## **Errata**

Title & Document Type: 8412A Phase-Magnitude Display Operating and Service

**Manual** 

Manual Part Number: 08412-90010

**Revision Date: April 1972** 

## **About this Manual**

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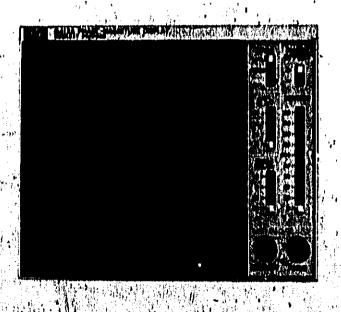
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# PHASE-MAGNITUDE DISPLAY 8412A



HEWLETT () PACKARD

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## PHASE-MAGNITUDE DISPLAY 8412A

## BERIAL NUMBERS

This manual applies directly to instruments with sorial numbers profixed 0000A and 1144A.

With changes described in Appendix 1, this manual also applies to instruments with serial numbers prefixed 920-through 970-.

For additional important information about' nortal numbers see "instruments Covered by Manual" in Section 1,

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Miscafiche Part No. 68412-88619
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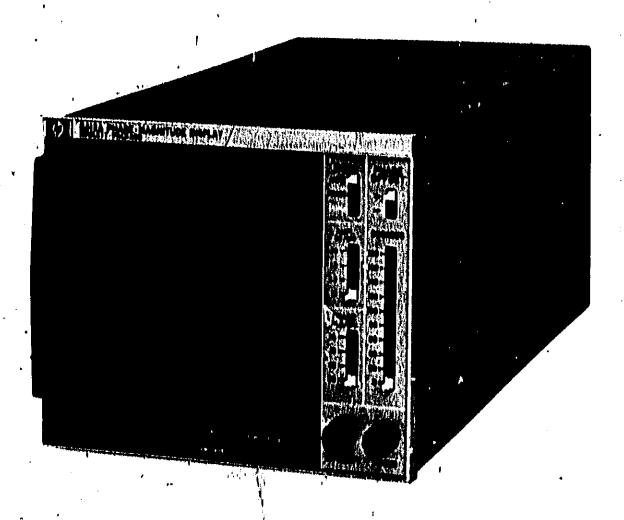
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Model 8418A



Pigure 1-1. Model (412A Phase-Magnitude Dienlay

# SECTION ( GENERAL INFORMATION

## 1-1. DESCRIPTION.

- 1-2. The Model 641RA Phase-Magnitude Display (Figure 1-1) is a plug-in display unit for the HP Models 6407A and 6410A Network Anglykers. The instrument contains a CRT which displays test signal amplitude and phase on two separate CRT traces.
- 1-3. The amplitude and phker display may show signals which represent various amplitude ratios depending up the transducer used in the network analyser. The displayed quantities may be ratios of voltage, whereout, impedance, or an incident-to-reflected signal.
- 1-4. Amplitude is displayed in decibels/division and plus so is displayed in degrees/division on the CRT graticule. Various vertical amplifier sensitivity ranges for both amplitude and pluse may be selected. Front panel pluse offset controls allow the pluse to be adjusted for the most convenient display.
- 1-6. A rear-panel connector accepts a voltage vs. frequency sweep signal from the sweep oscillator and amplifies the signal within the instrument to provide a horizontal sweep for the CRT. Rear panel connectors also provide amplitude and phase output signals and accept Z-axis market and blanking input signals. Complete specifications for the Model 0412A Phase-Magnitude Display are given in Table 1-1.

## 1-6. INSTRUMENTS COVERED BY MANUAL.

- 1.7. Each Phase-Magnitude Display carries a two-part sorial number. The number propositing the hydron, or letter, is a prefix. The nonthints of this minual apply directly to instruments having the same sprist number prefixes as listed after HERIAL NUMBERY on the title page.
- 1-ii. Revision required to shapt this manual to other sorial number profixes are given in a yellow-sheet Manual Changes insert supplied with the manual. For information geneerably sorial number profixes not listed on the title page or in an insert, contact your nearest Hewlett-Packard office.

## 1-9. WARRANTY.

, I-10. Terms of the warranty on the 8412A are desorthed on the front cover of this manual. For any additional information converning warranty, contact your nearest fiewlest -Packard field office.

## Table 1-1. Specifications (Sheet 1 of 2)

INSTRUMENT FUNCTION: Plug-in CRT display for HP 8407A and HP 8410A Notwork Analyzors. Displays ratio and phase versus frequency of RF signal.

DYNAMIC RANGE 60 dll amplitude and 4180 degree phase.

## CONTROLS:

MODE: Positions are amplitude, phase, or deal. In deal position, the amplitude trace is more intense than phase for identification.

AMPLITUDE RANGE: 0.25, 1.0, 2.5, and 10 db/Division

PHARE RANGE: 1, 10, 45, and 90 DEG/Division.

PHARK OFFERT: Offsets display in 20 degree steps from -180 degrees to +180 degrees,

DANISMIDTH: 10 klis for maximum information display or 100 lis to fitter displayed noise.

LOW LEVEL AMPLITUDE CALIBRATION: Callbrates low level amplitude signal display,

HORIZONTAL GAIN: Adjusts length of trace.

## INPUTS

BWEEP IN: Requires sweep signal (6V p-p minimum) from sweeper for horizonial sweep drive.

DLANKING: . Dlanks CRT with -4 Von applied. Compatible with HP 8601A and 8690 series sweepers.

Z-AXIS: Intensifies traces with -5 Vdc and blanks with +6 Vdc applied.

## OUTPUTS

AMPLITUDE AUXILIARY: 60 MV/dB

PHASE AUXILIARY: 10 MV/DEGREE

## AMPLITUDE ACCURACY:

Display: 0.03 dB/dB +0.06. div/div.

Rear Output: 0.05 dB/dB.

Temperature Coefficient: Typically < 0.05 dB/°C at hidsorden.

## PHABE ACCURACY:

Display: 0.016"/degree 40.05 div/div.

Rear Quipul: 0.015\*/degree.

Phase Offset: 0.3"/20 degree step, not to exceed total error of 5" for 560" of change, positive or negative direction.

Vs. Displayed Amplitude:

Over upper 70 dit amplitude ranget <1 "/10 dit, maximum phase changé not to exceed 4". Over full 80 dit amplitude ranget Maximum phase change not to exceed 6".

POWER: 25 Watts supplied by mainframe. -

WEIGHT Not 17 16. (7, 8 kg); Shipping 22 lb. (10 kg). .

DIMENSIONS: 6 in. high, 15-9/16 in. deep, 7-9/32 in. wide (15, 2 x 39, 5 x 18, 6 cm); excludes front panel knobs.

# 

# SECTION (II

## 3-1. INTRODUCTION

2. The Model 8412A Phase-Magnilude Display is a plug-in light for the Model 6407A or 6410A Network Analyzer mainframe, The 6412A provides a direct CRT trace of phone and magnifude showing the ratio between the test and reference RF signals applied to the network analyzer. Controls on the front panelprovide horizonial positioning and gain, amplitude low lovel nalibration, phase and amplitude display resolutibit, and phase offset of the phase trace, as well we CRT. intensity and focus. Controls on the rear paint provide vertical positioning and aligning the trace ville the horizontal graticule, The rear panel contains INC connectors which allow connection of the awayper horizontal signal, markers, and blanking. Output signals from the phase and magnitude amplifiers are available at rear panel BNC connectors for use with an external X-Y recorder or pacilibacope.

## 3.3. PANEL FEATURES.

3-4. Front and rear panel controls, connectors, and indicators are described in Figures 3-1 and 3-2. In these figures, the numbers on the illustrations match the description numbers.

## 3-6. SCREWORIVER ADJUSTMENTS

- 3-6. There are three operator acrewdriver adjustments on the 6412A, one on the front panel and two on the rear panel.
- 3-7. The AMPL CAL (LOW LEVEL) control on the front panel adjusts calibration of the amplitude amplifier. To properly adjust this control, set the Network Antityzer/test channel gain and amplitude vernier town obtain an 8412A trace on the center graticule line. Decrease the test channel gain to 10 dB steps, With the 8412A AMPL DB/DIV control set to 10, the trace should move down one major division for each step. If not, adjust AMPL CAL (LOW LEVEL) control on front panel. Continue adjusting the test channel gain and AMPL CAL (LOW LEVEL) controls until the trace moves exactly one major division for each 10 dB step, from the center graticule line toward the bottom of the CRT.
- 3-8. The YERT POS control on the rear panel is adjusted in a manner similar to adjusting the de balance of a de coupled oscilloscope. Set the Sweep Oscillator, Network Analyzer, and 8412A controls to obtain a swept amplitude display positioned near

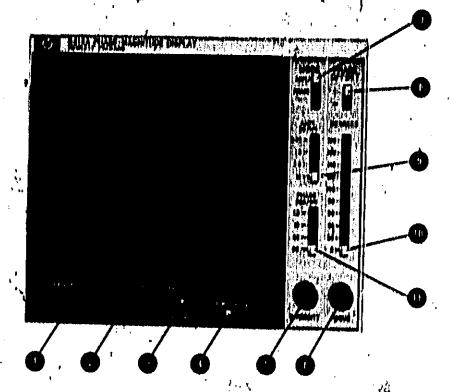
the center graticule line. With the 641RA amplitude sensitivity switch (AMPL DB/DIV) set to 0.26, adjust the Network Analyzer amplitude vernier control to position the 641RA trace on the center graticulatine, Then set the 641RA AMPL DB/DIV control to 10. If the trace has moved from the center graticulatine, recenter it by adjusting the VERT POS control on the rear panel. Continue adjusting the amplitude sensitivity, amplitude vernier/ and vertical position controls as described above; adjust for minimum trace change with a change in sensitivity.

5-9. The TRACE ALIGN control on the rear panel is adjusted to slign the 6412A trace to the horizontal graticule, "The slignment is done most effectively, on the center graticule line. The fiween Oscillator should be set for minimum sweep width.

## J-10. OPERATING PROCEDURES

3-11. The 6412A Phase-Magnitude Displayplugateto, both the Model 6407A and the Model 6410A Network. Analyzers which orgether cover the entire band between 100 kHz and 12.4 GHz. In an amplitude test soing, the 6412A displays both magnitude and phase. Tests thay be signed on many types of components and circuits, whether passive or active. Tests may also be made of two matched amplifiers dropher devices to see how they differ in gath and phase across a swept band of frequencies, in Wreflectometer test seine, the 0412A displays return loss and phase of the reflected signal. From this information, the VBWR, reflection coefficient, and impedance can be calculated. Typical test setups for both reflection and transmission measurements are shown in Figures 3-5 through 3-6.

5-12. In another, application, the 6410A together with an 6412A plug-in is used as the readout instrument for an B Parameter Test Set, HP Model 6745A (0,1 - 2 GHz), or for a Reflection/Transmission Test Unit, HP Model 6745A (2,0 - 12,4 GHz). These units test transmission and reflection characteristics of two-port devices. For transmission measurements, the 5412A displays gain or loss in dB and for reflection measurements the 5412A displays gain or loss in dB and for reflection measurements the 6412A displays return loss in dB. For more detailed operating instruction using the 6410A System with an 6743A or 6745A, see the appropriate operating manual for the transmission/reflection instrument used.

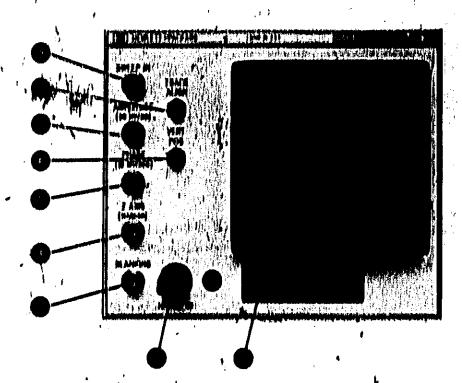


- RIROR POSITION control. Moves frace horizontally.
- ROREZ GAIN control. Adjusts gain of horisonial amplifier to change length of displayed traon.
- AMPL CAL (LOW LEVEL) control. Adjusts calibration of amplitude amplifier for alguals displayed on lower half of City series, ite-Ipr to Botton III, Paragraph 5-7,
- DW (klin) awitch, Bolouth bandwiglichaffnud by the reference and that chamble. This allown decreasing bandwidth while necessary to filler pains from the dimplay,
- INTENSITY control. Controls brightness of the trace.
- FOCUS control. Controls the sharpsess of the trace.

- MQDK awitch, Balacta AMPL (amplituda) PHARE, or both amplifude and phase (DUAL) to display on sorosm. When both amplitude and phase are displayed, the amplitude trace in brighter than the phase trace for entry ldentification.
- PHARE OFFIET polarity switch. From agro deligner, offert in enforted either in the negative or positive direction up to 180 degrees. The polarity switch selects the direction from servand works in competitor with the DECREES awilighto acteut offact.
- AMPL DB/DIV., switch. Belock the calibrated resolution of the test channel amplitude display.
- PHARE OFFRET DECREEN switch, Belegia offsol in 20-degree sleps. The switch works in our junction with the PHARE OFFIER polarity awitch to solect up to 100 degrees in alther the positive or negative direction from sure degrees. The phase office plus the dis-play reading gives the measured phase reading.
- MARK DRO/DIV, awiich, ficients the callbeated resolution of phase display.

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## REAR PANEL

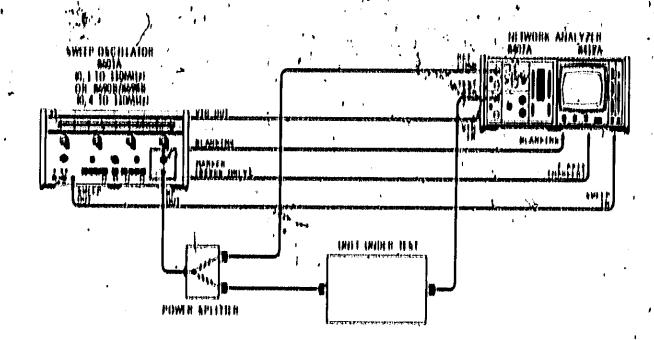


- Mainfranto interface connector J1. Makes att necessary connections with 6407A or 8410A mainfrages.
- Fune holder. Pune protection in 175 Vac line from mainframe. Fune in 1/6 ampere slow blow.
- il.AMKING connector J6, Input for blanking algorithm awasper. The algorithm lanks the trace furing a weep in retrace /4tV blanks, OV unblanked),
- E-AXB connector Jö; Marker Input to E-axia that Intensity undelates the trace, placing a bright dot on the trace at the selected marker frequency with 150 Model 4500A/D, The input can both mark and blank (-5V intensities, -6V blanks).
- DILARK (10 MV/DKO) connector 14. Voltage cuttent is proportional to the planes angle of the centering attent to the reference attent. Output, is 10 mV/degree positive voltage for plane angles of to 4100 degrees positive voltage for angles of 0 to -100 degrees.

- VERT 1938 Control. Enrong phase and amplitude traces vertically, Refer to Bect ton III, Paragraph 3-6.
- AMPLITUDE (60 MV/DB) connector 18, Dapponting on the translucer used on the unit under test, the voltage output in proportional to the amplitude ratio of:
  - (i) [20 log (varen/varen)],
  - (A) [ROIONIO (Prepr/Inke)], or
  - (a) [no log lo(viertum/vincident)].
- THACK ALION Control. Does to all CRT trace to the horizontal graticule. Adjustment should be performed with sweep openintor net for minimum sweep width.

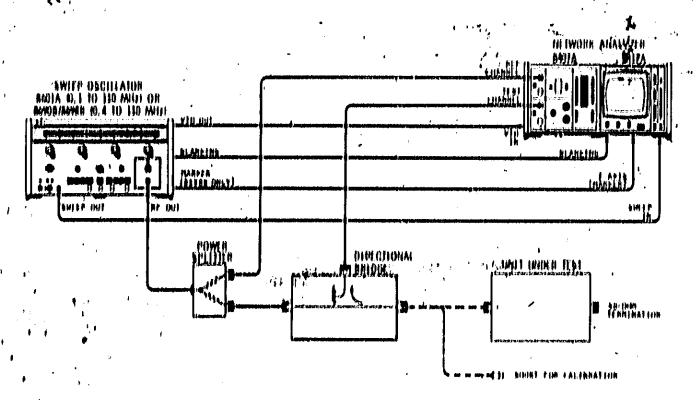
itefor to feetion ill paragraph 2-9;

#WKKP IN connector II. Input for aweaper algust that goes to no rison is in-axis sinplifer. γl



NOTE: POWER SPEEDING AND ENTERCOURCIEM CARLES ARE PART OF ACCESSORY KEET OF TRASE

Figure 9-8. Typical Transmission Test Schop Using #407A/#418A



HOTE: POWER BPLITTER, DERICTIONAL BRIDGE AND INTERCORNECTING CARLES ARE PART OF ACCESSORY RELEASE.

Figure 8-4. Typical Reflection Test detup Using 8407A/8418A Bystein

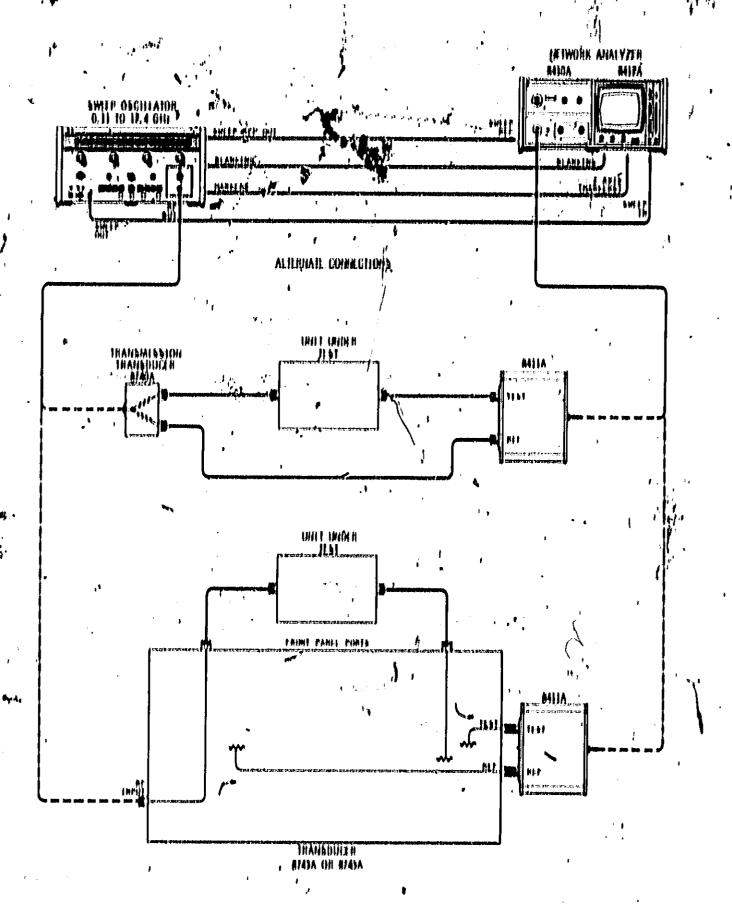


Figure 3-5. Typical Transmission Test Schop Using 8410A/8411A/8413A System

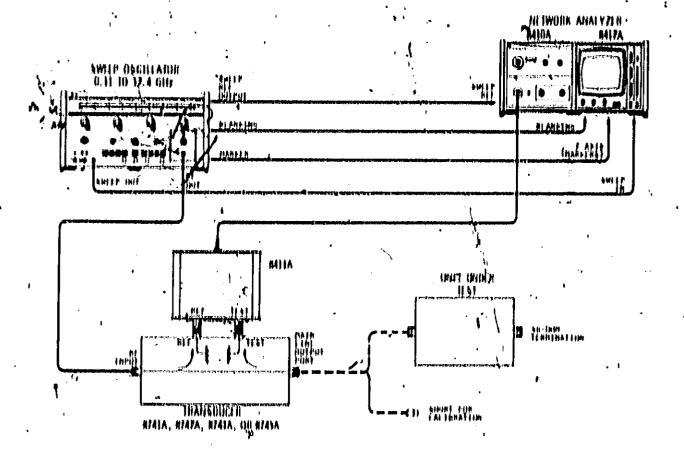


Figure 3-6. Typical Reflection Test Setup tisting 0410A/8414A/841RA Bystem

# 

## **SECTION IV**

## PRINCIPLES OF OPERATION

## 4-1. GENERAL

- 4-2. The Model 64 PRA Phase-Magnitude Display detects and displays magnitude and phase differences inherent in the RF input algusts to the maintrame. This is accomplished by detecting the 276 kits IF test and reference signals, multiplexing them into the vertical amplifier, and displaying the relative magnitude and phase on two separate traces on the CRT.
- 4-3. Inputs on the rear panel are provided for blanking and frequency marking of the CRT trace. Outputs allow display on an external recorder or oscilloscope. The horizontal sweep is driven by a de voltage vs. frequency sweep signal from the external sweep oscillator. A simplified block diagram of the 8412A is shown in Figure 4-1. A more detailed theory of operation is presented in Section VII opposite the individual schematic diagrams.

## 4-4. 'SIMPLIFIED BLOCK DIAGRAM DESCRIPTION.

4-5. As shown in Figure 4-1, RF input signals from a unit under test are converted to 278 kHz IF signals by the HP 6407A or 6410A Network Analyzer mainframe then applied to the 8412A plug-in display. The network analyzer mainframe also supplies dual channel automatic gain control (AGC) so that only the test channel amplitude need be measured to effectively measure the test-to-reference amplitude ratio.

- The test channel is separated into two signal channels in the mainframe, the test phase signal and the test amplitude signal. The test phase signal is amplified and limited in the B412A test channel amplifier AO, Two functions are accomplished; (1) a very fast sere arossing is obtained which is used for phase measurement, and (2) a square-wave constant-amplitude signal in obtained which is used for the drive signal in the amplitude detector. The second test channel input, the test amplitude signal, is amplified then detected in amplifude synchronous detector A10, using the drive from A0. The detected amplitude signal is converted in amplitude-channel log converter A7 to a logarithmic signal read in declicis. The logarithmic amplitude information is then multiplexed together with the phase information in multiplexer. A3 and displayed on the CRT,
- 4-7. The reference phase channel passes through phase offset A2. The output of phase offset A2 is applied to phase detector A1 where it is compared with the test channel phase signal from A9. The phase information at the output of the phase detector is applied to pultiplexer-deflection amplifier A3 along with the amplitude information. Multiplexer-deflection amplifier A3 time-multiplexes the phase and amplitude signals to the CRT where they are displayed.
- .4-8. The network analyzer mainframe (8407A or 8410A) also supplies 420 Vdc and 175 Vac to the 8412A. The high-voltage-power supply A5 and high-voltage rectifier A6 convert plus and minus 20 Vdc to -3000 Vdc for the CRT. Low-voltage power supply A8 converts the 175 Vac to 48 Vdc and 235 Vdc for other circuit requirements within the instrument.

# MAINTENANCE

## SECTION V MAINTENANCE

## **5-1. INTRODUCTION.**

1

6-2. This section provides instructions for performance testing, calibration, and troubleshooting of the HP 8412A Phase-Magnitude Display. Test equipment required for these procedures is listed in Table 6-2. If the test equipment recommended is not available, other equipment may be used if its performance meets the "Critical Specifications" listed in the table.

## 5-3. PRINTED ÇIRCUIT BOARD EXCHANGE.

The 8412A is unique in that the printed direult boards of the instrument have been carefully designed to be independent of each other so that problems can be ennity indiated to the board level. HP encourages the use of the troubleshooting tree in Section VII for isolating problems to the board level and has made rebuil(-exchange printed, circuit imards available to complement this repair approach. The robuiltexchange boards are available at a much reduced cost I from a new board. The lower price is dependent on the return of the defective board to HP. A replacement board should be ordered by the rebuilt-exchange stock number listed in Table 5-1. The board can be ordered through the nearest Rewlett-Packard Bales and Service office listed in the back of this manual. . The exchange board will immediately be sent directly from our stock of service parts. Upon receiving the replacement board, the faulty board should be returned in the same special carton in which the new loard was received. Do not return additective board to RP until the replacement board has been received.

5.5. If a defective exchange board will not be returned to RP, and the ordered board is for spare parts stock, etc., a new board should be ordered, using the new-assembly stock number listed in Table 5-1 or Gel.

## 5-6. MAINTENANCE PRECAUTIONS.

## WARNING.

Voltages greater than 1000 Volts are present at the CRT and in appemblies A5 and A6. These voltages could cause injury to personnel.

CAUTION

When replacing bottom covers, do not exceed screw strength.

## .6-7. PERFORMANCE TESTS.

5-6. The procedures in Table 5-3 and 5-4 test the performance of the 6412A. These procedures may be used during incoming inspection, periodic evaluation, or after repair or alignment. The test may be performed without access to the instrument interior. The

specifications of Pable 1-1 are the performance standards.

5-9. Two similar procedures are presented, one for the 8407A mainflams (Table 5-5) and the for the 8410A mainframs (Table 5-4). The two procedures differonly because of the differences in operation between the two mainframes.

## 5-10. ALIGNMENT PROCEDURES.

5-11. Alignment procedures are given in Table 5-6 and 5-7. These procedures should not be performed as a routhe maintenance procedure but should be used (1) after replacement of a part or component, (2) when the performance test shows that the specifications of Table 1-1 cannot be met, or (5) when instructed to do so in the troubleshooting tree (Figure 7-4). Before attempting any, adjustment, allow 50 minutes warm-up time for the 6412A and maintrame.

5-12. Table 5-2 lists the iest equipment required for alignment, Table 5-4 lists the alignment controls, and Figure 5-2 shows the location of the controls,

## 5113. TROUBLEBHOOTING:

5-14. The trouble mosting procedures are given in Figure 7-4. They should be performed in the order given, since each step promises the proper readout in preceding steps. The traditionhooling tree should isolate trouble to a defective printed circuit board or chassis-mounted part; if further fault isolation is desired, use the individual schematic diagram for the defective board and troublashoot, using the waveforms and voltages on the schematic diagram. The troubles shooting tree assumes that chassis wiring and capking is not defective. If this type of trouble occurs, use standard troublashooting techniques to focate trouble.

## 5-15. SELECTED COMPONENTS.

5-16. Bome component values are selected during manufacturing in order to achieve a desired directly performance. The typical value used in a circuit is shown on the schematic, along with a star after the value. These components are listed in the parts list as "factory; splected".

6-17. In the 6442A only AGRE is factory solected. A change in this value changes the lighteration vollage to the CRT. If the vertical amplifier in A5 cannot deflect the trace to the top and bottom of the CRT screen, the value of AGRE may be increased up to a maximum of 65K ohm. Conversely, the value of AGRE may be decreased to 24K ohm minimum, depending on the vertical deflection of the CRT trade.

Table'5-1. Relaill-Bahange Assembly Block Numbers

1	Annombly -		New Atook No.	Rel	nill-Karlange Mork No.
	Al Phase Delaglor -		00418-00001	***************************************	08418-00080
	AR Plining (Minol		ON4 ER = 0000 R	*	08410-00001
	All Multiplexer/Deflection Amp.		00418-00008		0841 <b>n</b> -0000A
	A4 Punction Bwitch A4A1 Bwitch Assembly		08418-80011 08418-80018		08418-60044 - + 08418-60046
	At HV Power thipply		00000-81940	•	00412-00054
	At HV Roulltor		00418-00000	ļ	0041R-0005h
_	AT Log Converter	-	0041#=00007		08418-60086
	At LV Power Bupply		00418-00000		00418-00087
¢	AV Test Channel Amp.	,	08418-00000	,	nfi(12-600an
í	A10 ffynah. Dataatal	M, #	00412-00010		00412-00000

Table 5-4. Recommended Test Dystpment

े के त — भे Instrument	Gritical Apeniforations	t Reconsmended HP Model
Dial-trace Oscilloscops with 10 pr 10:1 probes	: Vertical Amplifier: Dial Irace Dandwidth: 40 MHz minimum Horizontal Awsep Italy: 0, 8 pH/cm Vertical Benetivity: pmV/cm	1004/18014/10804
DC Digital Voltmeter	Admirady: 0,05% Input Impedanter: 10 megonore min. Automatic Range delection: Range to 180V	8489A/3448A
Power Bupply	Output: 45 Vda at 60mA	7816
DO Voltanter with High Voltage Probe	Ranger 4000 Vde Current Drain: 8.5 µA maximins Accurany: 45%	410C with 11044A high voltage proba
Bervice Cable (Bupplied with B407A & B410A)	•	он4 10-00бр
anni d'anting a desta de la companya	UBIED WITH BAOYA MAIRIFRAMIC ONLY	And developed the recognition of the state o
Network Analyzer	विकास के किया है जिस के किया है कि किया का का का का किया के किया है कि का का का किया के की का का का का का का क 	B407A''
HODIĄ Tranapiladim Ru	Includes 50 ohus power splitter and two matched, double shielded exhler.	TIODIA
	Dial-trace Cacilloacope with 10 pr 10:1 probes DC Digital Voltmater  Power Supply DC Voltmater with High Voltage Probe Service Cable (Supplied-with B407A & 8410A)  Network Analyses 11001A	Dial-trace Oscilloscope with 10 pr 10:1 probes  DC Digital Voltager  Power Bupply  DC-Voltanter with High Voltage Probe Bervice Cable (Bupplied-with B407A & 6410A)  Critical Specifications  Vertical Amplifier: Dual trace Bandwidth: 20 Milk minimum Horkwital Sweep Italy: 0, 2 pil/em Vertical Amplifier: Dual trace Bandwidth: 20 Milk minimum Horkwital Sweep Italy: 0, 2 pil/em Vertical Amplifier: Dual trace Bandwidth: 20 Milk minimum Accuracy: 0, 25% Jupit Impedation: 10 megolines min. Automatic Range Selection: Range to 1800  Current Drain; 25 year maximum Accuracy: 45%  URED WITH 6407A MAINFRAME ONLY  Network Analyzor  Includes 50 ohin power solutor and two matched, double shielded cables.

