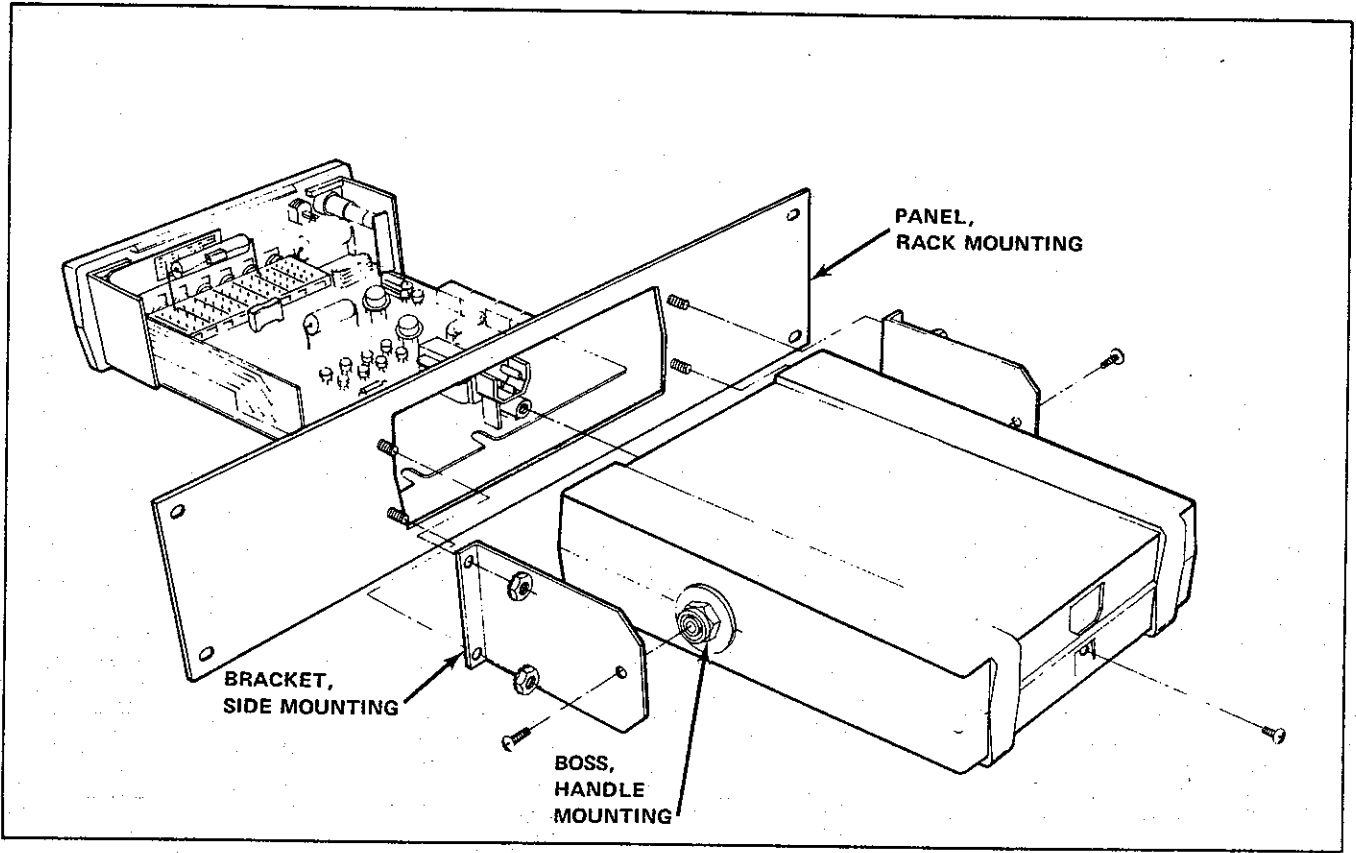


Figure 600-4. Rack Mounting Kit, Center Mounting

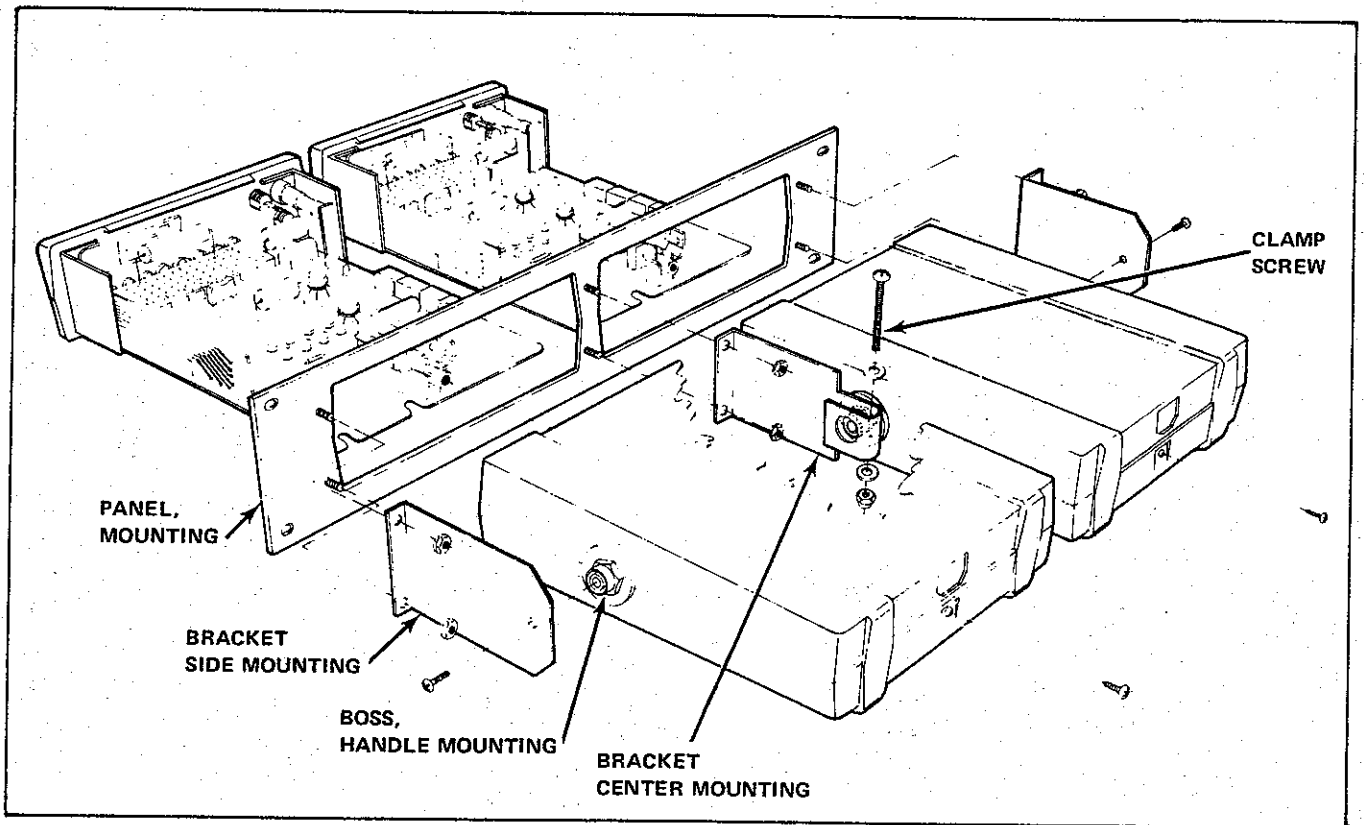


Figure 600-5. Rack Mounting Kit, Side-By-Side Mounting



Option —01 Battery Pack

WARNING

WHEN THE COUNTER IS OPERATING FROM THE BATTERY PACK THE UNIT WILL HAVE NO GROUND REFERENCE AND INPUT TO THE COUNTER MUST BE LIMITED TO A MAX. OF 30V.

601-1. INTRODUCTION

CAUTION

Any attempt to charge alkaline, zinc-carbon, or mercury batteries may damage the instrument.

601-2. Power for the instrument with the —01 Option installed is supplied by internal rechargeable batteries that allow the instrument to operate for at least four hours. The batteries should be recharged after every four hours of operation or when the input sensitivity falls below specifications. Recharging is most rapidly accomplished by connecting the counter to the line and depressing the POWER switch to the STBY position. In this way, the discharged batteries can be completely recharged in approximately 16 hours. The instrument can be operated while recharging, however the recharging time will be significantly extended.

NOTE

Battery manufacturers recommend that nickel-cadmium batteries not be stored for extended periods of time without recharging at least every 90 days. Storage temperature below 25° C is recommended.

601-3. Input Power (—01 Option)

601-4. To enable the unit to be compatible with international line voltages and frequencies it has been

designed to operate from the following configurations: 100V 48-52, 58-62 Hz, 115V 58-62 Hz, and 230V 48-52 Hz. Therefore for battery charging purposes, the AC PCB 601-4 unique for that particular line voltage and frequency must be used (See AC PCB Parts List, and schematic Section 6). These modifications shall be initiated by ordering the battery option and specifying the line voltages and frequencies the unit shall be operated from.

601-5. AC PCB

601-6. The AC PCB modifies the Main PCB -01, such that the unit is capable of charging the batteries from the various input voltages and frequencies. Basically the circuit is a constant current source determined by the value of the input capacitor C601.

601-7. Inverter PCB

601-8. The Inverter PCB is a DC converter used to change the +4V battery output to -12V (a level compatible with all input power configurations).

601-9. BATTERY & FUSE REPLACEMENT

CAUTION

Disconnect the instrument from the input line power before removing batteries.

601-10. The procedure described below provides step-by-step instructions for replacing the batteries.

1. Disconnect the line power cord. Remove retainer screw from the rear of instrument's case, and remove instrument from case.
2. On the underside of the Main PCB, remove two threaded bolts securing battery holders in place.

3. Remove holder tops and batteries
4. Replace batteries with 1.2 volt nickel-cadmium batteries (JF Part No. 346924). Install the batteries adhering to polarity indications on Main PCB.

NOTE

Use 1.2 volt nickel-cadmium batteries only.

601-11. The procedure described below provides step-by-step instructions for replacing the battery fuse.

1. Disconnect line power cord. Remove retainer screw from rear of instrument case, and remove instrument from its case.
2. Remove bottom shield.
3. The fuse is located directly on the underside of the Main PCB. It is clearly marked (Fuse), and may be checked visually.
4. Replace fuse if necessary by ordering: Part No. 167312.

Table 601-1. Final Assembly, Battery Power

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
	⊗ FINAL ASSY BATTERY POWER	ORDER	1912A	-01 OPTION			
	FIGURE 601-1						
A1	MAIN PCB ASSEMBLY	ORDER	1912A	-01 OPTION			
	FIGURE 601-2 (1912A-4011)						
	115/230V, 100V SOURCE	ORDER	REQ	SOURCE			
A2	INVERTER PCB ASSEMBLY	443333	89536	443333	1		
	FIGURE 601-3 (1910A-4004T)						
A3	AC PCB ASSEMBLY	SEE	AC	PCB ASSEMBLY	1		
H4	SCREW, PHP, 2-56X1/4	149534	89536	149534	6		
H5	SCREW, PHP, 6-32X3/8	152165	89536	152165	1		
H6	SCREW, THD, FORMING, 6-20 X 3/8	288266	89536	288266	2		
H7	WASHER, FLAT	340505	89536	340505	2		
H8	WASHER, INT LOCK #2	110676	89536	110676	2		
MP1	CASE, BASIC	458331	89536	458331	1		
MP2	FOOT, PAD	338632	89536	338632	2		
MP3	HANDLE, MOLDED	330092	89536	330092	1		
MP9	KNOB, DECAL	347401	89536	347401	2		
MP11	PLUG-IN ADAPTOR, 100V (NOT SHOWN)	100220	89536	100220	1		
MP12	SHIELD, BOTTOM	458869	89536	458869	1		
MP13	SHIELD, TOP	459248	89536	459248	1		
MP14	DECAL, SPEC. (NOT SHOWN)	454199	89536	454199	1		
MP15	DECAL, WARNING (NOT SHOWN)	454546	89536	454546	1		
U6	⊗ IC, P-MOS PROGRAMAR	460063	89536	4660063	1		
U7	⊗ IC, MOS 7 DIGIT, 2.5 MHZ, DECI/CTR	473215	89536	473215	1		
W10	LINE CORD W/INT. CONN (NOT SHOWN)	343723	89536	343723	1		

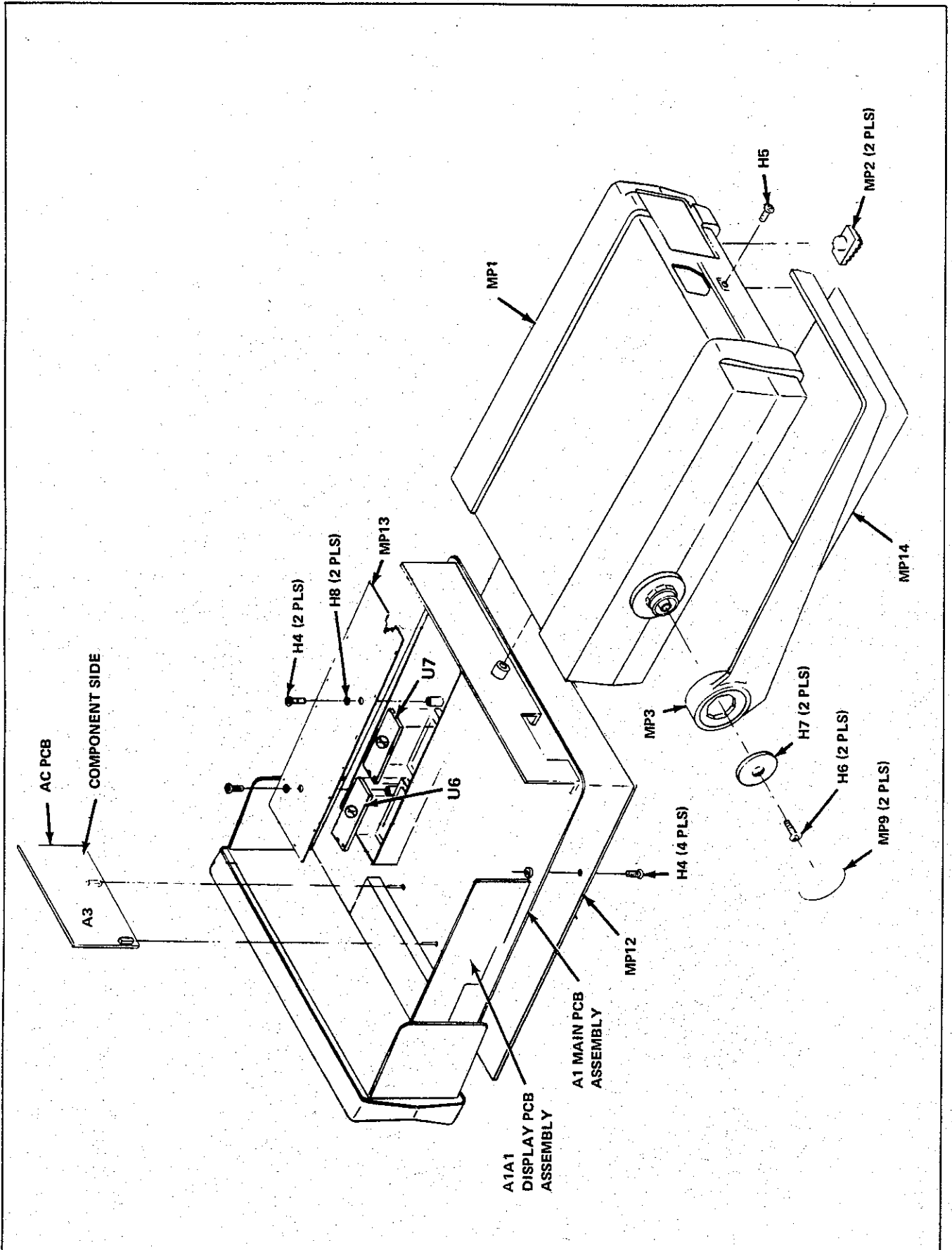


Figure 601-1. Final Assembly, Battery Power

Table 601-2. A1 Main PCB Assembly, Battery

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A1	⊗ MAIN PCB ASSEMBLY, BATTERY FIGURE 601-2 (1912A-4011)	ORDER	MODEL	1912A-01	1		
A1A1	⊗ DISPLAY, PCB ASSEMBLY (1910A-4020T)	462648	89536	462648	1		
A1A2	520 MHZ PRESCALER PCB ASSEMBLY (1912A-4007T)	458877	89536	458877	1		
BT1	BATTERY, NI-CAD	346924	06001	41B004A015	4	4	
BT2	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
BT3	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
BT4	BATTERY, NI-CAD	346924	06001	41B004A015	REF		
C1	CAP, ELECT, 10,000 UF -10/+100%, 6V	387241	25088	B41010/100006	1	1	
C4	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	5		
C5	CAP, VAR, 7 PF-25 PF, 350V	229948	72982	538-006B7-25	1		
C6	CAP, CER, 22 PF +/-20%, 10 KV	369157	72982	831-000-COGO-220	3		
C7	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C030B102H470J	1		
C8	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C9	CAP, CER, 1000 PF +/-10%, 1100V	368621	71590	DD-102	1		
C10	CAP, PLYSTYRN FILM, 0.1 UF +/-10%, 400V	447573	73445	C280M-F/A100K	1		
C11	CAP, CER, 100 PF +/-10%, 1 KV	105593	71590	DD101	1		
C12	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C13	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	6		
C14	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	2		
C15	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	6		
C16	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C17	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C18	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C19	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C20	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C21	CAP, CER, 22 PF, +/-20%, 10KV	369157	72982	831-000-COGO-220	REF		
C22	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C23	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C24	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C25	CAP, CER, 0.01 UF +/-20%, 100V	149153	56289	C023B101F103	REF		
C26	CAP, TA, 1 UF +/-20%, 35V	161919	56289	196D105X0025JA1	2		
C27	CAP, CER, 0.001 UF +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
C28	CAP, TA, 1 UF +/-20%, 35V	161919	56289	196D105X0025JA1	REF		
C29	CAP, CER, 0.0012 UF, +/-10%, 500V	106732	71590	CF122	1		
C30	CAP, TA, 22 UF, +/-20%, 15V	423012	56289	196D226X0015KA1	REF		
C31	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C32	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D106X0015KAI	REF		
C33	CAP, CER, 0.001 UF, +/-20%, 100V	402966	72982	8121-A100-W5R-102M	REF		
CR1	DIODE, SILICON, RECTIFIER, 1-AMP	343491	03877	IN4002	2	1	
CR2	DIODE, SILICON, RECTIFIER, 1-AMP	343491	03877	IN4002	REF		
CR6	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	4	1	
CR7	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR8	DIODE, LO-CAP	381806	07910	1N3062	2	1	
CR9	DIODE, LO-CAP	381806	07910	1N3062	REF		
CR11	DIODE, ZENER, 6.8 V	260695	07910	1N754A	1	1	
CR12	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		
CR13	DIODE, HI-SPEED SWITCH	203323	07910	1N4448	REF		

Table 601-2. A1 Main PCB Assembly, Battery (cont)