Table 5-9. Recommended Test Djulpment (Contd)

lien	Instrument	Oritical Appoliteations	Recommended HP Model
),	Byunp OnoMator	/ Hanger O. I to 110 Mile (any part) (III Output: +80 dbm - VYO Output: Pracks 800 Mile from - IIP Output signal.	##01A (0, 1 to 110 MHz) ############# (0, 4 to 110 MHz)
, ,	man di menungan dan di dikangan di dibangan di digangan di digangan di digangan di digangan di digangan di diga 	URED WITH BATON MAIRPHAME ONLY	and the second of the second o
0,	Hetwork Analyser with Harmonle Proquency Converser	The state of the same of a state of the stat	8410A/8411A
10,	Awarp Opellator	Range: 0, 11 to 18 4 Tille (any part) RY Output: \$5mW into 50 ohin dweep Width: One Octave into	000013/000011 (0:3 to 4 (3114) 000013/0003A (4 to 6 (3114) 00013/0004A (0:10:18:4 (3114)
î.	Transition (Power Aphiliar)	tmpotanou to ohma	8740A (de la 18,4 GHR) 8741A (0.11 to 8 GHR) 8748A (8 to 18,4 GHR) 8748A (8 to 18,4 GHR) 8748A (0,1 to 8 GHR)

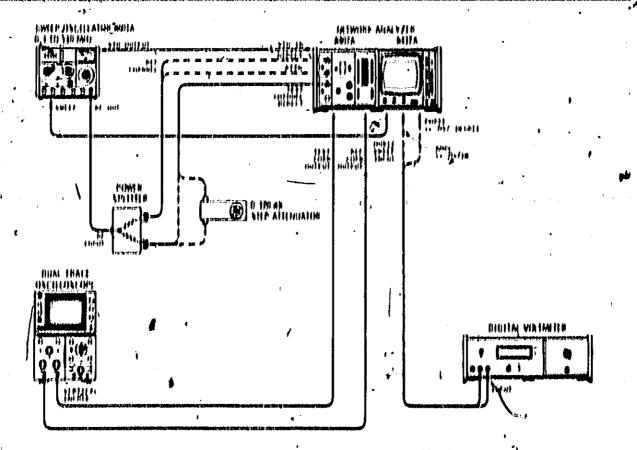


Figure 9-1. Populpment Supp for Performance Test with 8407A Mainframe

Table 5:8. Performance Test with 8497A Mainframe (Sheet 1 of 6)

APPKP.	DESCRIPTION AND PROCEDURG
Alemonianec 	· INITIAL BETUP
	BPECIFICATIONS - Outeral operation.
•	DESCRIPTION: But up and adjust instrument for amplitude and phase trace on Ofer.
:	PHOCKIMAR:
	A. Connect equipment an abown in Figure h.1. But award oscillator for award mode with award width of which of take. But the 6407A AMPL VEHNICH to midrange, and DISPLAY WITH ERICHOE award to see the following and DISPLAY HERERORE award position, and see DISPLAY REFERENCE award position, and see the DISPLAY REFERENCE award for on 10 dB/step award and top position on 1-dB/step award and top position on 1-dB/step award. Hel 6407A REF CHANREL LEVEL HANGE award to the middle position. Adjust sweep oscillator RF output for REF CHAN LEVEL, motor indication at the top of the OPENATIO-sange. If TROAL REDUCE MIPTY HATTO bight comes up, reduce award contillator RF power or clause position of REF CHAN LEVEL/range award to a lower position to osose the light to go out.
	b. The 198 life sine wave algust from the 6407A is TEST OUTPUT should be ±0.04V p=p and the IP IEEE OUTPUT should be ±1.0V p=p or swelloweeps
	e. But B418A MODE awitch to DUAL, AMPL DD/DIV awitch to 10, PHABL DBG/DIV awitch to 00, PHABL awitch to 1, DEGDECT awitch to 100, and DW (kilk) awitch to 10. But 8407A DIRPLAY REFERENCE ID dB/step control to 40 dB position. Both amplitude and phase traces about the displayed across 8418A CHT. Adjust the HORIN POSITION and HORIN OADS control as that the ends of the trace are at the two edge graticules. Adjust 8418A POOUS control and both traces about the in good focus. The souplitude trace about he brighter than the phase trace.
1	TINCE ALIUN
:	BPKOIPIOATIONS: Ouneral operation.
	DEBOHIPTION: Check that the greatly are properly athmed by adjusting trace to superimpose overlar grattents time.
• [	LHOGRDAUR!
	Het HAINA MODE newtich to AMPL. Adjust HAOYA AMPL VISINIES and DIRPLAY HEF. ENERGY I diverte controls to superingual the amplitude trace over the center horizontal graticule. The trace should align with the graticule within 1 mm of the trace except at the very end politis.
0.	AMPLITUDE TEST
	BPECIFICATIONS: 4, 03 dB/dB and 40.05 Avistos/division; sublisty satistics, 03 dB/dB.
	DENGINPTION: The accuracy of the rear banet output to checked then the CHT amplitude trace in checked through the 80 db amplitude range. All of the amplitude resolution ranges are then checked for calibration.
	A. Connect digital voltmeter (DVM) to 8418A AMPL 60 MV/DB rear spanel output. But award onestiator for single-frequency CW operation. Adjust 8407A DISPLAY REPERENCES 1 dB/step and AMPL VERBRECK 10 dB/step control wellings listed in table on following page. If necessary, adjust 8418A front panel AMPL CAL (LAW LEVEL) control for DVM indication within tolerance at positions of 40 to 480 dB on 8407A DISPLAY REPERENCE.

Table 5=8. Performance Test with 8407A Mainframe (Sheet 8 of 6)

HUKD.	ABMAMLA.	OH ARD PRO	<del>arenaare</del> GEDMIU	iningani asarsa kanaga soa		2 <del>57 : 5 4 5 1 1 1 1 1 1 1 1 1 1</del> 5 5 5 5	andreas a successive of	- Charles - Charles - Charles
#: (Contal)	•	8407A D	INPLAY RE 10 dN/step Nwitch Post Rern dN)	PEHENGE     	'Digital Vollmeter Heading		•	
	**	A STATE OF S	()	Taraman (ne	• <b>F.</b> (100 4 - 0	)0(1)		
Ī			· +10		- 1 L 600 4 . 0	· 1		
	•	'	+ (0.0)		#1.000 a .0	)00		
		]	·#()	,	(0:600 4 ; 0	)10	•	
1		/	+40		0,000 4 ,0	109   400		
	,		• 60,	. 1	×0.800 ± ,0	116		
			(ab	1	+1:000 4 :0	000 (		-
l	•	47	+70		-1.600 4 .0	140		•6
		1.	+80	,	<b>                                   </b>	MO .		

b. Bet awarp operitator for swept mode with sweep width of 10 kin or lane, Bet 8407A DBPLAY REPRESENCE TO discountril to 440 db, Bet MCDE switch to AMPL, Adjust 6407 AMPL VERBIER for the trace superimposed on the center graticule line. Check trace position at 8407A DBPLAY REPRESENCE TO discountril selfings listed in table below. If necessary, adjust 8418A front panel AMPL CAL (LAW LEVEL) control for CMT trace within tolerance at positions of 40 to 400 db on 8407A DBPLAY REPRESENCE.

NOMENTAL PROPERTY OF THE PROPE	Tolerance of 8418A Trans To Major Oraticula Division
reconstant seement and seement	40. N DIV
. 10	
7 1(/ - 8/)	40. 10 DIV
* B()	40.1 DIV
+ #1)	4 . 05 DIV
(41)	# ON DIV
•60	VICE NO. 4
480	l joji biv
. 76	40. in ibiv
• 60	10. 10 DIV

- e. Het 8407A DIRPLAY (LEFEITERGE 10 dit/step control to 40 dit and set 8418A AMPL DB/DIV syltch to 8.b. Adjust 8407A AMPL VEHINGE to superimpose the trace on the center CHT grationic. Change 8407A DIRPLAY REPRESENTED TO 10 dit/step control to 48 dB position. The 8418A trace should move up four major graticule divisions 40.6 small graticule division.
- d , del 84 BA AMP), DB/DIV awhele to 1.0 and set 0407A DBP AY REPERENCE to dB/step control to 40 db. If necessary, resignal 8407A AMPL VEHIBER to superimpose the trace on the center CHT graticule. Change 8407A DBPLAY REPERENCE I dB/step control to 41 db. The 8438A trace should move down one major division.

## Table 5-8. Performance Test with 8407A Mainframe (Sheet 8 of 5)

	H11,1615	DESCRIPTION AND PROPEDURE
	A (Crontel)	e det 8418A AMPI. DB/DIV switch to 0.86 position. Bet 840YA DBPI.AY HÉPERENCIC I dB/step control to sero and 10 dB/step control to 40. Adjust 840YA AMPI. VERNIER control to pisce the supplitude trace on the intelle CHP graticule. Change the 840YA DBPI.AY HEPERENCE I dB step control to +1 dB and 8418A trace should move down four major graticule divisions + one small division.
1	व्यवस्थात्र प्रस्तानसम्बद्धाः । स्टब्स्	THE TOTAL TOTAL TOTAL STREET THE PROPERTY OF T
i	4	Chyàr Tiat

BPECIFICATIONS: + 016 degrees degree + 06 divisions division, > 5 degrees manufative solding content + 016 degree degree.

DEMORIPTION: The accuracy of the rear panel output is checked, then the CRT trace is checked through \$60 degrees. All of the phase regulation ranges are then checked for calibration.

## PROCESION

- a Het awarp operitator to single-frequency (CW) operation. Coinset DVM to PHARE 10 MV/DEO comestor at rear panel of 0418A. On 0418A, set MODE awitch to PHARE, PHARE DES/DIV awitch to OO, and DECHERCH awitch to acro. But 0407A DISPLAY IEEE/ERECE CONTINUE for an on-screen amplitude display. Adjust 6407A PHARE VEHARE CONTINUE to obtain, 000 Volt on DVM, But PHARE DEG/DIV awitch to 1. Adjust awarp onelistor RF output for the amaljust phase dot on 0418A across (best signal to noise ratto), The 8407A REFERENCE CHANNEL LEVEL motor should indicate near the top of the OPENATE range.
- b. Ret 8418A DIGINEES awareh to 180 and PHABE DIGI/DIV awareh to 90. But PHABE awareh from positive to negative. The dot on the 8418A should be created, showing a thin vertical line. Adjust 8407A PHABE VERNIER slightly back and forth from in-phase position and observe trace dot become distinct on alther side of in-phase condition.
- e. Het 8418A DECINEES awitch to sero. Make slight adjustment of 6407A PHARIC VICINIEST for 0,000 DVM indication. Het PHARIC awitch from positive (+) to negative (-) and DVM should indicate, 000 Volt 4,005 Volt in both positions.
- d. Het PHARE switch to positive position. But DECITIES switch to positions shown in table below and obtain DVM indication as shown. But PHARE switch to negative (-) position and recheck DVM indication at each position of DICORESCO switch.

Dixirkiçi notting	DVM Indipation		
. 0	. 000 4 , 00B		
· no .	0.800 a 1.008		
40	0.400 4 .000		
00	0.000 + .009		
80	0.800 4 .019		
. 100	1.000 4 016		
180	1,800 4 ,010		
- 140	1,400 4 ON1		
160	. 1 000 4 034		

Table 5-3. Performance Test with 9407A Maintrame (Shoot 4 of 6)

arstr	DESCRIPTION AND PROGREDURE
(Contd)	e. Bet awaep oneHator for awept mode with aweep width of 10 kHz or lenn, het DEGNERA awitch to each awitch position and note the phanatrace movement. It should change by two large graticules for 180 degree offnet, (Each amail division is 18 degreen,)
	f. Bol PHABE DISI/DIV awitch to 46. Change DISHEES awitch by 186 degrees and phase trace aboute move two large graticula divisions.
•	g. Hel PHABE DECI/DIV switch to 10. Change DICHECOS switch by 20 degrees and phase dot should move two major graticule divisions.
	b. Check the LDEG/DIV range of the phase etrout by comparing its securacy to the 10 DEG/DIV range as follows. But DEG/DIVER switch to zero and PHABE DEG/DIV switch to 10. Adjust the 6407A PHABE VEHNIER to place the trace two small graticule lines below the center graticule line. But PRABE DEG/DIV switch to 1 and trace should move to the bottom graticule line.
<b>D</b> .	DANDWIDTH AWITCH, TERT
1	SPECUIOATIONS: General operation,
	Diminitipality and change in frequency response to observed on the CITA trace when a low-page filter to competed in both chamels.
	PROGROUPE:
	that algoral source for swept mode with sweep width of 10 kHz or less. And 8407A DISPLAY RICFRETCHOR controls to <40 dB. And 8418A MODE switch to DXAL, AMPL. DISPLAY RICFRETCHOR controls to <40 dB. And 8418A MODE switch to DXAL, AMPL. DISPLAY switch to 0.86, PHARE DISO/DIV to 1, PHARE polarity switch to positive (c), DISPLAY SWITCH to sero, and DW (kHz) switch to 10. Adjust 8407A AMPL VICENIER and DISPLAY RICFRETCHORS 1 dB/step switch to place smplitteds trace on seroon. Both phase and amplitude traces should be on 4418A and both traces should be jagged, showing normal noise on test claimed. Both W (kHz) switch to 0, 1 and both amplitude and phase trace should claimed to continuous smooth traces due to the low-pass filter domested seroes the smplitter inputs.
0.	BARSING TOOT
	APICOPICATIONA: Concrat operation.
	Dispersion: A voltage atmulating a blanking pulse is applied to the rear-panel blanking input and the Cit's trace should blank.
	PROGREDURAL
	Connect a -4 Vdc supply to 841RA rear-panel BLANKING connector and -4 Vdc seturn to ground. The traces should be blanked. Disconnect -4 Vdc supply.
4,	K-VANU WORLVYCHOUT TRAIT WOLLVYCHOOM WRV-N
	BPECIFICATION: General operation,
	DMCHIPTION: Voltages simulating marker or blanking polace are applied to the rear-panel K-AXR input and the CRT trace intensifies or blanks.
	PROCEEDITIES
],	a. Connect a -5 Vdc supply to 6418A rear-panel E-AXB connector and -5 Vdc return to ground. The traces should intensity.
	ii. Compact (b Vdo to 844RA rear-panel E-AXB connector and (b Vdo return to ground, ). 🗡

Table 5-3. Performance Test with 8407A Mainframe (Sheet 6 of 6)

## HPEP DESCRIPTION AND PROCEDURE A. PHABE CHANGE DUE TO AMPLITUDE CHANGE BURGIFICATION Over apper 70 dB amplitude range: \*1"/10 dB, maximum phase change not to exceed 4". Over full 40 dB amplitude ranges. Maximum phase change and to exceed 6", NOTE Phase error due to amplitude change in the Model 8418A can not be measured accurately fudependent of the phase error contributed by the Model 8407A. The close, this last measures the combined phase error of the Models and ALIMA, A test procedure starting st step (1) explains how to measure error contributed by #407A. DEBUILDING Test change power to varied to 40 dB stops while observing the 6412A phase indication. PROCEDURE Connect equipment as shown on page 6-3. Pigure 6-1, with reference input signal to HEF CHANNEL DIRECT (0-120 dir attenuator not uned), Het 0407A HELF CHANNIEL LIEVICE switch to middle position. b. hat awaap oneillator for narrowast possible awaap and output level for about 20 mV peak to speak at #407A topat. But 8407A 10 dB/map DBPLAY REFERENCE awitch to top position. But DBPLAY REFERENCE CAL thumbwheel for 0 dfl. Het BAIRA MODE awitch to AMPL and AMPL dB/DIV to 10. Adjust 4407A 1 dB/step DBPLAY REFERRICE switch and amplitude version for amplitude trace across top graticule line of 8412A display. If 6412A topol eignal laval ta ant too high initially, agreeanty phane error will engur when algorit level to dooropood, Het BIRA DW (kilk) switch to 0.1 and MODE switch to PHABE. 141 Adjust 8412A PRAME OF PRICE and 8407A PRAME VERNIER controls for a center sornen phane trace on the Lilegree/divinion range. MTCM Although the 6418A phase error cannot be accurately measured independent of the phase error contributed by the Model 6407A, inwolfet an bagtable at the gollaplint willathlaup a Connect a dual trace coefficiency to the 8407A rear-manel

IF REF and IF TERT outputs.

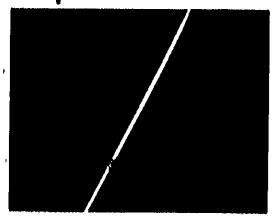
## Table 5-3. Performance Test with 8407A Mainframe (Sheet 6 of 6)

arkp	DESCRIPTION AND PROCEDURE
(), (Contd)	(a) Adjust oscilloscope and 8407A PHARE VERNIER  control to superimpose one waveform on the other.  Expand one cycle of trace so that the serb degree point on the sine wave is at the left edge, the 180 degree point on the sine wave is at the left edge, the 180 degree point is at the center, and the 360° point is at the right edge of the graticula (Figure 6-1a, Waveform A).  (With an oscilloscope having 10 cm graticula width, each cm is 56 degrees.) Expand the cantiloscope waveform borisontally by a factor of ten so that each cm represents 5, 6 degrees. Adjust oscilloscope to position the center of the waveform on the screen Arigard 5-1a. Waveform 11).
	(8) Observe the confiloscope display as the 6407A DBPLAY "REFICIONCE switch is changed. Any phase shift observed on the confiloscope is due to 4407A phase great. On low level test change "atgusts the cacilloscope display approaches a bortwontal line; however, a small ringing appears on the test channel waveform. This ringing can be observed for bortwontal movement down to the last two 6407A DBPLAY REFERENCES.
	<ol> <li>Change the 8407A DISPLAY REFERENCE 'switch from 0 to 60 dB. The 8418A phase indication should not vary more than 1.0 degree/10 dB step or more than 4 degrees over the upper 70 dB amplitude range. The phase indication should not vary quore than 6 degrees over the full 80 dB amplitude range.</li> </ol>
	<ol> <li>To measure that part of the error contributed by the 8407A phase change with amplitude abange, use the following procedure.</li> </ol>
	k. Connect equipment as shown in Figure 6-1. Connect the Reference channel input to the 6407A_REF CHANNEL ATTICN input. Connect the step attenuator between the power splitter and the 3407A TREE CHANNEL DIRECT input. But the 0-120 dB attenuator to 60 dB. Hel the 8407A REF CHAN LICUIT. ADJ switch to the middle position.
	1. Bet the 8407A DEPLAY REFERENCE 10 ab/stop switch to the top position and adjust the DEPLAY REFERENCE CAL thumbwheel, for 0.
	m. Bot the awarp conflictor for intrinum dwarp width at any frequency in the 8407A operating range. Adjust RF output level for maximum power out or until the 8407A REF CHAN LEVEL meter indication is slightly above the operate region, whichever comes first.
	n. Adjust the display unit PHABE OFFBET and 640% PHABE VEHILLED a goro degree phase reference on the display unit.
,	O. Cheek made DRPLAY HISPICRENCE TO dB atop an follows:
	(1) Hot the DIBPLAY INCLUSIONATE 10 dB/atep switch one position down.
	(2) Observe the phase shift indication of the display unit and record.
	(3) Increase the test channel input power by 10 dB by removing 10 dB from the step attenuator at the test channel input. Adjust the PHABIC VICINIES for a zero degree phase industries.
	(4) Report the above steps to check the remaining 10 dB/step positions. Resdings recorded are plans changes with amplitude change of the 8407A.
	ROTE
	The 6407A REDUCE INPUT RATIO light may come on at high test channel toput levels. If so, reduce the sweep cauthalor output power to extinguish the light.



Waveform A .

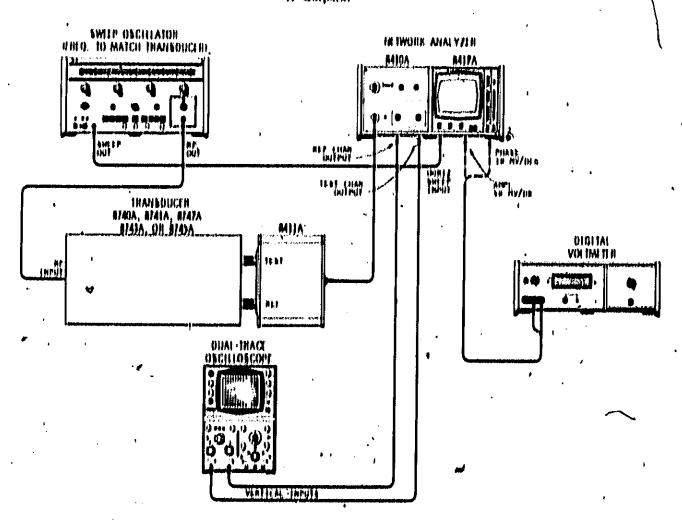
Omittoscope trace of one 876 kHz sinewave cycle showing in sines condition with channel A superimposed on channel 11. (Regimental neste is 36 degrees/



Waveform D

Trans A expanded horizontally and vertically a 10. (Horizontal soute to 3.0 dagrees/em.)

Piguro h-la. Osolitoscopo Display of in-phase ir Ostpota.



Figure, 5-2. Equipment fistup for Patformance Test with 8410A Mainframe

Table 6-4. Performance Tool with 8410A Maintrame (Sheet 1 of 6)

arko 1	DESCRIPTION AND PROCEDURE	٠.
1.	INTIVITIBETAIL	। श्रापः हेरात्रेष्ट भागाः ।
	8PECHICATIONS: General operation.	ď
	DMORIPTION: But up and adjust instrument for amplitude and phase trace on ORT.	
	PROCEDURA:	
•	a. Connect equipment as shown in Figure 5-%, liet awarn oscillator for away mode over to acrowest band possible, liet the 0410A AMPL VERNIER to midrange. Adjust 0410A BY STABILERY control and sweep oscillator IP coulout for REF CHANNEL meter indication middle of the OPERATE range.	V BC BC DI
,	b. White observing oscilloscope, adjust 8410A ÅMPLTTUDE TEST CRAINISE CAIN to obs	in
	o. But 841RA MODE switch to DUAL, AMPL DB/DIV switch to 10, PHABE DEG/DIV switch to 00, PHABE switch to (4), DEGREES switch to 100, and DW (KHz) switch to 10, But 6410A AMPLITUDE TEST CHANNEL GAIN 10 dB/step control to 80 dB. Both supplitude and phase traces should be displayed scross 841RA CRT. It necessary, silust transduct HICFENICHCE PLANE EXTENSION to obtain horizontal phase trace, Adjust 841RA FOCL control and both traces should be in good focus. The supplitude trace should be brighter	/ 
· • • • • • • • • • • • • • • • • • • •	than the phase train.	<b>在</b> 表示公司 (1) (1) (1) (1) (1) (1)
Ħ,	THACE, ALIGN	
	BPISCIPTOATIONS: Constal operation.	
'	DMCHIPTION: Check that CRT executibles property aligned by adjusting trace to emperimpose center graticule line.	
	PROCEEDIURE	
	the 6418A MODE switch to AMPL. Adjust 6410A AMPL Vitillist control to superimpo the amplitude trace over the center horizontal graticule. The trace should align with the graticula within 1 num of the trace.	
я,	omplation that	1.5
	BPEQ[PICATIONER '47 OF dif/dif and 4. Of division/division; gualitary outputs 4. Of dif/diff.	
	Dimchippion: The accuracy of the rear panel count is checked then the CRT trace is checked through the 60 db amplitude range. All of the amplitude respliction ranges are then checked for estibration.	
ļ	PROCEDURE	
	a. Connect digital voltmeter (DVM) to 1418A AMPL-50 mV/dB rear-panel output. Het signal source for single-frequency OW operation. Adjust 8410A AMPL VICINIER control for 8000 Vdc on DVM. Chebb DVM readout at AMPLITIDE TOTT CHANNEL.	,

Table 5-4. Performance Test with 8410A Mainframe (Sheet 2 of 5)

arrep	овнопретон Ано Риосковин в				
8. (Contd):	0410A Amplifudo Tost Chumol Gam <sup>†</sup>	Digtill Vottmeter Heading			
/	00 50 40 1 80	41.400 4.040 41.400 4.040 41.400 4.040			
	#0 10 *** 0	0.000 4 .000 -0.000 4 .010 -1.000 4 .000			

and awarp operitator for award mode over narrowest band possible. But 8410% AMPLITUDE TIGHT CHANNIEL CAIN 10 dis/step dentrol to 30 dis. But MODE switch to AMPL. Adjust 8410 AMPL VERNIER for the trace superimposed on the center graticale line. Check trace position at 8410 AMPL/MIDE TEST CHANNEL CAIN 10 dis/step control settings listed in table below. If necessary, gdjust 8418A front panel AMPL CAL (LOW LEVEL) control for CRT trace, within telegance at positions of 10 dis and sero dis on 8410A AMPLITUDE TEST CHANNEL CAIN control.

BATOA AMPLITUDE TIGHT CHANNEL GAIN BORING	Toleranne OF 0412A Trace To Major Oraticule Division		
, 00	40. 2 DIV .		
60	40. I6 DIV		
40	40, 1 DIV		
nt)	4 , 00 DIV		
RO .	4 . 00 DIV		
10	, 0h DIV		
0	. 40.1 DIV		

- o. But 6440A AMPLITUDE TEST CHANNEL GAIN 10 dB/stop control to 20 dB and set 6412A AMPLIDB/DIV switch to 2.5. Adjust 6410A AMPLIVERNIER for 0.000 Volt indication on DVM. Change 6410A AMPLITUDE TEST CHANNEL GAIN, control by < 5 dB. The 6412A dot should move up two major graticule divinians, 4 0.5 small graticule divinion and the DVM should indicate 250 mV + 10 mV.
- d. But 8418A AMPL DB/DIV awitch to 1.0 and not 8410A AMPLPTUDE TERT CHANGEL GAIN control to 80 dB.\* If naconarry, readjust 8410A AMPL VERNIER for 0,000 voit on DVM. Change 0410A AMPLPUDE TERF CHANNEL GAIN control by 4.1 dB. The 8418A dot about move up one major graticule division and the DVM about disidents 00 mV 4.5 mV.
- \*I dD/stop control att at setting determined in SPEP 1b.

Table 5-4. Performance Total with 4410A Mainframe (Sheet 5 of 5)

	431th	DISSIGNIPTION AND PROCEDURE
İ	(Contd)	a. Bot 8412A AMPL DB/DIV switch to 0.26 position. Adjust 8410A AMPL VERNIER control and AMPLITUDE TEST CHANNEL GAIN control to place the amplitude dot on the screen. Change the AMPLITUDE TEST CHANNEL GAIN control by one dB and 8412A dot.should move 4 major graticule divisions 4 one small division.
١	- 71	

## PHASE TEST

BPECIFICATIONS: 4.015 degrees/degree, 3.05 divisions/division;  $\leq 5$  degrees cumulative; suxiliary output 4.015 degree/degree.

DESCRIPTION: The accuracy of the rear panel output is checked, then the CRT trace is checked through 560 degrees. All of the phase resolution ranges are then checked for calibration.

## PROCEDURE:

- a. But sweep oscillator to single-frequency (CW) operation. Connect NVM to PHASE 10 MV/DEG connector at rear panel of \$112A\$. On \$412A\$, set MODE switch to PHASE and PHASE DEG/DIV switch to 90. Set \$410A PHASE VERNIER control to mid range and AMPLITUDE TEST CHANNEL GAIN control to 60 dB. Adjust transducer REFERENCE PLANE EXTENSION (line stretcher), \$410A PHASE VERNIER, and sweep oscillator frequency to superimpose the two sine waves on the oscilloscope, showing an in-phase condition at the input of the \$412A\$.
- b. Set 6412ADECREES control to 180. Set PRASE switch from positive to negative and dot on the 6412A should be erratic, showing a thin vertical line. Adjust 6410A PRASE VERNIER slightly back and forth from in-phase position and observe trace dot become distinct on either side of in-phase condition.
- c. Bet 8412A DEGREES switch to zero. Make slight adjustment of 8410A PHASE VERNIER for 0.000 Volt DVM indication. Bet PHASE switch from positive to negative and DVM should indicate .000 Volt 4 .003 Volt in both positions.
- d. Bet PHASE switch to positive (+) position. Set DEGREES switch to positions shown in table below and obtain DVM indication as shown. Set PHASE switch to negative (-) position and recheck DVM indication at each position of DEGREES switch.

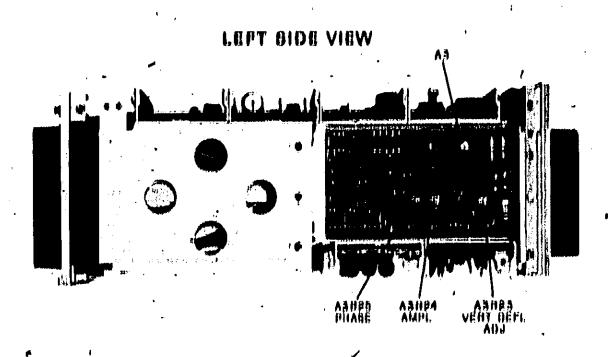
DEGREES	Betting		DVM Indication	
. 0	,	L .	,000 4 ,003	,
20			0.200 1.003	•
40	•		° 0,400 ± ,006	
60			0,600 ± ,000	•
. 60			0.800 1 .012	
	·		1,000, £ , 615	
120			1.200 + .018	•
140			1.400 1 .021	
_ 160		•	1.600 4 .024	

e. Set aweep oscillator for awept mode over narrowesteband possible. Set DEGREES switch to each switch position and note the place trace movement. It should change by two large graticules for 180 degrees offset. (Each small division is 18 degrees.)

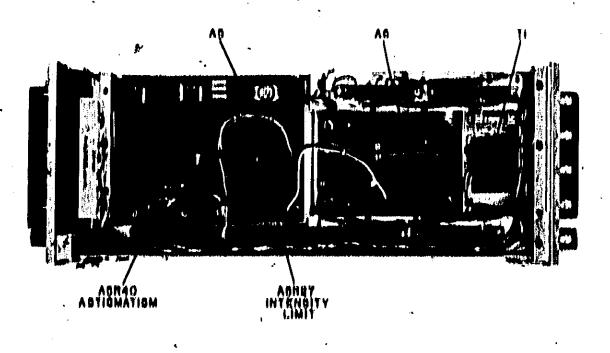
# Table 6-4 A Portorpance Test with 6410A Mainframe (Sheet 4 of 5)

·			l <sub>a</sub> e
NT IEP	DESCRIPTION AND PROCEDURE		
4. (Contd)	' 1. Bet PHABE DIST/DIV switch to 48. Change Districtions trace should move four large graticule divisions.	ISB awitch by 180 degroos and plu	180
,	g. 86t PHASE DEG/DIV awitch to 10. Change DEGITE trace should move two major graticule divisions.	DB awitch by 20 degrees and plac	40
	h. Check the 1 DEG/DIV range of the phase circuit by 6 DEG/DIV range as follows. Set DEGREES switch to 10. Adjust the 6410A DHASE VERNUM to place below the center graticule line. Set PHASE DEG/D to the bottom graticule line.	to karo and PHASE DEG/DIV aw the trace two small graticula line	1714
<b>5</b> ,.	DANDWIDTH BWITCH TEST		
	SPECIFICATIONS: General operation,	,	
	DESCRIPTION: The change in frequency response is ob- low-pass filter is connected in both channels.	sorved on the CRT trace when a	·.
i,	PROGEDURE:	• •	i vi
,	tiet sweep oscillator for swept mode over narrowest TEST CHANNEL CAIN control to 20 dB. Set 8412A switch to 0.25, PHASE DEC/DIV to 1.0, PHASE poleswitch to gero, and BW (KHz) switch to 10. Adjust amplitude trace on screen. Both phase and amplitude both traces should be jugged, showing normal noise to 0.1 and the traces should change to a continuous filter connected across the amplifier inputs.	MODE switch to DUAL, AMPL I arity switch to positive (+), DEG 64 foA AMPL VERNHER to pince- ig traces should be on 6412A CR' on test channel. Bet BW (KHz) s	DB/DIV REFE Tand
ø.	DLANKING TEST		
	SPECIFICATIONS: General operation.		
	DESCRIPTION: A voltage simulating a blanking pulse to input and the CRT trace should blank.	applied to the rear-panel blankir	ns
٠.	PROCEDURE:	<b>&gt;</b>	
	Connect a -4 Vdc supply to 8412A rear-panel BLANI ground. The traces should be blanked. Disconnect	GNO connector and -4 Vdc return -4.Vdc supply,	n 40
7.	Z-AXIS MODULATION TEST	- ,	
.	SPECIFICATIONS: Coneral operation.		•
1	DESCRIPTION: Voltages simulating marker or blanking	pulson are applied to the rear-pa	lone ,
	P. Ciedanie:		,
41	a. Connect a -5 Vdc supply to 8412A rear-panel Z=AXB ground. The traces should intensify.	s connector and -6 Vdc return to	
	b. Connect +5 Vdc to 8412A rear-panel Z-AXB connect The traces should blank.	or and +6 Vde return to ground,	*

		Table	5-4. Perfor	manke Test w	Ith 8410A Ma	iliiframe (Blied	g(% 0)	
BTEP	. Die	BCHIPTION /	ND PROCES	WRE ,		Marini Marini di Senerali br>Marini Marini di Senerali	ती को प्रकार के किया का देशों की लेखा है। की	derivativas para proper para para para de proper
0.	٠, ا	аве Спупа Спистрина		ariarubit di	ANAE.	<i>)</i>	र का अवस्था को स्था के का का पूर्व का स्था है	
,,,	,	Over upper	70 dH ampliti	udo rango: 4	''/10 dB, py	) कुन्नमध्य तामतास्थ	ange not to	exense 4".
,	,	Over full 100	dB amplitude	o rangos Maxi	mum pluse i	thange not to exe	rood D'*,	
3.	Dice	CRIPTION: Toglebannel	The phase tr ts changed th	una la obaervi hrough the 69 (	el for change III range of t	while the signa in 0410A.	t simplituda '	In the
<u>.</u> !		1/		иоди			<b>3</b> 1	
	٠.	When 0412,	using the 64 A assess be a	110A the full Debooked.	) dD ranga ol	T the		•
	PRO	ocedune	•	er sig				•
	а,	I position, 6 But PHABLE	lot 0410A TER Interest and D	BT CHANNEL	GATN contro ches and 641	allon. Bet PHA! Is for an on-ser OA PHASIC VICI	aan ampilitu	io dianlay:
		Adjust the 64 maximum an	d minimum p	HANNIEL GAH	V controla to O phase dot 11	naro dii, Tha rana should adi l 8419A,	lifforence be se more that	elwaan I .
				•	•	,	,	<b>‡</b>
				•				
	* '	<b>.</b>		.*		•		
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ī	•			n Sylvania		•		
ş.	• •	' · · · · ·	A	•		• ;		
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			<b>, \$</b> . ,					4
	1		r	3				
	<b>3</b> 1	,			,	•	•	
.•			•	•		. •		,



## RIGHT SIDE VIEW



Pigure 5-8. Alignment Control Locations (Sinet 1 of \$)

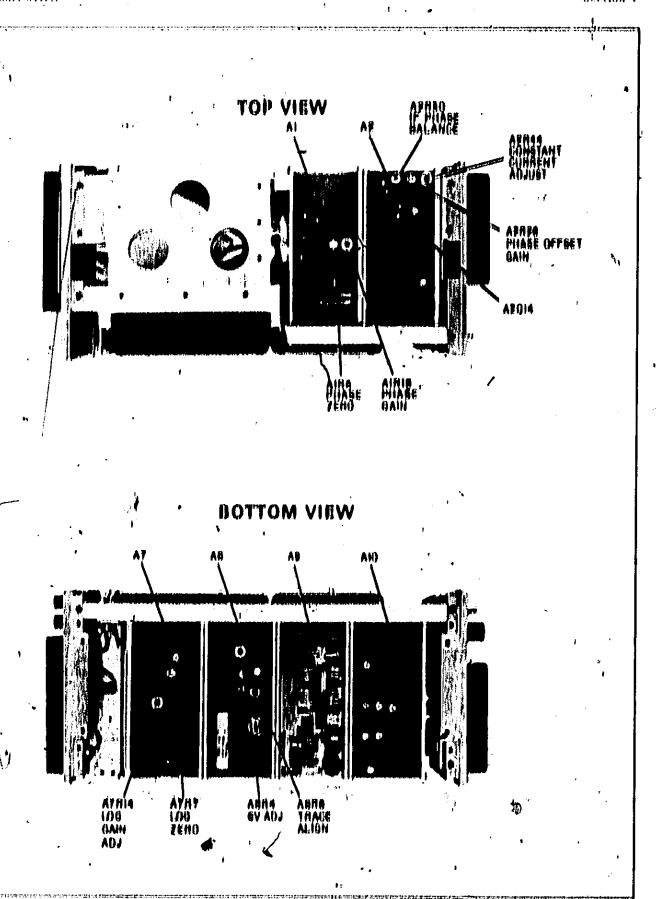


Figure 6-8. Alignment Control Lagations (Bleef 8 of 8)

Table 8:8. Altenment Controls

, #

			men glab	Altgen	ent Klep			
Heferenee Heeft	, inne	Fünetion	BAOYA Table B=B	#410A Tuhin 5-4	AVIDE D=A uking	HIIOA Pahlu h=7 H=0:		
A1114	Phas Sere	Plune (Afnet callbratton at zero degress with the plune input algunts.	<b>4</b> * \$	4:p	f) = #			
AIRI#	Plane Gain	Culturaten plane cendout and auxiliary output from plane detector.	<b>4</b> r/l	4 z ()	Q =1			
ABILBO	IF Plane Uplanes	Adjumn phane offset cults brutton to correspond with input phase.	4:1)	1=1)	A = (1	fi = 11		
VEHTH	Pinne Minel (Into	Adjum's for \$6-degrees be- tween each offset step:	4=(1	4=11	<b>A</b> =0	<b>4</b> ±0		
APH44	Gwallani A Gurreni Adjuni	Adjumn for nulffelent con- atent current to renet monostable multivibrator at each input cycle	4:11	4=11	0-11	A=1)		
ANIUN	Veni orti. Adv.	Adjusts gate of vertical amplifier for proper dis- play calibration.	#=1) (hpq) #=0, 4=0 (hpq) 4=1)	Azh then Aze, ' 4-e then 4-h	A=0 (lift) A=0, A=1, lift) A=1	Ara thru 6=0, Arh thru 0=1		
A\$11\$4	AMIL	Nersen the amplitude	A=() (1)(1)) A=H	Delp (lipti Aep	<b>\$</b> ≈ 11	Q=N manamananana Q=I)		
Vaira	MIVHR	Nurses the phase trace vertically.	4:#	4:4	A = #			
ABIINY	Interestly fatinit	Adjumin range of fronts panel intensity control.		r#  ,	4	y Parameter		
ATRY LONG METO (7A)  MICHIGAN METO (7A)  MI M  ONLY  O		Adjust trace autignistism and works with front panel focus control.		1+0	4	7		
		Calibrates logging circuit at zero volts on auxillary output.	Ara (livi Ara	N = N N = N ((137) Statement (1)	0×4	<b>))</b> c <b>))</b>		
		Calibrates the post-log eleculi	41/11) #=# 4=#	Aen (lievi Ben	D≖N •	· And		
Ý 8114	≠6V Adjum 🕏	Onlibrator and of Volt	######################################	Dan Hiru Ban				
AHIH	Trun Allun	Adjumin CHT finish to milyn the trace to the CHT gratecies		1	i i	A		
110	Trang Allan	Adjumen Clff field to align the trace to the CHT graticule.	The second of the second secon	Par of the second control of the second cont	0	P. Samuradi Market School St.		

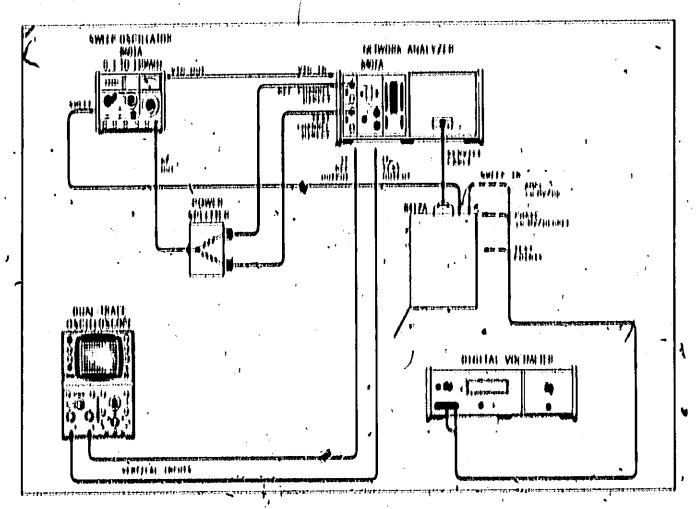


Figure 6.4 - Equipment Reluptor Altgament Procedures with 8407A Maintraine

Table 6:6. Altenment with 800A Maintraine (Bheel 1.66.6)

HTEP	DESIGNATION AND PROCEEDING
:	WAINING  Validium granter time 1000 Volle are proposed at the CDT and to analythice Ab and Ab. These voltages crash chose injury to important.
earne menad	DESCRIPTION: Being and adjust instrument for amplifieds and phase trace on CRT.
	A. Counce equipment an above to Platen B=4. Het award oneithfor for award hold with award with a 10 kins or team. Het the BADYA AMPL VEIGHTER to indicate and both DBD LAY (KERNERCR AWARDER to top position. Bet DBD LAY HEPERENCE CAL so that gern off in at the top on took negles. Bet 8407A HEP ENAN LEVEL ADB awtich to the middle position. Adjust award continuor for her collaboration at the top of the ODERATE range.

Table 6 th. Alignment with 6407A Maintrame (sheet 8 of 6)

	Twile 0:76. Allgament with 8407A Maintrame (Shoot 8 of 6)
HTRP	DENOMIPTION AND PROCEDURE
(Contd)	b. Whils observing the oscilloscope, adjust \$40% DISRLAY REFERENCE IND/step switch and AMPL VERMINE control to obsite \$16 my p-p from-\$40% IF TESP output. It may be necessary to slightly resignst Sweep Oscillator RF output to obsite destred result. Set DISPLAY REFERENCE CAL so that sero in appears in the IdB/step scale.
	e. Aet ALBA MODE switch to DUAL, AMPL DB/DIV switch to 10, PHARE DEG/DIV switch to 00, PITARE switch to + top), DEGREED switch to 100, snd DW (HIX) switch to 10, Act ALOYA DBPLAY REFERENCE to dD/step control to +40 dB, Noth simplifieds and phase traces should be displayed in ALBA CRY.
Ŋ,	YOWER BUPPLY (ABRI)
	DEBOMPTION: The 4 Volt power supplies are adjusted for correct output, PHOCEDIME:
	Check for it Vde +0.03 Vde at APPH and it Vde +0.03 Vde at APPH. If either the out of tolorage, adjust ABH and recheck twith test points again.
Ä,	TIMOE ALIGN (ABRB)
-	DESCRIPTION: The voltage to the CRT trace-align outlite adjusted to align trace to grationle on CRT face.
	photeonuc:
•	het Award Cartheter for minimum award width. Het Atlan MODE awird to AMPL.  Adjust 4407A AMPL VEHITHER control and DIBPLAY HERRICEE I differe awirds to superimpose the amplitude trace over the center horizontal graticule. For instruments with rear-panel THACE ALIGH control By, center rear-panel control and adjust Affill THACE ALIGH control for best alignment of trace to graticule. For instruments without rear-panel THACE ALIGH controls adjust Affill for best alignment of trace to graticule. If trace alignment is not correct when BITBA is installed directly into mainframe, readjust THACE ALIGH controls.
4,	VALIONVIAM (VANO)
ł	DESCRIPTION: The CIT trace is adjusted for heat focus, 🤝
	PHOTEDURES . F 2 +
	Het awarp excitator to single-frequency (GW) mode. Adjust ASTIGMATISM control ASH40 and front panel FOCHS control for the singlical dol trace on screen.
ħ,	AMPLITUDE CALIBIATION (ABIUB, ABIUA, AYIIY, AYIIIA, ANI), AMPL., CAL. LIA)
  -	DESCRIPTION: The CRT trace is adjusted for best focus,
	риосериям — — — — — — — — — — — — — — — — — — —
. 1	A. Connect digital voltmeler (DVM) to rear panel AMPL by MV/DB connector, det p418A MODE awitch to AMPL and AMPL DB/DIV control to 10, det 8407A DBPLAY REFERENCES control to 40 dB and adjust AMPL VERMINE control for 0,000 Vdg on DVM. If sero Vdc examples obsained, adjust AVRV, Cheek DVM readout at DBPLAY BRETHERICE control astings listed in-following table. Make alignment adjustments listed in-fallowing table.
.	

Table 6-6. Alignment with 6407A Maigtrame (Sheet 8 of 6)

BTKP	DEBORIPTION AND PROORDURK .										
§. (Qontd)	B407A DIBPLAY REFERENCE (ROLD HE LOD)	Voltmeter Heading	Adjust ment								
	Ų	• N. 000 4 . 040	LOSI GAIN A91114								
	J / 10	+1 <sub>5</sub> 800 + 5080 +	LOO GAIN AYRIA								
	·   / (BI)	+1,000 4 000	LANG DAIN APRIA 🧸								
	180	+0,500 + -010	LOO GAIN A9N14								
A	(40)	0.000 + .006	-IAOO NENO ATRY								
	100	· *0,500 4 · 010	AMPL GAL - LOW LEVER (Proof Panel)								
3	100	* 1 , 000 4 ONO	AMPL (2AL - LOW LEVEL (Front Pagel)								
	170	-1,500000	AMPL GAL - LOW LEVEL (Proof Panal):								
·	·#O	=N,000 + ,040	AMITA OAL = LOW LEVEL (Prost Panel)								

- the sweep condition for sweet mode with sweet width of 10 kHz or less. Bet the 6407A DRPLAY REPERTENCE control to 40 dit and reading AMPL VERNIER, if necessary, to get a 0.000 Volt indigation on the DVM. For instruments with rear-panel VRP IVS control, genter the VRP IVS control. The trace on the 6418A should be on the center horizontal graticule, it not, adjust ASIS4 AMPL control. Check vertical deflection amplifier do balance by moving the 6418A AMPL DB/DIV switch through its full range. If trace moves from center on gratical line, readinal 6407A AMPL VERBIER for 0.000 Volt indication on DVM. Readinal ASIG4 AMPL control slightly to obady minimum change in trace deflection with change in vertical sensitivity (AMPL DB/DIV), det the 6438A AMPL DB/DIV switch to 10 and change the 6407A DBPLAY HEPERIERICAE control in 10 dil stage. The 6418A trace should move one major division for each stag. It not, adjust ASIGS and from panel AMPL CAL (LOW LEVEL) controls.
- a. Het the 8407A DBPPAY REPERENCES awitches to 440 dB and set 8418A AMPL DB/DIV switch to F.S. Adjust 8407A AMPL VICENIER for 0,000 Volt indication on DVM. Change 8407A DBPLAY REPERENCES controls to 485 dB. The 8418A trace should move up two major divisions. If not, make ## fight adjustment of ASIRS.
- d. Bet 0418A AMPL BAZDIV awitch to 1.0 and 0407A DEPLAY DEFECTIONCE controls to 40 dft. If necessary, readjust 8407A AMPL VICINIER for 0.000 volt on DVM. Obsoge 8407A DEPLAY TICPICITIONCE controls to 480 dB. The 8418A trace should move up one major division. If not, make slight adjustment of AB188.
- a. Add A4TRA AMPL DIVIDIV awitch to: 0.85 position. Adjust 8407A AMPL VERNIER control and Directly Research Charles to place the amplitude trace on the soreen. Charge the DRPLAY REPERIENCE control by one dit and trace should move 4 major divisions. It not, make slight adjustment of ASTRS. It adjustment of ASTRS was necessary in sleps c, d, or e, recheck steps b through a again.

Table 5-6. Alignment with 8407A Maintraine (Sheet 4 of 5)

rep	DEBUILDTION AND PROCESURE									
ti,	PHARE CALIDACTION (ALID, ALILIA, ARIRA, ARIAA, ARIAR)									
,	DEBOMPTION: The phase offset directle are adjusted for correct estibustion and the phase detector is estibusted. The deflection amplifier is then checked by observing trace deflection on OMP.									
	PROCEDURE:									
	<b>#.</b> ,	Het aween cantilator for aymmetrical aween operation (minimum aween width), Connect DVM to PHARE 10 mV/DEG connector at 4419A fear. On 6419A, set MODE to PHARE, PHARE DB/DIV to 00, PHARE OFFRET to (-), and DEGHEER awitch to 0,—Bet Network Analyser PHARE VERNIER to exidennee.								
	b,	Connect dual trace escilloscope to the 8407A rear-panel IF fifth and IF TEST outpils.								
	u,	Adjust Nelwork Analyser PHARC VICINIER, DBPLAY REFERENCIC and oselloscope to display one sine wave superimposed on the other,								
	,	Expand one cycle of trace so that the zero degree point on the sine wave is at the left edge and the 360 degree point is at the right edge of the graticule (Figure 5-1s, Waveform A). (With an esotioscope having 10 on graticule width, each one is 36 degrees.) Expand the esotioscope waveform borisontally by a factor of ten so that each om represents 3.6 degrees. Adjust esotioscope to position the contex of the waveform on the gereen (Figure 5-1s, Waveform 1).								
	d,	Adjust 841RA A1R6 PHARE EXECUTOR DVM resigning of 0 43.8 mVds.								
	n,	Divide the 1982 and 1991 Religion to a state of 1992 A register of 1992 A register of 1992 A register of 1992 A								
	1,	Remove short and adjust A1R6, if necessary for 0 +5 mVdc.								
;	<b>H</b> •	Adjust ASIMS PHAME control for center graticule tine on #418A. Check vertical deflection amplifier do balance by moving the #418A PHAME DEG/DIV switch through its full range. If trace moves from center graticule line, residual #418A ALRO for 0 42 mVdc indication on DVM. Residual ASIMB PHAME control to obtain minimum change in trace deflection with change in vertical sensitivity (PHAME DEG/DIV), det #418A PHAME DEG/DIV switch to 00.								
	ħ,	Adjust ARITRO so that maximum difference in DVM resuling is 1 mVdc when switching from (*) to (*) PHARC positions.								
	1,	Adjust Network Analyses for 0 41 mVds DVM reading.								
	1.	Bet 8412A DECOMERN ewitch to 100 and adjust A11118 so that highest DVM reading for either polarity (+) or (-) is 1.000V +1 mVda.								
•	k,	not 0418A BW (kils) owitch to 0,1 and DEGITEER switch to 100. Adjust ARICIO so that GITT line display stays within I on of center line for either polarity (+) or (-) setting of 0418A.								
	l,	net 0418A DECOMMENT awitch to 0 and adjust A130, if assessary, for 0 48 mVds DVM reading.								

HPKP	DEBORDED AN	O PROGEDUIAE								
0, Contd)	or. But PHARE awhich to positive (up). Het DECHREES awhich and obtain DVM indication as shown in table below. If not, adjust AIRRS, Het PHARE awhich to negative and recheck DVM indication at each position of DEGHICES awhich. Readjust AIRRS, if uncersary,									
	Particular of the second	DEGREEA Hotting	DVM Indication	A CALLES AND A CAL						
	· V provid and sources where	0 RD 40 00 80 100 180 140	0,000 4,000 0,000 4,003 0,400 4,004 0,600 4,000 0,600 4,000 1,000 4,000 1,000 4,000 1,400 4,000	<b>«</b> Anteriories of						
7.	THTENHITY LIMIT (ASSET)  DESCRIPTION: The range of the front panel INTENHITY control is adjusted so that fully counterstockwise turns trace off and clockwise turns trace to full brightness.  PHOSEDUME:									
7.	DEBOMPPION (* *) fully mounter	The range of the front pa	na) INTICNATTY contr f and clockwise lyin	of the adjusted no that a trace to full brightness.						
7.	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front pa	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						
7.	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front parabookwise turns trace of -panel MTKHNPY contr filespear near the cont	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						
7.	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front paralled of calockwise turns trace of control of the control of the control of trace at fully clockwise	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						
7.	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front paralled of calockwise turns trace of control of the control of the control of trace at fully clockwise	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						
7,	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front paralled of calockwise turns trace of control of the control of the control of trace at fully clockwise	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						
7.	DESCRIPTION: " fully counter PROCEDUME: Adjust front 8418A shoote	The range of the front paralled of calockwise turns trace of control of the control of the control of trace at fully clockwise	f and alookwise tyrnr of fully courteralook iteralookwise positio	r trace io fult brightness. vice and traces on						

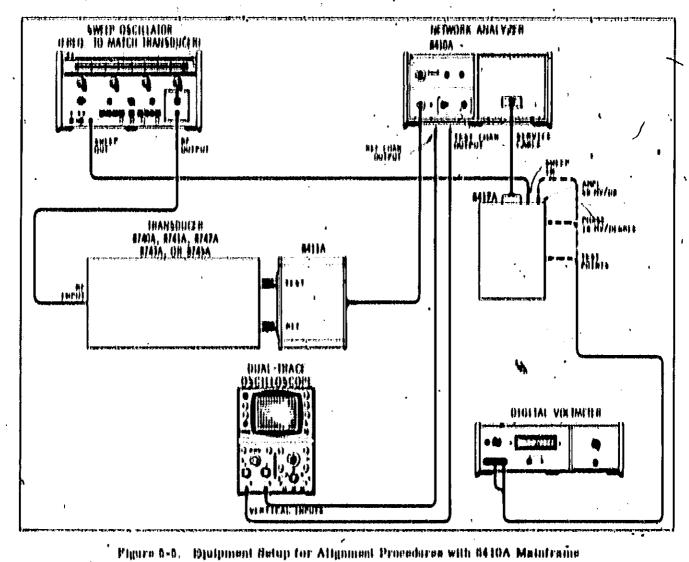


Table 5-7, Alignment with 8410A Mainframe (Bleet 1 of 5)

'anter	DESCRIPTION AND PRODUCTE  WAITING  Voltages greater than 1000 Volts are present at the CRT and in assemblies A5 and A6. These voltages qualit ususe injury to personnal.							
Contraction of the same of								
•								
1,	INITIAL SETUP DESCRIPTION: Setup and sulprat Instrument for amplitude and phase trace on CRT.							
	PROGRDURE:							
•	a. Comest equipment as shown in Figure 6-6, Hel awasp castilator for awapt mode over as narrow a band as possible. Adjust 0410A BWEEP STABILITY control and awasp oscillator RP output for BP CHANNEL LEVEL meter indication in the middle of the OPERATE range.							

Table 6-7. Altimment with 8410A Maintrance (Sheet 8 of 6) -

	All the Bast - William in the the state of t
grep,	DISBORUPTION AND PRODUCTURE
l, (Contd)	b. While observing the osethoscope, adjust 8410A AMPLITUDE TEST CHANNEL DAIN
<b>,</b> (1	o. Het H418A MODE switch to DUAL, AMPL DB/DIV switch to 10, PHABE DEG/DIV switch to 00, PHABE switch to positive (+), DEGITEEN switch to 100, and BW (kits), switch to 10. Het 6410A AMPLITUDE TEST CHANNEL GAIN 16 dB/step (leave 1 dif/dsep control at selling determined in STED 11), Doth suspitude and phase transaction should be displayed on 6418A CNT.
ĵ,	POWER BUPPLY (AURI)
	DESCRIPTION: The +6 Valt power supplies are adjusted for correct outpit.
	programm
	Them for at Vac 40,00 talent Atth and 3° the 40,00 vac at Atth. It is also and the action of the control and t
<b>4</b> ,	TIMUE ALION (AUNU)
	DESCRIPTION: The voltage to the CRT trace-sitys out is adjusted to sligs times to grationic on CRT face.
	PHOREGUME
	tel tweep Occiliator for minimum aweep width. But 6418A MODE switch to AMPL. Adjust 6418A AMPL VERNIER control to superimpose the amplitude trace over the center increantal graticule. For instruments with rear-panel TRACE ALIGN control RO, center pear-panel control and adjust ABIII TRACE ALIGN control for legit alignment of trace to graticule. For instruments without rear panel TRACE ALIGN control adjust ABIII for best alignment of trace to graficule. If trace signment is not correct when 6418A is installed directly into maintrame, readjust TRACE ALIGN control.
4.	vation value ;
	DESCRIPTION: The CITY trans is adjusted for best focus.
•	PROGRAMME:
	det awarp cantilator to single-frequency (CW) mode. Adjust ARTIGMATISM control AbiMO and from panel FOCUS control for the smallest dol trace on arrest,
٥.	AMPLITUDE CALIDIATION (ARIUR, ARIBRE, AZIEL, AZIEL, ANI ANI ANIZA DALA LED
	DipiditiPTION: The log converter is adjusted for proper estibustion at the resr- panel simplified sustitive output over the 60 dB range of 6410A/mainframe. The GRT amplified trace is then adjusted for estibusion to CRT graticule.
•	

Table 5.7. Alignment with 8410A Maintrame (Buet 5 of 6)

APEP DESCRIPTION AND PROCEDURE

# (Contd) PROGRDUNG

### NOTE

For all of the following settings of the \$410A AMPLITHDE TEST CHANNEL GAIN control, set only the 10 dft/stop control. The 1 dft/step control should remain at setting determined in STEP 1b unless otherwise stated.

Connect digital volumeter (DVM) to rear-panel AMPL 50 MV/DB gonnector. Bet 6418A MODE switch to AMPL and AMPL INI/DIV control to 10. Bet 6410A AMPLITUDE TIGHT CHANNEL CLAIN 10 dB/step control to 80 dB and adjust AMPL VERNICH control for 0,000 Vdo on DVM. If serve Vdo cannot be obtained, scheet ATBT. Check DVM readout at AMPLITUDE TEST CHANNEL CAIN control settings thated in Table on following page. Make alignment adjustments listed in table as necessary.

B410A AMPLITUDE TEST CHANNEL OAIN*	Digital Voltneter Roading	Adjustinant
60)	· 8. 000 · . 040	LOO OAIN ATRÍ4
50	1.600 + .030	1.00 GAIN A7R14
40	+1,000 4 .080	LOO GAIN ATILIA
80	(0,500 € ,010	LOO OAIN ATRI4
0.0	0,000 000	LOG ZERO, ATRT
10	W+0,000 4 ,010	AMPL CAL - LOW LIEVEL (Front Panel)
<b>1</b> 0	-1,000 ± .020	AMPLICAL - LOW LIEVICL (Front Panel)

<sup>\*1</sup> dB/stap control set at setting determined in GPEP 1b.

b. Bet awas notillator for awast mode over an narrow a band as possible. Bot the 8410A AMPLITUDE TEST CHANNEL CAIN 10 dD/step control to 20 dB and readjust AMPL VERNIER, if necessary, to get a 0,000 Vdc indication on the DVM. For instruments with reservance VERT 103 control, center the VERT 103 control. The trace on the 8412A should be on the gently horizontal grationle. If not, adjust AS134 AMPL control. Check vertical infraction simplifier do balance by inoving the 8412A AMPL DB/DIV switch through its full range. If trace moves from center graticule line, readjust 8410A. AMPL VERNIER for 0,000 Volt indication on DVM and readjust AS124 AMPL centrol slightly to obtain minimum change in trace deflection with change in vertical sensitivity (AMPL DB/DIV). Bet the 8412A AMPL DB/DIV switch to 10 and change the AMPL DB/DIV). Bet the 8412A AMPL DB/DIV is described in 10 and change the AMPL DB/DIV. CAIN control in 10 dB steps. The 8412A trace should move one major division for each step, if not, adjust AS12S and front panel AMPL CAI. (LOW LEVIEL) controls.