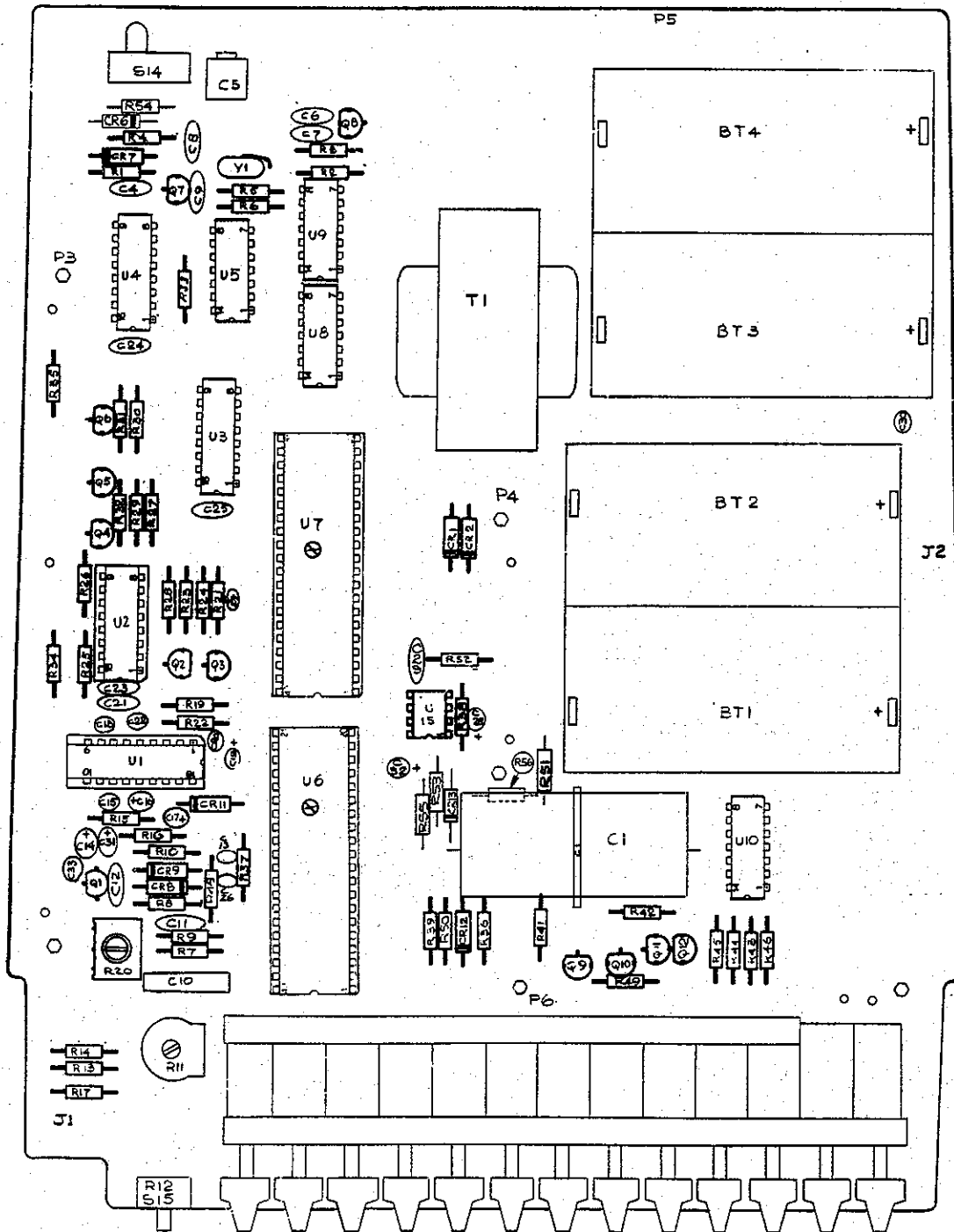
ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
F1	FUSE, 1/2A	109322	71400	MDL	1	5	
H5	LUG, SOLDER	151431	79963	329	2		
H6	LUG, SOLDER	441972	79963	761	1		
H7	NUT, HEX, 1/4-32	110601	73734	1/4-32NEF2B	1		
H8	NUT, HEX, 4-40	110635	73734	8003NF	1		
H9	SCREW, PHP, 4-40 X 1/4	129890	73734	19022	4		
H10	NUT, HEX 6-32	110551	89536	110551	2		
H11	SCREW, PHP, 6-32 X 3/16	381087	73734	19041	2		
H12	SCREW, 6-32 X 1.56	347427	89536	347427	2		
H14	WASHER, INT LOCK #4	110403	73734	1302	2		
H15	WASHER, FLAT #5	145391	76854	2-1185-119	1		
J1	CONN, RECEPTACLE, BNC	152033	95712	30355-1	1		
J2	CONN, RECEPTACLE, BNC	414201	02660	31-010	1		
MP1	ABSORBANT DISC.	458653	89536	458653	4		
MP2	ABSORBANT PAD	458661	89536	458661	2		
MP3	CABLE CLAMP (NOT SHOWN)	172080	06883	SST-1M	1		
MP4	DECAL, FRONT PANEL	454363	89536	454363	1		
MP5	DECAL, WARNING (NOT SHOWN)	386250	89536	386250	1		
MP12	HOLDER, BATTERY	390450	89536	390450	4		
MP13	RETAINER	352484	77969	9109-E	2		
MP15	CABLE TIE	331157	06383	PLT2M	1		
MP16	KNOB, POINTER ASSEMBLY	448803	89536	448803	1		
MP17	LENS, FRONT	456582	89536	456582	1		
MP18	PANEL, FRONT	443283	89536	443283	1		
MP19	PANEL, REAR	443291	89536	443291	1		
MP21	SHEILD, WALL (NOT SHOWN)	459230	89536	459230	1		
MP24	TERMINAL, PINS	376574	00779	3-87022-1	9		
MP25	PIN, GUIDES	375840	89536	375840	6		
MP27	CONTACT BATTERY (TO BT1 THRU BT4)	344200	89536	344200	8		
Q1	XSTR, FET, JUNCTION, N-CHANNEL	288324	89536	288324	1	1	
Q2	XSTR, FET, JUNCTION, N-CHANNEL	404277	89536	404277	1	1	
Q3	XSTR, SI, PNP	195974	04713	2N3906	4	1	
Q4	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q5	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q6	XSTR, SI, PNP	195974	04713	2N3906	REF		
Q7	XSTR, SI, NPN	218396	04713	2N3904	5	1	
Q8	XSTR, FET, JUNCTION, N-CHANNEL	386094	89536	386094	1	1	
Q9	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q10	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q11	XSTR, SI, NPN	218396	04713	2N3904	REF		
Q12	XSTR, SI, NPN	218396	04713	2N3904	REF		
R1	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	5		
R2	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	4		
R3	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	3		
R4	RES, DEP. CAR, 180 +/-5%, 1/4W	441436	80031	CR251-45P180E	2		
R5	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	5		
R6	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	10		
R7	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		
R8	RES, DEP. CAR, 150 +/-5%, 1/4W	343442	80031	CR251-45P150E	2		
R9	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		

Table 601-2. A1 Main PCB Assembly, Battery (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
R10	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	REF		
R11	RES, VAR, CAR, 10K +/- 20%, 0.20 W	369553	54869	PT10V-10K	1	1	
R12	RES, SWITCH/POT, 10K	443044	89536	443044	1		
R13	RES, DEP. CAR, 22K +/-5%, 1/4W	348870	80031	CR251-45P22K	1		
R14	RES, DEP. CAR, 150K +/-5%, 1/4W	348938	80031	CR251-45P150K	1		
R15	RES, DEP. CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-45P1K5	2		
R16	RES, DEP. CAR, 1.5K +/-5%, 1/4W	343418	80031	CR251-45P1K5	REF		
R17	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R19	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R20	RES, VAR, CERMET, 10K +/-10%, 1/2W	309674	89536	309674	1		
R21	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R22	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	4		
R23	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R24	RES, DEP. CAR, 1.2K +/-5%, 1/4W	441378	80031	CR251-45P1K2	1		
R25	RES, DEP. CAR, 270 +/-5%, 1/4W	348789	80031	CR251-45P270E	1		
R26	RES, DEP. CAR, 220 +/-5%, 1/4W	342626	80031	CR251-45P220E	1		
R27	RES, DEP. CAR, 33 +/-5%, 1/4W	414524	80031	CR251-45P33E	1		
R28	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R29	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R30	RES, DEP. CAR, 2.7K +/-5%, 1/4W	386490	80031	CR251-45P2K7	REF		
R31	RES, DEP. CAR, 150 +/-5%, 1/4W	343442	80031	CR251-45P150E	REF		
R32	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R33	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R34	RES, DEP. CAR, 1K +/-5%, 1/4W	343426	80031	CR251-45P1K	REF		
R35	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R36	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R37	RES, DEP. CAR, 1M +/-5%, 1/4W	348987	80031	CR251-45P1M	REF		
R38	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R39	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R41	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R42	RES, DEP. CAR, 27 +/-5%, 1/4W	348763	80031	CR251-45P27E	2		
R43	RES, DEP. CAR, 27 +/-5%, 1/4W	348763	80031	CR251-45P27E	REF		
R44	RES, DEP. CAR, 4.7K +/-5%, 1/4W	348821	80031	CR251-45P4K7	2		
R45	RES, DEP. CAR, 4.7K +/-5%, 1/4W	348821	80031	CR251-45P4K7	REF		
R46	RES, DEP. CAR, 560 +/-5%, 1/4W	385948	80031	CR251-45P560E	REF		
R48	RES, DEP. CAR, 180 +/-5%, 1/4W	441436	80031	CR251-45P180E	REF		
R49	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R50	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R51	RES, DEP. CAR, 100K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R52	RES, DEP. CAR, 10K +/-5%, 1/4W	348920	80031	CR251-45P100K	REF		
R53	RES, DEP. CAR, 10K +/-5%, 1/4W	348839	80031	CR251-45P10K	REF		
R54	RES, COMP, 820 +/-5%, 1/4W	148015	01121	CB8215	1		
R55	RES, DEP. CAR, 15K +/-5%, 1/4W	348854	80031	CR251-45P15K	1		
R56	RE, DEP. CAR, 3.9K +/-5%, 1/4W	148064	01121	CB3925	1		
S1 - S13	SWITCH ASSY (13 PART W/REMOVEABLE COVER)	429589	89536	429589	1		
S1	SW. BUTTON, GREEN	445197	89536	445197	1		
S2	SW. BUTTON, BLUE	445205	89536	445205	1		
S3	SW. BUTTON, DARK GREY	426759	89536	426759	6		
S4	SW. BUTTON, DARK GREY	426759	89536	426759	REF		
S5	SW. BUTTON, DARK GREY	426759	89536	426759	REF		

Table 601-2. A1 Main PCB Assembly, Battery (cont)

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
S6	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S7	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S8	SW, BUTTON, LIGHT GREY	425900	89536	425900	5		
S9	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S10	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S11	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S12	SW, BUTTON, LIGHT GREY	425900	89536	425900	REF		
S13	SW, BUTTON, DARK GREY	426759	89536	426759	REF		
S14	SWITCH SLIDE	354878	95146	MSS22504	1		
S15	SEE R12						
T1	PWR, XFMR, BATTERY OPTION	463802	89536	463802	1		
U1	IC, DIL, ANA/BIP AMP, SCHMITT/TRIG	429191	89536	429191	1	1	
U2	IC, ECL, EDGE-TRIG, JK FLIP-FLOP	402743	07263	F95029DC	1	1	
U3	IC, TTL, DUAL, JK EDGE-TRIG, FLIP-FLOP	363440	01295	SN74S112N	2	1	
U4	IC, TTL, DUAL JK EDGE-TRIG, FLIP-FLOP	363440	01295	SN74S112N	REF		
U5	IC, QUAD, 2-INPUT, POS NOR GATES	288845	01295	SN7402N	1	1	
U6	SEE FINAL ASSY. ADDED IN TEST						
U7	SEE FINAL ASSY. ADDED IN TEST						
U8	IC, TTL, 50 MHZ DECADE COUNTER	320754	01295	SN74196N	1	1	
U9	IC, TTL, MSI DECADE COUNTER	402545	01295	SN74LS90N	1	1	
U10	⊗ TC, MOS-TO-LED, HEX/DIGIT/DRIVER	429506	12040	DS75492N	1	1	
U15	IC, LINEAR TIMER	402610	12040	LM555CN	1		
W1	CABLE ASSEMBLY	398461	89536	398461	1		
XF1	FUSE HOLDER, BAYONET CAP	460329	89536	460329	1		
XF2	FUSEHOLDER	460238	89536	460238	1		
XU1	SOCKET, IC, 18-PIN	413229	91506	318-AGC39D	1		
XU2	SOCKET, IC, 16-PIN	276535	91506	316-AGC39D	1		
XU6	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	2		
XU7	SOCKET, IC, 40-PIN	429282	09922	DILB40P-108	REF		
Y1	CRYSTAL 10 MHZ	385732	89536	385732	1		



WARNING: Ⓢ INDICATES USAGE OF MOS DEVICE(S) WHICH MAY BE DAMAGED BY STATIC DISCHARGE. USE SPECIAL HANDLING PER S.O.P. 15.7.

CAUTION
SUBJECT TO DAMAGE BY
STATIC ELECTRICITY

Figure 601-2. A1 Main PCB Assembly, Battery

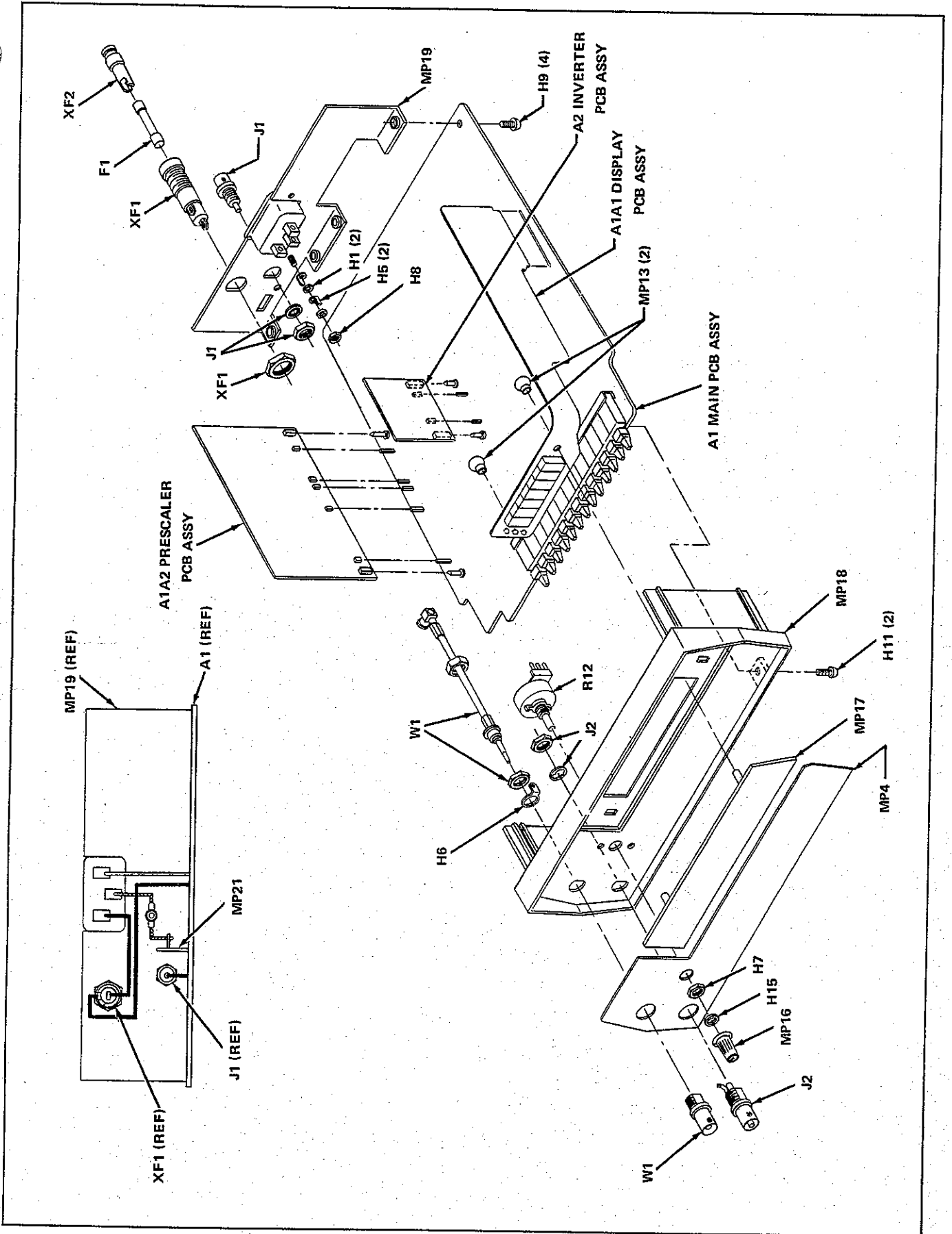


Figure 601-2. A1 Main PCB Assembly, Battery (cont)

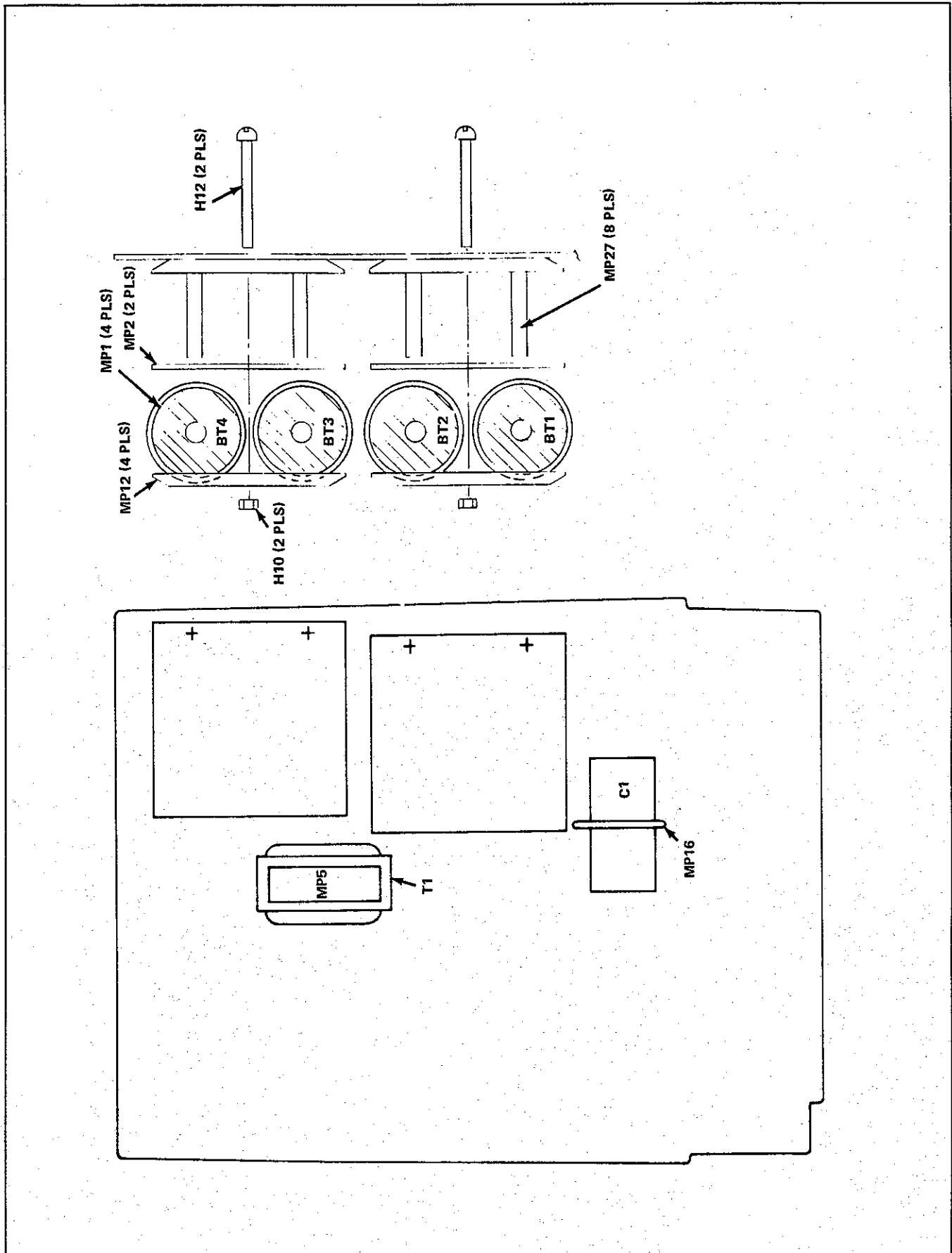


Figure 601-2. A1 Main PCB Assembly, Battery (cont)

Table 601-3. A2 Inverter PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A2	INVERTER PCB ASSEMBLY FIGURE 601-3 (1912A-4004T)	443333	89536	443333	1		
C401	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D105K0015KA1	3		
C402	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D105K0015KA1	REF		
C403	CAP, CER, .01 UF +/-20%, 100V	149153	56289	C023B101F103M	1		
C404	CAP, CER, 47 PF +/-20%, 1000V	369132	56289	C030B102-H470J	1		
C405	CAP, TA, 10 UF +/-20%, 15V	193623	56289	196D105K0015KA1	REF		
CR401	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	2	1	
CR402	DIODE, SI, HI-SPEED SWITCH	203323	07910	1N4448	REF		
J7	CONNECTOR CONNECTOR RCPTCL, FEMALE, SMALL RECEPTACLE, LARGE	375329 149112	00779 74970	85863-3 105-0753			
L401	CHOKE, 6-TURN	320911	89536	320911	1		
Q401	XSTR, SI, NPN	330803	04713	MPS6560	2	1	
Q402	XSTR, SI, NPN	330803	04713	MPS6560	REF		
R401	RES, DEP. CAR, 220 +/-5%, 1/4W	342626	80031	CR251-45P220E	1		
R402	RES, DEP. CAR, 82 +/-5%, 1/4W	442277	80031	CR251-45P82E	1		
R403	RES, DEP. CAR, 10 +/-5%, 1/4W	340075	80031	CR251-45P10E	1		
T401	XFMR, INVERTER	462093	89536	462093	1		
U401	IC, LINEAR, NEG VOLT, REG 3-TURN	429514	07263	79M12HC	1	1	
XU401	TRANSIPAD, IC (NOT SHOWN)	152207	07047	10123-DAP	1		

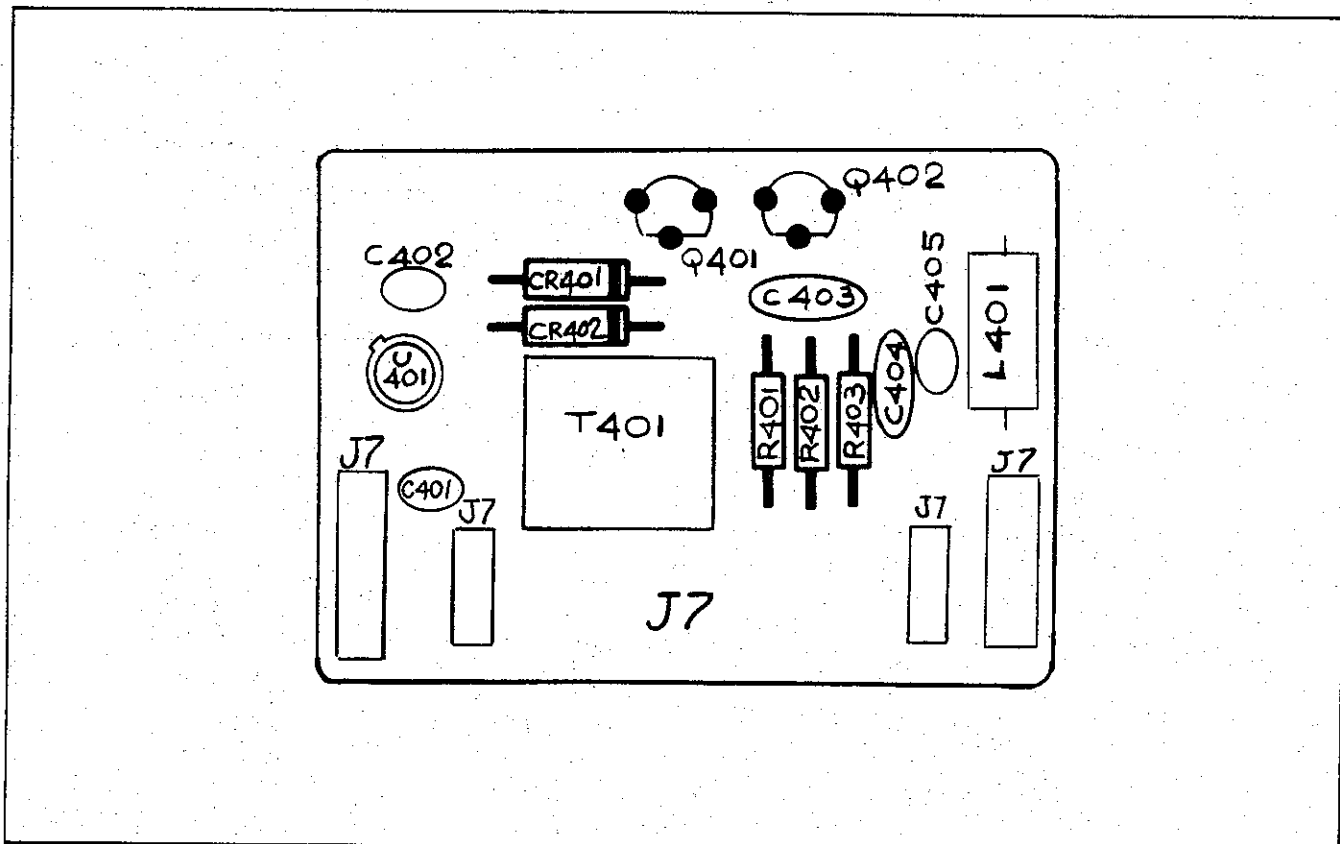


Figure 601-3. A2 Inverter PCB Assembly

Table 601-4. A3 AC PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
A3	AC PCB ASSY, FIGURE 601-4	ORDER	FOR	REQUIRED SOURCE	1		
	115V SOURCE, 58-62 HZ (1910A-4006T)	456251	89536	456251	REF		
	230V SOURCE, 48-52 HZ (1910A-4013T)	459362	89536	459362	REF		
	100V SOURCE, 48-52 HZ (1910A-4012T)	459370	89536	459370	REF		
	100V SOURCE, 58-62 HZ (1910A-4014T)	463307	89536	463307	REF		
C601	CAP, MYLAR	ORDER	FOR	REQUIRED SOURCE	1		
	6UF +/-5%, 115V (115V/60HZ SOURCE)	383546	98536	393546/D2-505D			
	6.6UF +/-5%, 135V (100V/50HZ SOURCE)	384189	89536	394189			
	6UF +/-5%, 115V (100V/60HZ SOURCE)	393546	98536	393546/D2-505D			
	3.3UF +/-5%, 300V (230V/50HZ SOURCE)	380253	89536	380253			
CR601	DIODE, ZENER, UNCOMP, 40V	407825	12969	UZ8740	2		1
CR602	DIODE, ZENER, UNCOMP, 40V	407825	12969	UZ8740	REF		
J8	CONNECTOR, SMALL	375329	00779	85863-3	2		
	CONNECTOR, LARGE	149112	74970	105-0753	2		
MP1	DECAL, WARNING	386250	89536	386250	1		
MP2	MOUSETAIL	104794	98189	2829-115-3	1		
R601	RES, DEP. CAR, 1M +/-5% 1/4W	348987	80031	CR251-4-5P1MTS	1		