Table 5-% Altgumok with 8410A Mainframe (Sheet 4 of 5)

·		
arep.	DESCRIPTION AND PROCEDURE	
(Contd)	a. But \$1410A AMPLITUDE TEST CHANNEL GAIN 10 dB/stop control to 20 dB and set \$112A AMPL DB/DIV switch to 2.6. Adjust \$410A AMPL VERNIER for 0,000 Volt indication on DVM. Change \$410A AMPLITUDE TEST CHANNEL GAIN control by \$6 Mb. The \$412A trace should move up two major division. If not, make slight adjustment of A3223.	,
W	d. Set 6412A AMPL DB/MV switch to 1.0 and set 6410A AMPLITUDE TEST CHANNEL GAIN control to 20 dB (1 dB/step control set at setting determined in step 1b). It necessary, readjust 6410A AMPL VERNIER for 0.000 Volt on DVM. Change 6410A AMPLITUDE TEST CHANNEL GAIN control by 41 dB. The 6412A trace should move upone major division. If not, make slight adjustment of ABR23.	
N .	o. But B412A AMPL DB/DIV switch to 0.25 position. Adjust 8410A AMPL VEINIER control and AMPLITUDE TEST CHANNEL GAIN control to place the amplitude trace on the screen. Change the AMPLITUDE TEST CHANNEL GAIN control by one dB and dot should move 4 major divisions. If not, make slight adjustment of A3R23. If A3R23 was adjusted in steps c, d, or a, recheck steps b through a sgain.	
6.	PHASE CALIBRATION (A1RG, A1R16, A2R26, A2R26, A2R44, A3R26, AND VERT, POS., R6)	
,	1873-4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	DESCRIPTION: The phase offset circuits are adjusted for correct calibration and the phase-detector is calibrated. The deflection amplifier is then checked by observing trace deflection on CRT.	
	PROCEDURE:	•
	a. But sweep oscillator for single-frequency (CW) operation. Connect DVM to PHASE 10 mV/DEG connector at 8412A rear. On 8412A, set MODE to PHASE, PHASE DEG/DIV to 90, PHASE OFFSET to (-), and DEGREES switch to 0; Set Network Analyzer PHASE VERNIER to mid-range.	
.	b. Connect dual trace oscilloscope to the 8410 rear-panel TEST CHAN OUTPUT and REF CHAN OUTPUT connectors.	
	c. Adjust Network Analyzer PHASE VERNIER, AMPLITUDE TEST CHANNEL GAIN and oscilloscope to display one sine wave superimposed on the other.	
	Expand one cycle of trace so that the zero degree point on the sine wave is at left edge and the 360° point is at the right edge of the graticule (Figure 5-1a, Waveform A). (With an oscilloscope having 10 cm graticale width, each/cm is 36 degrees.) Expand the oscilloscope waveform horizontally by a factor of ten so that each cm represents 3.6 degrees. Adjust oscilloscope to position the center of the waveform on the screen (Figure 5-1a, Waveform B).	
,	d. Adjust 8412A A1R6 PHASE ZERO for DVM reading 0 ±1.6 mVdc.	
	6. Short current source (short A2Q14 base to emitter) and adjust A2R44 for -207 42 mVdc.	
	f. Remove short and adjust AIR6, if necessary, for 0 43 mVdc.	,
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Table 5-7. Alignment with 8410A Mainframe (Shoot 5 of 5)

	DESCRIPTIO	ON AND PROCEDURE								
6, (Contd)	Adjust A3R25 for center graticule line on 8412A. Check various deflection amplifier de balance by moving the 8412A PRASE DEG/DIV switch through its full range. If trace moves from center graticule line, readjust 8412A A1R6 for 0.43 mVdc indication on DVM. Readjust A3R25 PRASE central to obtain minimum change in trace deflection with change in vertical sensitivity (PRASE DEG/DIV). Bet 8412A PRASE DEG/DIV switch to 80.									
1	h. Adjust ARRES so that maximum difference in DVM reading is 1,mVdc when switching from (+) to (-) PHASE positions.									
1	1. Adjust Network Analyzer for 0 41 mVdq DVM reading.									
	6. But 1412A DECREES switch to 160 and adjust A1R18 so that highest DVM reading for either polarity (+) or (-) is 1,600V +1 mVde.									
	k. Bet 8412A BW (klig) switch to 0.1 and DEGREES switch to 180. Adjust ARESO so that CRT line display stays within 1 cm of center line for sither polarity (+) or (-) setting of 8412A.									
	1. Set 8412A DEGREES switch to 0 and adjust A1R6, if necessary, for 0 42 mVdc DVM reading.									
	m. Bet PHA na show recheck necessar	DVM indication at each contitor	EGREES switch and obtain DVM indication 1816. Bet PHASE switch to negative and of DEGREES switch. Readjust A1816 if							
,		DEGREES Botting	DVM Indication							
į.		0	0,000 4 .002							
	•	20 40 60 80	0,200 4 .003 0,400 4 .004 0.000 4 .005 0.800 4 .000							
•	•	20 40 00 80	0,200 4 .005 0,400 4 .004 0.000 4 .005							
	INTERRITY	20 40 00 80 100 120 140	0,200 4 .005 0,400 4 .004 0,000 4 .005 0,800 4 .000 1,000 4 .007 1,200 4 .008 1,400 4 .000							

### PROCEDURE:

Adjust front-panel INTENSITY control fully counterclockwise and traces on 0412A should diskposer near the counterclockwise stop. If not, adjust A5R27 for a range of INTENSITY control that gives no trace near counterclockwise position and maximum brightness of trace at fully clockwise position.

### SECTION VI REPLACEABLE PARTS

### 6:1. INTRODUCTION.

6-2. This section contains information for ordering replacement parts. Table 6-1, gives the meanings of the abbreviations and reference lesignations used in the table of replaceable parts. Table 6-2 lists parts in alphanumerical order of their reference designators and indicates the description and HP stock number of each part, together with any applicable notes. Miscellaneous parts are listed at the end of Table 4-2.

- a. Description.
- b. Manufacturer of the part in a five-digit code; see list of manufacturers in Table 6-3.
  - c. Mayulacturor's part number.
  - d. Total quantity uged (TQ column).

### 6-3. ORDERING INFORMATION,

- 6-4. To obtain replacement parts, address order or inquiry to your local Hewlett-Packard Field Office (see list at rear of this manual for addresses). Identify parts by their Howlett-Packard stock numbers.
- 0-5. To obtain a part that is not Italed, include:
  - a. Instrument model number.
  - b. Instrument social number,
  - c. Description of the part.
  - d. Function and location of the part,

Table 6-1. Reference Designations and Abbreviations Used in the Table of Replacable Parts.

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Table 6-2. Replaceable Parts'"

Reservance Designation	HP Part Number	Οιγ	Description	Mir Code	Mir Part Number
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2786 { 1 2788 2789 2789 2789	0191-0180 0446-3351 0448-8450 0448-8450 0448-8450	:	RIPRO MET PEN 18 INGN EN 1786 ' S PIPRO MET PEN 18-AR INGN EN 18 1786 ' RIPRO MET PEN 48-28 INGN EN 18 1786 PIPRO MET PEN 48-28 INGN EN 18 1786	## #0. ## #0 ## #0 ## #0 ## #0	0757-0760 0646-3157 0648-3650 0648-3650 0648-3650
A/F11 A/F12 A/F13 A/F13 A/F13	0648-3450 0767-0422 0648-3447 0648-3447 0753-0880		# 814 DO MET PLM W.F. JR CHIP 19 1/8W RIPRO MET PLM 909 DWM 12 1/8W RIPRO MET PLM 429 DWM 12 1/8W RIPRO MET PLM 429 DWM 12 1/8W RIPRO MET PLM 12 CMW 12 1/8W	28480 28480 28480 28480 28480	'n - Oame-3450 . 075f-8473 0498-3447 1498-3447 0787-3480
42416 42417 42414 42414 7122520 ,	0797=0643 0797=0643 0797=0423 0698=0081	11 \`	RIFAD HET FLM 10.0A DIM 1E JAN RIFAD HET FLM 10.0R DIM 18 17AU RIFAD HET FLM 909 DIM 18 17AU RIFAD HET FLM 1.9AA DIM 18 17AU RIFAD HET FLM 1.9AA DIM 18 17AU	28480 28480 28480 28480	0757-0442 0757-0447 0757-0457 
4004 4104 4104 4104 4104 4104	0797-0280 0797-0441 0797-0442 0797-0442 - * 0797-1094	<b>~</b> },	REFRO MET PLM IN CHIP IN 17RM RIPROMET PLM II-DE DIM IE 17RM REFRO MET PLM II-DE DIM IE 17RM REFRO MET PLM IO-DE DIM IE 17RM REFRO MET PLM IO-DE DIM IE 17RM	28480 28480 28480 28460 28480	0 F5F-0Fe0 0 F5F-0443 0 F5F-0443 0 F5F-0445
11876 11887 11878 11877 11840	0757-0401 0757-0778 7100-1770 0648-6657 7100-1778	1	RIFED MET PLM LOU DAM 1% L/MU RIFED MET PLM 1. FOR DAM 1E 1/MU BAVAN NM 100 DAM 8% TYPE 11 IN RIFED FLM 1. FOR DAM 1% 1/MU BAVAN, MM 1K DAM 8% TYPE II 1M	284 80 284 80 284 80 284 80 2714 80	0797-0401 0797-0778 2100-1770 0498-6492 2100-1773
274 51 275 57 276 57 276 53 276 53 276 53	0448-6337 0753-0280 048-3442 0498-6337 0757-0424	3	ALFRO FLM 1-38 DOM SET 1/88 RIPED MET FLM 18 DOM 18 1/88 RIPED MET FLM 257 DOM 18 1/88 RIPED FLM 1-38 DOM 18 1/88 RIPED MET FLM 1-10P DOM 18 1/88	#04 80 #84 80   #84 80   294 80	0048-6837 0787-0280 0498-3446 0448-6337 0727-0474
A26 \a A266 f 26 a A27 a A27 a	6197-0199 0191-0418 0191-0418 0191-0494 0498-2191	•	RIFED MET FLM 47.5 INM IE 1/AW BIFED MET FLM 5.518 INM IE 1/AW AIFED MET FLM 5.518 INM IE 1/AW RIFED MET FLM 47.5 INM IE 1/AW RIFED MET FLM 10.44 INM IE 1/AW	28 485 28 485 28 485 28 485 12 485	0 19 19 0 29 9 0 19 1 - 04 28 0 19 1 - 04 29 0 19 1 - 03 19 0 4 19 19 19
20701 APROJ APROJ APROS	0797~0440 0797~0440 0797~0149 7100~1777 0797~0780	;	e nerd met fem 61. On thim to 1/86 nerd met fem fisch t	FR4 80 FR4 80 FR4 80 FR4 80 FR4 80	0757-0469 0757-0440 0757-0149 2100-1777 0757-0780
	. 1		4		•

Table 0.2. Replaceable Birth

,			Table 6-2. Replaceable Parts	•	•
Reference Designation	HP Part Number	Qiy.	Description	Mir Code	Mfr Part Number
## ## ##! ##! ##!	inele valore are in valore are in valore are in valore		anafil abbrohin tipliping in flanging to the s at hij) at -1 at thinks abbrohing annum in (abbrohing to the sab-pine annum in (abbrohing to the sab-pine annum in (abbrohing to the sab-pine indupine	######################################	( usat sast sast sast the f sast sast sast sast the f sast sast sast sast the f sast sast sast sast sast sast sast sast
AM, 9 AM, 9 AM, 6 AM, 6	0180-1086 0180-0199 0180-0199 0180-1080 0180-118		LPPD, LPP G. 04 OF CRU-RIS (MOTH W UPPD STATE, P. 2 OF POLY FOUND CPPD STATE, P. 2 OF SATE CPPD STATE, P. 2 OF CRU-RIS CPPD STATE OF CRU-RIS LPPD STATE OF CRU-RIS LPPD MILE BY PP BE SUCVIDED	14/84 14/84 14/84 14/84	ENSBY   NJP   NJP   SP - COH   1
ABL 9 ABL 10 ABL 18 ABL 18 ABL 18	0160-7146 0160-7118 0160-7166 0160-0146 0160-0146	•	Coren (in a of the energy joints of the coren and the coren and the core of the coren and the core	71 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ta o diau-sels ta i verigense-pre i verigenses-pre
ANCRE ANCRE ANCRE ANCRE ANCRE ANCRE	401-0040   401-0040   401-0040   401-0040   401-0040	•	02002+8163CDW BURN BUW D1007+8861CDW BURN BUW C D1002+8861CDW BURN BUW D1007+88661CDW BURN BUW D2005+8161COW BURN BUW	01743 01743 01743 01743	f 1145 ans f 1161 ans f 1161 ans f 1161 ans f 1161 ans
ebied est e est e est s	140  - 0040   100-   664   100-   664   1440-0710   1844-0757	. 4	DECACE AND ECONOMISMO SOME SOME SOME SOME SOME SOME SOME S	07#68 #8460 #8460 #8464 #8460	FDUJUMA VJSO-jahi VJSO-jahi 16-jaja-jas 1861-0735
A 501 A 503 A 503 A 504 A 504	1103-0030 135-0071 1454-0071 1654-0071 1654-0030	•	HEAT DISSIPATOR TEERS SI PROSELECTRO FROM PROFICES TEERS SI PROSELECTRO FROM PROFICES TEERS DISSIPATOR HEAT DISSIPATOR	##4### ##4## ##4## ##4## ##4##	
euch Aue Tuea Buea, Buea, Puea	1844-0535   484-0535   484-0051   484-0051   484-0051		TETPIES MPNISSITETED FROM FNSAADS TETRISI MPNISSISCTTO FROM FNSAAD) TETRISI MPNISSISCTED FROM FNSTDAS TETRISI MPNISSISCTED FROM FNSTDAS TETRISI MPNISSISCTED FROM FNSTDAS	/8480 -/8480 /8480 /8480 /8480	184-07 184-07 184-07 184-07 184-07
A3414 A3411 - A3418 A3418 A3414	1894-0071 1851-0070 1853-0070 1864-0071 1864-0071	•	TETRIBE MAMERILETED FROM PARTUAL TETRIBE PARTETLETED FROM PARTUAL TETRIBE MAMERILETED FROM PARTUAL TETRIBE MAMERILETED FROM PARTUAL TETRIBE MAMERILETED FROM PARTUAL	##4#0 ##4#0 ##4#0 ##4#0 ##4#0	1864-001    1868-0010   1868-0011   1868-001
A1015 A1A1 A1A4 M1A4 M1A4	184-0073 0448-846 6448-3446 0448-3440 0448-3440	•	TETRIER MPHIERLECTED FROM PARTONE RIPED MET DE 12E DIM 98 PU RIPED MET DE 12E DIM 98 PU RIPED MET DEN 1ME DIM 12 PUM RIPED MET DEN 1ME DIM 18 1/PM	764 80 784 80 784 80 784 80 784 80	
# 3# 9	0151-0700 0656-3443 0656-3443 0751-0780 0757-3401	•	PEFAU MET FEM IN INN IN 1/0W  ROFND MET FEM FOF DAM IN 1/NU  ROFND MET FEM FOF DAM IN 1/NU  ROFND MET FEM FOF DAM IN 1/NU  ROFND MET FEM 100 DAM IN 1/N 1/N  ROFND MET FEM 100 DAM IN 1/N	##4#G ##4#G ##4#G ##4#G ##4#G	0197-0180 0448-2443 0448-2443 0197-0180 0197-040]
43810 A3A11 A3A13 A3813 A3814	0797-0410 0797-0400 0797-0400 0797-0410	•	BIFAD MEF FLM IR DKM IR 1786 RIFAD MEF FLM IO CHAN IR 1786 RIFAD MET FLM IR CHAN IR 1786 BIFAD MET FLM IF TRIM IR 1786 RIFAD MET FLM SIL DHAN IR 1786	##4 #0 ##4 #0 ##4 #0 ##4 #0 ##4 #0	0797-0780 0787-0401 0797-0780 0787-0780
ASR19 #3816 #3817 #3810 #3810	0181-0214 0181-0401 0181-0484 021-0214 0181-0401	.;	REFUL MET FLM 3.568 (34M ) B 3/8W REFUL MET FLM 500 (34M ) B 3/8W REFUL MET FLM 50.5% (34M ) B 3/8W REFUL MET FLM 3.568 (34M ) B 3/8W REFUL MET FLM 100 (38M ) B 3/8W	76480 - 26480 76480 78480 78480	0767-0178 0767-0401 0767-0464 0767-0401
#3870 -3387] -33627 -33628 -33628 -33624	0648-3186 0797-0397 0498-3440 7100-7619 7100-7971	;	ROFAD MET FLM 14.TA CHIM 18 1/8W ROFAD MET FLM 1.22A CHIM 18 1/8W ROFAD MET FLM 194 CHIM 18 1/8W ROFAM CERMET FOOK CHIM 108 LIM 1/8W ROFAM FLM 2000 CHIM 108 LIM 1/8W	##4#0 ##4#0 ##4#0 ##4#0	0449-3144 0787-0117 0498-8440 F100-F311 F100-F351
/38/9 ) / ASR/6 / ASR/7 / ASR/8 / ASR/9	71 700-78 5.72 0787-0408 0787-0408 0197-0230 0498-3443 0498-3443		ROVAR FLM 2000 DHM 108 11M 1/2W RIFKD MET FLM 500 DHM 18 1/2W RIFRD MET FLM 34 CHM 18 1/2W RIFRD MET FLM 24F DHM 18 1/2W RIFRD MET FLM 24F DHM 18 1/2W	##4 80 ##4 80 ##4 80 ##4 80 ##4 80	\$100-76\$} 0197-0401 0197-0401 0490-3443 0490-3443
438 30 438 31 438 33 438 34	0787-0401 0498-1198 0797-0499 0797-0780 0797-0780	,	RIFAD HTT FLM 100 (NW 18 1/84 RIFAD HTT FLM 23.70 (SW 18 1/84 RIFAD HTT FLM 18.20 (NW 18 1/84 RIFAD HTT FLM 18 (SW 18 1/84 RIFAD HTT FLM 18 (SW 18 1/84	744 90 784 90 784 90 784 80 784 80	0797-0401 0494-3194 0797-0499 0797-0780 0797-0780
		· **	of in.		

Table 6-9. Replaceable Parti

Hafaranca	HP Part Number	Oly	Description	Mir	Mfr Part Number
Dationation	Programmy for the state of the			Code	
######################################	116 48-8586 12 55-16 514 12 55-16 514 12 55-16 511 12 55-16 511	•	papal) net pen an ep akin te arau alpah net ein al vo (bin te arau alpah net ein al vo dian te arau alpah net ein ab lan al arau alpah net ein an lain al arau	70.00 70.00 70.00 70.00 70.00	114 ya = \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$ \$
6844 6344 6344 6344 6344 6344 6344 6344	11 f b 2 - 13 b b f 11 f b 4 - 13 b b f 13 f b 5 - 13 b b f 15 b b - 13 b b f 1 f b 5 - 13 b b		Actor met tem 110.00 juin ta leau Betali met tem 110.00 juin 18 1/20 Betali met tem 6.10 juin 18 1/20 Betali met tem 1/20 juin 18 1/20 Betali met tem 1/20 juin 18 1/20	## ## ## ## ## ## ## ## ## ##	# 197-4447 # 197-4447 # 197-4448 # 198-448 # 198-7448
# 1 # 4 # # 1 # 4 # # 1 # 4 # # 1 # 4 #	11 7 4 7 - 11 0 0 11 11 7 7 - 11 0 0 11 7 8 7 - 11 0 0 3 11 7 6 7 - 11 7 8 11 11 7 6 7 - 11 7 8 11	•	nifel) Mrt fin bije inim to i/mu sifen mrt fin bije thim is i/au sifel mrt fin a.go inim ia i/au sifel mrt fin ie inim tijou sifel mrt fin ie inim tijou	## ## ## ## ## ## ## ##	0797-0458 0787-0458 0187-0461 8787-0260 0781-0260
110 10 110 11 110 11 110 11	0797-0780 0797-0780 0797-0779 0797-0779 (797-0779		Attol MET TOM TO SHOW TH STOW OFFISH MET TOM TO SHOW TO TOM ATTOL MET TOM B. SAN SHOW TO TOM ATTOL MET TOM S. SAN SHOW TO TOM ATTOL MET TOM S. SAN SHOW TO TOW	08 4 8 4 98 4 8 4 98 4 8 6 98 4 8 6 98 4 8 6	### ##################################
)1444 44	48418-84444 48418-844181	1	parou met pam 8,540 imim 18 s/aw Priast ippost 6 pain 1310m 8m33lia abby Proujat-tocalour Abbombly	\$84.00 \$84.00	#197-0119 
jan .	/1448-9430	' ;	nitan rim kan min h.ron krou	18480	0444-4×38
\$45 f \$40 f \$40 f \$40 f	136 48 - 9 6 58 UA 48 - 9 6 58 136 48 - 9 6 58 136 48 - 9 6 58 UA 98 - 9 6 58		RIPED FEM SUD (Hom 0.794 3/00 SIPED FEM SOD (Nom 0.254 3/00 FIPED FEM SOD (Hom 0.254 3/00 SIPED FEM SUD (Hom 0.254 3/00 SIPED FEM SUD (Hom 0.254 3/00	######################################	1)499-9498 1)492-9498 0498-9498 0498-9498 0498-9498
\$40 F \$40 B \$40 B \$40 B \$40 B \$40 B	C498-9438 (M40-9438 (M40-9438 (M40-438 (M40-4393 (M40-4393	},	RIPSD PER LOG THAN U.JSB 1/RW RIPED TER LOG THAN U.JSB 1/RW RIPED TER LOG THAN U.JSB 1/RW RIPED TER TOOR THAN U.SB 1/RW RIPED TER TOOR THAN U.SB 1/RW	76+80 76+80 76+80 76+80	0448-4438 0448-4438 0448-4438 0448-4034 0448-4233
ALB   F ALB   B ALB   B ALB	0181-1175 (D6 98-7584 449-6755 0191-0214 6757-0407 (B6 17-00045 C8 670-60013 08 417-60034	<i>•</i>	# ### ### ### #### ###################	##4## ##4## ##4## ##4## ##4## ##4## ##4## ##4## ##4## ##4## ##4##	0787-1093 0498-7394 0498-4393 0787-0774 01413-10015 08413-40015 08413-40015 08413-40015
4561 456.2 456.1 456.4 456.5	0] 60=0484 0] 70=0040 0140=0116	1	CIFED BY 0.25 UF EDE AUVOLW CIFED BY 0.04F OF 108 FOUVICW BOT ASSISMED OTHER TERMS 0.00 FOUR SERVICW	\$4480 \$4587	0140-0889 147747347-P18
in the state of th	03 80 -0 536 03 80 -0 536 03 80 -0 536		CIFED CLECT A.G OF LOW SEVOCH CIFED CLECT A.G OF 108 SEVOCH CIFED CLECT A.G. UP 108 SEVOCH NOT ASSIGNO	\$6789 \$6789 \$6789	\$ 900 48 5 F90 3 9 6 7 7 7 5 1 900 48 5 F90 3 9 8 7 7 7 5 1 900 4 8 5 F90 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
PICTO	#1#0-Q1#7 #1#0-##3# #1#0-##4 #1#0-34## #1#0-34## #1#0-###		CIPRO SESCE 3.0 UP 108 30VICH CIPRO CER 0.05 IP - 80-208 EUGNICH	16707 16707 16707 16707 16707 16707	1900#88890#8#-07\$ 1900#68#038#9-07\$ 60#8#1018 90#8##-07\$ 1900#88#098#############################
49610 49617 49614 49614 49614	0140-3007 0140-3007 0140-3007 0140-3007	. ;	CIFED CER 4 FOO PF FOR AR VICE CIFED CER 4 FOO PF FOR AR VICE	92449 72949 12949 12949 72943	3888-024-Y507-6738 3888-024-Y507-6738 3888-024-Y507-4738 3888-024-Y507-6738 3888-024-Y507-4738
ASCAI ASCAI ASCAI ASCAI	0140-840 9 1903-0040 1908-0049 1908-0049		CIFFO CER 1900 PF POR 9R VOCH CIFFO CER 1900 SOME BONY DISCRETERACIONE 8.199 98 DISCRETERACIONE 8.199 98 DISCRETERACIONE 19941 11.59 88	15783 61543 04711 07543 04713	AFR-GFS-RSPQ-18FM FOGICAR EFFGSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS
ASCAS ASCAS ASCAS ASCAS ASCAS ASCAS	1901-0040 1901-0040 1901-0040 1901-0040 1901-0076	de solo	ORDOFASTLECOM BONA BONY BESTOTASSILECOM BONA BONY BESTOTASSILECOM BONA BONY DESDETESSILECOM BONA BONY DESDETESSILECOM OF BAR FOOPEN	07/63 6/60 6/60 6/61 0/61	POGLORA POGLORA POGLORA POGLORA SPLESS-4

Table 6-9. Rophoceable Parts

Rafarana	HP Part Number	······/···/·	Description	Mir	Mir Part Number
Dasignation	·1		to account of the first account of the second of the secon	COM	
amengaf abi bil abi bil abi bi abi b	1 400 - 1 6 5 0 1 401 - 2016 0 4 100 - 1 6 5 0 4 100 - 1 6 5 0	i • •	Colle vermon de un min de Notation de un de la collection	01743 01744 01744 7444 7444	**************************************
bens eer e eer e eer e	\$### - 1115 \$## - 11150 #\$ (41) - PV\$1 #\$ (41) - \$ ##D	•	CITES/CRIME /BLO IN BE CITES/CRIME BLO IN BE CITES/CRIME BLO IN BE CITES/CRIME BLO IN BE FRENCE MANUELLE IN FRIM PROPRIE FRENCE MANUELLE IN FRIM PROPRIE	# # 0 # 0 # 0 # 0 # 0 # 0 # 0 # 0 # 0 #	4100-1030 4100-1030 1100-1030 1033-0030 1034-0071
abus sbub abub sbub abus .	-1 1014-1014 1019-1014 1019-1014 1014-1014	1	TATECAS POPERAGESTED PRIM PROTUPS TO BATE PAPE TATECAS PAPE TATECAS PAPE TATECAS PROP.	######################################	1 003 - 1001 0   001 - 1000   001 - 1000   003 - 1000   0
4004 VIII 0 11004 1404 1404		. 1	TOTAGO POPULARI MANISHERI BEPLALENDES ( POPULAS PAPE TOTAGO PAPENTO PER PER PAPENTO ( TOTAGO PAPENTO ( TOTAG	# # # # # # # # # # # # # # # # # # #	0161-064   066-0010   066-0010   166-0010
464 464 464 464 484	0797-044 0797-0464 0497-3134 0787-3094	}.	PICED MET PLW 4,750 (DU 16 1/84) PACTION DELECTED PART PICED MET PLW 1100 (BM 18 1/84) PICED MET PLW 12,80 (BM 18 1/84) PICED MET PLW 12,80 (BM 18 1/84)	##4#0 ##4#0 #### ##4##	0767-044) 0767-0444 N/44. 7>8 0767-1644
464 p 464 p 464 q 464 q 464 q	16 48- 5 6 5 0 7 5 7 - 0 46 7 0 7 5 7 - 0 46 5 0 4 4 - (1) F 5 116 4 8 - 5 3 5 6	-	nerall met ten fa, j inm. 10 l/au a.	# # 4 # # # # # # # # # # # # # # # # #	DAYS-333 - BAYS-343 - BAYS-333 - BAYS-33 - BAYS-333 - B
1976   1981   7 1981   3 1981   4 1981   4	114 4 m = 1   1	- 4:3	Been wit tim bitte thin to 1/br been wit the total time is 1/br been wit the total in 10 1/br been wit the total in 10 1/br been wit the total in 1/br	7 A A AU 3 A A AU 3 A A AU 3 A A AU 3 A A AU	na 1
49F16 49F17 49F18 49F19 49F70	0448-3187 0767-0700 0767-0700 0848-3418 0448-0338		RIFAN MET FLM 14.AP (DIM 18 1/8W RIF DD MET FLM 6.APP (DIM 18 1/8W RIF DD MET FLM 8.APP (DIM 18 1/8W RIF DD MET FLM 88,3 (DIM 68 1/8W	##4 #0 ##4 #0 ##4 #0 ##4 #0	0 + 4 = - 6 + 4 0 + 6 + - 0 + 00 0 + 6 + - 0 + 00 0 + 4 = - 5 + 5 +
4987A 4987A 4987A 4987A	1767-1611 1767-1618 1767-1618 1767-1618	,	miran mit fim agiga imm tu iyaw miran mit fim agiga imm na iyaw miran mit fim agiga imm tu iyaw miran mit fim an na miran tu iyaw miran mit fim an imm tu iyaw	##4 #0 ##4 #0 ##4 #0 ##4 #0 ##4 #0	· 0.478-3450 0.478-3450 0.451-0.456 0.481-3444 0.481-0.403
49676 49677 49678 49679 49679	0757-0458 2100-1458 0834-0003 0484-1055 0483-1215		GIFON MET FLM 6,64 NIM 68 5/84 FRM B MICHAEL BUT 6 1/4 6/74 FRM FRM FRM BILL BUT 6 1/74 GIFON FRM B 1/74 GIFON FRM B 1/74 GIFON FRM B 1/74	##A## ##A## ##A## ##A## ##A##	UTST-DASS PARTIES PARTIES CANADAS
A1811 A1817 A1811 Fibras	0797-0942 - 0797-0280 0648-244 0648-222 0686-222	. 1	neral mis rim soude thin so stan of meral mis rim so dum so standescom, arms ) meral mis rim so mission so th meral mis rim so mission so th meral comp aroo dum or stan	044 NO 044 NO 04	0707-0445 0707-0540 0440-2444 Q440-1145 FR 7224
0 2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	044-339 035-0003 044-4739 044-4739 2100-2440	* 1	RIPALL COMP 3.3 MEGNIM 56 3/2W PIPAL COMP 57 MEGNIM 508 1M PIPAL COMP 57 ININ 52 3/7W PIPAL COMP 57 ININ 52 3/7W PIPAL COMP 57 ININ 52 3/7W	01143 96480 91441 01141	FR 3305 GRAG-GOGS FR 8775 FR 8775 FR 8775 FR 8775 FR 8775 FR 9775 FR 9
#3F4  #3V1 #6 #6 #6	0797-0740 F140-0014 OBA1F-60006 OBA1F-60019 O160-3007		RIPAD MET PEN IN DIM 18 1/80 MULB LAMPIGI DIG 98 MILLIANS I PRULB 1880: VILTAGE PANTY (MPA & PECTIFOR REMUSLE-LACIANGE ASSEMBLY COPAD GEN 4,200 PE 208 AP VICU	##4#0 #1144 ##4#0 ##4#0 ##4#0	0 VTT-0180 (48)M1-94) (94)2-42004 (94)2-40034 (1880-024-7310-4728
pacp pacpi pachi paai paai	0 A0-300A \$40 -034  \$40 -034  044-734 044-1433		CIPRO CIP ATOO PT YOU AR YOUN  DECOPT ON TOOD PTY BORK PEPRO COMP JER ONE SE IVAN  REPUD COMP JER ONE SE IVAN  REPUD COMP JER ONE SE IVAN		8000-074-781)-472H 8709-074  8709-074  (H 8224) 60 1624
ART 1 AT AT AFC 1 AFC 1 AFL 8	0141 F-8000 F 0141 F-8000 F 0141 F-600 F 0140 FFF 0140 FFF 0140 FFF		TRANSFIRMER ASSVILLEN WETAGE AMPLYSTIME CHAMMED LIGG COMPETER ASSV PERUSET-EXCHANGE ASSEMBLY COPPED MECA POOD PT SP BOOVIEW COPPED MECA POOD PT SP BOOVIEW	78180 74180 77181	08412-80001 08412-80007 08412-80006 69812767236 9981777236
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Her introduction to this section for priceing information

Table 6-2. Replaceable Parts

Table 6-2. Replaceable Parts								
Reference Designation	HP Part Number	Qty	Description	S MIr Code	Mfr Part Number			
976 9 676 9 876 9 876 9 876 9 876 9	1401-1050 0180-0116 0180-0116 0180-0116	,	LIPPO ESECT A. A SP LUB BAVIMA ESPECITAÇÃO DE SUB BAVIMA DIMETAS POR MA AT LA DIMETAS POR MA AT LA DIMETAS POR MA AT LA	%apay %apay 07pas 07pas 07pas	bmasbrusbag-myb   bmabbrusbag-myb   fna asna   fna asna   fna asna			
#75.64 #75.64 #75.1 #96.4 #71.3	1 40 p = 0 p3 p 1 40 p = 0 p3 p 1 4 ph = 0 00 f 1 4 ph = 0 00 f 1 4 ph = 0 00 f	عاسسر،	Deine Breadinnesso. Dy 98 22 (1908 Breadinnesso. Dy 98 22 (1908 Breadinnesso. Dy 98 22 (1908 Breading)   1908 Breading   1908	/4480 /8480 /8480 /8480 /8480	403-0505   403-0505   654-0605   654-0605			
atica atui atai atai atai	1854-0307 1854-0595 0648-5163 0648-0085 0787-0441	;	COLINGARINECOMMEMBED REPLACEMENT) THEFT, MPM R. 1. REPLACEMENT ( REPUBLIE FOR 1. REPUBLICATION REPUB	##4#0 ##4#0 ##4#0 ##4#0	18f4-000f 1844-0745 0444-3155 0446-0085 017f-0441			
#	0191-0939 0698-6368 0191-0640 7190-1778 0781-0640	1	RIPAD MET PEM GERRO INN 18 17AU RIPAD MET PEM GERRO INN 18 17AU RIPAD MET PEM GERRO INN 18 17AU RIPAD MET PEM GERRO IN 18 17AU	#84 80 #84 80 #84 80 #84 80 #84 80	0 15 2-0434 0498-4348 0 517-0440 5100-1178 0 15 1-0440			
alen alelo alela alela alela	0199-0094 0191-0444 0191-0180 0411-1180 0197-0441	1	ATPRO MET PEM E MEGINAN ER SYRW ATPRO MET PEM SYLVAN BITTO MET PEM SYLVAN BITTO MET PEM SALVAN	#84 80 #84 80 #84 80 #84 80	0797-0094 0787-0944 0787-0780 0411-1780 01197-0447			
#   #   4   #   #   4   #   #   #     #   #   #   #   #   #	#100-1174 0707-0416 0707-0416 0707-0416 0690-3447	e j'	RIVAR MU JR. DIN ON TYPE II IM hiffd het fin hii den in 1706 Riffd het fin in den in 1706 Riffd het fin hii den in 1706 Riffd het fin hit den in 1706 Riffd het fin 28f den in 1706	#8480 #8480 #8480 #8480	7100-1774 0787-0414 0787-0416 0787-0416 0488-3447			
APA JU AU AU AUC.) AUC.)			RJERO MET PLM FOR DOME LE EZEM LIDW VOLTAGE POWER EUMPLY REBULLT-ERCHANGE ABERMELY GIFAD FLECT EAF UP LOS PROVOLU GIFAD FLECT EAF UP LOS PROVOLU	#44 80 #44 80 #64 80 \$64 89 \$64 89	0498-2448 # 08412-6008 04412-60037 15002288402048-075 15002288402748-078			
ARCS ARCA ARTCA! ARTCA!	100 5-00 10 100 10-00 10 1000 - 00 10 1000 - 00 10 1000 - 10 10	:)   	CIPED MICA OF PP SE  CIPED FLECT OS UP OFF-LOS PSOVDC  ICIVILIZAT REGULATOR GOV MABGERFLOM, REPL)  [CILINEAN RECOMMENDED REPLACEMENT)  TSTRIST PMP	#84 80 #6#4 14040 #8480 07#83	05-0-507 - 399-507 - 199-507 - 195-007 - 195-007			
AND/ AND) AND/ AND/ AND/ AND/ AND/ AND/ AND/ AND/	1494-0094 1493-0093 0797-0390 0498-0084 0797-0384	 	TETRISE NOM TETRISE NOM TETRISE NOM RIPED MET FLM 6-190 CHIM IR 1/80 . RIPED MET FLM 8-150 CHIM IR 1/80 RIPED/MET FLM 13-30 CHIM IR 1/80	20131 20131 20131	283093 283740 4 / ~ 0797-0290 0498-0034 0197-0289			
348 q 448 q 448 q 448 q 448 q	#10045789 7 00498-3491 00498-3491 0055-1470 #100-1577	, ,	ALYAR WE IS CHIN SE TYPE H IW  RIFED HET FLN IS CHIN C.18 1/8W  RIFED HET FLN IS CHIN C.18 1/8W  RIFED WE JOJ CHIN SE TYPE H IW  RIVAR WE ZOS CHIN SE TYPE H IW	##4 ## 0 ##4 ## 0 ##4 ## 0 ##4 ## 0	#100-1773 0498-1491 0498-1491 0411-1470 4100-1777			
4889 484 [0 488 [1] 49 49	0151-0784 0151-0784 0151-0110 08418-40007 08418-40038	1	RIPED MET PLM 30.0 (RIM 3E 1/2W RIPED MET PLM 30.0 (RIM 3E 5/2W RIPED MET PLM 333R (RIM 3E 5/2W PEST CHANNEL AMPLIPIER ASSY REGUILT-PREHAMUE ASSEMBLY	284 80 284 80 284 80 284 80 284 80	0197-0984 0197-0984 0197-0980 08412-00009 08412-00009			
8968 8968 8968 8964 8968	01 00+0354 01 00+0354 01 00+0354 01 00+0354	/ _  -	CIFED EFECT 33 M. FOR SOADCM. CIESD EFECT 1'S MY TOR SOADCM. CIESD EFECT 1'S MY TOR SOADCM. CIESD EFECT 1'S MY TOR SOADCM.	34/47 34/47 34/47 24/47 24/40	150010510039A7-DV5 1500105100105-DV5 1500155105002-DV5 1500154150136-DV5 15001545000000000000000000000000000000			
8904 8904 8904	01 00-01 16 01 00-1741 01 00-1743 01 00-0197 01 00-0791	••	CIFBD ELECT 6.6 UP 10E 35VDCW CIFBD ELECT U.1 UF 10E 35VDCW CIFBD ELECT 0.1 UF 10E 35VDCW CIFBD ELECT 1.0 UP 10E 36VDCW CIFBD ELECT 1.0 UP 10E 36VDCW	30287 36287 36387 36284 36287	SOCIONE EN STREET DE SOCIONES EN SOCIONES			
44C14 44C14 44C14 44C14	0140-0209 0180-0391 0180-0397 0180-0391 0160-8078		CIPRO MICA AZ PF SE ZGOVOCH CIPRO ELECT 1.0 UP 108 ZBVOCH CIPRO ELECT 2.2 UP 108 ZBVOCH CIPRO ELECT 2.4 UP 108 ZBVOCH CIPRO ESER ATO PF SE ZGOVOCH	00653 84584 54584 54584 71540	EDMISEAFOJSC 18001 05X9035A2~DV5 18001 05X9035A2~DV5 18001 05X9035A2~DV5			
A9C1A A9C19 A9C19 A9C19	0140-0384 0180-0391 0180-0397 0180-0391 0180-0391		CYPRO MICA MEGO PF IN LOOVEDCH CIPRO ELECT 1.0 UF LOR DEVOCH CIPRO ELECT 2.2 UF LOR POVICH CIPRO ELECT 2.5 UF LOR POVICH CIPRO ELECT 1.0 UP LOR DEVOCH	24140 34249 34249 34249	0340-0184 13001032-03342-075 13001232-02032-075 13001232-0203-075 13001032-0334-075			
		'	,					

	Table 6-2. Replaceable Parts									
	Reference Designation	HP Part Number	Ωιγ	Description	Mfr Code	Mfr Part Number				
ð	#91.81 #91.88 #96.88 #96.89 #96.8 #96.1 #918.3	0; mu=0; PY; 0; m0=0; PY; 0; m0=0; PY; 0; m0=0; PY; 0; m0=0; PY; 1m; p0=0; P; 1m; p0=0; P; 1m; p0=0; P; 1m; p0=0; P;		COPRO FLECT 1.0 UP 108 39VDCW COPRO FLECT 1.0 UP 108 36VDCW COPRO FLECT 1.0 UP 108 36VDCW COPRO FLECT 1.0 UP 108 36VDCW COPRO FLECT 2.0 UP 108 /UVDCW COPRO FLECT 2.0 UP 108 /UVDCW DEDOT REKARDOWNIA, RAY /SE 15:15CL QUAD LINE RECEIVER 15:15CL QUAD LINE RECEIVER 15:15CL QUAD LINE RECEIVER 15:15CL QUAD LINE RECEIVER	AAJAV AAJAV AAJAV AAJAV JALAD DATIS DATIS	iados daragaras-dva laudi uaragaras-dva laudi uaragaras-dva laudi aragaras-dva laudi arag				
	api i api p api s api s api a api a api a	9) 40=0210 9) 00=1641 9) 00=1641 9) 00=1641 9) 00=2209 9) 00=1641 9) 00=1641		CD14/CHBRT 100 1H/VE CD14 FOLDD CHBRT 400.0 UH CD14 FOLDD CHBRT 400.0 UH CD14 FOLDD CHBRT 240.0 UH INDUCTOR1 37.0 UH 18 CO34 FOLDD CHBRT 240.0 UH	## 47 ## ## ## ## ## ## ## ## ## ##	0- 3 0-      0 00-       0 00-        0 00-        0 00-         0 00-				
	AVI. B AVI. V AVIII AVIII AVIII AVIII AVIII	9800-1841 9800-1841 1884-0071 1894-0071 1894-0071		CORLINATOR CHART SAGE THE TAME  THE CORLINATED CHART SAGE THE  THE CORLINATED CHART SAGE THE  THE CORLINATED CHART SAGE  THE CORL	78480 78480 78480 78480 78480 78480 78480	9100-164) 9100-164 9100-164 1689-0071 1884-0071 1884-0071 1884-0071 0787-0447				
	AGAR AGAR AGAR AGAR AGAR AGAR	0797-0447 0797-19447 0498-3440 0498-3440 0797-0488 0797-0480	1	RIFED MET TEM EQ. OR CHIP IT 1/84 RIFED MET TEM 196 CHIM 1/8 1/84 RIFED MET FEM 196 CHIM IR 1/84 RIFED MET FEM 9.00% CHIM IR 1/84 RIFED MET FEM 9.10% CHIM IR 1/84	#84.00 #84.00 #84.00 #84.00 #84.00	0197-0447 0640-3440 0440-3440 0157-0788 0157-0788				
11	APRI O APRI I APRI I APRI I APRI I APRI I APRI I APRI I APRI I APRI I APRI I	0797-0414 0797-0414 0797-0280 0797-0280		RIFED NET FEM JOG CHM 18 1/84 RIFED NET FEM SEIR CHM 18 1/84 RIFED NET FEM SEIR CHM 18 1/84 RIFED NET FEM SEIR CHM 18 1/84 RIFED NET FEM SEI CHM 18 1/84 RIFED NET FEM SEI CHM 18 1/84 RIFED NET FEM SEI CHM 18 1/84 RIFED NET FEM SE CHM 18 1/84 RIFED NET FEM SE CHM 18 1/84	284 80 08 485 08 485 08 485 08 485 08 485 08 485	0797-0403 0797-0438 0797-0416 0797-0416 0797-0416 0797-0416 0797-0416				
1	A4814 ~94814 ~44810	0797-0401 0797-0416 0797-0416		APPRO MET FEM 100 (NOM 18 1/46 RIFRO MET FEM 511 (NOM 18 1/46 RIFRO MET FEM 511 (NOM 18 1/46 RIFRO MET FEM 511 (NOM 18 1/46	#84 80 #84 80 #84 80 #84 80	0757-0A01 0757-0A1A 0757-0A1A 0757-0A1A				
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fier introduction to this section for ordering information

Table 6-2. Replaceable Parts

Table 6-2. Replaceable Parts							
Reference Designation	HP Port Number	Qty	Description	Mir Code	Mfr Mirt, Number		
#10 #10 #801.1 #100.# #100.1		1	AMPS & TUDE STREEMEDRINGS (ISTRETON ASSV. REBUJET = POLISANSE ASSUMBLY CEPRO CER 0:08 (IP +80=808 1804)DILW 4.PRO CER 0:08 (IP +80=808 1804)DILW 4.PRO CER 0:08 (IP +80=808 1804)DILW	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	19 19 19 19 19 19 19 19 19 19 19 19 19 1		
#10L4 #10L9 #10C# #10C# #10C#	0140-0197 0140-0197 0140-0197 0140-0197	}	CIPAD CIA 0.004 UP ING JOOVUCH CIPAD CIA 0.00 UP ING JOQVUCH CIPAD CIA 0.00 UP ING JOQVUCH CIPAD CIA 0.004 UP ING JOOVUCH	70000	14 14 0140-2527 14294 1245-914 14294 1249-914		
#106.9 #106.10 #106.11 #106.14 #106.15	######################################		CIPAD NY G.G) UP 108 2004UCH CIPAD NY G.G) UP 108 2004UCH CIPAD NY G.G) UP 108 2004UCH CIPAD NY G.G) UP 108 2004UCH	14/61	42P   6543-P1 &		
AIGCIA AIGCIA AIGCII AIGCII	F401-6020 0120-004 0120-004 0120-004 0100-0341	•	CIPRO ELECT 1.0 UP 100 35VDCW CIPRO ERR 0.05 UP «80-208 100VDCW	90509 91018 91018 91010 - 07203	14 001 05 5 00 5 A2 -0 V 6 1A		
A10CB# A101L1 A1001 A1003 A1003	1401-0050 1474-0007 1454-0071 1854-0071		OFFICE IS 3 FOR MA AT JY ICILIMEAR HEMISELECTED FROM EMSTOAL TATHIS HEMISELECTED FROM EMSTOAL TATHIS HEMISELECTED FROM EMSTOAL TATHIS HEMISELECTED FROM EMSTOAL	01768 24480 24480 28460 28460	FDA 6308 i 8fa-0007 i 884-007i i 884-007i		
ADDIA EUDIA AUDIA LUCIA BUDIA	1884-0616 1884-081 1884-0818 1884-0618 1884-0418		TATRIBE NPN TETRIBE	##4#0 ##4#0 ##4#0 ##4#0	1454-0454 1854-0075 1854-0175 1854-0454 1854-0475		
#1999 #10010 #10011 #1001#	1854-0614 1854-6675 1854-6071 1854-6071		TETRIES NPH TETRIES NPH TETRIES NPHETCOMMENOED REPLACEMENT) TETRIES NPHETLECTED FROM 2017041 TETRIES NPHETLECTED FROM 2017041 TETRIES NPHETLECTED FROM 2017041	28480 28480 28480 28480 28480	1894-0414   1894-8475   1894-0471   1894-0471		
Adams Adams Adams Adams Adams Adams	(#17-044)  448-1440  448-1444  47-040   47-040		RIPED HET PEM 4.23E DIN 18 1/00 RIPED HET PEM 176 DIN 18 1/00 RIPED HET PEM 10,18 DIN 18 1/00 RIPED HET JEM 100 DIN 18 1/00 RIPED HET JEM 176 JOHN 18 1/00	284 80 284 80 284 80 284 80 284 80	0 FB F= 0441 0446- 2440 0 FB F= 0444 0 FB F= 0401 0446- 2440		
ainafo aigaa aigaa aiga aiga	0157-040  0157-0414 0157-040  0648-3440 0757-044	1 .	RIFED RET FER 100 OHR 18 1/84 RIFED RET FER 110 OHR 18 1/84 RIFED RET FER 140 OHR 18 1/84 RIFED RET FER 14 OHR 18 1/84 RIFED RET FER 1.25K OHR 18 1/84	######################################	0797-0401 0797-0414 0797-0401 0449-5440 0797-0441		
#10#11 #10#17 #10#18 #10#18 #10#18	0757-0444 0757-0414 0448-3440 * 0448-3427	ı	RIFAD HET FLM 12.10 OHM 18 1/0W RIFAD HET FLM 981 OHM 88 1/0W FACTORY SELFÉTED FART RIFAD HET FLM 194 DHM 18 1/0W MIFAD HET FLM 194 DHM 18 1/0W	#84 80 #84 80 #84 80 #84 80	0797-0444 0797-0416 0498-9440 0498-9447		
ALUATA ALUATA ALUATA ALUATA ALUATA	0197-0443 0448-3194 0197-0438 0448-3431 0448-3431	, ,	RIPED HET FLM 10.0K DIN 18 1/AM NOFED HET FLM 26.1K DIN 18 1/AM NOFED HET FLM 1.67K DIN 18 1/AM RIPED HET FLM 21.7 DIN 18 1/AM RIPED HET FLM 464 DIN 18 1/AM	784 80 784 80 784 80 284 80	0787-0447 0498-1617 0797-0478 0798-1491 0498-0491		
ASUMPO ASUMPS ASUMPS ASUMPS ASUMPS	0648-3431 0787-0428 0787-0442 0787-0442 0797-0418	•	REFER HET FLM 23,7 CHM LE 1/8W REFER HET FLM 10,00 CHM LE 1/8U REFER HET FLM 10,00 CHM LE 1/8U REFER HET SCH 10,00 CHM LE 1/8U REFER HET SCH 10,00 CHM LE 1/8U	284 80 284 80 284 80 284 80 284 80	0648-3431 0197-0426 0197-0447 0391-0442 0797-0418		
A10#5% A10#5% A10#57 #60#5# A10#59	0797+044  0797-0444 0498-7649 0797-0418 0898-5490	,	RIPAD HET FEN G.ZOK CHINTE LIAU REFID HET FEN 12.1A JOH 18 1/AU RIFAD HET FEN ALS CHIN 18 1/AU RIFAD HET FEN ALS CHIN 18 1/AU RIFAD HET FEN ZR CHIN 18 1/AU	764 80 264 80 264 80 264 80 264 80	0797-0441 0797-0444 0798-0417 0797-0418 0698-9490		
ALOR 30 - ALOR 30 - ALOR 31 - ALOR 31 - ALOR 31	0757-0516 0678-3136 0757-0780 0757-0616		RIFED MET-FLM \$517DM 18 LZAW FACTORY SELECTED PART RIFED MET FLM 15-104 DIM 18 2/4W RIFED MET FLM 16 DIM 18 1/4W RIFED MET FLM 16 DIM 18 1/4W	284 80 19701 264 80 284 80	0797-0414 PRIAC 1-0 0797-0780 0797-0414		
ALORSA ALORSA ALORSA ALORSA ALORSA ALORSA	08)1-1390 0797-0443 0498-7449 0498-3440	ı	BIFAD WW F R ZA CHM SMATCHED PAIR) BEF RAG BIFAD NET FEN 104 OR CHM 12 L/GW RIFAD FEN 303 CHM 0.1% 1/GW RIFAD MET FEN 19A CHM 18 1/GM	78480 78480 28480 28480	0831-3347 0787-0447 0484-7644 9498-3440		
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See introduction to this section for ordering information

Table 6-2. Replaceable Parts

	,		labla 0-2. Replaceable Parts -	<del>, , , , , , , , , , , , , , , , , , , </del>	, 
Reference Designation	HP Part Number	Qty	Description	Mir Code	Mir Part Number
18:15	04 48-0089 0741-0447		Arran met fem siele imin to 1/86	764 80 784 80	0440-0000 0767-0447
11004) 11004) 11004)	0797-0416 0797-0401	_ 1	PART OF PAR OLI CHIM DE TAND RIFD MFT FEM DUT CHIM DE TAND RIFD MFT FEM DUD CHIM DE TAND	#84 89 #84 89	0191-0414
#10#41 #10#44	0448-1143 0448-1144	1	RIFFO MET FEM GA.GR COIN LO 2/84	78480 78480	1 1416-8940
410948 410947	04 48 - 3 19 8 04 48 - 3 19 8 04 48 - 3 44 0	مختر	RIPPO MIT PEN AJAAN ININ' IN 1789 RIPPO MIT PEN AJAAN ININ IN 1789 APPRO MIT PEN AJAAN ININ IN 1789 BIPPO MET PEN 1786 ININ 18 1788	284 80 284 80 284 80	0448-3440 0448-3154 0448-3154
Ch) Ch)	1401-00+4 1401-00+4 0140-1144	, }	CIPAD ELECT FOR PARTS CIPAD ELECT FORD MY *FR-TOR FRYDOM DINORISTE STATEM SOFTE	34744 78480 78480	1 401-044   1 401-044   1 401-0044
CAS +	i vai-bass 1901-bass	'	Diodrifición Ado FIV	78480	1401-0014
	## 10-0044 1400-0084 0900-0014 #170-0044		LODE OF THE TRANSPORT OF TANK LODE OF THE TRANSPORT OF THE TANK LODE OF THE TRANSPORT OF THE TANK LODE OF TH	38480 19410 19410 19480	0400-0019 3410-004 1110-0044
**	0641#-40007 1#81-0098 1#80-0118	.!	FUSTINGUER CONNECTORINAL DE L'EUNTACES	/#140 /#160	1991-40009
<b>#</b>	1440-0114	•	COMMECTOR OR NC COMMECTOR OR NC COMMECTOR OR NC	7493 7493 7493	1034 154-1 1034 154-1 1434 154-1
11 14 11	1780-0118 1780-0118 01700-66001	•	CONNECTORISME CONNECTORISMC COTE ARRYSALIGHMENT	74731 24731 24730	01500-6001 5030 158-1 01500-6001
#1 *** .	7100-7843 7100-7847	1	BIVAR COMP & MECCHIN FOR LIN 1/24	78480 78480	7100-7843 -7100-7847
A/ #3 B4 F3 F4	90 40-0453 3100-7834 3100-3838		EUVERSPUTENTSOMETERSPUCUES RIVAR COMP FOR ONE LOB LIM U. BW RIVAR COMP FOR ONE LOB LIM U. BW	76160 76160 76160 76160	9040-0489 # #100-#998 # #100-#849 # #100-##28
# 7 # 8	0483-1048 0483-1039 2100-7492		RIFAD COMP BOOK DIGHT BE 374W	01171	( co 1046 Co 1096
## \$1 ?1	1100-1010 3101-1330 1100-1013		RAME COMP SE OWN FOR LEN SYRW RIVER COMP FOR OWN FOR LEN SYRW SWITCHISLEDE OPDIT U.S. LIN SYRW REMEMBERS STORM FOR LEN SYRW REMEMBERS STORM FOR SYRW REMEMBERS	78480 78480 77777 78480	#100-2443 4100-2083 G7186-0017 4100-2850
VI ************************************	1781-1309 1791-1190 1791-9091		CRI CONNECTORAPO EDGE 18 R 181 84 CONTACT. CONNECTORAPO F8 CONTACTS	28480 71785 71785	3013-4001 344-13-10-104 344-13-10-104
PA1 PA4	1791-2199 1791-2109	. [	CONNECTORIPE EDGE 2 R 19 CONTACT CONNECTORIPE 22 CONTACTS	71783 80119	191715-10-161
eas Pas Pas	2040-0118	13	CONTACTIFIC CONNECTOR BY ANGLE CONNECTOR ASSESSED CONTACT HOT ASSESSED	00774	\$6147-3 \$640-0113
147 148	1761-1704	,	CONNECTORIPE LY CONTACTS CONNECTORIPE EDGE LY A 191 24 CONTACT	76745 73745	\$90-18-30-810 \$91-18-30-841
IA) PAI BAId	1781-7309 1781-7309 1706-0037 1700-0030		CONNECTORIPE SE CONTACTS CONNECTORIPE SE CONTACTS SUCCESTERT TUBE CONTRACTS SUCRET, DOAD ASSTERFINDER	7,775	755-1 750-17-20-210 750-17-20-210 7553-1
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			7	Pable 6-2. Raplaceable Parts			
	Rafarence Designation	HP Part Number	Qıy	Description	Mir Code	Mir Part Numbe	) I
	,			CANENCE MARES			
•	,		•	ETANDARD. ENDTFATES BULFA, INCLUDES MINT WAAR AND USING BULFA FRUNK MANEL AND 2015 UBAN CARRINGS.			
	1			OPTION AGG. IMDICATES LITE GRAY AND BLACK PRINT PANEL.			
	;		•	OPTION NOS. INDSCRIPT CONTRETE BAJER CONTRE ECHTURE MICLIOTS LITE GRAS AND BEATS FROM PARKEL & BLUE GRAS (ARTHES).		•	
	. :	,		•	:		•
		8040-090# 9040-0444 1017#A 9080-04fm 04418-00084		ENJELDILIGHT, ON LOF DE ACRESTANDARDI ENJELDILEGIT, BLACK INTERMIDIT ARS, KURI CONTRART ENPRIVENENT SCREEN BEFELLERT PANELERRONT, MENT GRAY DELIVE BLATTERDE	##4#0 ##4#0 ##4#0 ##4#0	\$040-0408 \$040-0444 10170-0474 9070-0474	
		0841#+00003 0841#+0001 90 #0-3 #01 01 #00-47 #03 01 #00-40001		PANYLIFRONT, LETE GRAY & RELEIPT ARR, 248 SUB-PANELIFACHT TAIN, MARIPI ATE SUPPLITIENT BUTTED SHEELDICAR	##4#U ##4#0 ##4#0 ##4#0 ##4#0	0841 #-00001 0841 #-0001 000-2#01 01 #00-44109 01 #00-4001	
	10	08418-00001		SUPPLIETATION CRISS	24480 24480	084 - 00003 084 - 00003	
		08417-70016 , 08417-00927 08412-00017 .0709-0030 00180-41707	, ;	SHIELD PC BOARD COVER ASSVOTOP, OLIVE GRAVISTOS COVER ASSVOTOP, BUT GRAVISMT ROSI BEAL "OL" RIGO 3-164 ID BRACKET (PLASTIC	78480 - 26480 - 26480 - 03618 - 26480	08412-20014 08412-00027 08412-00027 2-388329-4 00180-41207	
	19 16 17 10 19	08-18-00018 08-18-00018 08-18-0003	 	CEAMPINISE COVER PLATERCOT ESCRITTRECHMICHDED REPS COVERROCAT REAR RETAINERIN-BHIELD SUB-PANELINGAR	10.00 10.00 10.00 10.00	34); 	د
ŀ	10 11 11 11	08417-00010 08417-00010 08417-00013 08417-00018		PANEL: NEAD ENYER HIVPS RECTIFIER ENYER HIVPS REQUISTOR ENYER ASSYSBOTTON, BLOF GRAVISTUP ENYER ASSYSBOTTON, BLOF GRAVISTUP	28480 28480 28480 28480 28480	08415-00016 08415-00016 08415-00015 08411-00045	į
	14 14 15 14	08412-20018 08412-20033 08412-20033 08412-20033		SCREWIADAPTER (LONG) INSULATORINYS SCREWIADAPTER (SUBET) SPACERTINSULATOR SWITCH SCREWIFTE HO POIL OR 2-34 B 1.250° LG	744 80 784 80 244 80 284 80 884 80	04412-20018 08412-20073 08412-20017 04412-20071 080	
	. 76 . 70 . 30 . 31	71 70-2 330 0841 7-7007Q 03 70-0191 0841 7-40001	) ? ?	PLATE (EDENTEPICATION PEN ESTRACTOR RNOGEROUND FOR 0,125" DEA MISET RNOG CONTROL	78480 78480 88480 78480	7120-1310 08412-20020 0870-0151	
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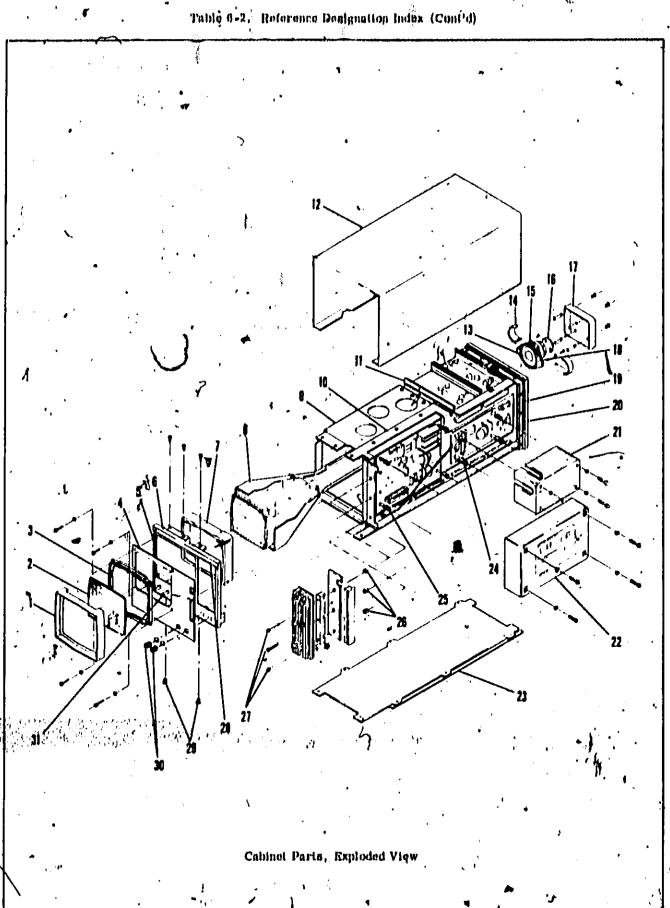


Table p.3. Code List of Manufacturary,

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### SCHEMATIC DIACINATION BIACINATION

### SECTION VII \* , , , BCHEMATIC DIAGRAMS

### 7-1. INTRODUCTION

- 7-2. The schematic diagrams in this section, represent the circults electrically. They are not wiring diagrams, though wire colors are given where practical.
- 7-3. The large numbers in the lower right corners of the schematics are the schematic numbers. These is unbers are used to cross reference connections between schematics. Smaller numbers proceeded by A located below the schematic number list the assem 45 biles included in the schematic.
- 7-4. Some of the general information oblainable from the schematic diagrams is shown in Figure 7-1. Notes and explanations of symbols perioding to all the diagrams are contained in Figure 7-2. Figure 7-2.