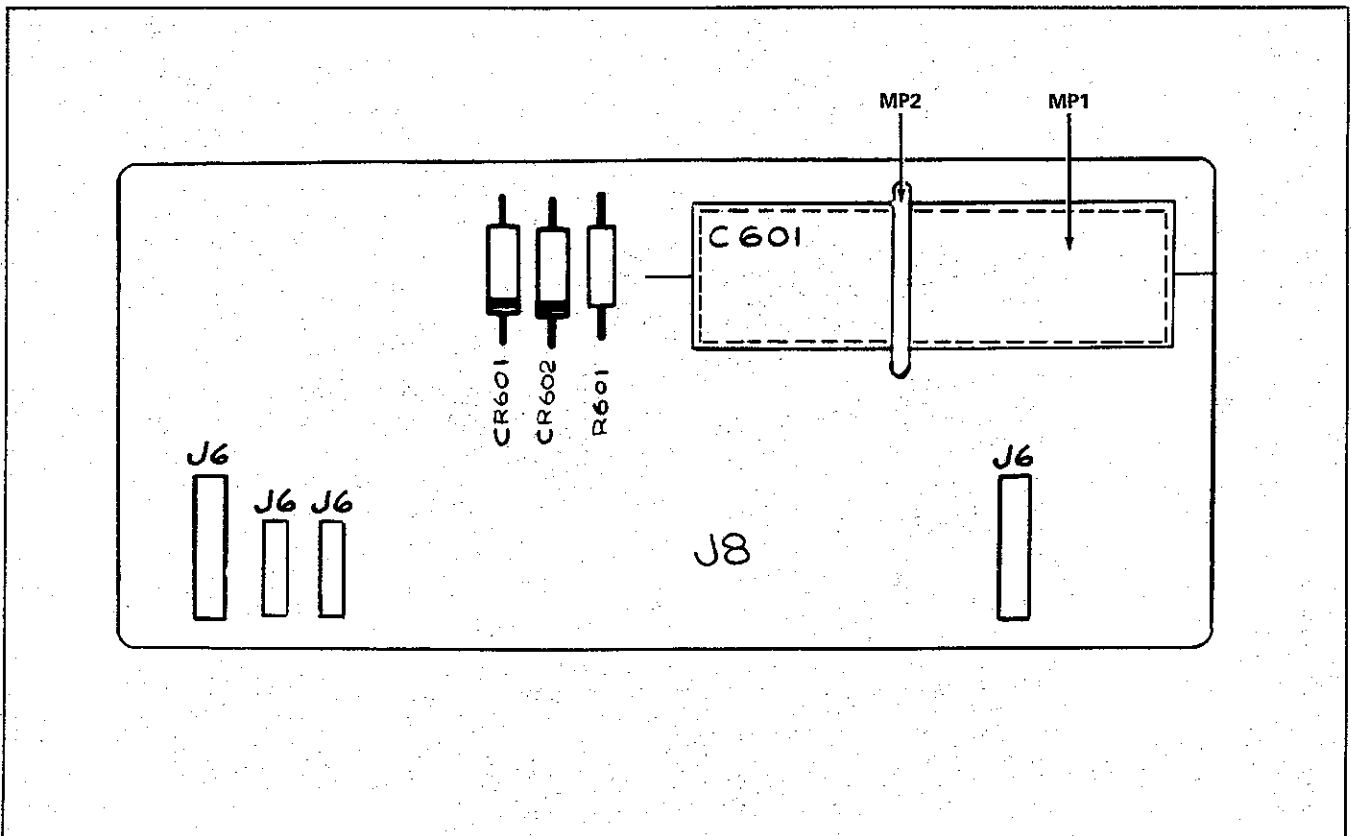


Figure 601-4. A3 AC PCB Assembly

Option —02 Data Output Unit

602-1. INTRODUCTION

602-2. The DOU consists of 18 data lines containing all the display data necessary for external logging. The data lines are output on an extender pcb at the rear of the instrument. Due to space limitation, this option may only be used on line versions of the Model 1912A.

602-3. OPERATION

602-4. The output data available at the rear panel DOU connector is listed in Table 602-1. The encoded input data to position the decimal in the frequency and period modes are given in Tables 602-2 and 602-3 respectively. To interface the DOU with an external logging unit, see Theory of Operation of this section.

602-5. THEORY OF OPERATION

602-6. The DOU's output on connector J5 is obtained directly from the latches contained in U7. Its timing sequence is therefore exactly the same as the display strobe cycle (see Figure 602-1). Because the displays are strobed serially, the output data on the DOU is also serial, and any external logging system interfaced with the DOU must be capable of using serial data or it must have its own serial to parallel converter.

602-7. The decimal point positioning and unit annunciators are enabled simultaneously with the selection of a range (see Table 602-2 for frequency mode encoding, which will apply a encoded input to U6 on Pins 22, 23, and 24, and Table 602-3 for period mode encoding).

Table 602-1. DOU Output Data

PIN NO. (J5)	NOMENCLATURE	FUNCTION
1 & 3		Ground
2 & 4	Not used	
5	B1 (Blanking)	Blanks leading Zero
6	D, (8)	BCD Information
7	C, (4)	BCD Information
8	B, (2)	BCD Information
9	A, (1)	BCD Information
10	DS1, (digit - 1 strobe)	Enable 1st digit LED (LSD, - strobed last)
11	DS2, (digit - 2 strobe)	Enable 2nd LED, (2SD)
12	DS3, (digit - 3 strobe)	Enable 3rd LED (3SD)
13	DS4, (digit - 4 strobe)	Enable 4th LED, (4SD)
14	DS5, (digit - 5 strobe)	Enable 5th LED, (5SD)
15	DS6, (digit - 6 strobe)	Enable 6th LED (6SD)
16	Ovfl, (overflow)	Enable overflow annunciator (goes high following MUP if carry out of MSD)
17	DP, (decimal position)	Occurs simultaneously with digit strobe.
18	UX, (Units enable)	Enable units annunciator simultaneously with digit strobe lines.
19	DS7, (digit - 7 strobe)	Enable 7th LED, (MSD, strobed first).
20	MUP, memory update	Indicates new data being entered.

Table 602-2. Decimal Positioning (Frequency Mode)

ENCODED INPUT TO U6 (FREQUENCY MODE)			GATE TIME	DECIMAL LOCATION (DISPLAY LED)	ANNUNCIATOR
R22	R23	R24			
0	1	0	10 msec	D5	MHz
1	1	0	0.1 sec	D3	kHz
0	0	1	1.0 sec	D4	kHz
1	0	1	10 sec	D5	kHz
1	1	1	Autorange	*	*

*In autorange the gate time varies between 0.1 and 1 sec.

Table 602-3. Decimal Positioning (Period Mode)

ENCODED INPUT TO U6 (PERIOD MODE)			CYCLES	DECIMAL LOCATION (DISPLAY LED)	ANNUNCIATOR
R22	R23	R24			
0	0	0	■	D5	msec
1	0	0	■	D6	msec
0	1	0	■	D4	usec
1	1	0	■	D5	usec
1	1	1	■	*	*

*Autoranges through all four of the above ranges plus 10^4 periods averaged, which is D6 and μ sec.s.
 ■ Not a fixed value.

NOTE

The drive capability of all data outputs in PMOS; must be able to sink 0.16 mA at logic 0 or source 0.16 mA for logic 1 levels.

602-8. DOU Output Timing

602-9. The timing diagram of Figure 602-1 is for one test case in which an input signal of 3.8 MHz is applied to channel A, frequency mode, with 100 Hz resolution.

NOTE

The DOU data is output on connector J5 in BCD format serially, and is valid only on the positive edge of memory update (M).

602-10. DOU Interface Cable

602-11. A mating DOU connector is supplied as part of the -02 Option for use in fabricating a custom interface cable. Use the following procedure to fabricate the interface cable.

1. Assemble the following equipment:

- a. Teflon or vinyl insulated wire, 26 gauge, 20 pieces cut to desired length.
- b. Sleeving, # 16 for vinyl insulated wire, or # 18 for teflon insulated wire.
- c. Rosin core solder, 60/40
- d. Wire strippers
- e. Soldering Iron, pencil-type (45W max.)
- f. DOU mating connector
- g. Mating connector for interfaced instrument.
- h. Connector vice

2. Slide cable wires through the DOU connector backshell (hood) as shown in Figure 602-2.
3. Strip one-eighth of an inch of insulation from the DOU connector end of the cable. Tin the ends.
4. Cut 20 pieces of sleeving to a length of three-sixteenths of an inch.
5. Slide one piece of sleeving over each prepared wire end.

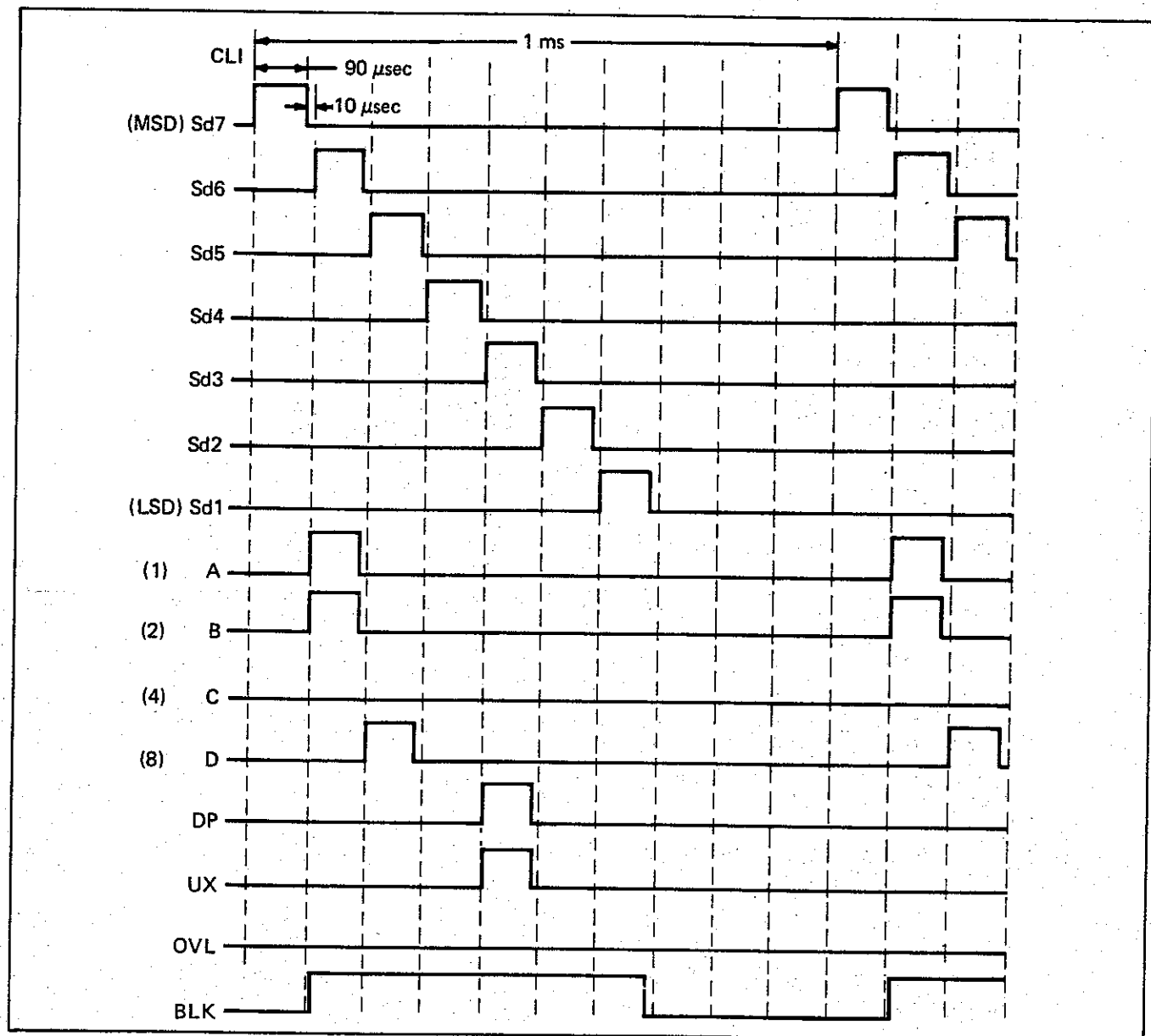


Figure 602-1. DOU Timing Diagram

6. Place the DOU mating connector in the connector vice, and tin each connector pin.
7. Solder one prepared wire to each connector pin.
8. Position the sleeving over the solder joints, and install the connector backshell (hood) and strain relief as shown in Figure 602-2.
9. Install the wires on the mating connector for the interfaced instrument using the DOU connector information given in Table 602-1.

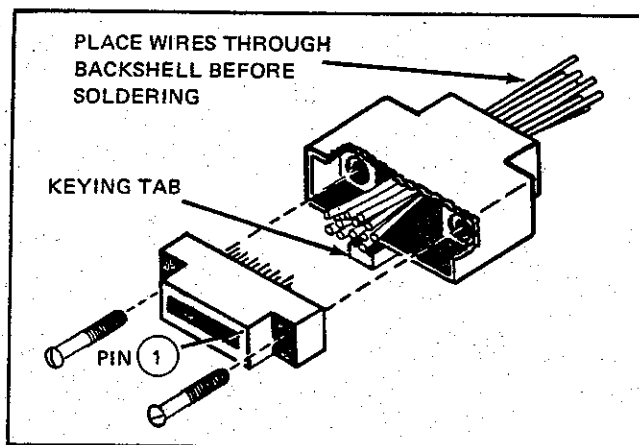
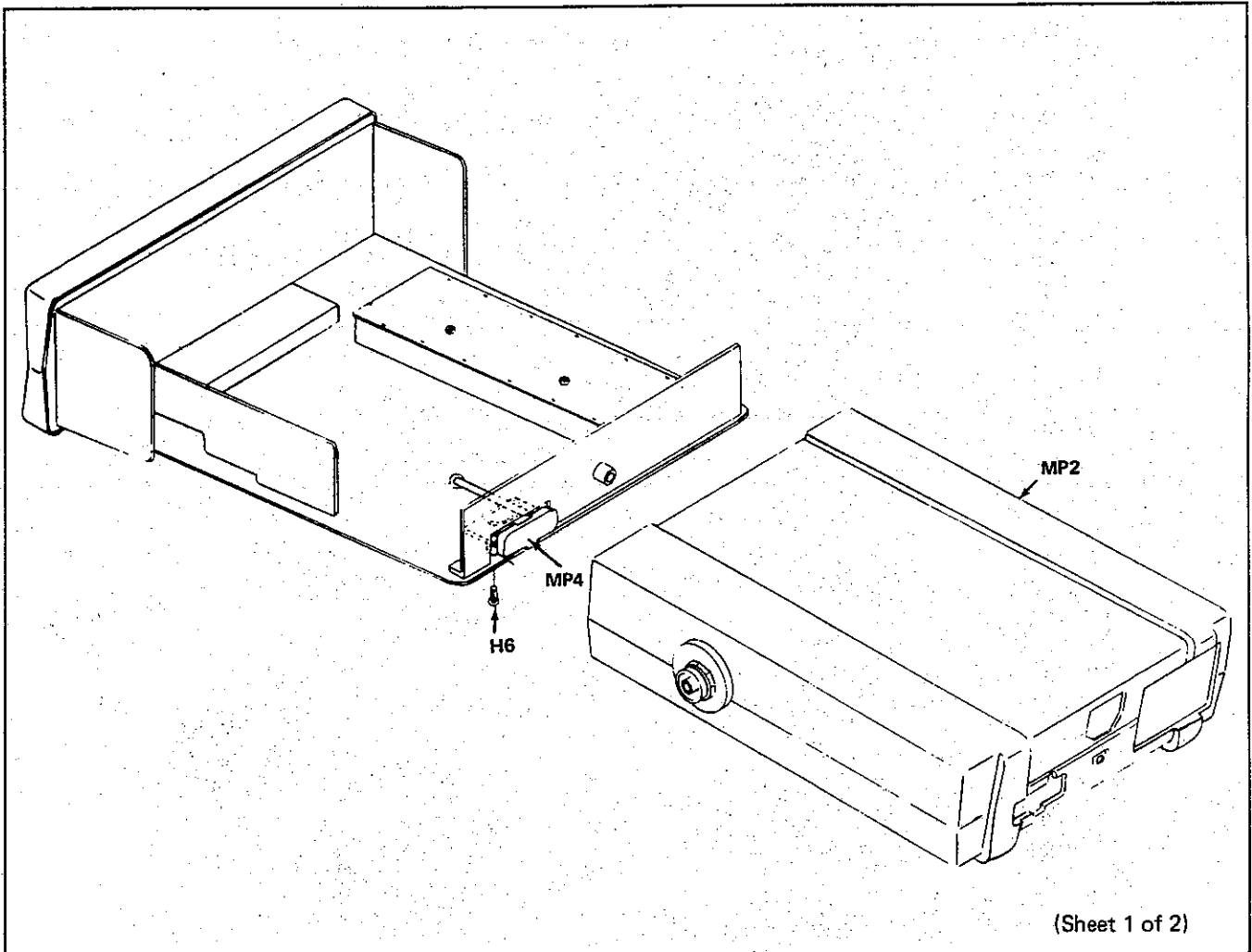


Figure 602-2. DOU Connector

Table 602-3. DOU PCB Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
-02	DOU, FIGURE 602-3 (SHT 1 OF 2)	ORDER	1912A	-02			
A12	DOU PCB ASSY	ORDER	NEXT	HIGHER LEVEL	1		
H6	SCREW, PHP, 4-40 X 1/4	129890	73734	19022	2		
H7	SCREW, PHP, 6-32 X 1/4 (NOT SHOWN)	152140	73734	19042	2		
MP1	CABLE TIE, 4 INCH (NOT SHOWN)	172000	06303	SST-1M	1		
MP2	CASE	458323	89536	458323	1		
MP3	CONN. RECEPTACLE, CARD-EDGE (NOT SHOWN)	352310	89536	352310	1		
MP4	CONNECTOR, BACKSHELL	357020	89536	357020	1		
A12	DOU PCB ASSY, FIGURE 602-3 (SHT 2 OF 2)	ORDER	NEXT	HIGHER LEVEL	REF		
H4	NUT, HEX, 4-40	110635	73734	8003NP	1		
H5	SCREW, PHP, 4-40 X 5/16	152116	73734	19023	1		
H6	WASHER, FLAT #4	195909	73734	97405	1		
H7	WASHER, INT LOCK #4	110403	73734	99402	1		
H8	TERMINAL, CONN POST	376574	00779	3-87022-1	10		
MP1	CABLE CLAMP, 3/16	101345	95987	3/16-3NA	AR		
MP2	COVER CONNECTOR	450015	89536	450015	1		



(Sheet 1 of 2)

Figure 602-3. DOU PCB Assembly

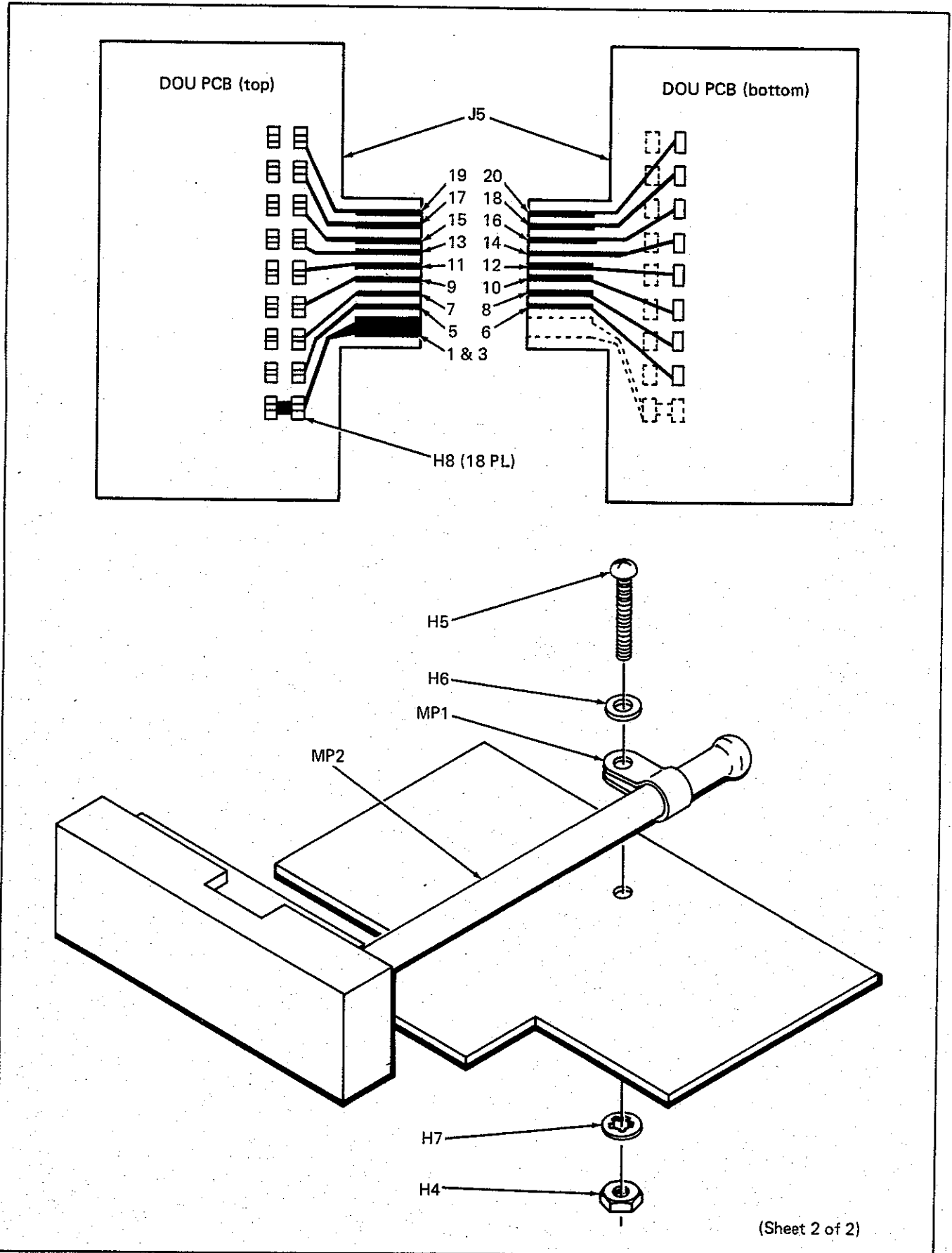


Figure 602-3. DOU PCB Assembly (cont)

(Sheet 2 of 2)



Option —03 TCXO

603-1. OPTION —03 TCXO

603-2. INTRODUCTION

603-3. Option —03 is a temperature compensated crystal oscillator (TCXO) which exhibits superior stability than the standard Y1 by using a neutralization circuit. The effects of the neutralization circuit on the crystals center frequency is shown in Figure 603-1. The resultant center frequency deviation (solid line) is held to a minimum over the designed temperature range. Within the desired temperature range the —03 affords a very stable output frequency as well as instantaneous warmup and low power consumption. However, if the temperature limits are exceeded, the crystal's stability will no longer be valid (See Section 1).