- also contains the test so tup, and measurement conditions required to obtain the normal test point waveforms and voltages noted on the schematic diagrams, Notes about specific components, circuits, or conditions are given on the diagram to which they apply,
- 7-6. As an aid to finding components and sesemblies in the set of diagrams, each diagram has a lox labelled Reference Designations that contains all the reference designations appearing on the diagram,
- 7-6. An asteroik indicator a factory selected partithe component values shown is the typical or most commonly selected value.
- 7-7. Component producement information and specific component descriptions are included in Bection VI. Refer to page 6-1 for information on how to order parts.

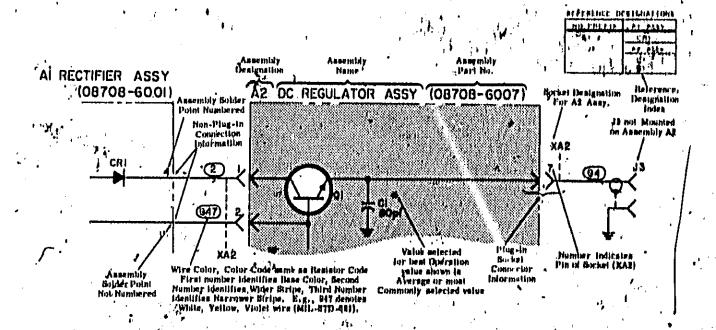
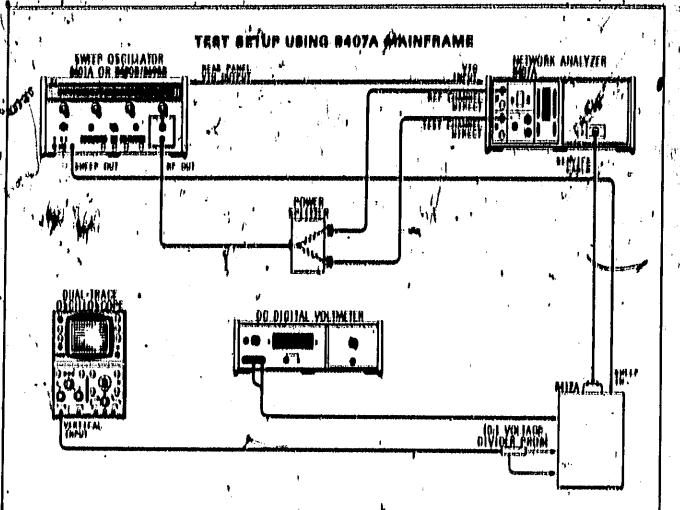


Figure 7-1. General Information on Schematic Diagrams

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- For Model 8410A Hatwork Analyzer Mainframe,
  - Connect equipment as shown in test setup. But 8410A controls as follows:

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AMPIATUDE TEST CHANNEL GAIN - 66 du.

AMPL VKRNIKR - Midrango,

PHARK VERNIKR - Midrange,

SWEEP STABILITY - Adjust for best place look.

- 3) Bet aware oneillator controls for symmetrical aware over narrowest band possible and , output aignal unmodulated,
- i), Adjust sweep oscillator HF toutput for an \$410A REF in the middle of the OPERATE range.
- On Model MillA Plug-in, nei controls as follows:

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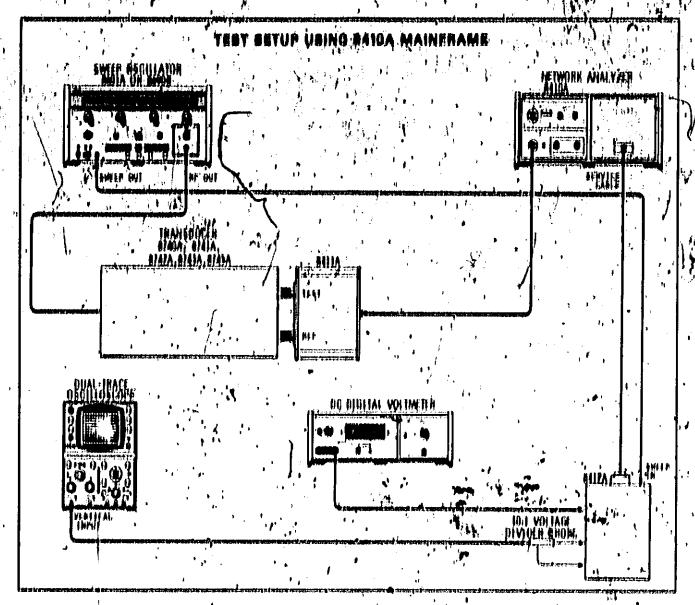
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PHARE DECIDIV to DO.

PHASE OFFSET polarity to 4.

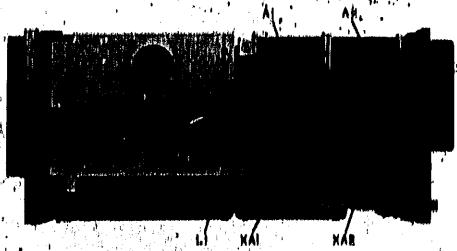
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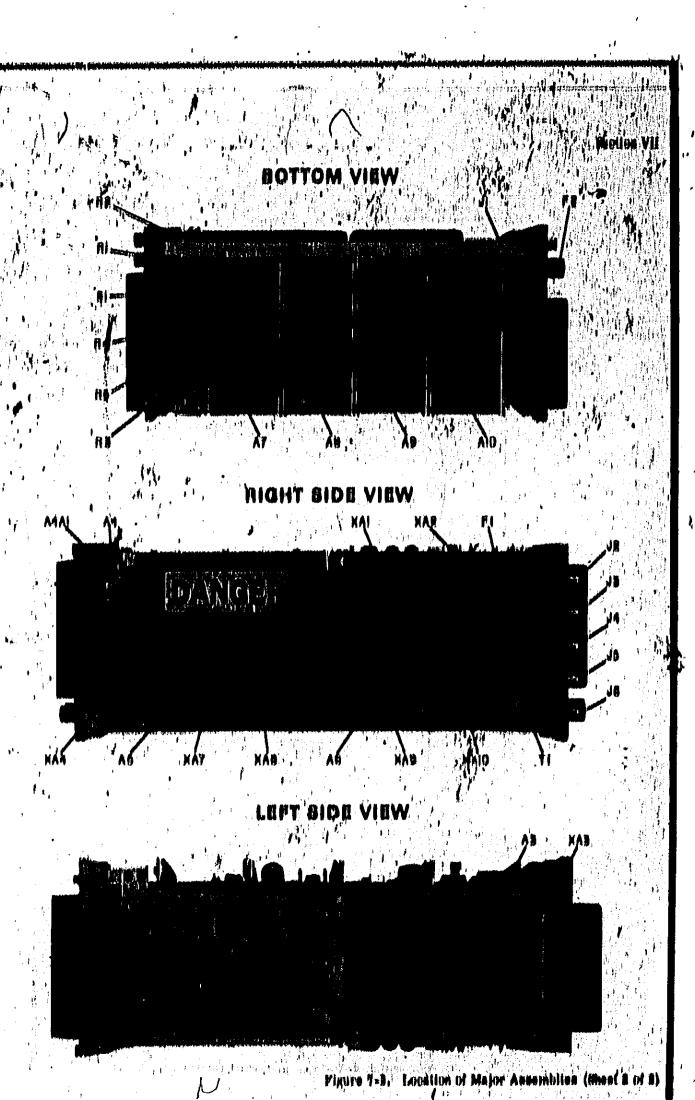


Pigure 7-8. Schematic Dingrafic, Hoton (Sheet 8 of 8)

TOP VIEW

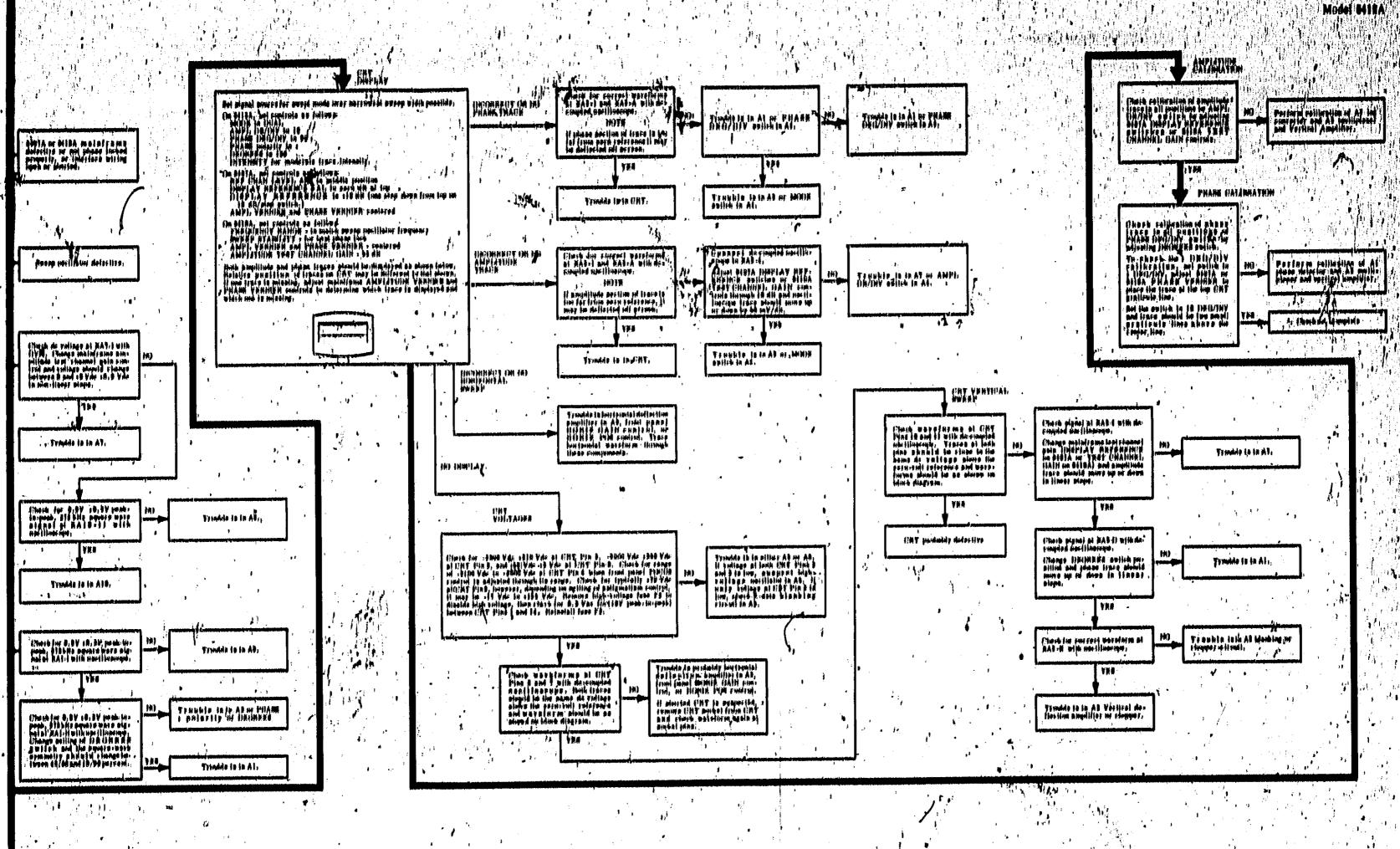


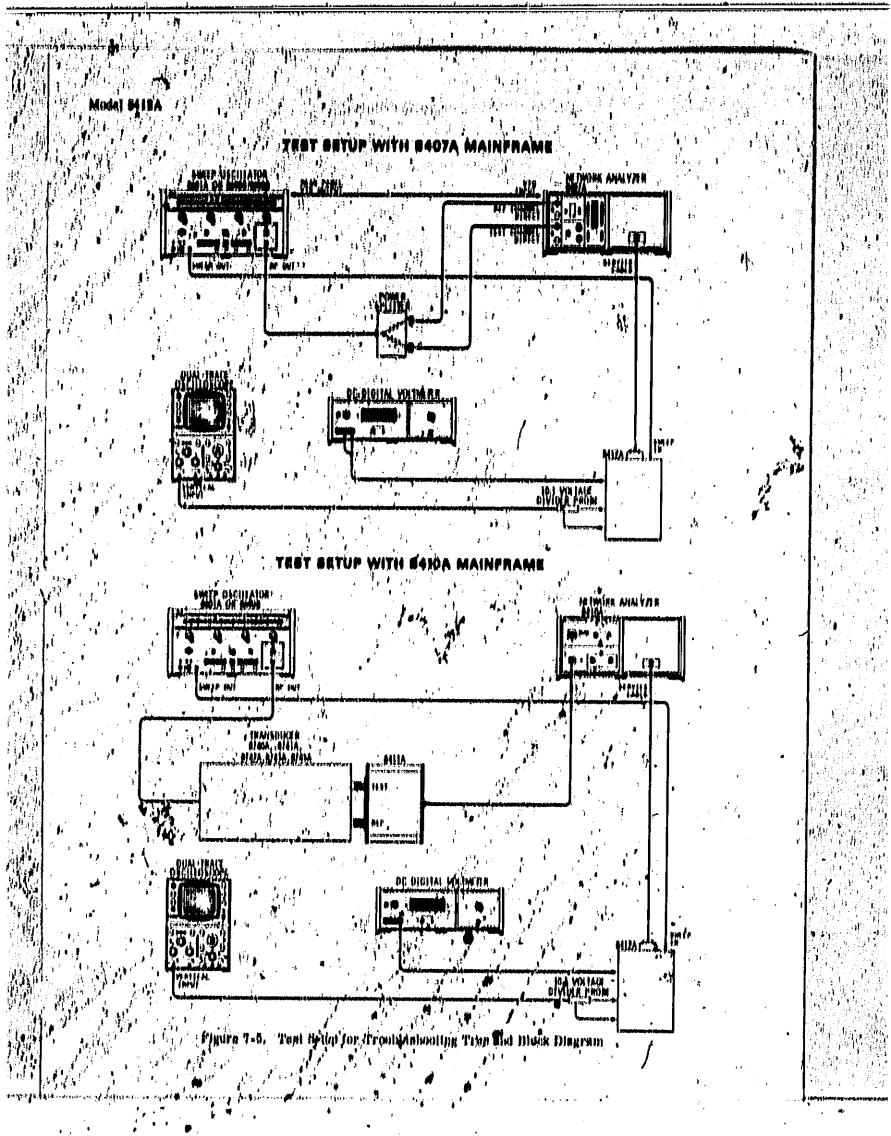
Pigure 7-8. Location of Major Annembites (theet 1 of 8)



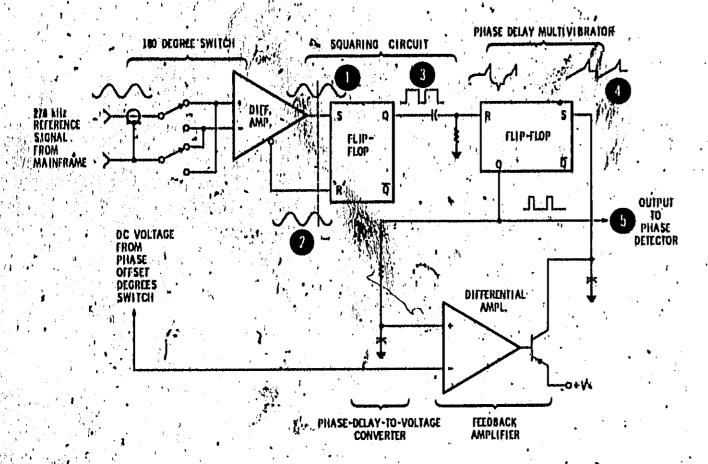
7=4

Figure 7-4. Troubleshooting Tree





**Bootion VII** 



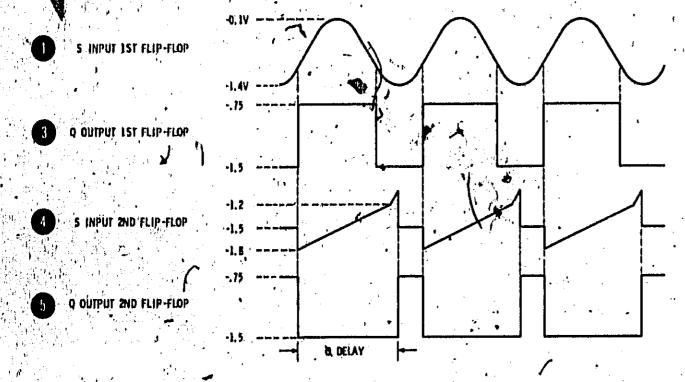


Figure 7-6a Phase Offset A2

# THEORY FOR PHASE OFFSET AZ

#### AS PHASE OFFSE

The phase offset circuit delays the phase of the reference channel signal. The circuit consists of a 180-degree electronic switch and a phase delay system.

#### 100-DEGREE SWITCH

The reference channel signal is applied through emitter follower QI to a double-pair double throw electronic switch composed of QZ-Q5. The switch applies the signal and its ground to the inputs of differential amplifier Q5-Q6. When legislated ground are reversed at the inputs, a 160-degree phase shift or yers. The positive PHASE OFFSET switch position applies at Vd to the bases of Q2-Q5, closing Q2 and Q5, and opening Q3 and Q4, so that the bignal is applied to Q6 and the ground to Q7. A negative PHASE OFFSET switch position applies at Vdc to Q2-Q5, reversing the switch.

#### SQUARING CIRCUIT

The signal is filtered at test point (1) and then it is squared by R-S flip-flop [CI-FF]. The Q output of ICI-FFI at lest point (3) is differentiated and applied to the reset input of ICI-FF2;

#### PHASE DELAY MULTIVIBRATOR

The phase delay through FF2 is the time between a positive going R (reset) input and a positive going Q output at test point (5). The Q output goes to its low state (-1,5 Vdc) when the R input crosses a -1,1 Vdc threshold in a positive direction. The Q output goes to its high state (zero Vdc) when the B (set) input crosses the -1,1 Vdc threshold in a positive direction. Hence the phase delay is the proportion of a period between reset and set inputs, when the Q output is in its low state.

#### PHASE DELAY TO VOLTAGE CONVERTER

During the time that the Q output of FF2 is low, the current in R31 is switched by Q10 and Q11A through R29 and R26. A current precisely equal to that in R31 and R34 is drawn through the phase offset registors on A4. These resistors are each precisely 1/10 of R28 and R29. Each time one resistor is switched in or out, the proportion of time changes that the Q output of FF2 is low. This also changes the phase delay by 1/18. One eighteenth of 360 degrees is 20 degrees for each resistor. There are nine resistors so there is 180 degrees of possible phase delay. With the 180 degree (4) switch to select either 180-degree segment, a full 360 degrees of phase offset is possible. R28 is adjustable to set the current through R28 and R29. R30 is a fixed delay to match the test and reference phases but does not affect the switched offset.

#### FEEDBACK AMPLIFIER

Tile time for set input to follow reset input depends upon the rate at which current source Q14 charges capacitor C15. The current from Q14 is controlled by feedback amplifier Q12 and Q13. The feedback amplifier compares the voltage set by the resistors of the PHASE OFFSET DEGREES switch to a voltage at test point (6) which is proportional to the phase delay and drives Q14 so that the phase delay is correct.

#### FIXED CURRENT BOURCE

Q15 always passes enough current to C15 to be sure FF2 sets between resuls. R44 adjusts this current.

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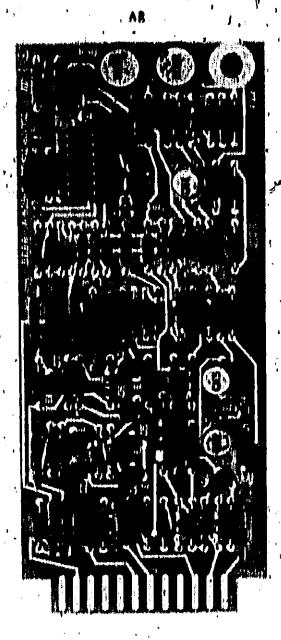
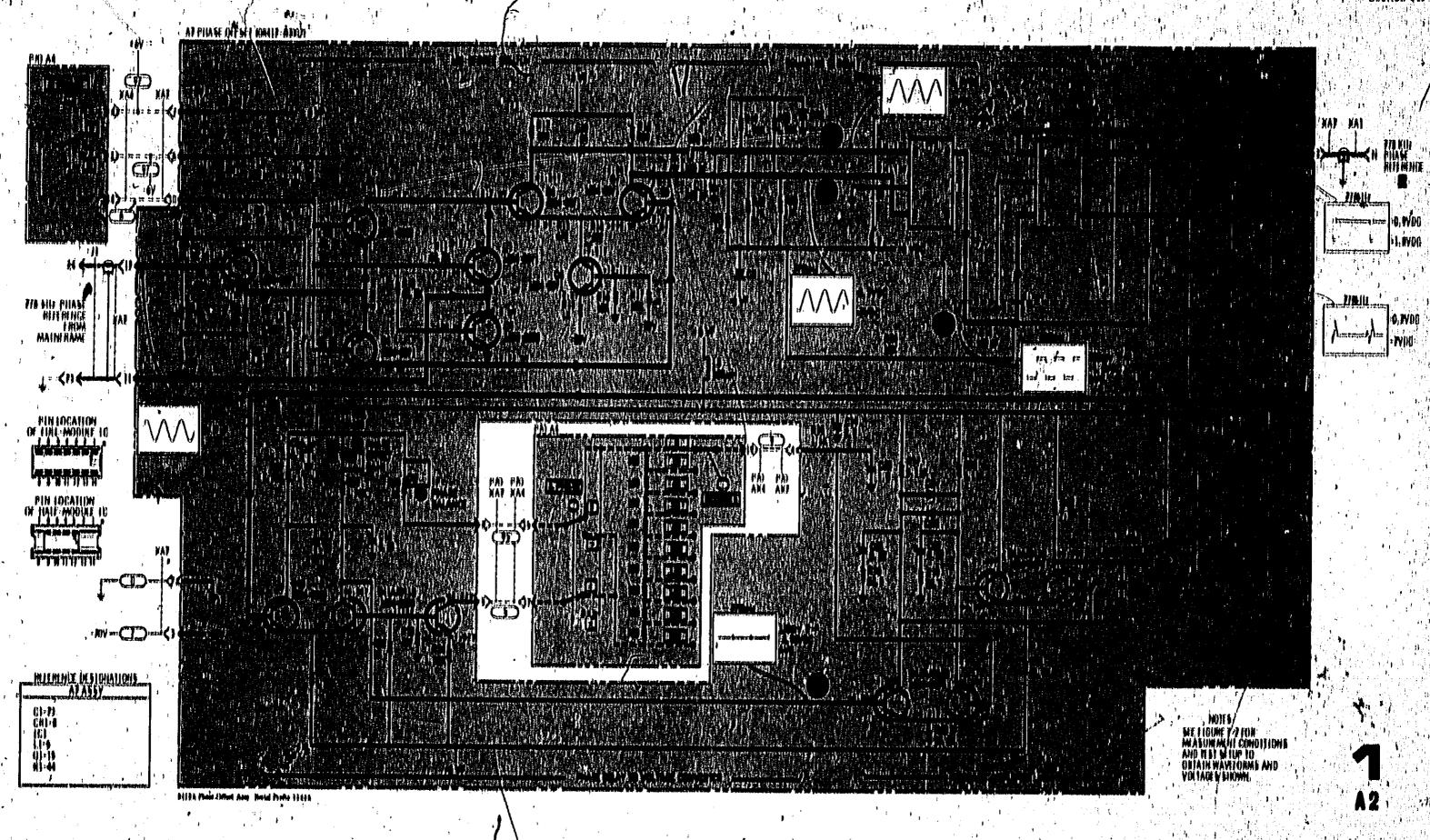


Figure 7-7. Parts Location for Phase Offset Al



Pigure 7-6. Physe Offert A2, Holsemallo Diagram

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# THEORY FOR PHASE DETECTOR AM

#### DHYRR DELECTOR

The test phase signal from A9 is applied at test point (1) and passes through a differentiating network to one thous of J.K (lip:flop IC) that is used as a bi-stable multivibrator. The reference phase signal from A8 is applied at test point (8) to the other input of IC1. The output of IC1 at test point (4) is a square wave, going up on a reference signal sero crossing and down on a phase signal sero crossing. The symmetry of the square wave is an indication of the sphase difference between channels.

#### PHARR-TO-VOLTAGE CONVENTER

The agence wave a years etry to converted to a devoltage at test point (6) as follows. The current from constant burrent sources Q4 to switched through Q8 only when test point (4) to bown. This switched current is filtered by the L-Q network (78, C7, and 1.5). Current source Q4 is adjusted by 18 to have exactly half the current in Q4. With a symmetrical agence wave, the filtered current through Q8 and the voltage at test point (5) is zero because there is no current flowing in fift and 118. (A symmetrical agence wave because that, the reference and test algebrase in phase in A0.) When the constant 180° phase white then been added to the less phase in A0.) When the agence wave is not symmetrical, current through 117 and 1118 gives a voltage cultivated by 118, so that 10 mV is equivalent to one degree of phase difference. This do voltage is applied to the rear panel PHARE 10 mV/DEG output. The bandwidth is changed by the BW (41s) switch that grounds pin 8 so that C8 and C9 apply 100 Hz low-pass filtering at the protton of 178, 117, 1180 and 1881.

#### RESOLUTION\_CONTROL

A PHASE DECIDIV switch changes the feedback resistor from output to input of ICE setting the gain of the phase channel. This switches the resolution of the CRT phase display.

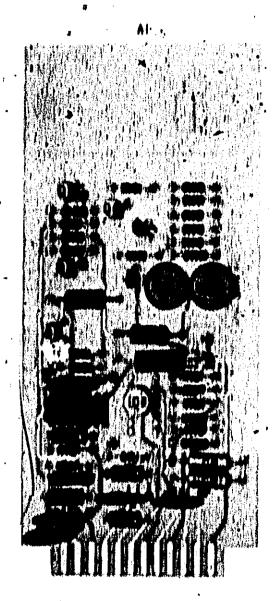


Figure 7-9. Parts Location for Phase Detector Al-

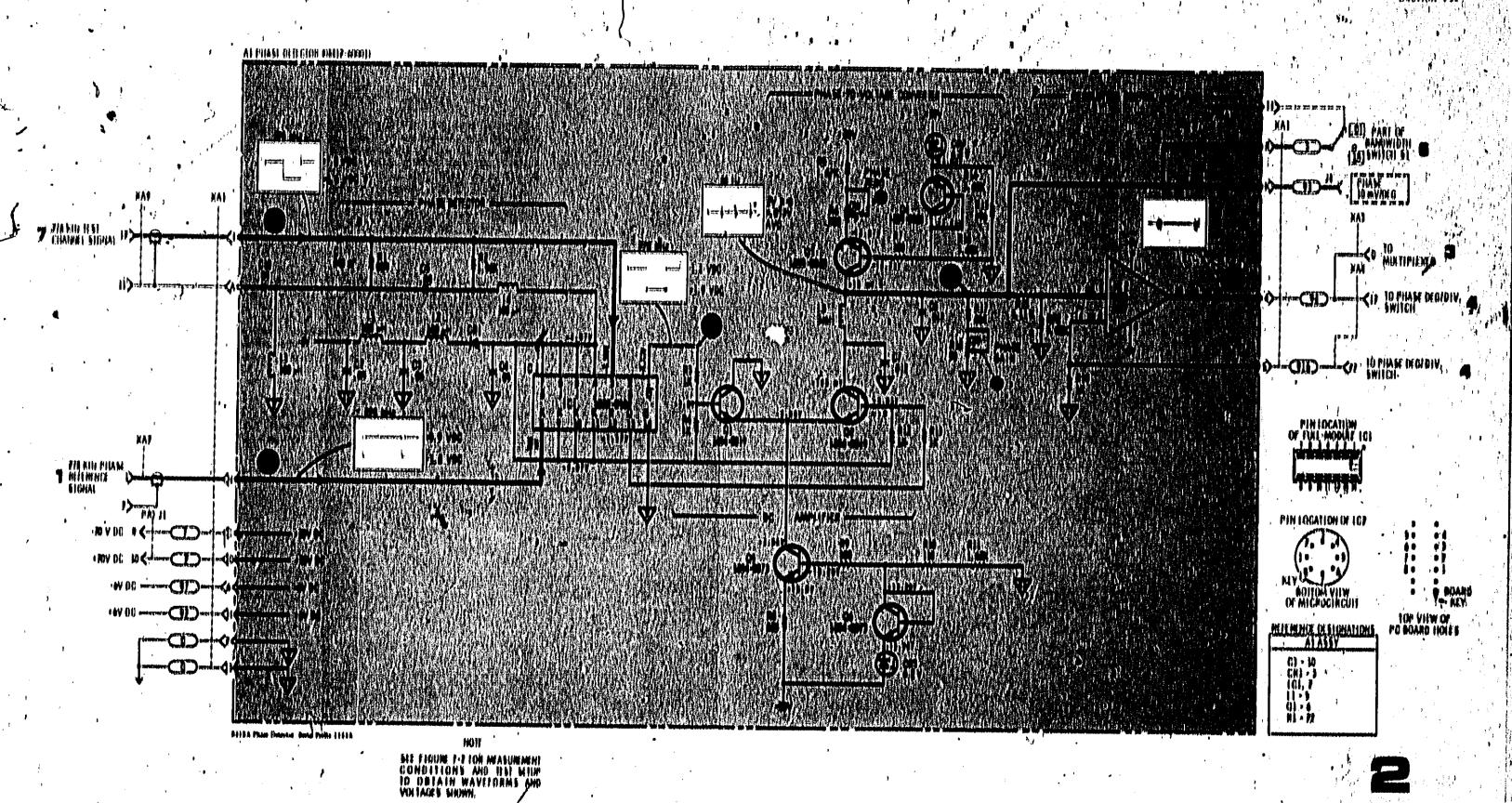


Figure 7-10. Phase Detector A1, Bolematic Diagram

7-0

# HEORY FOR MULTIPLEXER AND DEFLECTION AMPLIFIER AS

# CHT DEFINITION

The phase information from phase detector A1 and the amplitude information from log converter A7 are multiplexed by a free-running multivibrator, Q18 and Q14. The two multivibrator outputs afternately switch Q3 and Q3 our pent sources, which alternately operate the amplitude (Q7 and Q8) and the phase (Q9 and Q10) differential amplifiers. The differential amplifiers operate in caseads with Q1 and Q4 to produce the deflection voltages. VERT, DEF1, ADJ, H38 calibrates the vertical deflection gats of the circuit to match the QRT. Adjustments distant H38 position the amplified and phase tracerst the center of the surees. The borizontal deflection amplifier is Q6 and Q7.

# anopyri,

In DUAL position, the multiviterator is allowed to operate free-running by restorning both leases to -6 Vde. However, in AMPL (amplitude) position, -6 Vde is only applied to the base of Q14, turning it on, turning Q18 off, and holding them in that state. This turns Q8 on and Q3 off, allowing only the amplitude signal to be applied to the QRT, When the MODE switch is in PRABE position, -6 Vde is applied only to the base of Q18, turning Q18 on and Q14 off, This allows only the phase signal to be applied to the Q17.

## CHOPPER DLANKING

The multivibrator outputs are also coupled to blanking amplifiers QLI and QLS, which provides the chapper blanking algori to high-voltage power supply AB. This blanks the acress on transition between amplifude and place.

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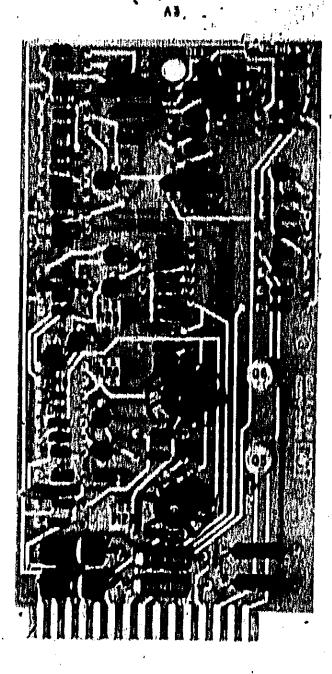
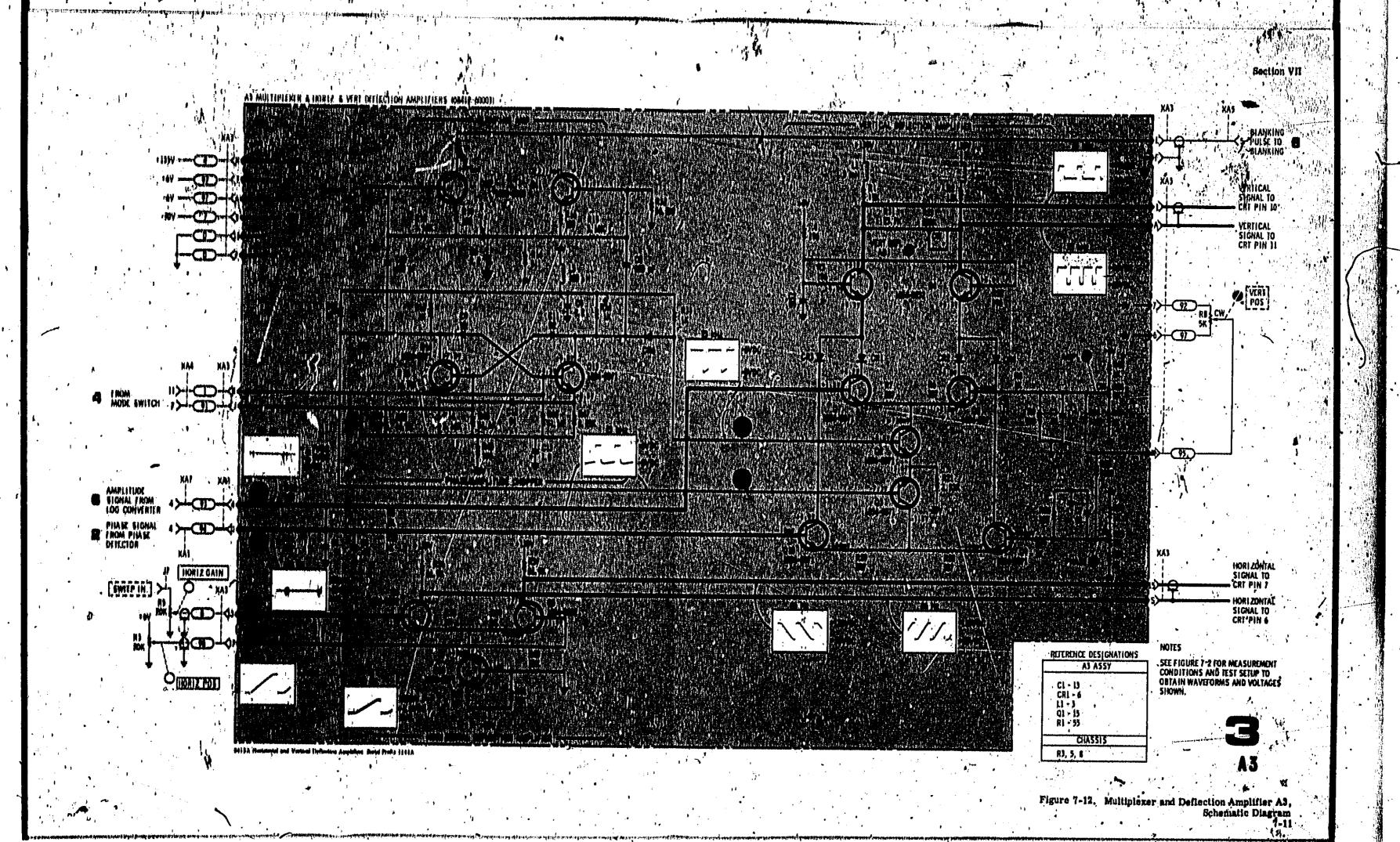


Figure 7-11. Parth Location for Multiplexer and Deflection Amplifier AS



# THEORY FOR PHASE OFFSET AND FUNCTION SWITCH A4

# PHASE OFFSET SWITCH

The two phase offset switches work together to select the desired phase offset. The phase offset polarity is selected by the 1 phase offset switch and the phase offset magnitude by the PHASE OFFSET DEGREES switch.

#### AMPL DB/DIV SWITCH

The AMPL DB/DIV switch controls the display amplitude resolution by supplying the feedback resistor for A7IC3.

#### PHASE DEG/DIV SWITCH.

The PHASE DECIDIV switch controls the display phase resolution by supplying the feedback resistor for AIIC2.

#### MODE SWITCH

The MODE switch controls the multivibrator-chopper in A3.

AAAI

± PHASE OFFSET

PHASE OFFSET DEGREES

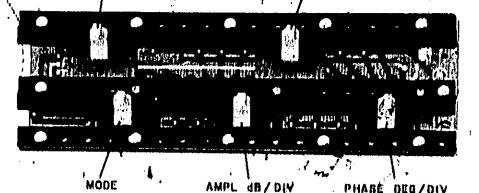


Figure 7-13. Parts Location for Phase Offset and Function Switch A4

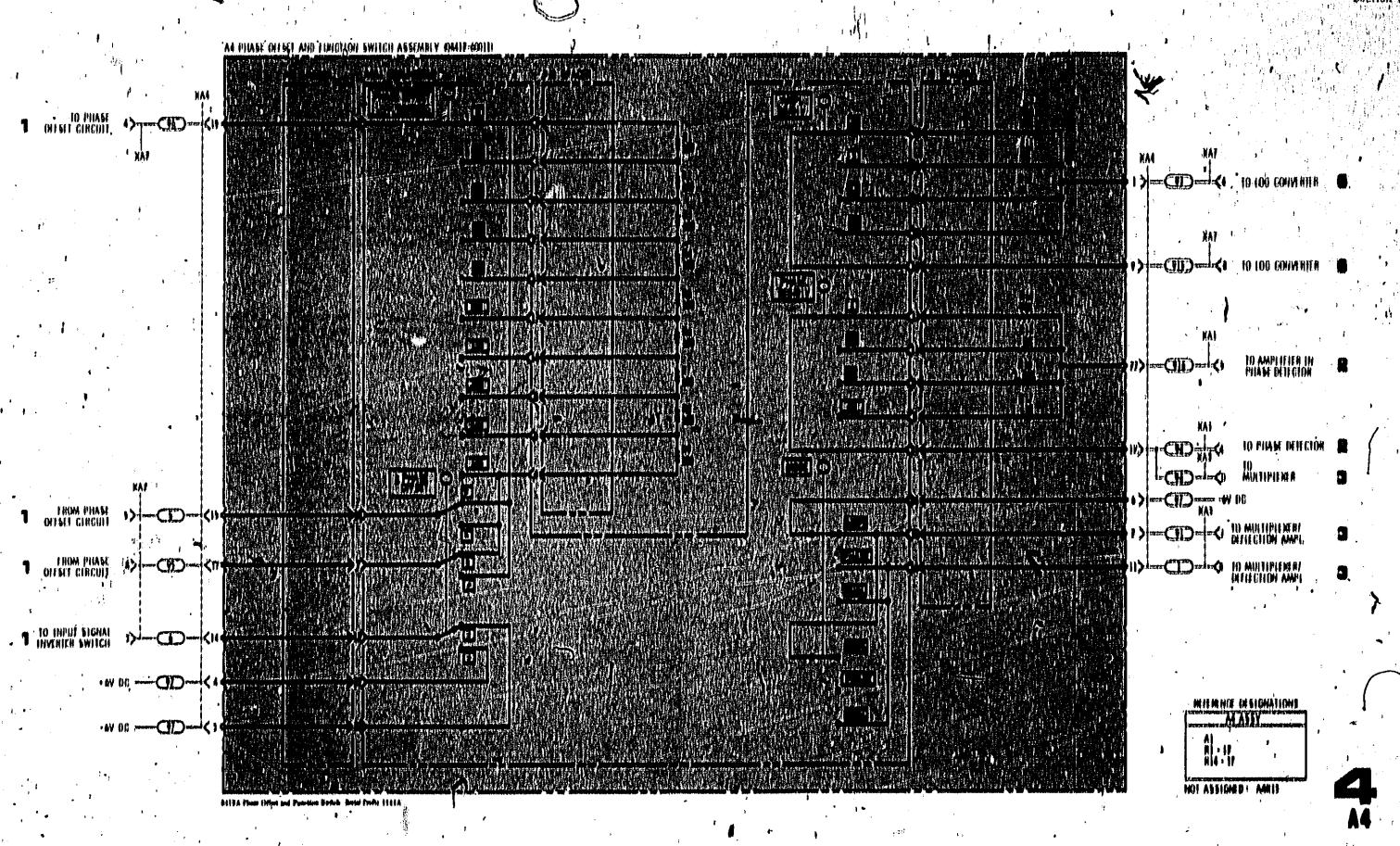


Figure 7-14. Phase Offset and Pubetion Switch A4, Schematic Diagram
7-15

# THEORY FOR AMPLITUDE BYNGHRONOUS DETECTOR A10

### UPUT AMPLIFIER

The BYREHE test channel sorplitude signal at test point (8) is sorplifted through Q1 and Q2 and applied to the sorplitude detector tight at the bases of Q1A and Q1B.

#### DILLY E. AMPLIFIER

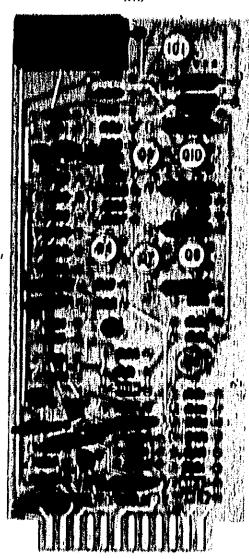
The amplitude detector drive algoal from A8 (test points) to amplified through Q8A and Q6B and applied to the amplified detector at the bases of Q7-Q10. The drive algoal to synchronous with the test elannel amplifieds signal because both are derived from the test channel.

#### MIXER DETECTOR

The drive eigned ewitches Q7-Q10 and that the correct through 184 and 1140 to the full wave rectified taget a populate eignel. Front panel AMPL GAL (LAW LEVEL) control 1810 believed the circuit so that for vero-amplitude eignel taget, the voltages at test points (1) and (7) are equal.

#### GROUND REFERENCING

The feedback elecult composed of 101, Q11, and Q18 maintains the output voltage referenced to ground.



Pigure 7-16. Parts Location for Amp) mide , Bynchronous Delegior A10

47,

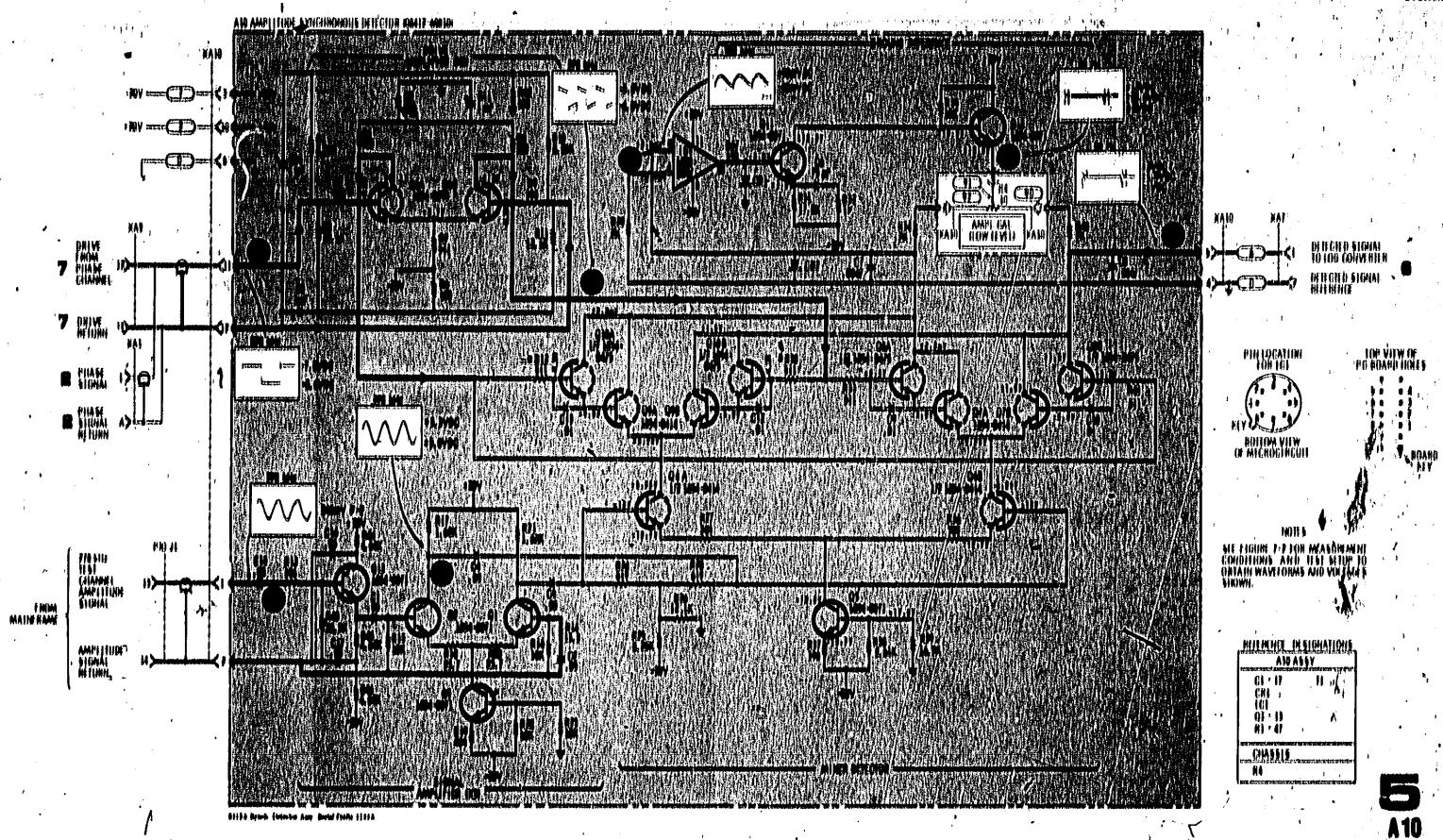


figure 7-16. Amplitude Synchronyun Delector A10, Schematic Disarsm

#### THEORY FOR LOG CONVERTER AT

#### POO GONARULRI

The log circuit consists of translator QIA and operational amplifier 101. The voltage at test point (1) and virtual ground at 101 pto 4 couses a correct of that current must be equal to the collector current of QIA, affice no important splitter. The operational amplifier madiates the loss total the operational amplifier that the correct collector current is main a fained. Since the base-to-emitter voltage of QIA is proportional to the log of the collector current, the output voltage is the log of the input voltage.

#### VOLTAGE FOLLOWER

Q10 shifts voltage level so that at test point (8), the log output operates about pround at approximately 80 mV output for X3 input at test point (1). It? sets the correct amplitude center level. It? It as voltage follower. It? It as timel gain amplifier with adjustment It.4 so that a 1 d0 input change produces 60 mV output. The de voltage is brought to the rear panel AMPLITUDE (60 mV/d0) examedors. The DW (kits) switch convects a capacitor from ICB, pin\_6 to greened, which forms a 100 lis low-pass filter.

#### RESOLUTION CONTROL

The feedback restator between the output and the Input & 104 sets the gain of the amplitude channel. The value of this restalance is changed by the AMPL dB/DIV awitch, thus changing the resolution of the ONT display.

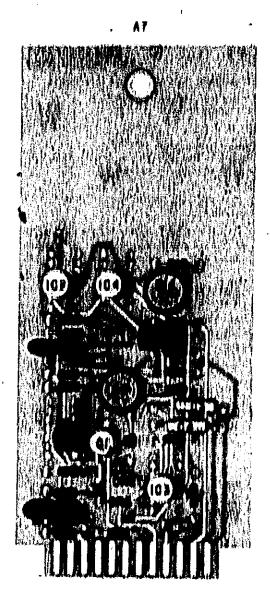


Figura 7-17. Parts Location for Amplitude Minimal Long Convertor A7

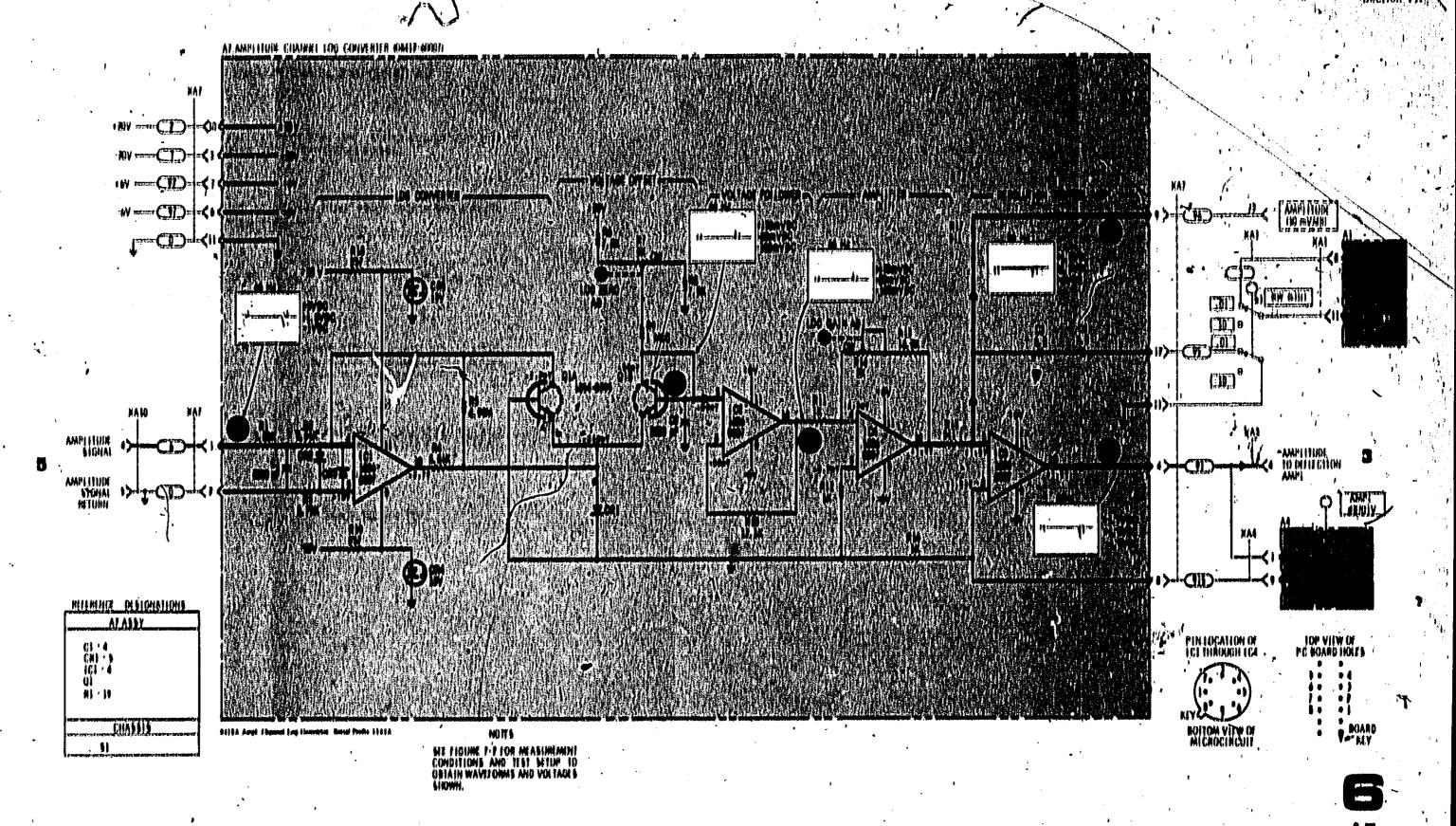


Figure 7-18. Amplitude Changel Log Converter A7, Schematic Diagram

# THEORY FOR TEST CHANNEL AMPLIFIER AS

#### <u> 90 AB (XRO) AMPLIFIER</u>

Translators QI-Q3 form a differential amplifier and emitter (ollower strault, providing \$6.05 of preamplification to the test channel sign).

#### # MIDE LOW PARK FILTER

The output of ICI passes through a flow pass filter which only passes signals below R Mils, then applies the signals to ICS.

#### 84 dB (X60) AMPLIPHERS

Both 1671 and 1678 amplify the 878 kills signal by 84 dil, it mitting the output when the signal level is high enough in amplifude.

#### 978 kHy DAND PASS FILTER

The output signal from ICA passes through a 870 kHz band pass filter with a bandwidth of 10 kHz. This relates a constant-amplitude fundamental frequency, so that further limiting will produce a square wave with constant symmetry.

#### BQUARK WAVE GENERATOR

The output from the 878 kHs band pass filter is amplified and limited by 103, The square wave output is applied to the phase detector and to the amplitude synchronous detector.

#### OROUND PLANK

The inputs of ICI, ICE, and ICS are biased by Kener diode CIVI.

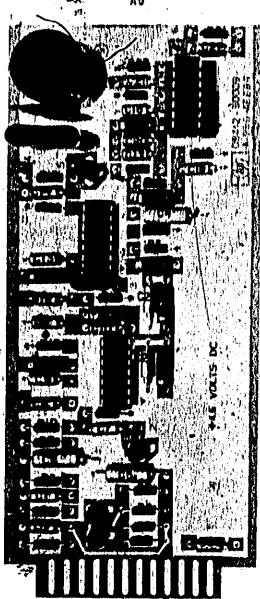
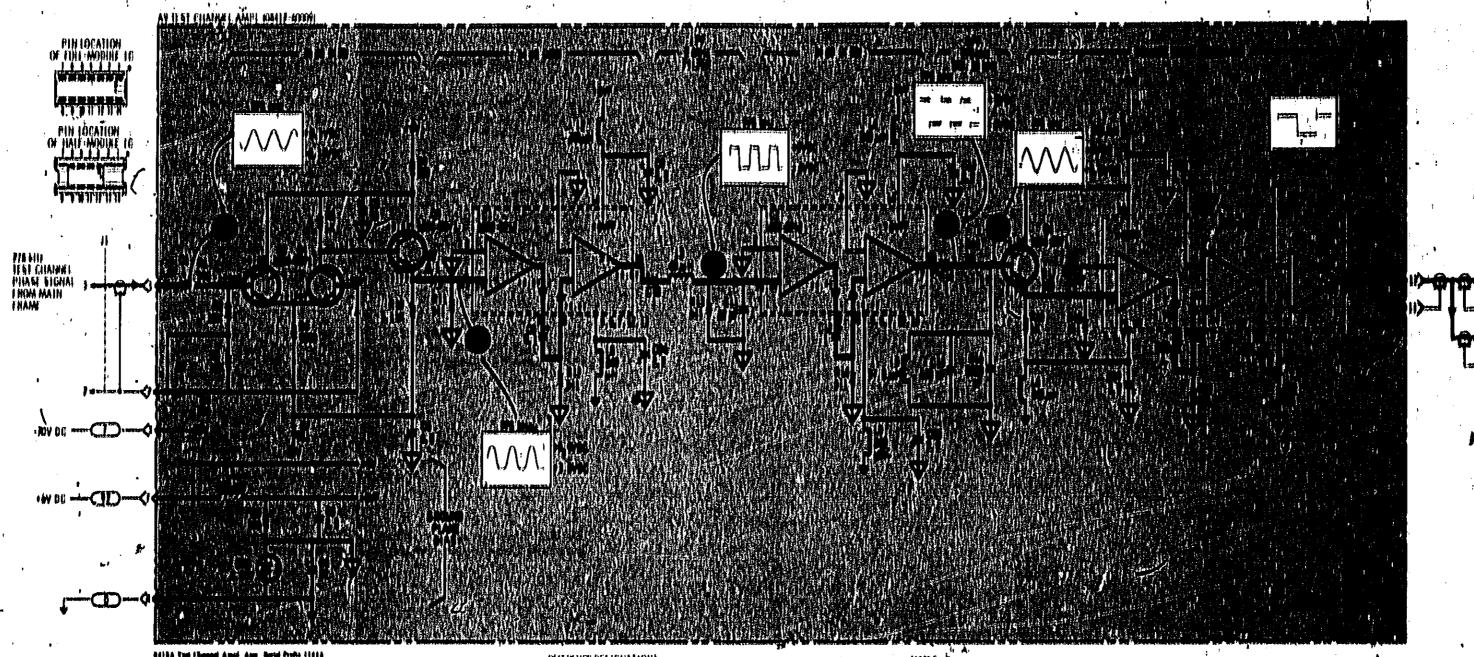


Figure 7-10. Parts Location for Test Channel Amplifier Ad

AD

v



PLITABLICE DESIGNATIONS

CI · PS

C · CAI

CI · S

OI · A

AI · S

AI · S

INSTES L. A. DE LANGUE DE LA COMPANION DE LA C

Figure 7-10, Test Channel Amplifier A0, Heliomalis Diagram;

# THEORY FOR HIGH-VOLTAGE POWER SUPPLY AS AND

#### HIGH-VOLTAGE OFFILLATOR

ligh voltage in developed by an excitator elecuti constating of Q11 and the two primary windings of ASTL.

Fifty kits enettator energy to transformer coupled through A6T1 to the two high-voltage see on dary windings, then rectified and littered, producing a =1980 Vdp CRT enthods supply and a =1980 Vdp control grid supply.

# HEGULATON FEEDBACK AMPLIFIER

The shall vocamply for the CRT cathwis is voltage regulated. A small amount of voltage is obtained by a high resistance voltage station agroup the supply output consisting of 'ABNI, ABNS, and ABNA. The is possibled through QB, QB, and Q10, then applied back to oscillator Q11 through TI feedback winding. This feedback loop changes the bias on Q11, thus controlling the peak current flowing is transformer TI. This, is turn, controls the peak-to-peak voltage at the secondary of ABTI and thus controls the high voltage output.

# CHT SHOTEGRION

VI, RSS, and CRIO form a protective elreuit for the CRT. This elreuit prevents the CRT grid from going positive relative to the eathods and from going farther than ISOV negative from the eathods since these voltages might cause areing between elements and damage to the CRT.

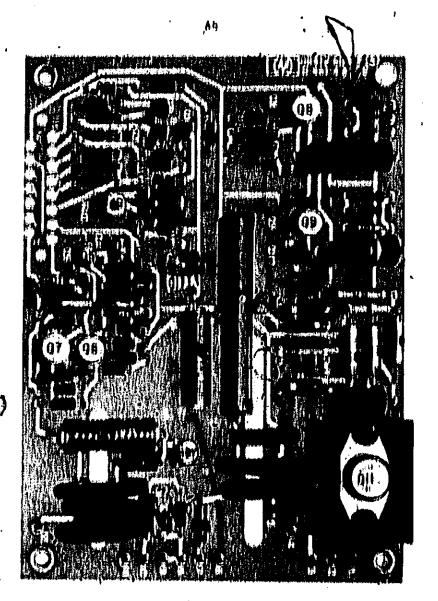
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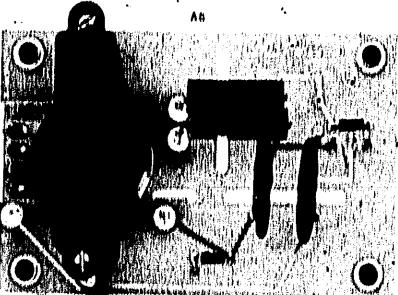
The ground raturn elecult for the \*1080V supply driving the CitT grid is used to modulate the K=Axts. This provides means to insert CRT bianking from several sources, and intensity modulation for frequency marking on the CRT trace. The K=Axts migulation amplifier is composed of Q(-Q).

A resistance summing natwork and two preamplifier stages considered of QI-QA plus the intensity control etreuit provide liquitor foot different sources of R-Asis modulation.

#### MAPTAMOTERA

ff40 adjunta antigmattem.