603-4. CALIBRATION

1. Allow the counter to operate for at least 30 minutes to stabilize the internal temperature.

2. Select the channel A frequency function, at 0.1 Hz resolution.
3. Connect the 10 MHz reference frequency to the channel A input.
4. Using a non-conductive screwdriver, adjust the TCXO through the rear panel. See component and test point location drawing in Section 4, to obtain a reading of overflow 000.000 \pm 10 digits.

603-5. LIST OF REPLACEABLE PARTS

- 603-6. The —03 TCXO is a completely sealed unit, containing no replaceable parts (See Figure 603-2).

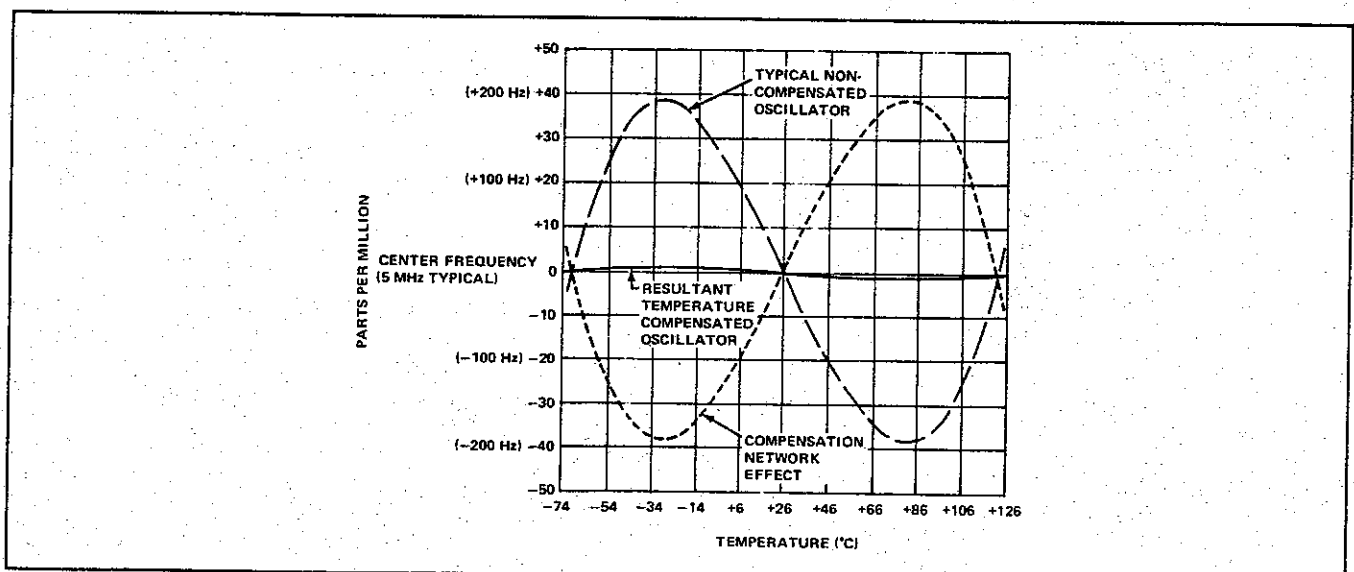


Figure 603-1. Temperature/Frequency Deviation

Table 603-1. -03/-04 TCXO Assembly

ITEM NO.	DESCRIPTION	FLUKE STOCK NO.	MFG SPLY CODE	MFG PART NO. OR TYPE	TOT QTY	REC QTY	USE CDE
-03	TCXO, FIGURE 603-1, -03	ORDER	MODEL	1912A-03			
-04	TCXO, FIGURE 603-1, -04	ORDER	MODEL	1912A-04			
MP1	INSULATOR, OSCILLATOR	508820	89536	508820	1		

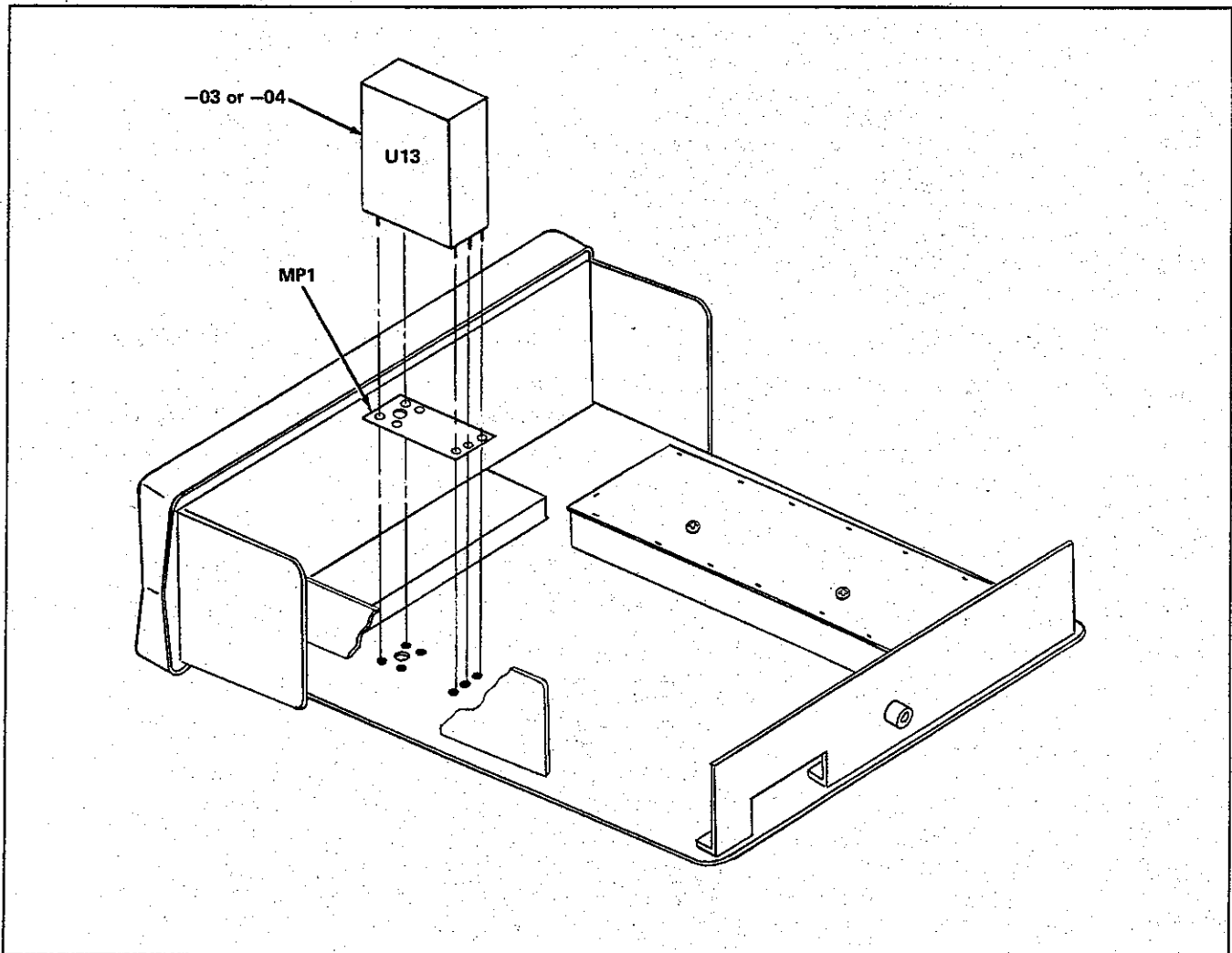


Figure 603-2. -03/-04 TCXO Assembly

Option —04 TCXO (Superior)

604-1. OPTION —04 TCXO (SUPERIOR)

604-2. INTRODUCTION

604-3. Option —04 is also a temperature compensated crystal oscillator which used the same neutralization scheme as the —03 Option (See Figure 603-1). However, because of tighter specifications, it is able to reduce its total deviation from the standard 10 MHz to approximately $\frac{1}{4}$ of the —03's deviation, 0.5 ppm/month.

604-4. CALIBRATION

1. Allow the counter to operate for a least three hours to stabilize internal temperature.

2. Select the channel A frequency function at 0.1 Hz resolution.
3. Connect the 10 MHz reference frequency to the channel A input.
4. Using a non-conductive screwdriver adjust the TCXO through the rear panel, see component and test point location drawing in Section 4, to obtain a reading of 000.0000 ± 3 digits.

604-5. LIST OF REPLACEABLE PARTS

- 604-6. The —04 TCXO is a completely sealed unit, containing no replaceable parts (See Figure 603-2).



Section 7 General Information

7-1. This section of the manual contains generalized user information as well as supplemental information to the List of Replaceable Parts contained in Section 5. The following information is presented in this section:

List of Abbreviations

Federal Supply Codes for Manufacturers

Fluke Technical Service Centers — U.S. and Canada

Sales and Service Locations — International

Sales Representatives — U.S. and Canada

List of Abbreviations and Symbols

A or amp	ampere	H	henry	pF	picofarad
ac	alternating current	hd	heavy duty	pn	part number
af	audio frequency	hf	high frequency	(+) or pos	positive
a/d	analog-to-digital	Hz	hertz	pot	potentiometer
assy	assembly	IC	integrated circuit	p-p	peak-to-peak
AWG	american wire gauge	if	intermediate frequency	ppm	parts per million
B	bel	in	inch(es)	PROM	programmable read-only memory
bcd	binary coded decimal	intl	internal	psi	pound-force per square inch
°C	Celsius	I/O	input/output	RAM	random-access memory
cap	capacitor	k	kilo (10 ³)	rf	radio frequency
ccw	counterclockwise	kHz	kilohertz	rms	root mean square
cer	ceramic	kΩ	kilohm(s)	ROM	read-only memory
cermet	ceramic to metal (seal)	kV	kilovolt(s)	s or sec	second (time)
ckt	circuit	lf	low frequency	scope	oscilloscope
cm	centimeter	LED	light-emitting diode	SH	shield
cmrr	common mode rejection ratio	LSB	least significant bit	Si	silicon
comp	composition	LSD	least significant digit	serno	serial number
cont	continue	M	mega (10 ⁶)	sr	shift register
crt	cathode-ray tube	m	milli (10 ⁻³)	Ta	tantalum
cw	clockwise	mA	milliampere(s)	tb	terminal board
d/a	digital-to-analog	max	maximum	tc	temperature coefficient or temperature compensating
dac	digital-to-analog converter	mf	metal film	tcxo	temperature compensated crystal oscillator
dB	decibel	MHz	megahertz	tp	test point
dc	direct current	min	minimum	u or μ	micro (10 ⁻⁶)
dmm	digital multimeter	mm	millimeter	uhf	ultra high frequency
dvm	digital voltmeter	ms	millisecond	us or μs	microsecond(s) (10 ⁻⁶)
elect	electrolytic	MSB	most significant bit	uut	unit under test
ext	external	MSD	most significant digit	V	volt
F	farad	MTBF	mean time between failures	v	voltage
°F	Fahrenheit	MTTR	mean time to repair	var	variable
FET	Field-effect transistor	mV	millivolt(s)	vco	voltage controlled oscillator
ff	flip-flop	mv	multivibrator	vhf	very high frequency
freq	frequency	MΩ	megohm(s)	vlf	very low frequency
FSN	federal stock number	n	nano (10 ⁻⁹)	W	watt(s)
g	gram	na	not applicable	ww	wire wound
G	giga (10 ⁹)	NC	normally closed	xfmr	transformer
gd	guard	(-) or neg	negative	xstr	transistor
Ge	germanium	NO	normally open	xtal	crystal
GHz	gigahertz	ns	nanosecond	xtlo	crystal oscillator
gmV	guaranteed minimum value	opnl ampl	operational amplifier	Ω	ohm(s)
gnd	ground	p	pico (10 ⁻¹²)	μ	micro (10 ⁻⁶)
		para	paragraph		
		pcb	printed circuit board		

Federal Supply Codes for Manufacturers (Continued)

00213 Nytronics Comp. Group Inc. Subsidiary of Nytronics Inc. Formerly Sage Electronics Rochester, New York	03797 Eldema Div. Genisco Technology Corp. Compton, California	05574 Viking Industries Chatsworth, California	07597 Burndy Corp. Tape/Cable Div. Rochester, New York
00327 Welwyn International, Inc. Westlake, Ohio	03877 Transistron Electronic Corp. Wakefield, Massachusetts	05704 Replaced by 16258	07792 Lerma Engineering Corp. Northampton, Massachusetts
00656 Aerovox Corp. New Bedford, Massachusetts	03888 KDI Pyrofilm Corp. Whippany, New Jersey	05820 Wakefield Engineering Inc. Wakefield, Massachusetts	07910 Teledyne Semiconductor Formerly Continental Device Hawthorne, California
00686 Film Capacitors, Inc. Passaic, New Jersey	03911 Clairex Electronics Div. Clairex Corp. Mt. Vernon, New York	06001 General Electric Co. Electronic Capacitor & Battery Products Dept. Columbia, South Carolina	07933 - use 49956 Raytheon Co. Semiconductor Div. HQ Mountain View, California
00779 AMP Inc. Harrisberg, Pennsylvania	03980 Muirhead Inc. Mountainside, New Jersey	06136 Replaced by 63743	08225 Industro Transistor Corp. Long Island City, New York
01121 Allen-Bradley Co. Milwaukee, Wisconsin	04009 Arrow Hart Inc. Hartford, Connecticut	06383 Panduit Corp. Tinley Park, Illinois	08261 Spectra Strip Corp. Garden Grove, California
01281 TRW Electronic Comp. Semiconductor Operations Lawndale, California	04062 Replaced by 72136	06473 Bunker Ramo Corp. Amphenol SAMS Div. Chatsworth, California	08530 Reliance Mica Corp. Brooklyn, New York
01295 Texas Instruments, Inc. Semiconductor Group Dallas, Texas	04202 Replaced by 81312	06555 Beede Electrical Instrument Co. Penacook, New Hampshire	08806 General Electric Co. Miniature Lamp Products Dept. Cleveland, Ohio
01537 Motorola Communications & Electronics Inc. Franklin Park, Illinois	04217 Essex International Inc. Wire & Cable Div. Anaheim, California	06739 Electron Corp. Littleton, Colorado	08863 Nylomatic Corp. Norrisville, Pennsylvania
01686 RCL Electronics Inc. Manchester, New Hampshire	04221 Aemco, Div. of Midtex Inc. Mankato, Minnesota	06743 Clevite Corp. Cleveland, Ohio	08988 - use 53085 Skottie Electronics Inc. Archbald, Pennsylvania
01730 Replaced by 73586	04222 AVX Ceramics Div. AVX Corp. Myrtle Beach, Florida	06751 Components, Inc. Semcor Div. Phoenix, Arizona	09214 G.E. Co. Semi-Conductor Products Dept. Power Semi-Conductor Products OPN Sec. Auburn, New York
01884 - use 56289 Sprague Electric Co. Dearborn Electronic Div. Lockwood, Florida	04423 Telonic Industries Laguna Beach, California	06860 Gould Automotive Div. City of Industry, California	09353 C and K Components Watertown, Massachusetts
02114 Ferroxcube Corp. Saugerties, New York	04645 Replaced by 75376	06961 Vernitron Corp., Piezo Electric Div. Formerly Clevite Corp., Piezo Electric Div. Bedford, Ohio	09423 Scientific Components, Inc. Santa Barbara, California
02131 General Instrument Corp. Harris ASW Div. Westwood, Maine	04713 Motorola Inc. Semiconductor Products Phoenix, Arizona	06980 Eimac Div. Varian Associates San Carlos, California	09922 Burndy Corp. Norwalk, Connecticut
02395 Rason Mfg. Co. Brooklyn, New York	04946 Standard Wire & Cable Los Angeles, California	07047 Ross Milton, Co., The South Hampton, Pennsylvania	09969 Dale Electronics Inc. Yankton, S. Dakota
02533 Snelgrove, C.R. Co., Ltd. Don Mills, Ontario, Canada M3B 1M2	05082 Replaced by 94988	07115 Replaced by 14674	10059 Barker Engineering Corp. Formerly Amerace, Amerace ESNA Corp. Kenilworth, New Jersey
02606 Fenwal Labs Div. of Travenal Labs. Morton Grove, Illinois	05236 Jonathan Mfg. Co. Fullerton, California	07138 Westinghouse Electric Corp., Electronic Tube Division Horsehead, New York	11236 CTS of Berne Berne, Indiana
02660 Bunker Ramo Corp., Conn Div. Formerly Amphenol-Borg Electric Corp. Broadview, Illinois	05245 Components Corp. now Corcom, Inc. Chicago, Illinois	07233 TRW Electronic Components Cinch Graphic City of Industry, California	11237 CTS Keene Inc. Paso Robles, California
02799 Aero Capacitors, Inc. Chatsworth, California	05277 Westinghouse Electric Corp. Semiconductor Div. Youngwood, Pennsylvania	07256 Silicon Transistor Corp. Div. of BBF Group Inc. Chelmsford, MA	11358 CBS Electronic Div. Columbia Broadcasting System Newburyport, MN
03508 General Electric Co. Semiconductor Products Syracuse, New York	05278 Replaced by 43543	07261 Aumet Corp. Culver City, California	11403 Best Products Co. Chicago, Illinois
03614 Replaced by 71400	05279 Southwest Machine & Plastic Co. Glendora, California	07263 Fairchild Semiconductor Div. of Fairchild Camera & Instrument Corp. Mountain View, California	11503 Keystone Columbia Inc. Warren, Michigan
03651 Replaced by 44655	05397 Union Carbide Corp. Materials Systems Div. New York, New York	07344 Bircher Co., Inc. Rochester, New York	11532 Teledyne Relays Hawthorne, California

Federal Supply Codes for Manufacturers (Continued)

11711 General Instrument Corp. Rectifier Division Hickville, New York	14099 Semtech Corp. Newbury Park, California	17069 Circuit Structures Lab. Burbank, California	24655 General Radio Concord, Massachusetts
11726 Qualidyne Corp. Santa Clara, California	14140 Edison Electronic Div. Mc Gray-Edison Co. Manchester, New Hampshire	17338 High Pressure Eng. Co., Inc. Oklahoma City, Oklahoma	24759 Lenox-Fugle Electronics Inc. South Plainfield, New Jersey
12014 Chicago Rivet & Machine Co. Bellwood, Illinois	14193 Cal-R-Inc. formerly California Resistor, Corp. Santa Monica, California	17545 Atlantic Semiconductors, Inc. Asbury Park, New Jersey	25088 Siemen Corp. Isilen, New Jersey
12040 National Semiconductor Corp. Danbury, Connecticut	14298 American Components, Inc. an Insilco Co. Conshohocken, Pennsylvania	17856 Siliconix, Inc. Santa Clara, California	25403 Amperex Electronic Corp. Semiconductor & Micro-Circuits Div. Slatersville, Rhode Island
12060 Diodes, Inc. Chatsworth, California	14655 Cornell-Dublier Electronics Division of Federal Pacific Electric Co. Govt. Control Dept. Newark, New Jersey	17870 Replaced by 14140	27014 National Semiconductor Corp. Santa Clara, California
12136 Philadelphia Handle Co. Camden, New Jersey	14752 Electro Cube Inc. San Gabriel, California	18178 Vactec Inc. Maryland Heights, Missouri	27264 Molex Products Downers Grove, Illinois
12300 Potter-Brumfield Division AMF Canada LTD. Guelph, Onatrio, Canada	14869 Replaced by 96853	18324 Signetics Corp. Sunnyvale, California	28213 Minnesota Mining & Mfg. Co. Consumer Products Div. St. Paul, Minnesota
12323 Presin Co., Inc. Shelton, Connecticut	14936 General Instrument Corp. Semi Conductor Products Group Hicksville, New York	18612 Vishay Resistor Products Div. Vishay Intertechnology Inc. Malvern, Pennsylvania	28425 Serv.-/Link formerly Bohannon Industries Fort Worth, Texas
12327 Freeway Corp. formerly Freeway Washer & Stamping Co. Cleveland, Ohio	15636 Elec-Trol Inc. Saugus, California	18736 Voltronics Corp. Hanover, New Jersey	28478 Deltrol Controls Div. Deltrol Corporation Milwaukee, Wisconsin
12443 Budd Co. The, Polychem Products Plastic Products Div. Bridgeport, PA	15801 Fenwal Electronics Inc. Div. of Kidde Walter and Co., Inc. Framingham, Massachusetts	18927 G T E Sylvania Inc. Precision Material Group Parts Division Titusville, Pennsylvania	28480 Hewlett Packard Co. Corporate H.O. Palo Alto, California
12615 U.S. Terminals Inc. Cincinnati, Ohio	15818 Teledyne Semiconductors, formerly Amelco Semiconductor Mountain View, California	19451 Perine Machinery & Supply Co. Seattle, Washington	28520 Heyman Mfg. Co. Kenilworth, New Jersey
12617 Hamlin Inc. Lake Mills, Wisconsin	15849 Litton Systems Inc. Useco Div. formerly Useco Inc. Van Nuys, California	19701 Electro-Midland Corp. Mepco-Electra Inc. Mineral Wells, Texas	29083 Monsanto, Co., Inc. Santa Clara, California
12697 Clarostat Mfg. Co. Dover, New Hampshire	15898 International Business Machines Corp. Essex Junction, Vermont	20584 Enochs Mfg. Inc. Indianapolis, Indiana	29604 Stackpole Components Co. Raleigh, North Carolina
12749 James Electronics Chicago, Illinois	15909 Replaced by 14140	20891 Self-Organizing Systems, Inc. Dallas, Texas	30148 A B Enterprise Inc. Ahoskie, North Carolina
12856 Micrometals Sierra Madre, California	16258 Space-Lok Inc. Burbank, California	21604 Buckeye Stamping Co. Columbus, Ohio	30323 Illinois Tool Works, Inc. Chicago, Illinois
12954 Dickson Electronics Corp. Scottsdale, Arizona	16299 Corning Glass Electronic Components Div. Raleigh, North Carolina	21845 Solitron Devices Inc. Transistor Division Riveria Beach, Florida	31091 Optimax Inc. Colmar, Pennsylvania
12969 Unitrode Corp. Watertown, Massachusetts	16332 Replaced by 28478	22767 ITT Semiconductors Palo Alto, California	32539 Mura Corp. Great Neck, New York
13103 Thermalloy Co., Inc. Dallas, Texas	16473 Cambridge Scientific Ind. Div. of Chemed Corporation Cambridge, Maryland	23050 Product Comp. Corp. Mount Vernon, New York	32767 Griffith Plastic Corp. Burlingame, California
13327 Solitron Devices Inc. Tappan, New York	16742 Paramount Plastics Fabricators, Inc. Downey, California	23732 Tracor Inc. Rockville, Maryland	32879 Advanced Mechanical Components Northridge, California
13511 Amphenol Cadre Div. Bunker-Ramo Corp. Los Gatos, California	16758 Delco Electronics Div. of General Motors Corp. Kokomo, Indiana	23880 Stanford Applied Engrng. Santa Clara, California	32897 Erie Technological Products, Inc. Frequency Control Div. Carlisle, Pennsylvania
13606 - use 56289 Sprague Electric Co. Transistor Div. Concord, New Hampshire	17001 Replaced by 71468	23936 Pamotor Div., Wm. J. Purdy Co. Burlingame, California	32997 Bourns Inc. Trimpot Products Division Riverside, California
13839 Replaced by 23732		24248 Replaced by 94222	33173 General Electric Co. Products Dept. Owensboro, Kentucky

Federal Supply Codes for Manufacturers (Continued)

34333 Silicon General Westminister, California	70563 Amperite Company Union City, New Jersey	73293 Hughes Aircraft Co. Electron Dynamics Div. Torrence, California	77969 Rubbercraft Corp. of CA. LTD. Torrance, California
34335 Advanced Micro Devices Sunnyvale, California	70903 Belden Corp. Geneva, Illinois	73445 Amperex Electronic Corp. Hicksville, LI, New York	78189 Shakeproof Div. of Illinois Tool Works Inc. Elgin, Illinois
34802 Electromotive Inc. Kenilworth, New Jersey	71002 Birnback Radio Co., Inc. Freeport, LI New York	73559 Carling Electric Inc. West Hartford, Connecticut	78277 Sigma Instruments, Inc. South Braintree, Massachusetts
37942 Mallory, P.R. & Co., Inc. Indianapolis, Indiana	71400 Büssmann Mfg. Div. of McGraw-Edison Co. Saint Louis, Missouri	73586 Circle F Industries Trenton, New Jersey	78488 Stackpole Carbon Co. Saint Marys, Pennsylvania
42498 National Radio Melrose, Massachusetts	71450 CTS Corp. Elkhart, Indiana	73734 Federal Screw Products, Inc. Chicago, Illinois	78553 Eaton Corp. Engineered Fastener Div. Tinnerman Plant Cleveland, Ohio
43543 Nytronics Inc. Transformer Co. Div. Geneva, New York	71468 ITT Cannon Electric Inc. Santa Ana, California	73743 Fischer Special Mfg. Co. Cincinnati, Ohio	79136 Waldes Kohinoor Inc. Long Island City, New York
44655 Ohmite Mfg. Co. Skokie, Illinois	71482 Clare, C.P. & Co. Chicago, Illinois	73899 JFD Electronics Co. Components Corp Brooklyn, New York	79497 Western Rubber Company Goshen, Indiana
49671 RCA Corp. New York, New York	71590 Centrelab Electronics Div. of Globe Union Inc. Milwaukee, Wisconsin	73949 Guardian Electric Mfg. Co. Chicago, Illinois	79963 Zierck Mfg. Corp. Mt. Kisko, New York
49956 Raytheon Company Lexington, Massachusetts	71707 Coto Coil Co., Inc. Providence, Rhode Island	74199 Quan Nichols Co. Chicago, Illinois	80031 Electro-Midland Corp., Mapco Div. A North American Phillips Co. Morristown, New Jersey
50088 Mostek Corp. Carrollton, Texas	71744 Chicago Miniature Lamp Works Chicago, Illinois	74217 Chicago Switch Corp. Marlboro, New Jersey	80145 LFE Corp., Process Control Div. formerly API Instrument Co. Chesterland, Ohio
50579 Litronix Inc. Cupertino, California	71785 TRW Electronics Components Cinch Connector Operations Div. Elk Grove Village, Chicago, Illinois	74276 Signalite Div. General Instrument Corp. Neptune, New Jersey	80183 - use 56289 Sprague Products North Adams, Massachusetts
51605 Scientific Components Inc. Linden, New Jersey	72005 Driver, Wilber B., Co. Newark, New Jersey	74306 Piezo Crystal Co. Carlisle, Pennsylvania	80294 Bourns Inc., Instrument Div. Riverside, California
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58474 Superior Electric Co. Bristol, Connecticut	72653 G.C. Electronics Div. of Hydrometals, Inc. Brooklyn, New York	75378 CTS Knights Inc. Sandwich, Illinois	81439 Therm-O-Disc Inc. Mansfield, Ohio
60399 Torin Corp, formerly Torrington Mfg. Co. Torrington, Connecticut	72665 Replaced by 90303	75382 Külka Electric Corp. Mount Vernon, New York	81483 International Rectifier Corp. Los Angeles, California
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64834 West Mfg. Co. San Francisco, California	72928 Gulton Ind. Inc. Gudeman Div. Chicago, Illinois	76854 Oak Industries Inc. Switch Div. Crystal Lake, Illinois	81741 Chicago Lock Co. Chicago, Illinois
65092 Weston Instruments Inc. Newark, New Jersey	72982 Erie Tech. Products Inc. Erie, Pennsylvania	77342 AMF Inc. Potter & Brumfield Div. Princeton, Indiana	82305 Palmer Electronics Corp. South Gate, California
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82879 ITT Royal Electric Div. Pawtucket, Rhode Island	88690 Replaced by 04217	94145 Replaced by 49956	98278 Malco A Microdot Co., Inc. Connector & Cable Div. Pasadena, California
83003 Varo Inc. Garland, Texas	89536 Fluke, John Mfg. Co., Inc. Seattle, Washington	94154 - use 94988 Wagner Electric Corp. Tung-Sol Div. Newark, New Jersey	98291 Sealectro Corp. Mamaroneck, New York
83058 Carr Co., The United Can Div. of TRW Cambridge, Massachusetts	89730 G.E. Co., Newark Lamp Works Newark, New Jersey	94222 Southco Inc. formerly South Chester Corp. Lester, Pennsylvania	98388 Royal Industries Products Div. San Diego, California
83298 Bendix Corp. Electric Power Division Eatontown, New Jersey	90201 Mallory Capacitor Co. Div of P.R. Mallory Co., Inc. Indianapolis, Indiana	95146 Alco Electronic Products Inc. Lawrence, Massachusetts	98743 Replaced by 12749
83330 Smith, Herman H., Inc. Brooklyn, New York	90211 - use 56365 Square D Co. Chicago, Illinois	95263 Leecraft Mfg. Co. Long Island City, New York	98925 Replaced by 14433
83478 Rubbercraft Corp. of America, Inc. West Haven, Connecticut	90215 Best Stamp & Mfg. Co. Kansas City, Missouri	95264 Replaced by 98278	99120 Plastic Capacitors, Inc. Chicago, Illinois
83594 Burrhoughs Corp. Electronic Components Div. Plainfield, New Jersey	90303 Mallory Battery Co. Div. of Mallory Co., Inc. Tarrytown, New York	95275 Vitramon Inc. Bridgeport, Connecticut	99217 Bell Industries Elect. Comp. Div. formerly Southern Elect. Div. Burbank, California
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84411 TRW Electronic Components TRW Capacitors Ogallala, Nebraska	91407 Replaced by 58474	95354 Methode Mfg. Corp. Rolling Meadows, Illinois	99779 - use 29587 Bunker-Ramo Corp. Barnes Div. Landsdowne, Pennsylvania
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Appendix 7A Manual Change Information

INTRODUCTION

This appendix contains information necessary to backdate the manual to conform with earlier pcb configurations. To identify the configuration of the pcb's used in your instrument, refer to the revision letter (marked in ink) on the component side of each pcb assembly. Table 7A-1 defines the assembly revision levels documented in this manual.

NEWER INSTRUMENTS

As changes and improvements are made to the instrument, they are identified by incrementing the revision letter marked on the affected pcb assembly.

These changes are documented on a supplemental change/errata sheet which, when applicable, is inserted at the front of the manual.

OLDER INSTRUMENTS

To backdate this manual to conform with earlier assembly revision levels, perform the changes indicated in Table 7A-1.

CHANGES

There are no backdating changes at this printing. All pcb assemblies are documented at their original revision level.

CHANGE #1-11131

On page 5-8, Table 5-2, and page 601-7, Table 601-2, make the following changes:

DELETE: U15/IC, Linear Timer/402610/12040/LM555CN/1

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

DELETE: R51/Res, dep car, 100k \pm 5%, $\frac{1}{4}$ W/348920/80031/CR251-4-5P100K/Ref
R52/Res, dep car, 100k \pm 5%, $\frac{1}{4}$ W/348920/80031/CR251-4-5P100K/Ref

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

ADD: R18/Res, dep car, 4.7k \pm 5%, $\frac{1}{4}$ W/348821/80031/CR251-4-5P4K7/3

CHANGE: FROM: R20/Res, var, cermet, 10k \pm 10%, $\frac{1}{2}$ W/309674/89536/309674/1
TO: R20/Res, dep car, 1.8k \pm 5%, $\frac{1}{4}$ W/441444/80031/CR251-4-5P1K8/Ref

FROM: R39/Res, dep car, 10k \pm 5%, $\frac{1}{4}$ W/348839/80031/CR251-4-5P10K/Ref
TO: R39/Res, dep car, 100k \pm 5%, $\frac{1}{4}$ W/348920/80031/CR251-4-5P100K/Ref

FROM: R38/Res, dep car, 1k \pm 5%, $\frac{1}{4}$ W/343426/80031/CR251-4-5P1K/Ref
TO: R38/Res, dep car, 10k \pm 5%, $\frac{1}{4}$ W/348839/80031/CR251-4-5P10K/Ref

FROM: R17/Res, dep car, 22k \pm 5%, $\frac{1}{4}$ W/348870/80031/CR251-4-5P22K/Ref
TO: R17/Res, dep car, 4.7k \pm 5%, $\frac{1}{4}$ W/348821/80031/CR251-4-5P4K7/Ref

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

CHANGE: FROM: C32/Cap, Ta, 10 μ F \pm 20%, 16V/193623/56289/196D106X0015KAI/Ref
TO: C32/Cap, cer, 0.01 μ F \pm 20%, 100V/149153/56289/C023B101F103/Ref

On page 4-4, make the following changes:

DELETE: Title 4-23, paragraph 24, and replace with the following:

4-23. Trigger Level Adjustment (Channel A)

4-24. The trigger level adjustments should be performed whenever repairs have been made to the input section of the counter. Perform the trigger level adjustment as follows:

1. Remove the instrument from its case.
2. Energize the counter, connect the high frequency generator and an RF millivoltmeter via a T-connector terminated into 50 Ω to the channel A input.
3. Set the front panel trigger level control to the preset position.
4. Set the generator to 75 mV output level at about 100 MHz. Note the display reading as a reference.
5. Reduce the input level until the display becomes unstable and then try to adjust R11 (internal trigger level, see Figure 4-1) for the reference reading as noted in step 4.
6. Repeat steps 4 and 5 until no additional sensitivity is possible. The display must remain as noted in step 4, with an input level below 75 mV.

On page 4-5, Figure 4-1, page 5-9, Figure 5-2, page 601-8, Figure 601-2 and page 8-2, Figure 8-1, make the following changes:

DELETE: U15, R51, R20 and its ground, R52, the ground from C28 and the +5V from R38.

On page 8-4 and 8-5, Figure 8-1, make the following changes, where applicable:

- ADD: HYST line, see Figure 1
 R20, 1.2k, see Figure 2
 R18, 4.7k, see Figure 2
 +5V to C28, see Figure 3
 Ground to R38, 10k, see Figure 3

- CHANGE: R39, 10k TO: R39, 100k, see Figure 4
 R38, 1k TO: R38, 10k, see Figure 3
 R17, 22k TO: R17, 4.7k, see Figure 2
 C32, 10 μ F TO: C32, .01 μ F, see Figure 4

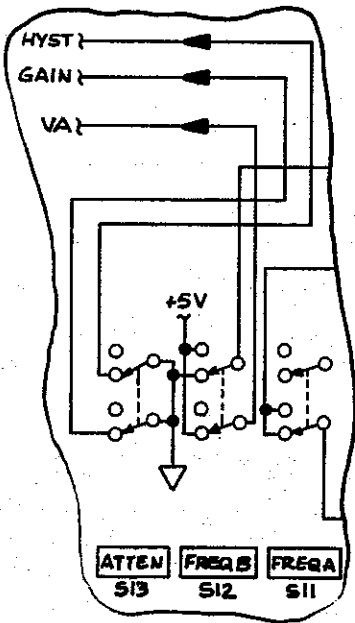


FIGURE 1

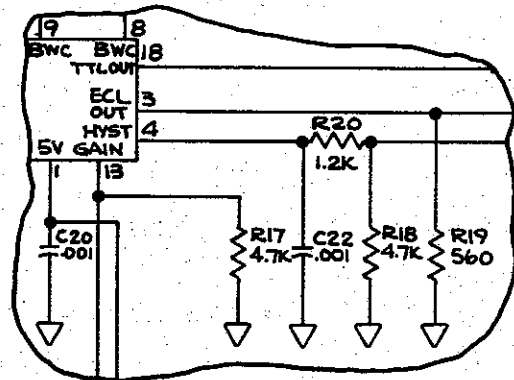


FIGURE 2

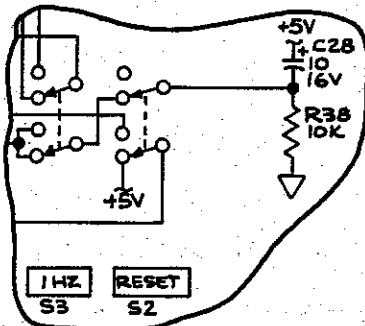


FIGURE 3

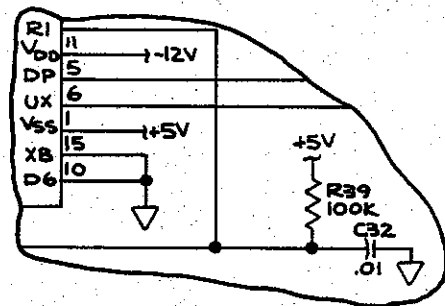


FIGURE 4

CHANGE #2-11432, 11305

On page 5-3, Table 5-1, and page 601-2, Table 601-1, make the following changes:

- FROM: U7/IC, MOS(Installed in test)/473215/55261/LS7031/1
 TO: U7/IC, MOS (Installed in test)/380238/89536/380238/1

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

- FROM: C9/Cap, cer, 0.001 μ F \pm 10%, 1kV/368621/71590/DD-102/1
 TO: C9/Cap, cer, 0.01 μ F \pm 20%, 100V/149153/56289/CO23B101F103/Ref

FROM: C27/Cap, cer, 0.01 μ F \pm 20%, 100V/407361/72982/812-A100-W5R-103M/1
 TO: C27/Cap, cer 22 pF \pm 20%, 10 kV/369157/72982/831-000-C0G0-220/Ref

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

ADD: R40/Res, dep car, 100k \pm 5%, $\frac{1}{4}$ W/348920/80031/CR251-4-5P100K/Ref

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

DELETE: R54/Res, comp, 47 \pm 5%, $\frac{1}{4}$ W/147892/U121/CB4705/1

On page 5-6, Table 5-2, and page 601-5, Table 601-2, make the following changes:

FROM: MP12/Cable tie/331157/06383/PLT2M/1

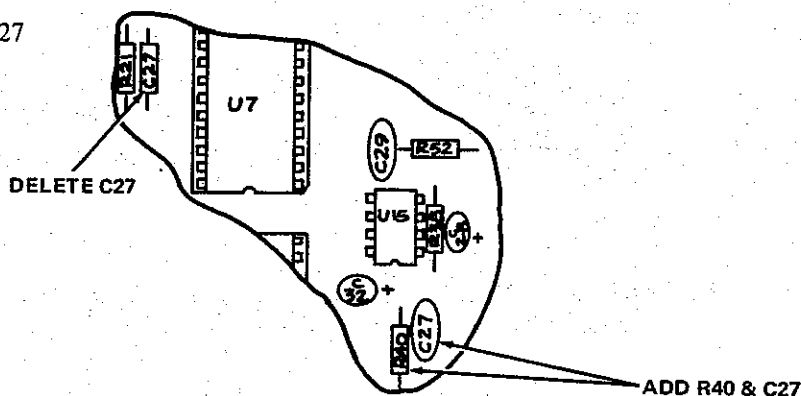
TO: MP15/Holder, com (with C2)/104794/98159/2829-115-3/1 (Line Power Only)

FROM: MP12/Cable tie/331157/06383/PLT2M/1

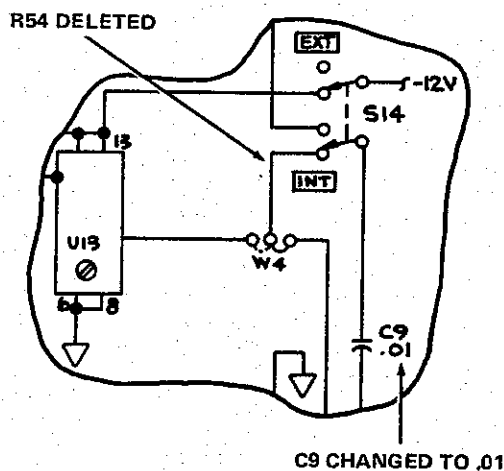
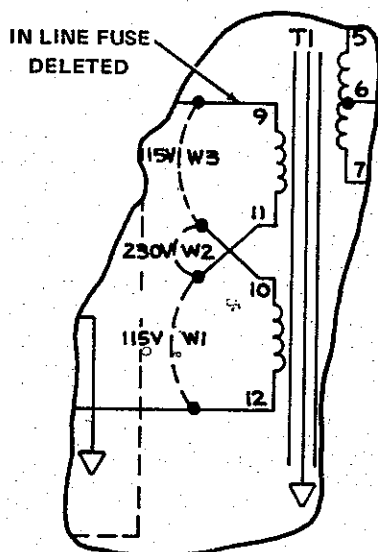
TO: MP16/Holder, com (with C2)/104794/98159/2829-115-3/1 (Battery Power Only)

On page 4-5, Figure 4-1, page 5-9, Figure 5-2, page 601-8, Figure 601-2, and page 8-2, Figure 8-1, make the following changes:

DELETE: R54 and C27



On page 8-3, Figure 8-1, make the following changes:

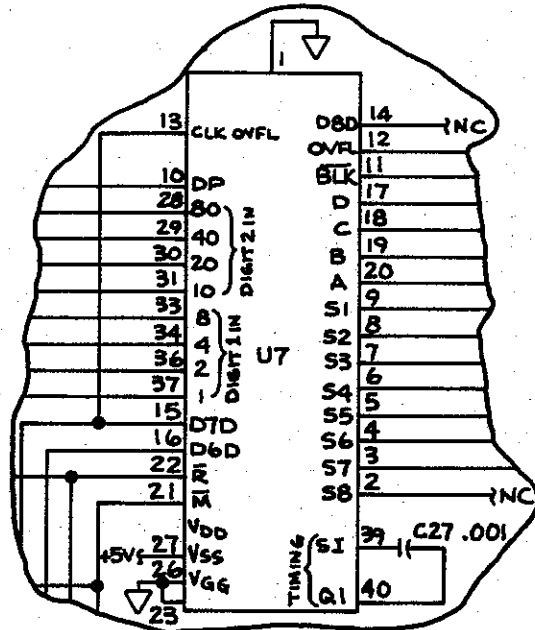
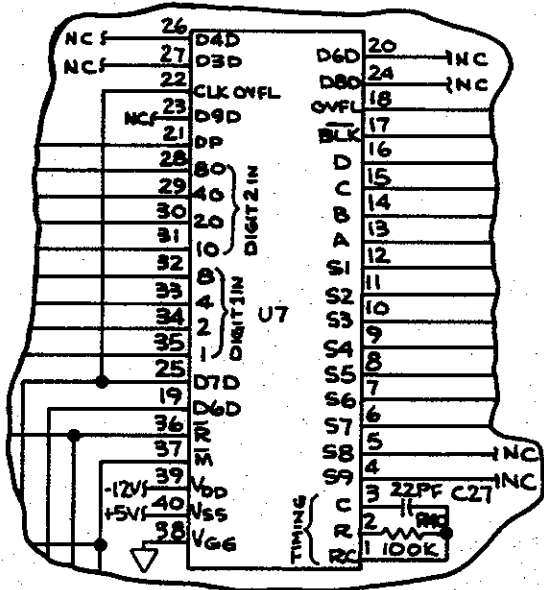


On page 8-5, Figure 8-1, make the following changes:

CHANGE pin number of U7:

FROM:

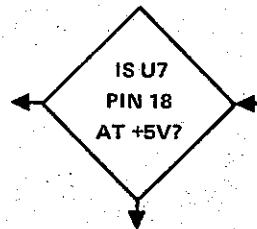
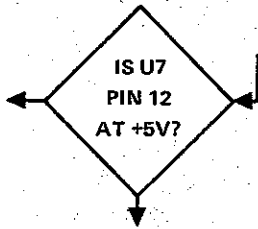
TO:



On page 4-12, Figure 4-7, make the following changes:

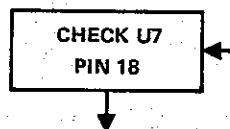
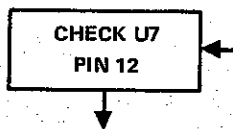
FROM:

TO:



FROM:

TO:



CHANGE #3-11270, -11287

On page 5-14, Table 5-4, make the following changes:

FROM: R27/Res, dep car, 330 \pm 5%, 1/4W/368720/80031/CR251-4-5P330E/1
 TO: R27/Res, dep car, 1k \pm 5%, 1/4W/343426/80031/CR251-4-5P1K/Ref

FROM: R8/Res, dep car, 270 \pm 5%, 1/4W/348789/80031/CR251-4-5P270E/1
 TO: R8/Res, dep car, 220 \pm 5%, 1/4W/343626/80031/CR251-4-5P220E/Ref

ADD: R24/Res, dep car, 330k \pm 5%, 1/4W/376640/80031/CR251-4-5P330K/1

On page 5-13, Table 5-4, make the following changes:

FROM: C11/Cap, mica, 2 pF \pm 0.5 pF, 500V/175208/72136/15C020K/1
 TO: C11/Cap, mica 1 pF \pm 0.5 pF, 500V/368654/71590/DD5RO/1

On page 5-15/5-16, Figure 5-4, and page 8-8, Figure 8-3, make the following changes:

Place R24 horizontally and directly below C14.

CHANGE #4-11166

On page 601-12, Table 601-4, make the following changes:

FROM: CR601/Diode, zener, Uncomp, 40V/407825/12969/UZ8740/2
 TO: CR601/Diode, zener, Uncomp, 30V/453134/12969/UZ8730/2

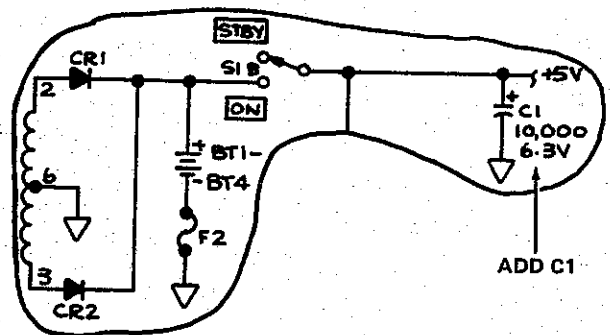
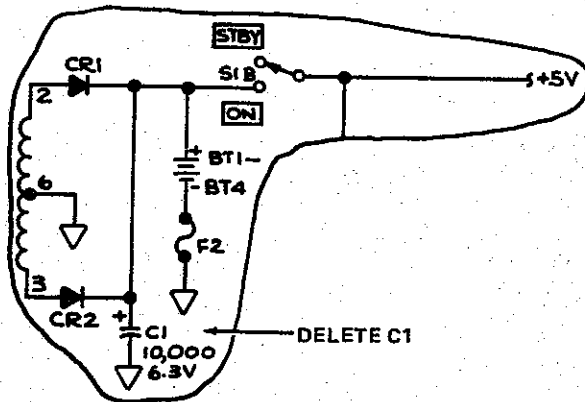
FROM: CR602/Diode, zener, Uncomp, 40V/407825/12969/UZ8740/Ref
 TO: CR602/Diode, zener, Uncomp, 30V/453134/12969/UZ8730/Ref

CHANGE #5-11439

On page 8-3, Figure 8-1, Main PCB schematic, make the following changes:

FROM:

TO:



1912A

CHANGE #6-11545

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

ADD: H4/Nut, hex, 6 x 32 (not shown)/110510/89536/110510/1

CHANGE #7-11632

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

FROM: R17/Res, dep car, 10k \pm 5%, ¼W/348839/80031/CR251-4-5P10K/Ref

TO: R17/Res, dep car, 22k \pm 5%, ¼W/348870/80031/CR251-4-5P22K/Ref

CHANGE TOT QTY of R6 FROM: 10 TO: 9

CHANGE TOT QTY of R13 FROM: 1 TO: 2

On page 8-4, Figure 8-1, make the following changes:

CHANGE value of R17 FROM: 10k TO: 22k

CHANGE #8-11346

On page 5-14, Table 5-4, make the following changes:

FROM: R17/Res, comp, 470 \pm 5%, ¼W/147982/01121/CB4715/2

TO: R17/Res, dep car, 1k \pm 5%, ¼W/343426/80031/CR251-4-5P1K/3

FROM: R18/Res, comp, 470 \pm 5%, ¼W/147983/01121/CB4715/Ref

TO: R18/Res, dep car, 1k \pm 5%, ¼W/343426/80031/CR251-4-5P1K/Ref

CHANGE TOT QTY of R28 FROM: 1 TO: Ref

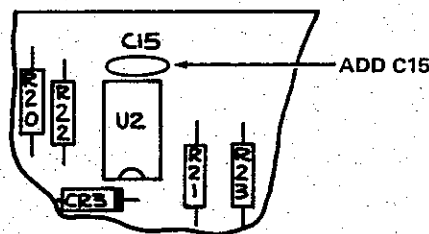
FROM: R25/Res, comp, 10M \pm 5%, ¼W/194944/01121/CB1065/1

TO: R25/Res, comp, 22M \pm 5%, ¼W/221986/01121/CB2255/1

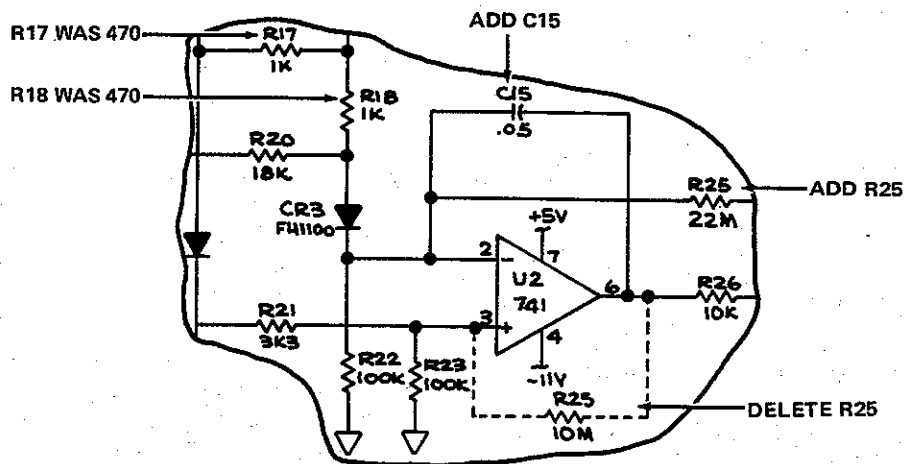
On page 5-13, Table 5-4, make the following changes:

ADD: C15/Cap, cer, 0.05 μ F $-20/+80\%$, 25V/148924/72982/5855-Y5U-502Z/1

On page 5-15/5-16, Figure 5-4, and page 8-8, Figure 8-3, make the following changes:



On page 8-9, Figure 8-3, make the following changes:



CHANGE #9-11646

On page 5-15/5-16, Figure 5-4, make the following changes:

Transpose item numbers for C7 and C8:

C7 is really C8

C8 is really C7

Parts list and schematic are correct.

CHANGE #10-11657

On page 5-13, Table 5-4, make the following changes:

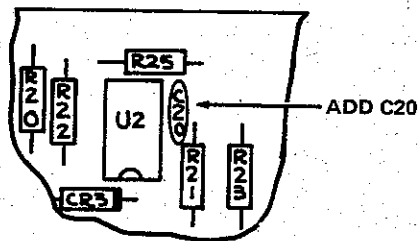
DELETE: C20/Cap, cer, 0.01 μ F \pm 20%, 100V/407361/72982/8121-A100-W5R-103M/Ref

CHANGE TOT QTY of C1 FROM: 8 TO: 7

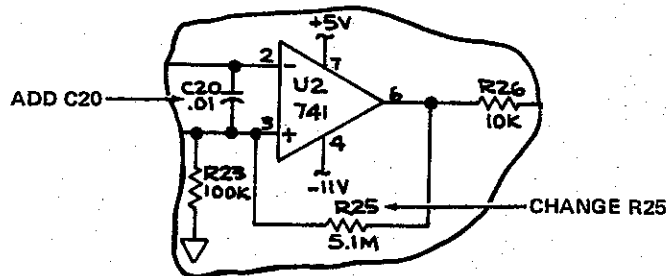
FROM: R25/Res, comp, 5.1M \pm 5%, 1/4W/296467/01121/CB5155/1

TO: R25/Res, comp, 10M \pm 5%, 1/4W/194944/01121/CB1065/1

On page 5-15/5-16, Figure 5-4, and page 8-8, Figure 8-3, make the following changes:



On page 8-9, Figure 8-3, make the following changes:



CHANGE #11-11689

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

CHANGE TOT QTY of item CR6 FROM: 4 TO: 3

DELETE: CR13/Diode, Hi-speed switching/203323/07910/1N4448/Ref

On page 5-6, Table 5-2, and page 601-5, Table 601-2, make the following changes:

CHANGE TOT QTY of item H22 FROM: 5 TO: 3 (on Line Power)
FROM: 9 TO: 7 (on Battery Power).

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

CHANGE TOT QTY of item R22 FROM: 4 TO: 3

FROM: R38/Res, dep car, 100k \pm 5%, 1/4W/348839/80031/CR251-4-5P100K/Ref
TO: R38/Res, dep car, 1k \pm 5%, 1/4W/343426/80031/CR251-4-5P1K/Ref

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

FROM: R52/Res, dep car, 100k \pm 5%, 1/4W/348920/80031/CR251-4-5P100K/Ref
TO: R52/Res, dep car, 10k \pm 5%, 1/4W/348839/80031/CR251-4-5P10K/Ref

DELETE: R55/Res, dep car, 15k \pm 5%, 1/4W/348854/80031/CR251-4-5P15K/1

On page 4-5, Table 4-1, page 5-9, Figure 5-2, and page 8-2, Figure 8-1, make the following changes:

DELETE: ~~R55~~ and ~~CR13~~

On page 8-5, Figure 8-1, make the following changes:

DELETE: Reset Line which runs between P3-6 and node of U15-T, S11.

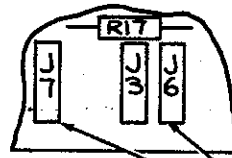
CHANGE value of R52 and R38 FROM: 100k TO: 10k

On page 5-13, Table 5-4, make the following changes:

CHANGE TOT QTY of J2 FROM: 5 TO: 3

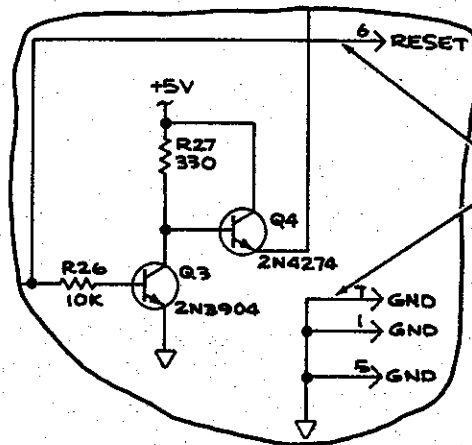
DELETE: J6/Conn, Recpt/375329/00779/85863-3/Ref
J7/Conn, Recpt/375329/00779/85863-3/Ref

On page 5-15/5-16, Figure 5-4, and page 8-8, Figure 8-3, make the following changes:



DELETE J7 & J6

On page 8-9, Figure 8-3, make the following changes:



DELETE LINE 6 & 7

CHANGE #12-11798, -11842, -11844

On the Main PCB Assembly, Line and Battery Power:

C26's polarity was reversed, all Main PCBs with revision letters of L and greater have been corrected, no action is required in the manual.

On page 5-6, Table 5-2, and page 601-5, Table 601-2, make the following changes:

DELETE: H6/Lug, solder/441972/79963/761/2 (Line Power)
H7/Lug, solder/441972/79963/761/2 (Battery Power)

FROM: J1/Conn, Receptacle, BNC/41420/
TO: J1/Conn, Receptacle, BNC/152033/95712/30355-1/2

CHANGE TOT QTY of J2 FROM: 1 TO: Ref.

CHANGE #13-11915

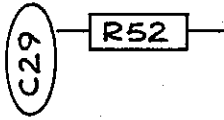
Artwork change, does not affect the manual.

1912A

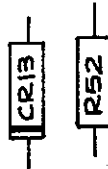
CHANGE #14-11915

On page 4-5, Figure 4-1, page 5-9, Figure 5-2, and page 8-2, Figure 8-1, make the following changes:

FROM:



TO:



CHANGE #15-11937

On page 5-5, Table 5-2, and page 601-4, Table 601-2, make the following changes:

FROM: C28/Cap, Ta, 1 μ F \pm 20%, 35V/161919/56289/196D105X0025JA1/Ref
TO: C28/Cap, Ta, 10 μ F \pm 20%, 15V/193623/56289/196D106X0015KA1/Ref

CHANGE TOT QTY of C26 FROM: 2 TO: 1
CHANGE TOT QTY of C6 FROM: 2 TO: 3

On page 8-5, Figure 8-1, make the following changes:

CHANGE value of C28 FROM: 1 μ F 35V TO: 10 μ F 15V

CHANGE #16-11505

On page 5-11, Table 5-3, A1A1 Display PCB Assembly, make the following changes:

FROM: U201-U207/IC, Display LED/472910/28480/QDSP-3017/7
TO: U201-U207/IC, Display LED/454249/28480/5082-4887/7

CHANGE #17-12086, -12121, -12166, -12184

On page 5-8, Table 5-2, A1 Main PCB Assembly, make the following changes:

FROM: T1/115/230V/491167/89536/491167/
TO: T1/115/230V/463794/89536/463794/

FROM: T1/100V/491159/89536/491159
TO: T1/100V/463810/89536/463810

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

DELETE: R56/Res, comp, 3.9k \pm 5%, $\frac{1}{4}$ W/148064/01121/CB3925/1

On page 8-5, Figure 8-1, make the following changes:

DELETE: R56 and its connection between the high end of S10 and the anode of CR13.

On page 5-7, Table 5-2, and page 601-6, Table 601-2, make the following changes:

FROM: R54/Res, comp, 820 \pm 5%, $\frac{1}{4}$ W/148015/01121/CB8215/1
TO: R54/Res, comp, 47 \pm 5%, $\frac{1}{4}$ W/147892/01121/CB4705/1

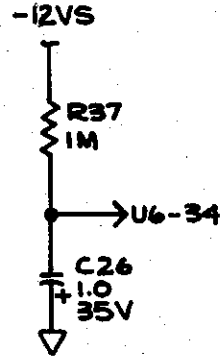
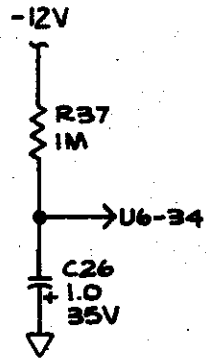
On page 8-5, Figure 8-1, make the following changes:

FROM: R54, 820

TO: R54, 47

FROM:

TO:





Section 8

Schematic Diagrams

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FIGURE	TITLE	PAGE
8-1.	Main PCB Assembly	8-2
8-2.	Display PCB Assembly	8-6
8-3.	520 MHz Prescaler PCB Assembly	8-8
8-4.	Inverter PCB Assembly (-01 Option)	8-10
8-5.	AC PCB Assembly (-01 Option)	8-11
8-6.	Mnemonics	8-12

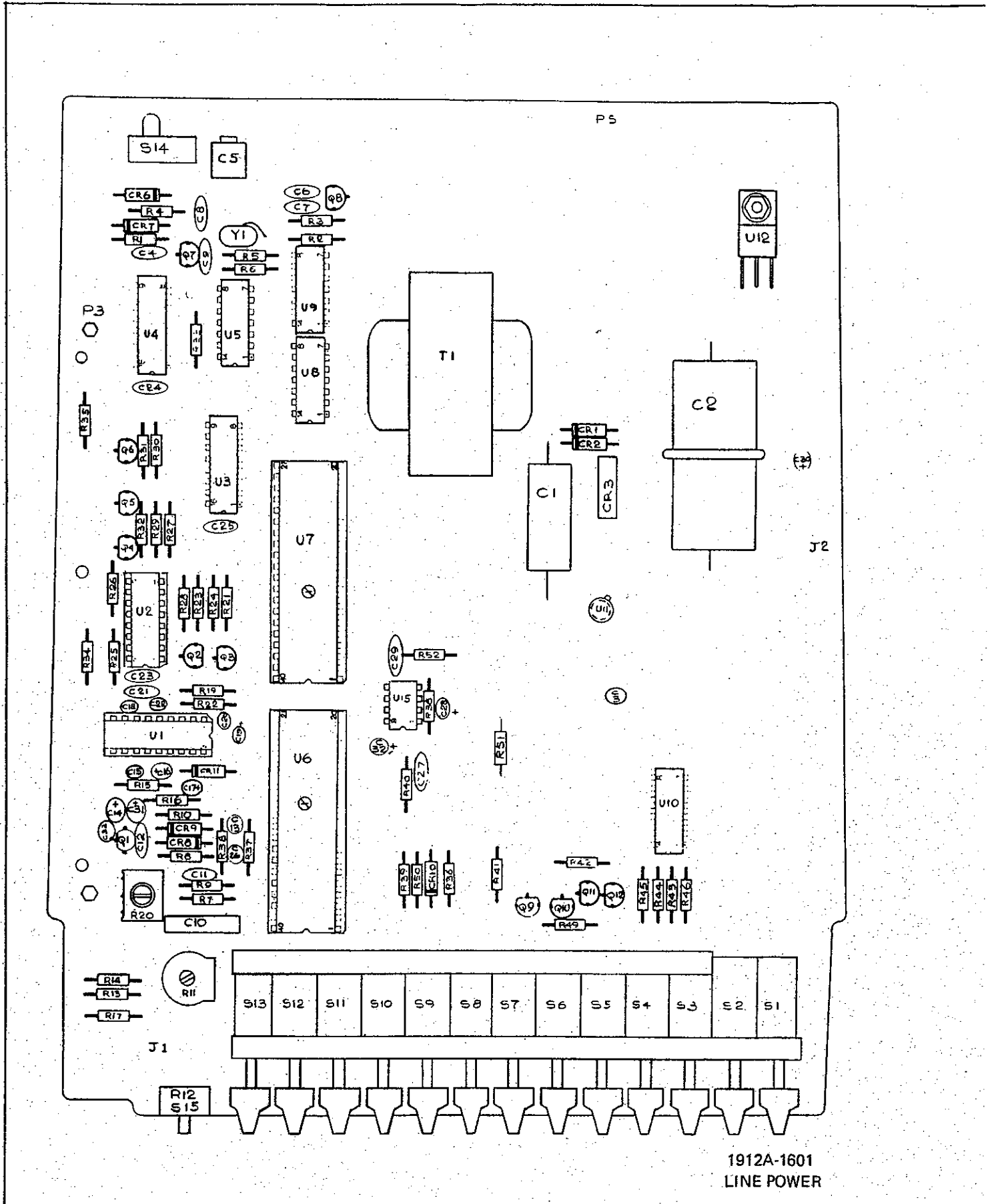
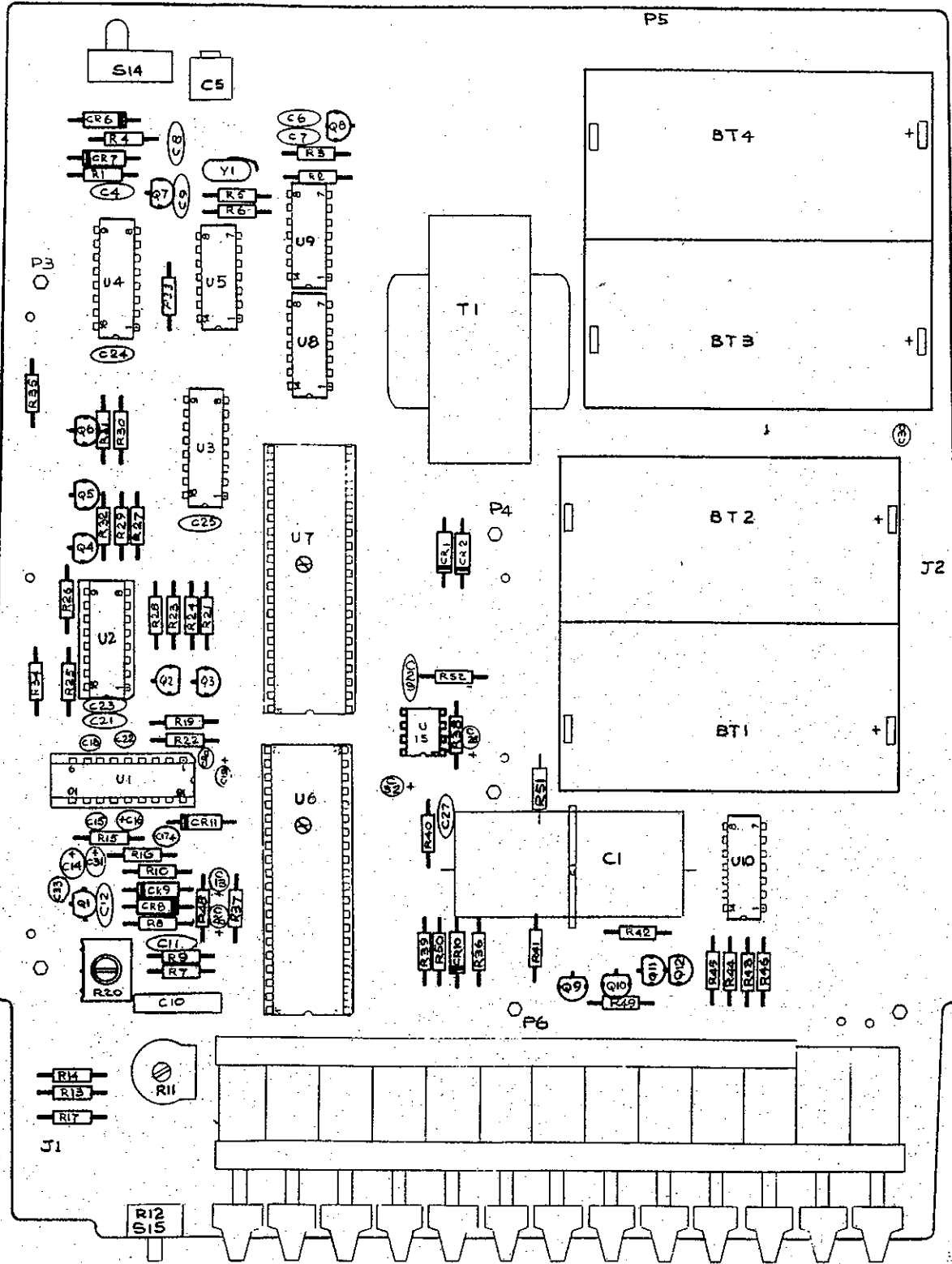
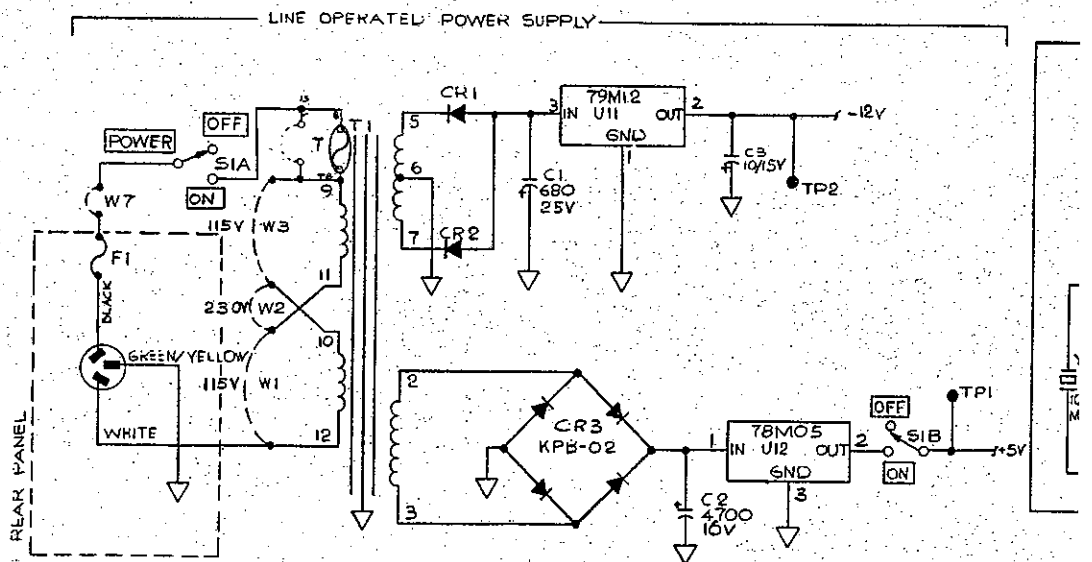
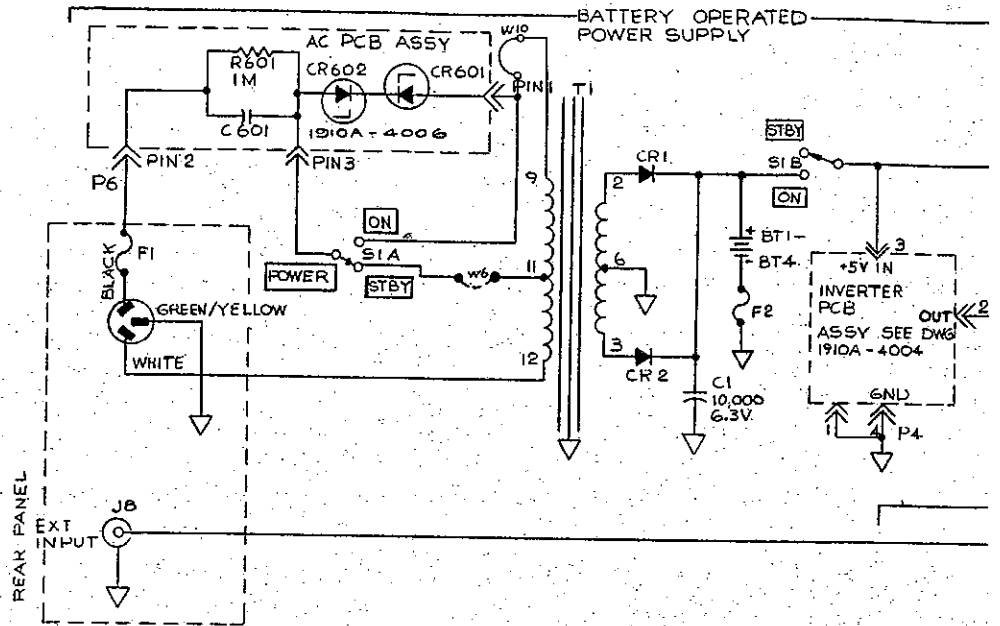


Figure 8-1. Main PCB Assembly

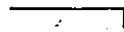


1912A-1611
BATTERY POWER



NOTES:

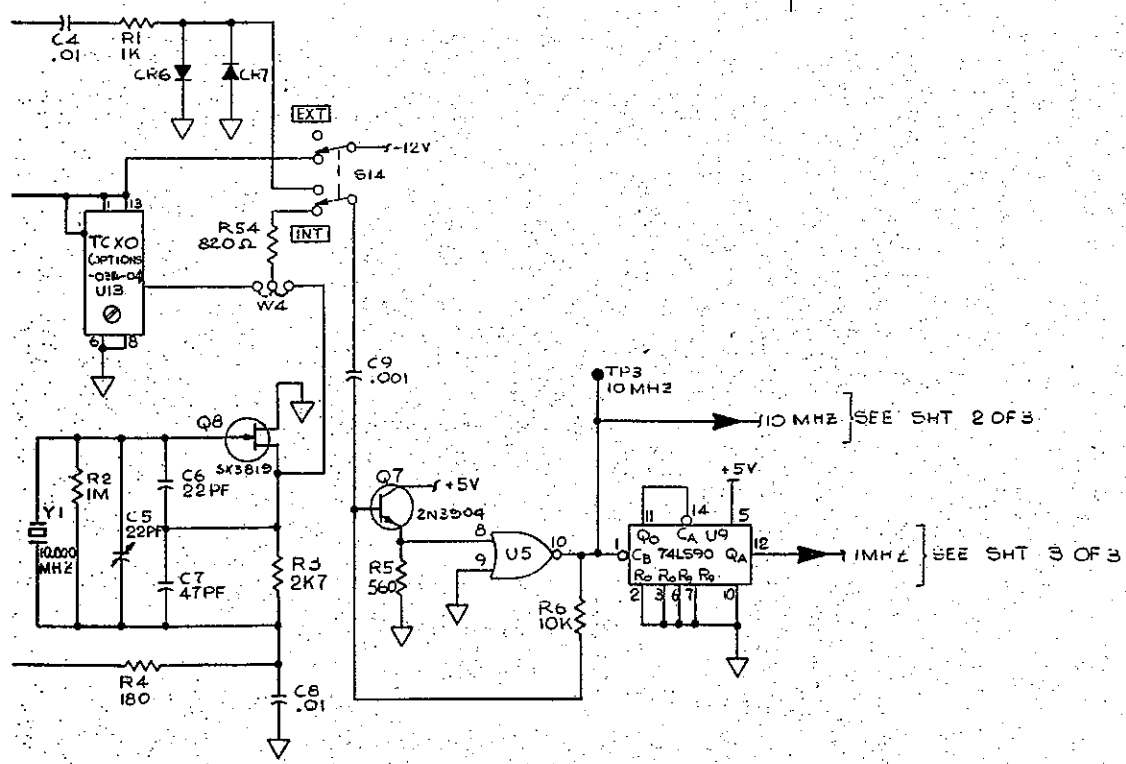
1. ALL RESISTORS ARE IN OHMS, $\frac{1}{4}$ W, 5% CC UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.



+5V

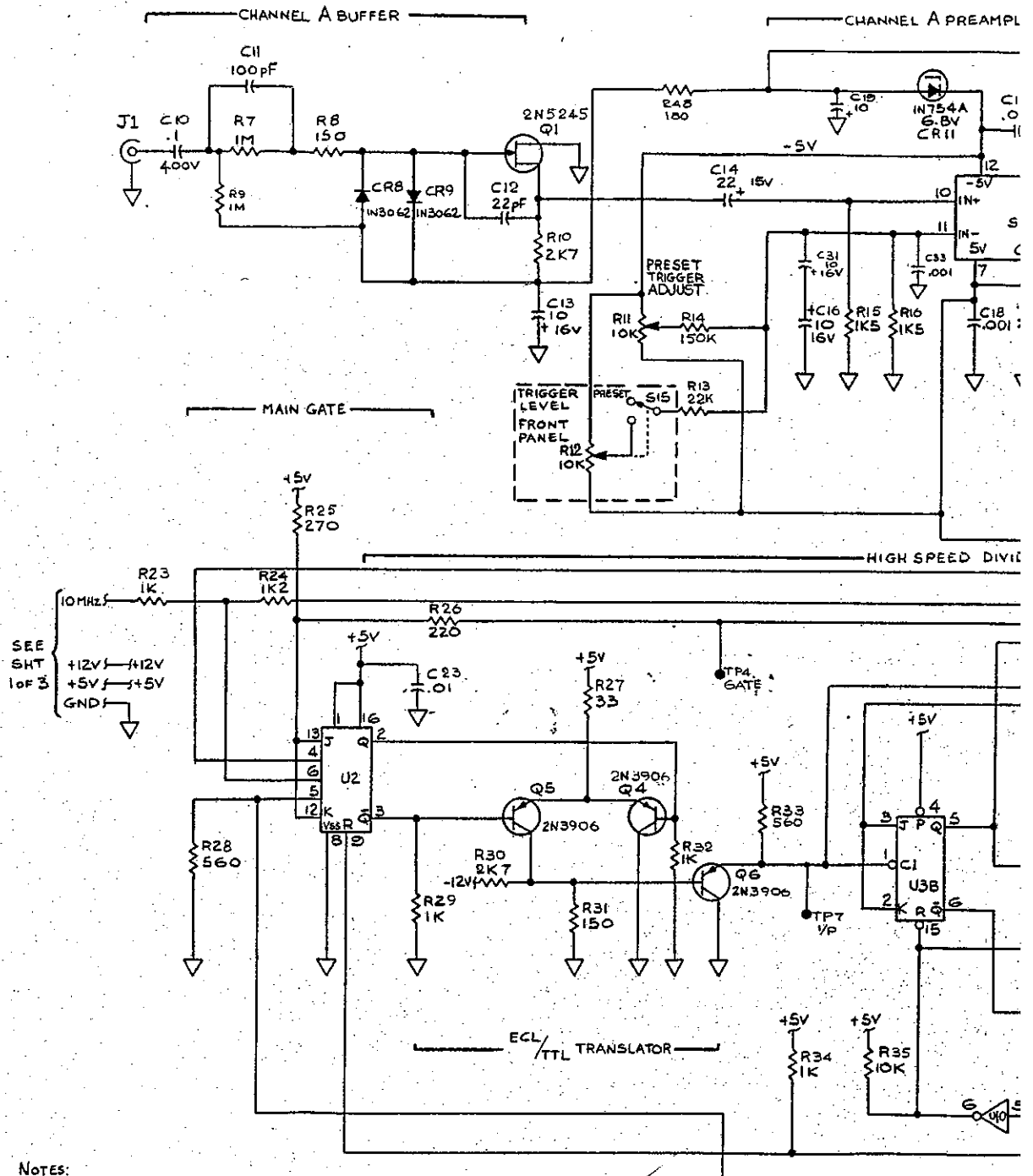
-12V

TIMEBASE CKT

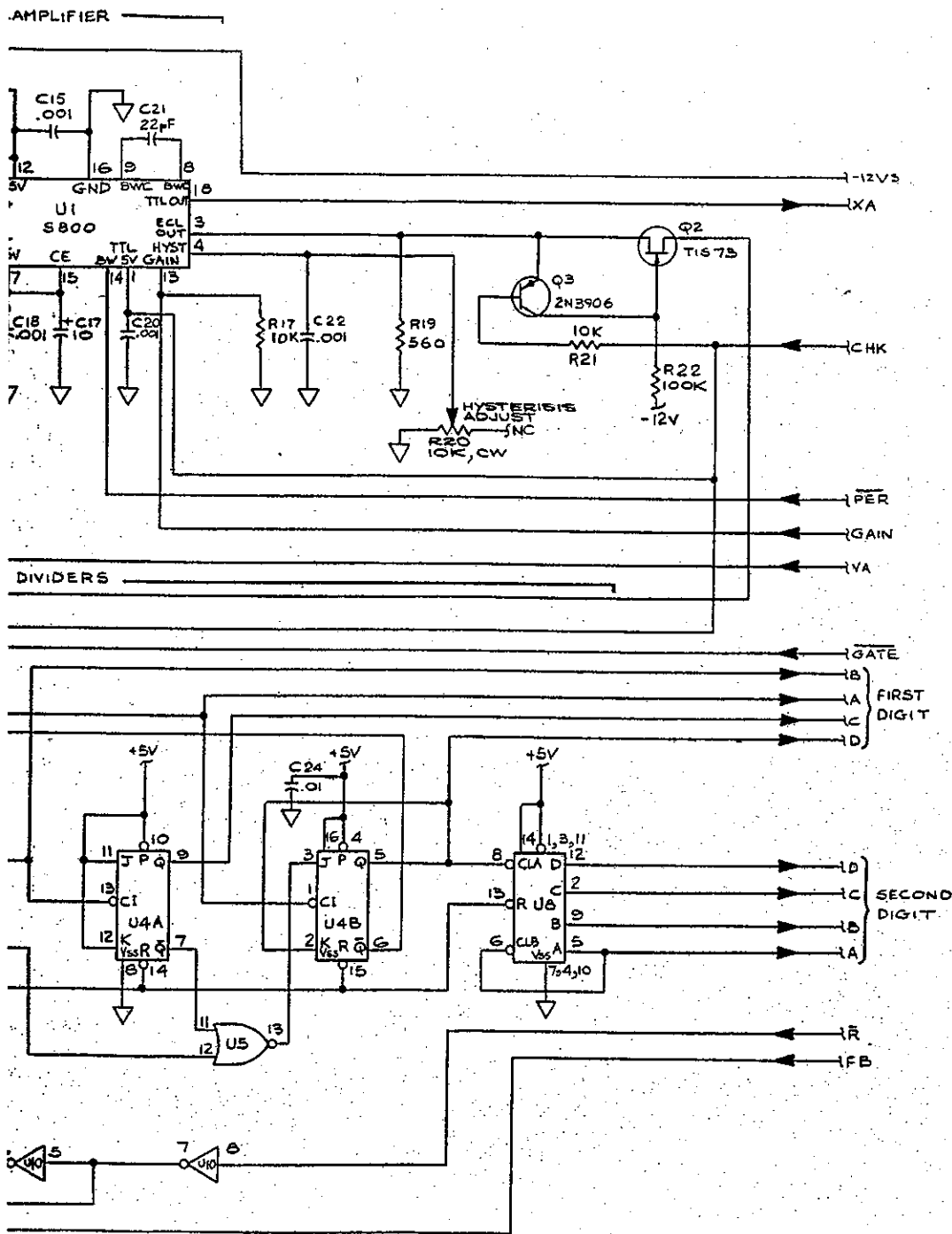


1912A-1001 (Sheet 1 of 3)

Figure 8-1. Main PCB Assembly (cont)

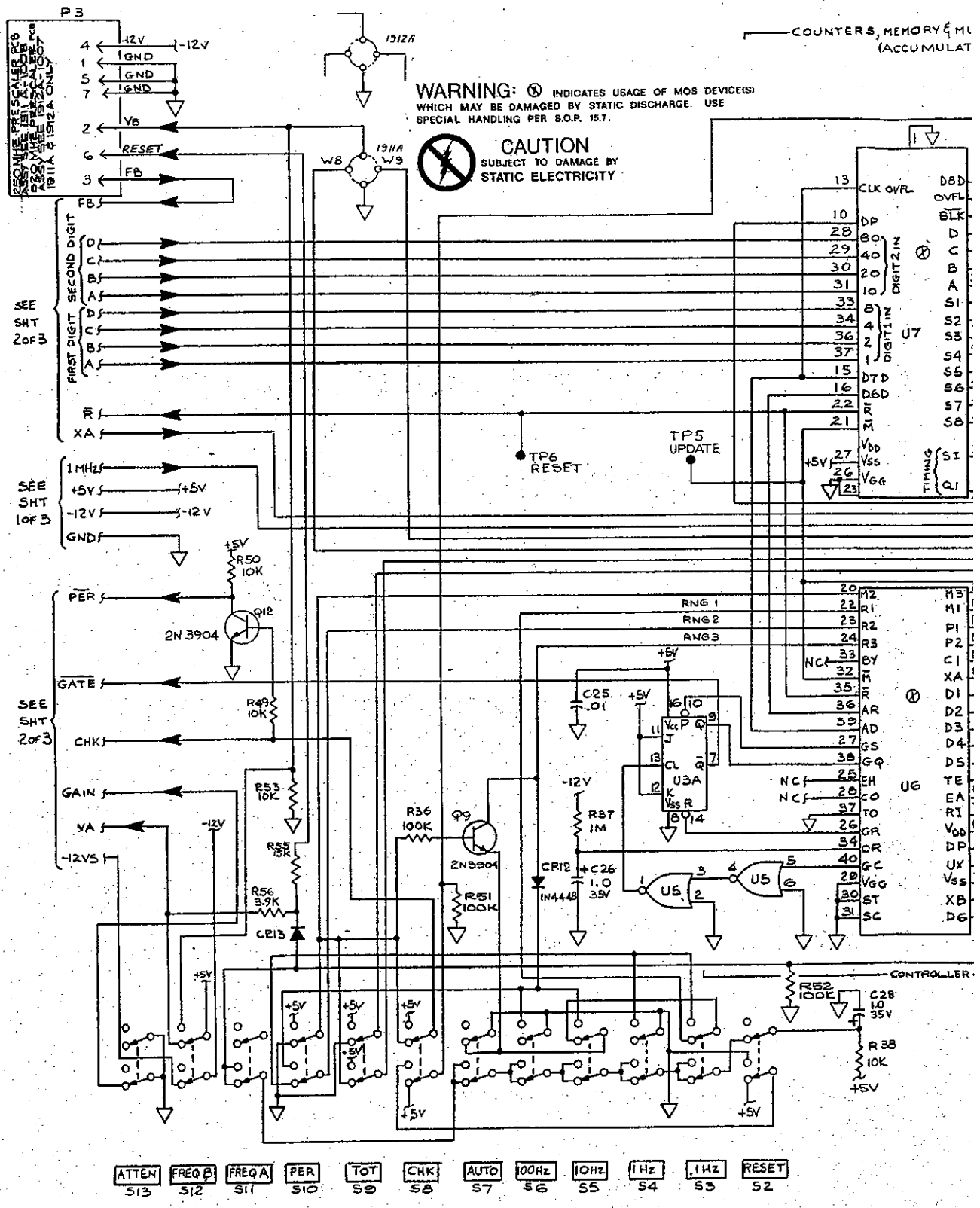


NOTES:
 1. ALL RESISTORS ARE IN OHMS, 1/4W, 5% CF, UNLESS OTHERWISE NOTED.
 2. ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE NOTED.

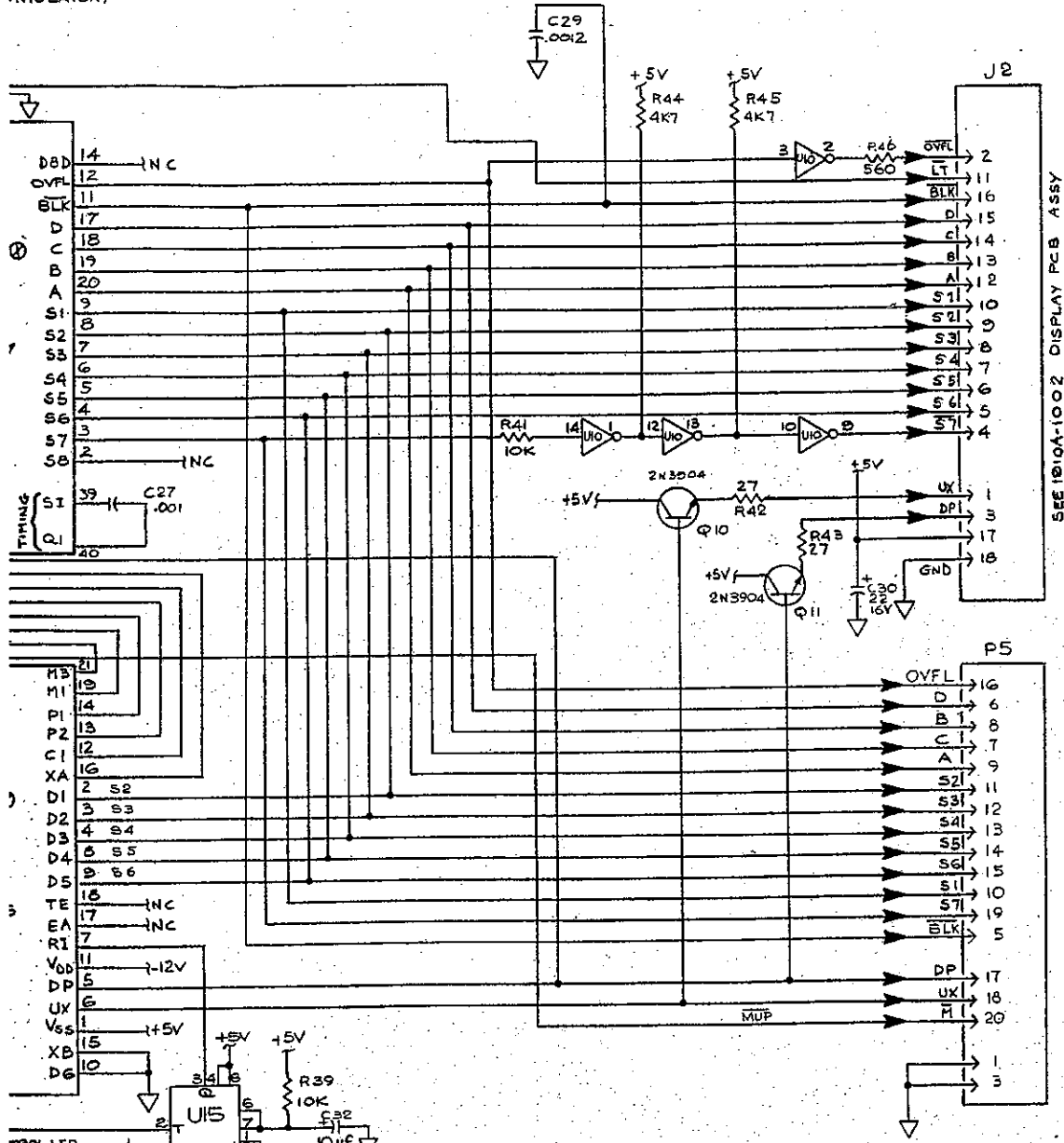


SEE SHT
3 of 3

Figure 8-1. Main PCB Assembly (cont)



DRY (MULTIPLEXERS
SIMULATOR)



SEE 1910A-1002 DISPLAY PCB ASSY

- NOTES:
1. ALL RESISTORS ARE IN OHMS, 1/4 W, 5 % CF, UNLESS OTHERWISE NOTED.
 2. ALL CAPACITORS ARE IN MICROFARADS, UNLESS OTHERWISE NOTED.
 3. LAST USED R55, NOT USED R18
 4. LAST USED C 33.
 5. LAST USED U 15.
 6. LAST USED CR13, NOT USED CR10
 7. LAST USED Q 12

1912A-1001 (Sheet 3 of 3)

Figure 8-1. Main PCB Assembly (cont)

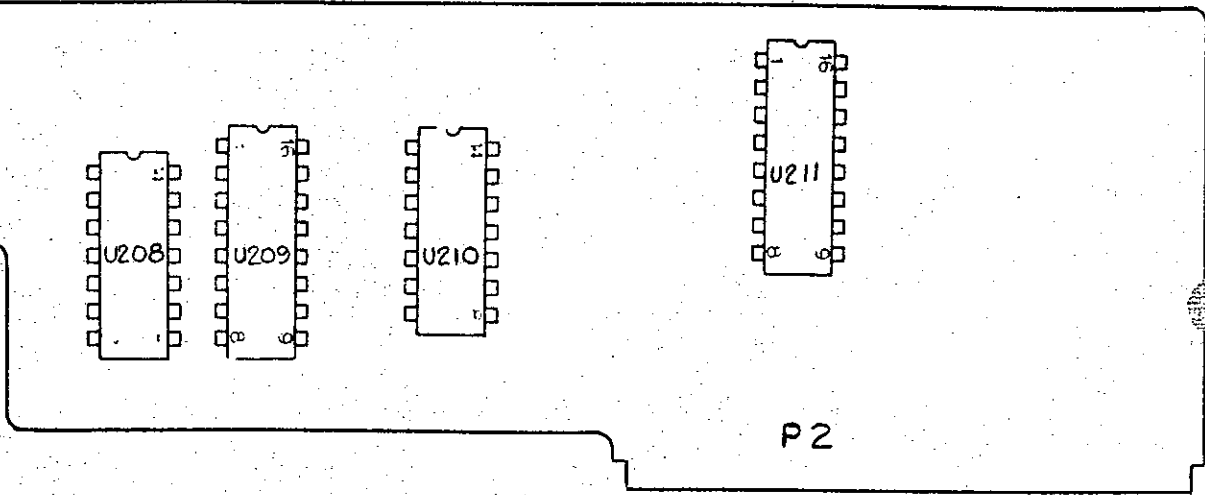
DS201 ○

DS203 ○

DS202 ○

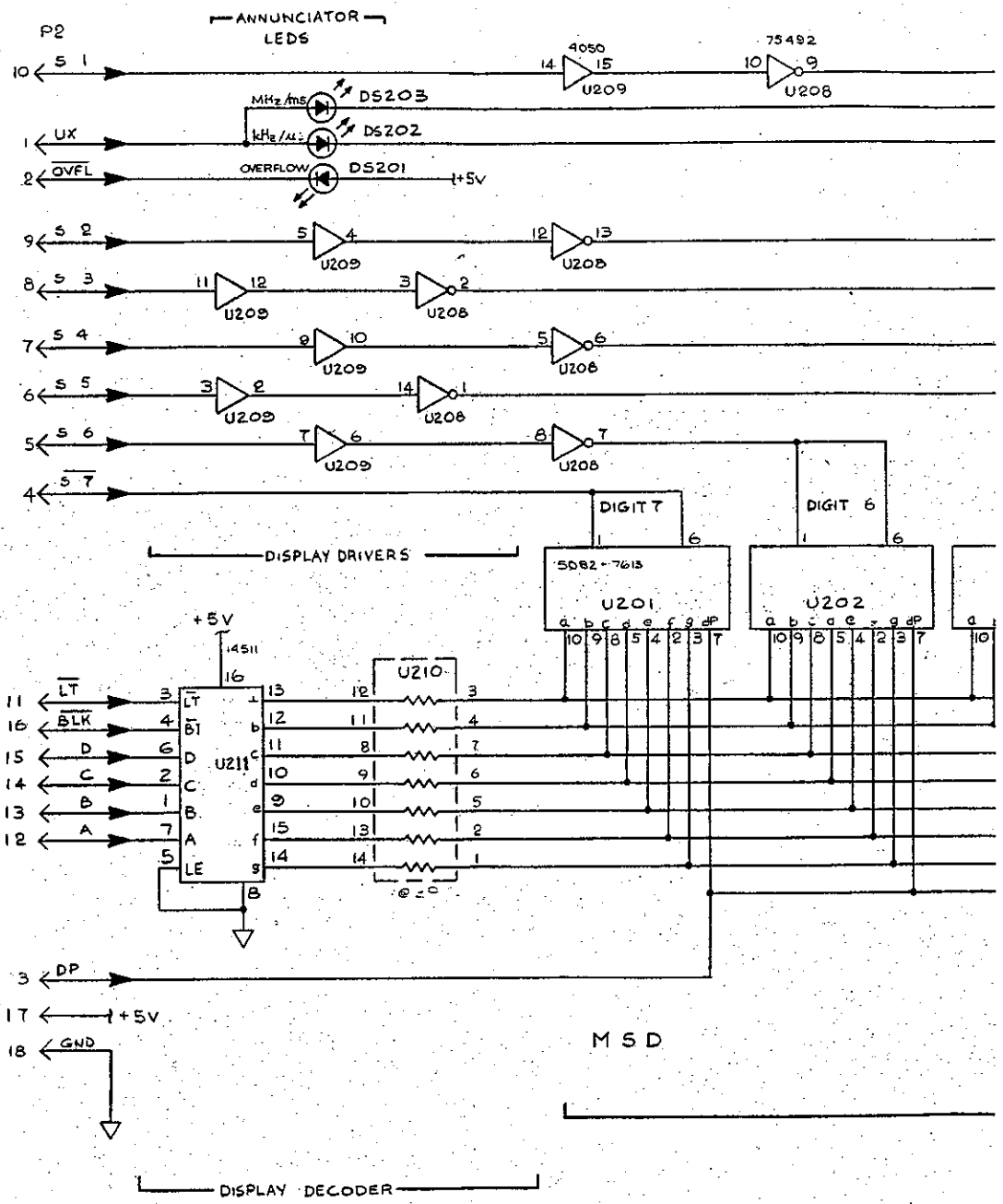
CR204
CR201
CR202
CR203

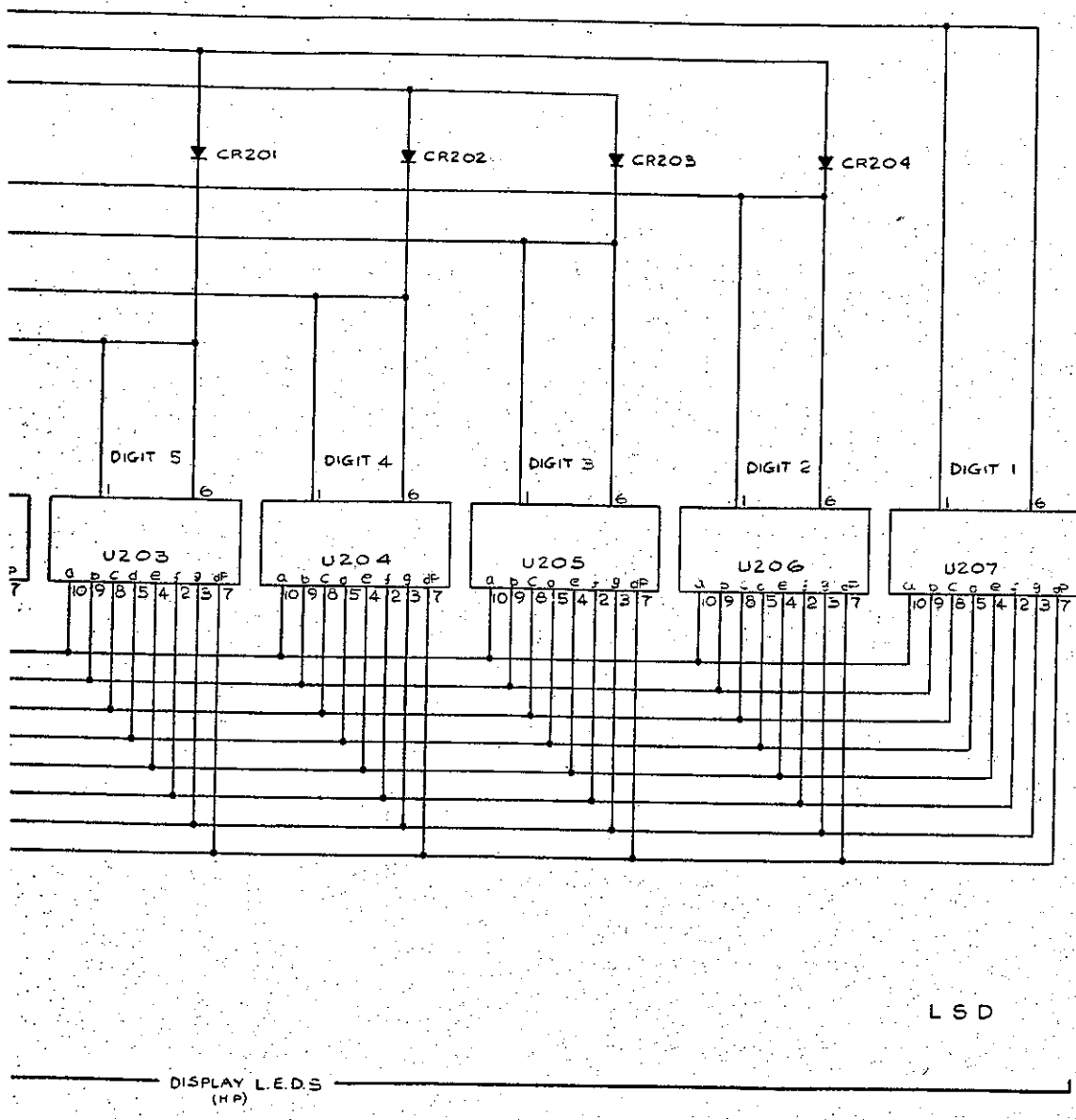
U201	U202	U203	U204	U205	U206	U207
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1912A-1602

Figure 8-2. Display PCB Assembly



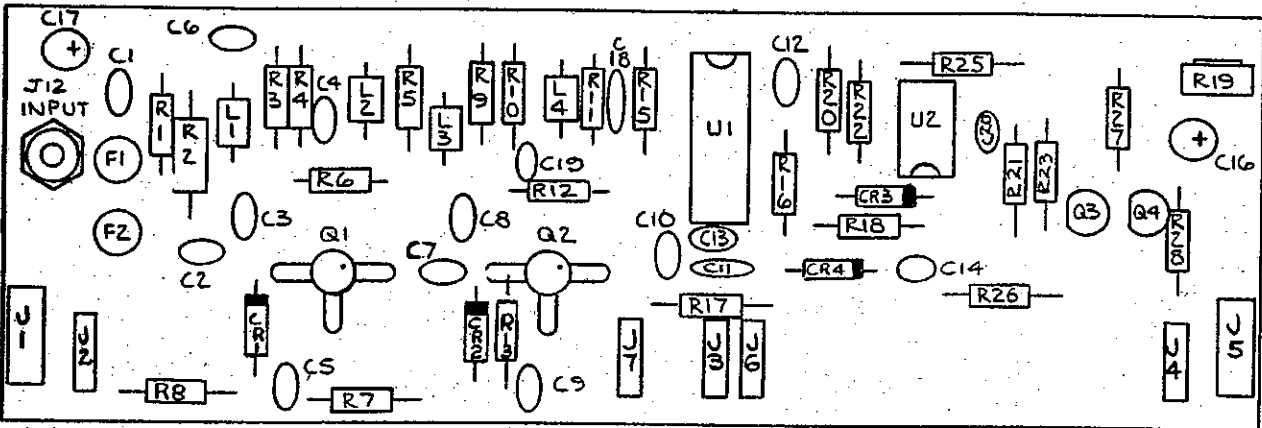


LSD

DISPLAY L.E.D.S.
(HP)

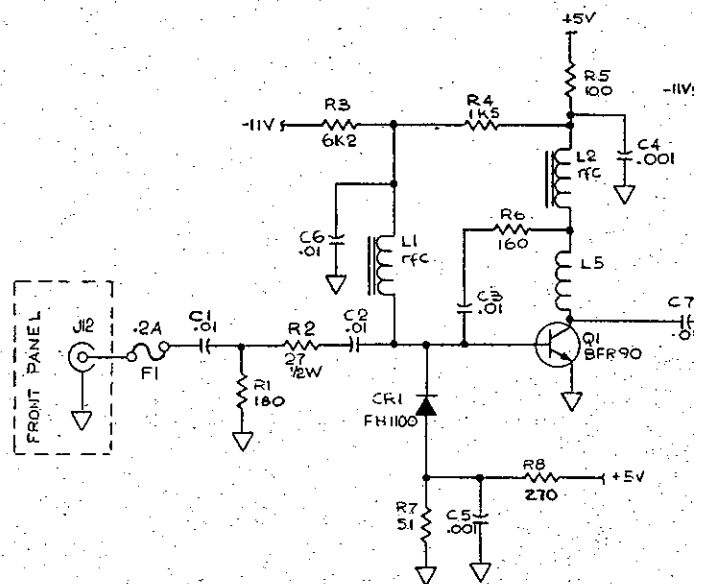
1912A-1020

Figure 8-2. Display PCB Assembly (cont)

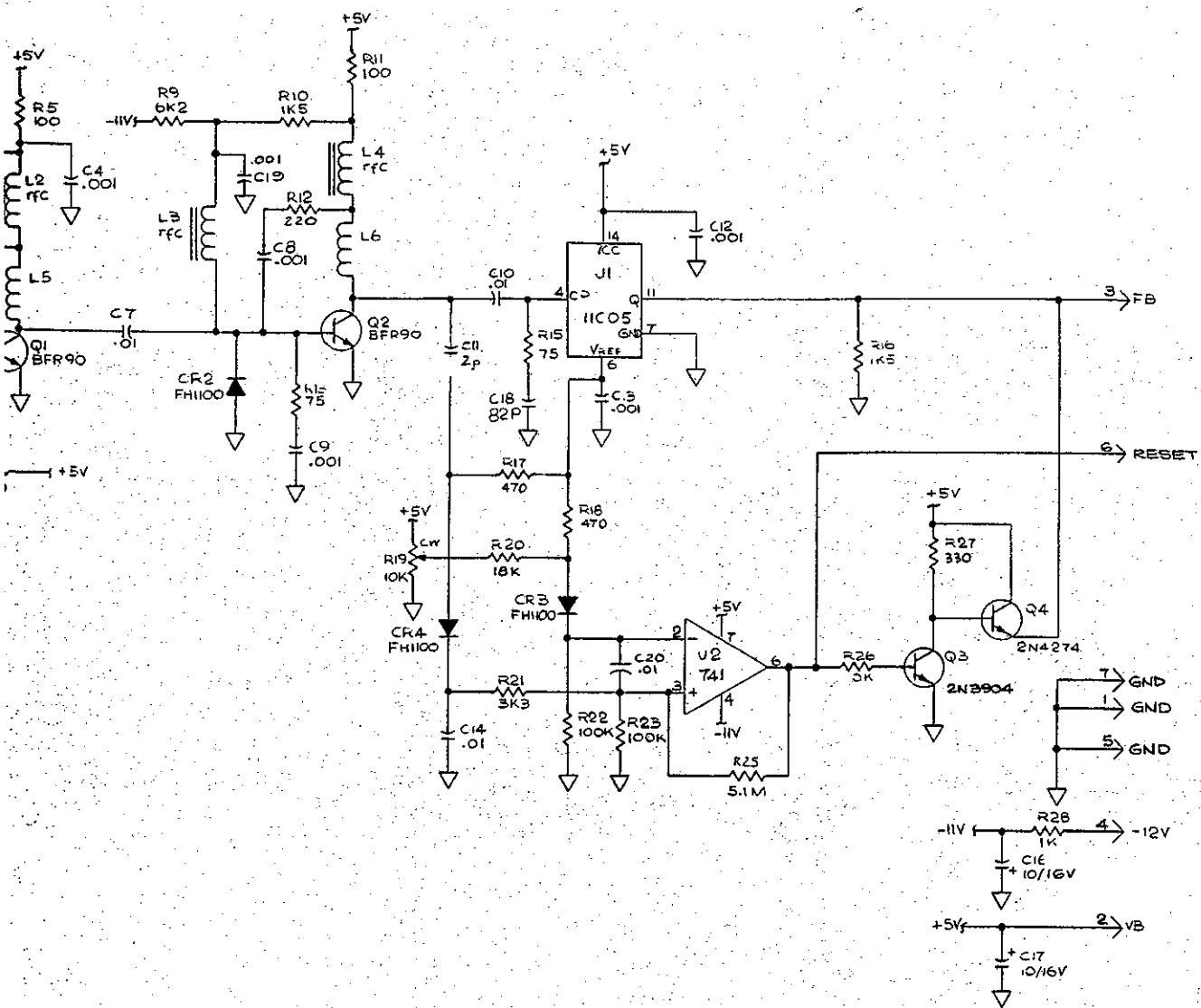


1912A-1607

Figure 8-3. 520 MHz Prescaler PCB Assembly

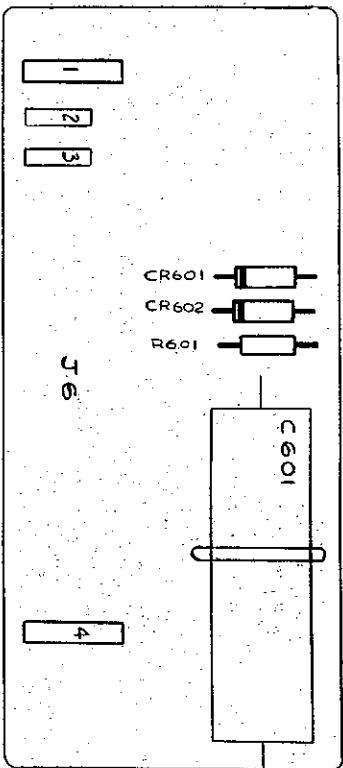


NOTES:
 1 UNLESS OTHERWISE SPECIFIED:
 ALL RESISTORS ARE IN OHMS, 1/4W, 5% CF.
 ALL CAPACITORS ARE IN MICROFARADE.

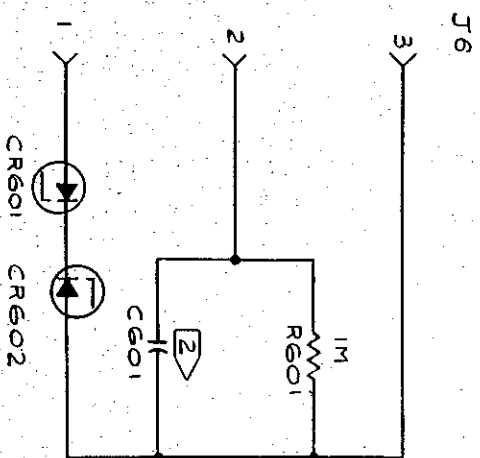


1912A-1007

Figure 8-3. 520 MHz Prescaler PCB Assembly (cont)



1912A-1806



LINE FREQUENCY Hz	VOLTAGE	CAPACITOR uF	P/N	DRAWING NO.
58 - 62	115/60 Hz	6	383546	1912A-1006
48 - 52	100/50 Hz	6.6	394189	1912A-1012
48 - 52	230/50 Hz	3.3	380253	1912A-1013
58 - 62	100/60 Hz	6	383546	1912A-1014

1912A-1006

Figure 8-5. AC PCB Assembly (01 Option)

A = BCD (1)
 B = BCD (2)
 C = BCD (4)
 D = BCD (8)
 a =
 b =
 c =
 d = Seven-/Segment
 e = decoded BCD.
 f =
 g =
 ATTEN = Attenuator
 AUTO = Autoreolution
 BLK = Blanking Pulse to Display, low = time
 CHK = Check
 DP = Decimal Positioning Pulse
 FB = Conditioned Frequency B Signal
 GAIN = Gain to U6
 GATE = Inverted Gate Pulse
 HYST = Hysteresis to U6
 \overline{M} = CMOS Pulse to update memories in Display Section,
 low = true
 M2 = Transition pulse for period mode, blocks ECL
 level, high = true
 \overline{MUP} = M
 OVL = Overflow
 PER = Period
 \overline{R} = TTL Pulse to Reset display decode counters
 low = true
 STBY = Standby
 $\overline{S1}; \overline{S7}$ = Negative switch pulse
 S8, S9 = Switch pulse
 TOT = Totalize
 UX = Units annunciation, multiplexed high = true
 VA = Chan A, 5V supply
 VB = Chan B, 5V supply, high = true
 XA = Conditioned Frequency A Signal, from Preamp
 (used in period)

Figure 8-6. Mnemonics