Pigure 7-81. Parts Location for High-Voltage Power Supply Ab, and Reclifter Ab

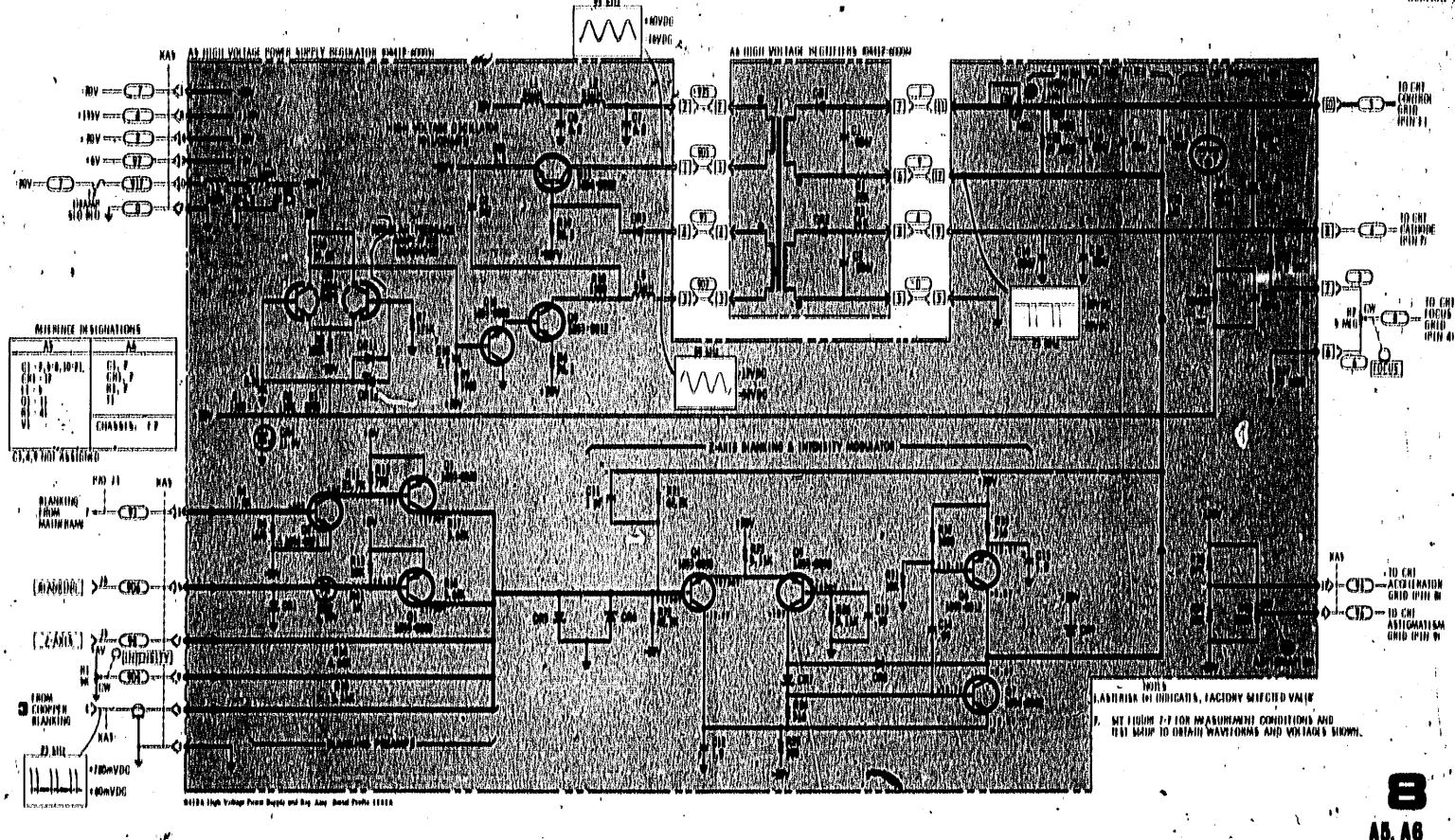


Figure 7-88. High-Voltage Power Supply A5.

mid Recliffer A5, Schematic Diagram

7-81

#### THEORY FOR LOW VOLTAGE POWER SUPPLY AS

#### 18 VOLT RUPPLY

Buries regulator Q3 is driven by JD1, maintaining a regulated 18 Volta across the +6 Volt and +6 Volt supplies (between ping I was 6). The 18 Volta is adjusted by 144. Restators R8, R8, and 144 sense any change from 18 Volta, amplifying the change through ID1, then changing the bias on Q3 to bring the occupat back to 18 Volta. Restators R5 and R6 form a voltage divider across the 18 Volt output, dropping 6 Volta across each restator. The voltage at the center of the voltage divider is compared to ground at the input of ICB. The resultant output from ICB drives Q1 and Q8, Q1 and Q3 together with their associated resistors R5 and R10 balance the load impedance across the plus and minus 6 Volta to maintain 6 Volta across each supply. This compensates for the difference in load presented by the instrument circuits to the two supplies. This means that the lotal current draws by Q1 and the +6 Volt load circuits will equal the total current draws by Q1 and the +6 Volt load circuits.

#### HAR VOLT SUPPLY

Capacitier C4 together with rectifier diodes CRS and CR4 and transformer Ti make the unregulated 188 Volt supply.

#### TRACK ALIGN

110 Milunta frace align on GNT.

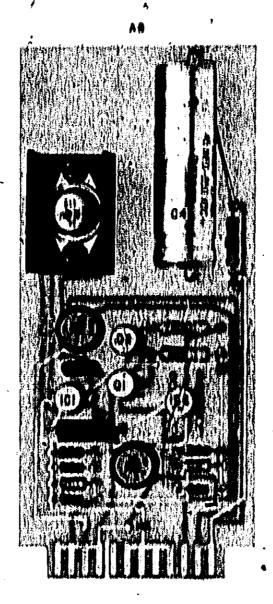


Figure 7-88. Parts Labortton for Law-Voltage Power Bupply A6

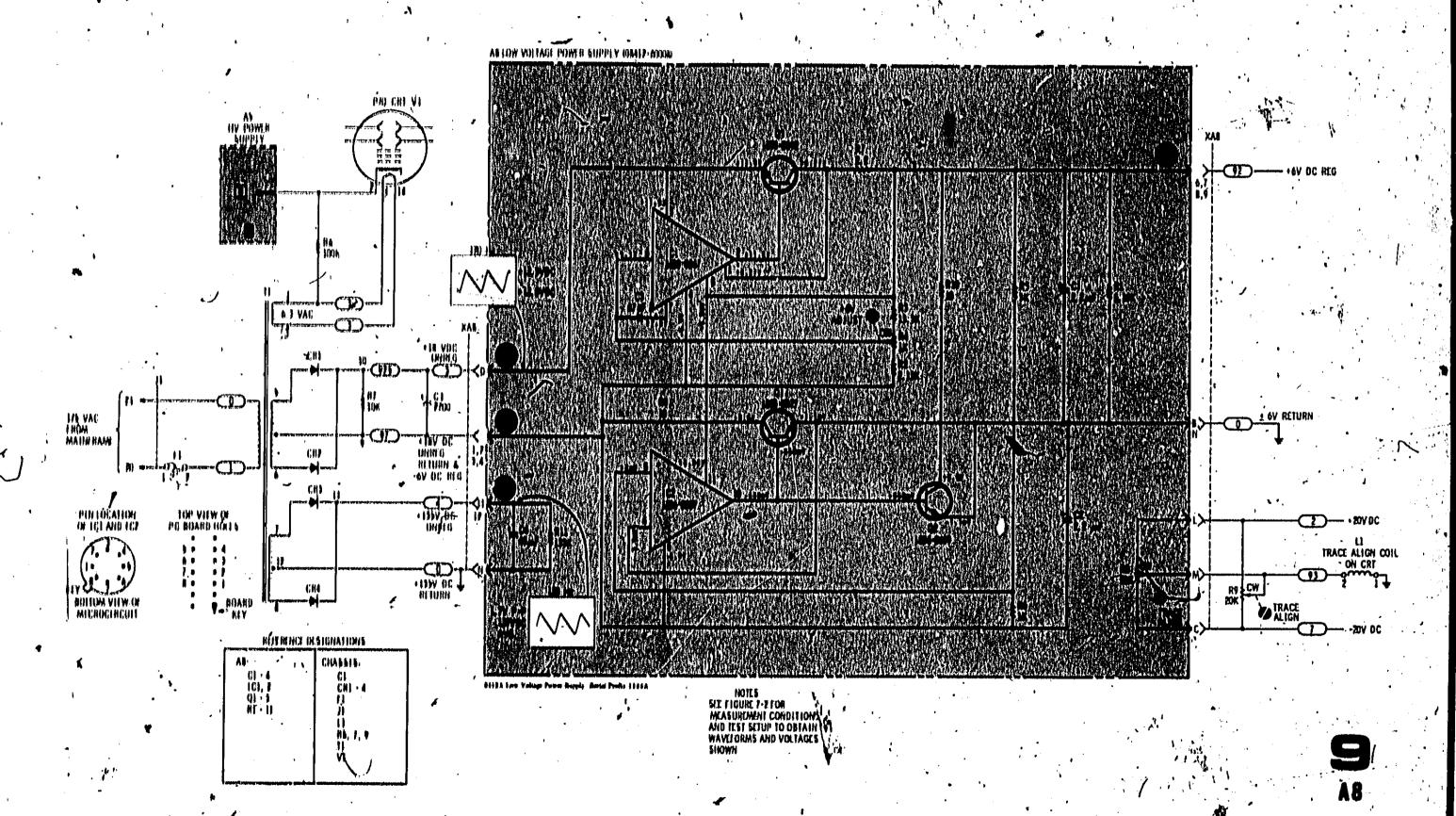


Figure 7-24. Low-Voltage Power Supply A8, Schematic Diagram 7-23/24

# BACK DAING MANUAL CHANGES

# APPENDIX ;

#### 1. INTRODUCTION

To adapt this manual to instruments with serial numbers prefixed 030, 040, 057, 060, 970, and 970 make the changes indicated below.

	080-00180 and balow	۸٠١,
	089-011-089-00180 045-00181-045-00167	A-0
,	945-00158-945-00198 1 945-00196-957-00845	A-F A-B

958 -00246 -968 -00295 970 -00296 -970 -00295	λ, Β, Q, D 'λ, Β, Q
976 -00896 -976 -00446 978 -00446 -976 -00689	A, 1)

#### CHANGE A

Instruments with serial numbers 976-00580 and below may not have resistor A785. The performance of the 6418A may be improved by adding a 4.00 megohin resistor (IIP Part No. 0688-4848) on A7 (06418-60007). See Figures 7-17 and 7-18 on page 7-17 of Manual for proper location of A785.

#### CHANGE D

Instruments with serial numbers 978-00145 and below may have dual inline flat pack IC (IIP Part No. 1530-0135) for ASIC1. The TO-99 type package (IIP Part No. 1530-0347) is the recommended replacement. The TO-99 offers greater reliability than the flat pack. See schematic diagram on page 7-33 for pin location of TO-99.

#### CHANOE C

Instruments with serial numbers 970-00395 and below may have dual in-line flat pack 10/s (HP Part No. 1620-0216) for the following operational amplifiars:

ATICE ATICI, E, S, and ( ABICE ATOCI

The recommended replacement for the flat back IC's forementioned is the TO-99 type package HP Part No. 1826-0007.

#### CHANGE D

Page 0-7, Table:0-1:

Change A9C4 to HP Part No. 0180-0197 CIPXI) ELECT 3.2 UP 10% 20 VDCW

Page 7-10, Figure 7-10:

Delete CRF and Cab Delete L6 and L9

Page 7-19, Figure 7-20:

Change the value of A9C4 to 3.2 µF Delete A9L6 and A9C24. Ground pine 5, 6, 7, 12, 13 of IC1. Delete A9L9 and A9C25. Ground pine 5, 6, 7, 12, 13 of IC2. Appundin

#### CHANGE E

#### Page 0:6, Table 0:1:

Change ASCI to TIP Data No. 0100-0160; C; PND MY 0.1 UF 10% 800 VDCW, Change ASCI to IIP Part No. 0100-0160; C; PND ELECT 6.8 UF 10% 85 VDCW, Add ASCA, MIP Part No. 0180-0110; C; PND ELECT 6.8 UF 10% 85 VDCW, Add ASCA, MP Part No. 0160-8017; C; PND OBLCO 6.05 UF 100 -80% 100 VDCW, Change ASCI 10 UP Part No. 0180-0168; C; END MY 0.1 UF 10% 800 VDCW, Change ASCI 18 and ASCI 10 to IP Part No. 0160-8017; C; PND OBLC 0.05 UF 180 -\$0% 100 VDCW, Change ASCI 10 Part No. 1901-0040; DIODE: SILICON 60 PIV, Change ASCI 10 UP Part No. 1901-0040; DIODE: SILICON 80 MA 80 WV.

#### Page Ord, Table 1-11

Change ABLI, ABLE, ABLE, and ABLE to Part No. 0100-1685; COIL/CHOKE SELL, Change ABCH to the Part No. 1885-1068; Ct. FIET, Change ABCH to the Part No. 1885-1068; Ct. H. PNI, Change ABCH to the Part No. 1885-1068; Ct. H. PNI, Change ABCH to the Part No. 0757-0164; it: FXD MET FLM. 878K CHM 14-1/8X; Change ABHE to the Part No. 0757-0188; It: FXD MET FLM. 84.8K CHM 14-1/8X; Change ABHE to the Part No. 0757-0447; It: FXD MET FLM. 10.8K CHM 14-1/8X; Change ABHE to the Part No. 0757-0447; It: FXD MET FLM. 181 CHM 14-1/8X; Change ABHE to the Part No. 0757-0317; It: FXD MET FLM. 181 CHM 14-1/8X; Change ABHE to the Part No. 0608-0680; It: FXD MET FLM. 181 CHM 14-1/8X; Change ABHE to the Part No. 0608-3150; It: FXD MET FLM. 181 CHM 14-1/8X; Change ABHE to the Part No. 0608-3150; It: FXD MET FLM. 18, 3K CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 18, 3K CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 18, 3K CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 18, 3K CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 187 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1887 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1887 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 36, 3K I'-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X; Change ABHE to the Part No. 0608-3160; It: FXD MET FLM. 1000 CHM 14-1/8X;

# Page 7-81, Figures 7-81 and 7-88: 🥗 -

Heplaco Figuro 7-31 in Manual with Figuro 7-31 (change 10) in this appendix. Replaco Figure 7-38 in Magual with Figuro 7-38 (change 10) in this appendix.

#### CHANGE F .

Page 6-4, Table 6-1:

Change A3 R84 and A3R85 to HP Part No. 2100-2489; Rt VAR PhM 5K OHM 10% LIN 1/2W.

#### Page 6-7, Table 0-1:

Change A7C3 and A7C4 to HP Part No. 0100-2141; C: FXD ELICOT 5.8 UF 10% B0 VFCW+ Change A7R1 to HP Part No. 0698-3184; R: FXD MET FLM 4.88K OHM 1% T/8W. Change A7R3 to HP/Part No. 0698-3183; R: FXD MET FLM 5.03K 1% 1/8W. Change A7R3 and A7R4 to HP Part No. 0767-044R4 MET FLM 10.0K 1% 1/8W. Change A7R5 to HP Part No. 0600-6094; R: FXD COMP 8.1 MECOTIM 6% 1/8W. Change A7R15 to HP Part No. 0600-6094; R: FXD MET FLM 1K OHM 1% 1/8W.

#### Page 6-9, Table 6-11

Change A10C1 and A10C2 to HP Part No. 0160-0161; C: PXD MY 0.01 tlp 10% 200 VDCW, Add A10L1 and A10L2.

Change A10L4 to HP Part No. 000H-5444; R: PXD MET FLM 516 OHM 1% 1/8W, Change A10R5 to HP Part No. 000H-0085; R: PXD MET FLM 1.00K OHM 1% 1/8W, Change A10R7 to HP Part No. 0767-0436; R: PXD MET FLM 6.11K OHM 1% 1/8W, Change A10R5 to HP Part No. 050H-5444; R: PXD MET FLM-816 OHM 1% 1/8W, Change A10R14 to HP Part No. 050H-5440; R: PXD MET FLM 106 OHM 1% 1/8W, Change A10R14 to HP Part No. 050H-540; R: PXD MET FLM 106 OHM 1% 1/8W, Change A10R15 and A10R15 to HP Part No. 050H-5155; R: PXD MET FLM 26.7K OHM 1% 1/8W, Change A10R17 and A10R21 to HP Part No. 050H-5155; R: PXD MET FLM 3.65K 1% 1/8W,

1 -5

CHARGE F (CONTINUED)

Page 6:0, Pable 6:1:

Change A101119, A101190, A101097 and A101090 to HP Part No. 0698=6486 to FM) FLM 100 OHM 0, 26% 1/8W.

Change A101119 to HP Part No. 0769=0416; H5 FM) MET FLM 641 OHM 19. 1/8W, Change A10118 to HP Part No. 0698=8166; H; FM) MET FLM 4,64 19. 1/8W, Change A10108 to HP Part No. 0698=8166; H; FM) MET FLM 14.7K OHM 19. 1/8W,

Page 6=10. Pable 6=1;

Change A10BBB to HP Payt No. 0008-8180) III FXO MRT FLM 17.0K OHM 18 1760, Page 7-11. Floure 7-11 and 9-10:

Naplace Figure 7=11 in Manual with Figure 7=11 ((2) ange F) in this appendix. To his expendix.

Page 7=16. Figures 7=16 and 7=16;

Replace Figure 9=16 in Manual with Figure 9=16 (Change F) in this appendix. Replace Figure 9=16 in Manual with Figure 9=16 (Change F)-in-this appendix.

Page 7:44, Figurea 7:14 and 7:18;

Replace Figure 7=17 in Manual with Figure 7=17 (Change F) in this appendix (Replace Figure 7=18 in Manual with Figure 7=18 (Change F) in this appendix (

Paga 7=88; Flaure 7=84;

Delete BO TRAOR ALION control, Pigure 7:84 of Manual,

**GHANGE O** 

Page 7-81. Playre 7-88:

Delete ABC11 and ABC18 in Figure 7-38 of Manual. How direct connections from both bases of Q8 to the jonetion of ABC1 and ABIS.

CHANGE II

Page 6-5, Table 6-11

Change ABC1 to HP Part No. 0160-0165; G; FXD MY 0.1 DF 10% 200 VDCW. Add ABC4 HP Part No. 0160-0174; G; FXD CRR 0.47 UF :80 -20% 20 VDCW. Change ABC10 to HP Part No. 0160-0168; G; FXD MY 0.086 UF 10% 200 VDCW.

Page 6-6, Table 6-1;

Change ASQS to HP Part No. 1658-0080; Qi ili PNP (delected from fina708), Change ASQS to HP Part No. 1884-0071; Qi ili NPN (Balacted from fina704), Change ASRS to HP Part No. 0608-3480; Ri PXD MICT FLM 48.8K OHM 13/1/6W, FACTORY RELIGITED PART.
Add ASRS HP Part No. 0767-0447; Ri PXD MET FLM 16.8K OHM 13/1/6W,

Page 7-21, Pigure 7-29;

Replace Figure 7-32 in Manual with Figure 7-32 (Change II) in this appendix,

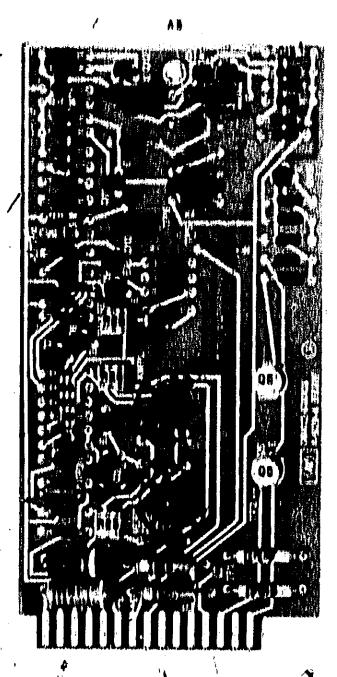
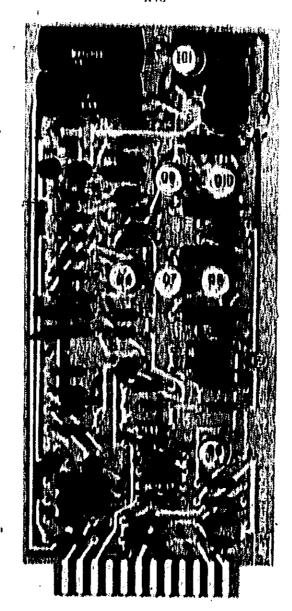


Figure 7-11. Parts Location for Multiplexer and Multiplexer and

(Chauge F, Harial No. 946-00195 and below)



Eigure 7-15. Paris Location for Amplitude Hynghronous Detector A10

(Change F., Barial No. 945-00195 and below)

AT

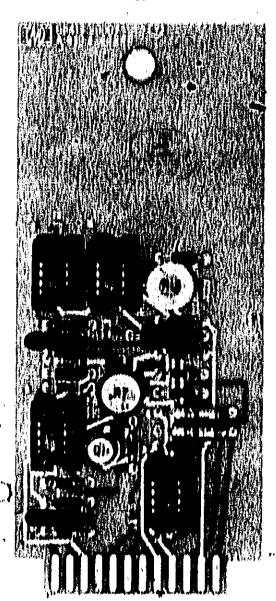
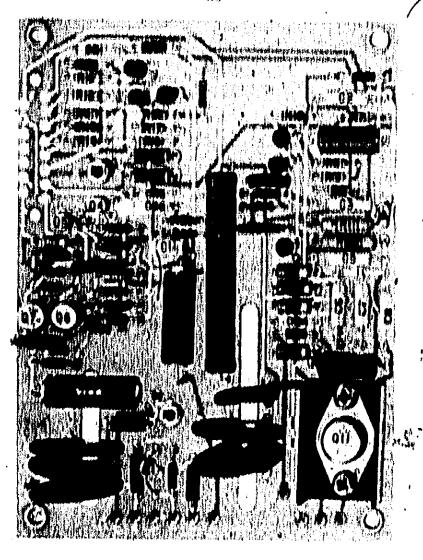


Figure 7-14. Parts Location for Amplitude Channel' Log Converter A7

-{Change F, fibrial No. 045-60195 and balow)

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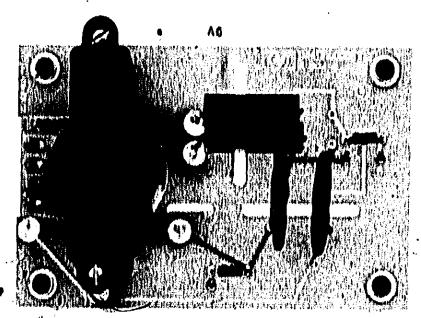


Figure 7-21. Paris Location for High-Voltage Power Supply A5, and Rectifier A6 (Change E, Serial No. 945-90131 and below)

analist William radi E

A'igure 7-12. Multiplexer and Deflection Amplifier A5, Schematic Diagram (Change F, Serial No. 045-00195 and below)

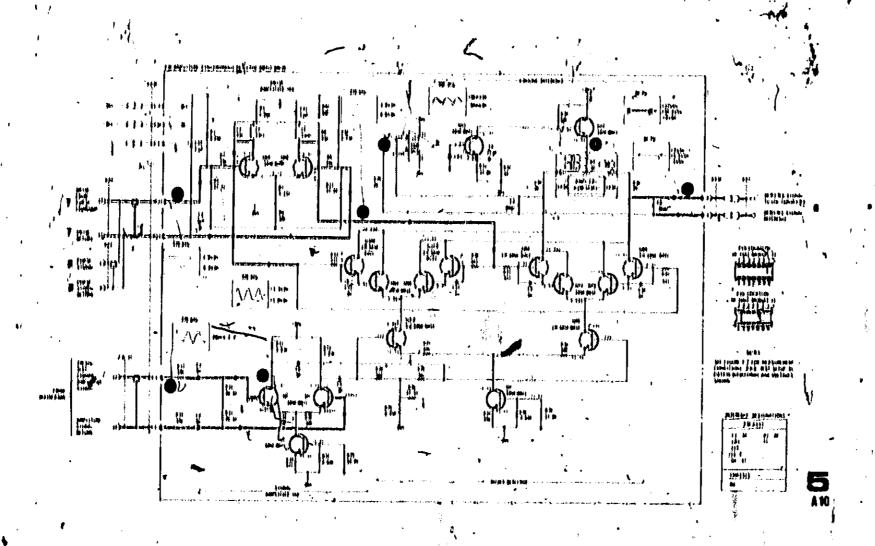


Figure 7-16 Amplitude Bynchronous Defector A10, Behamatic Diagram (Change Ka Berial No. 045-00105 and below)

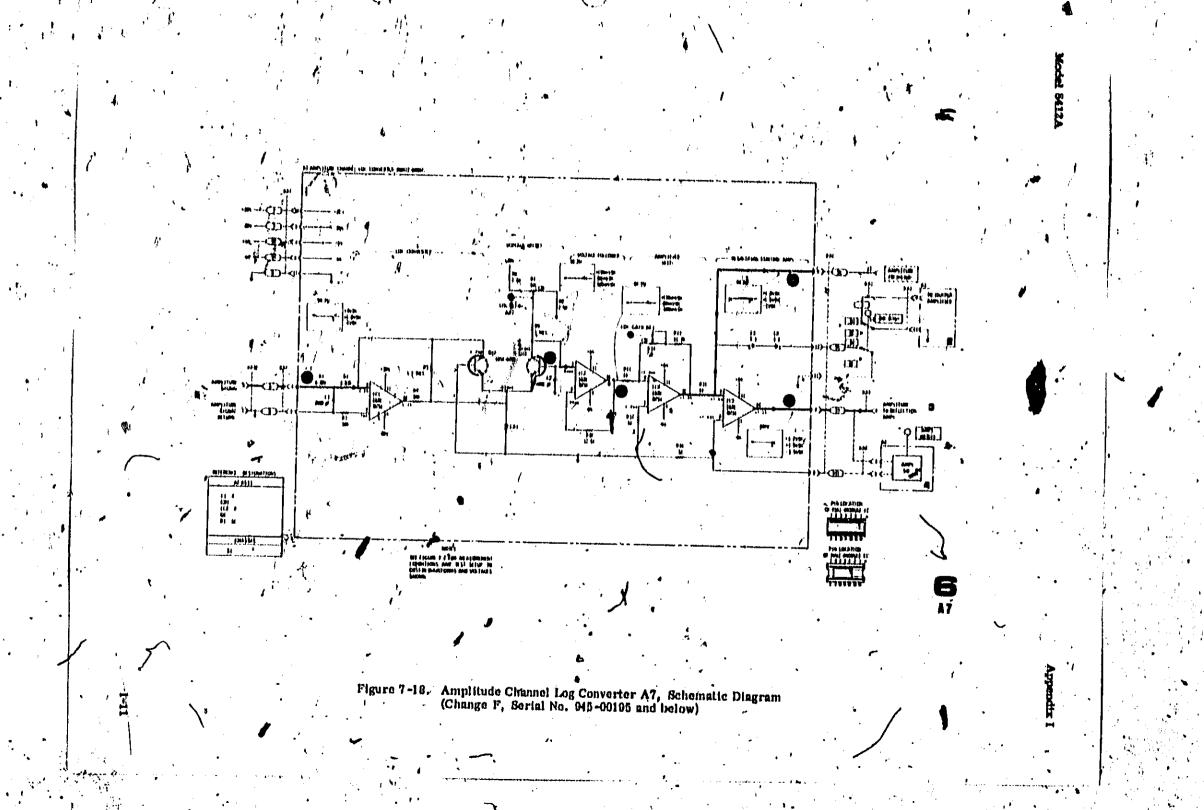
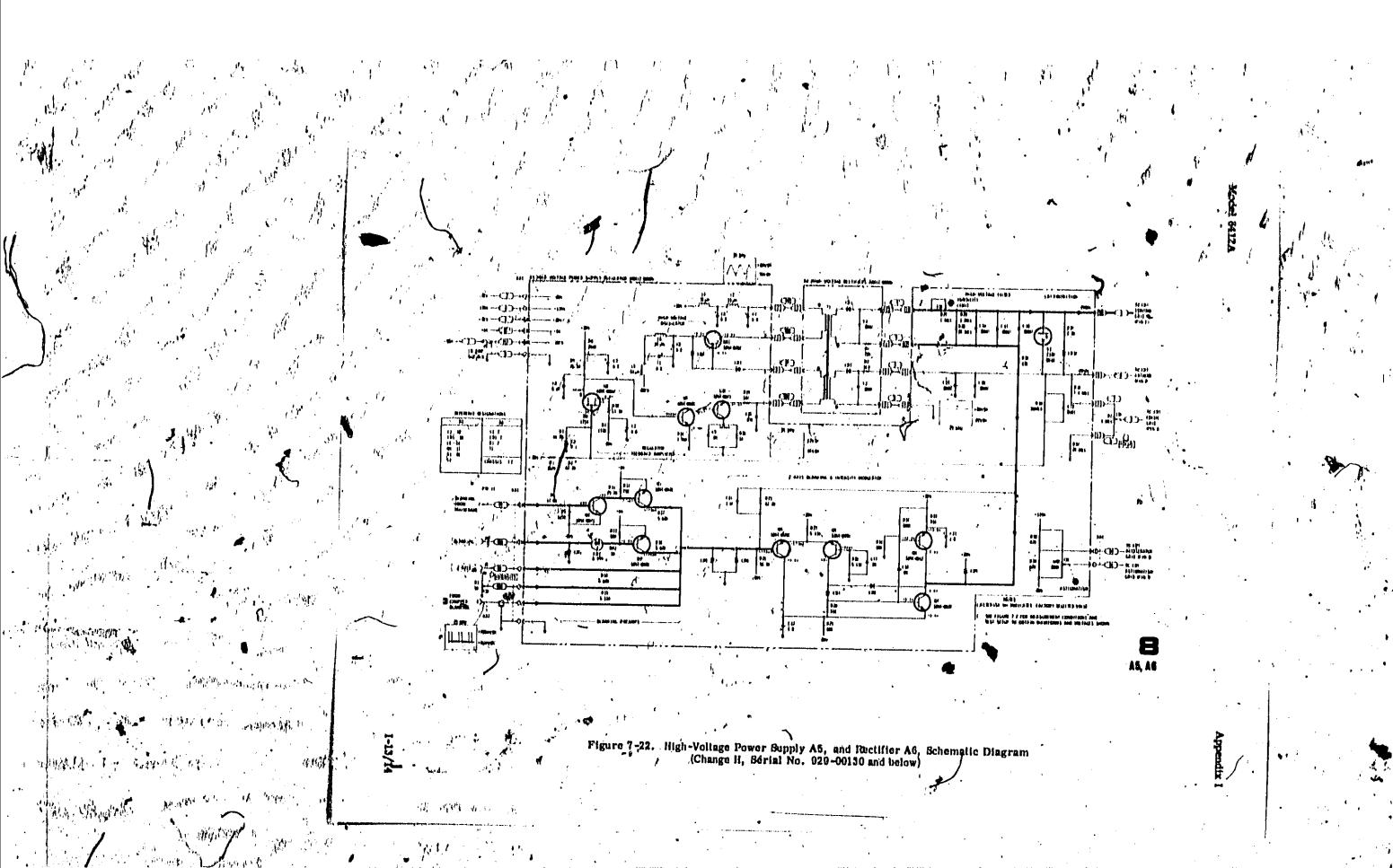
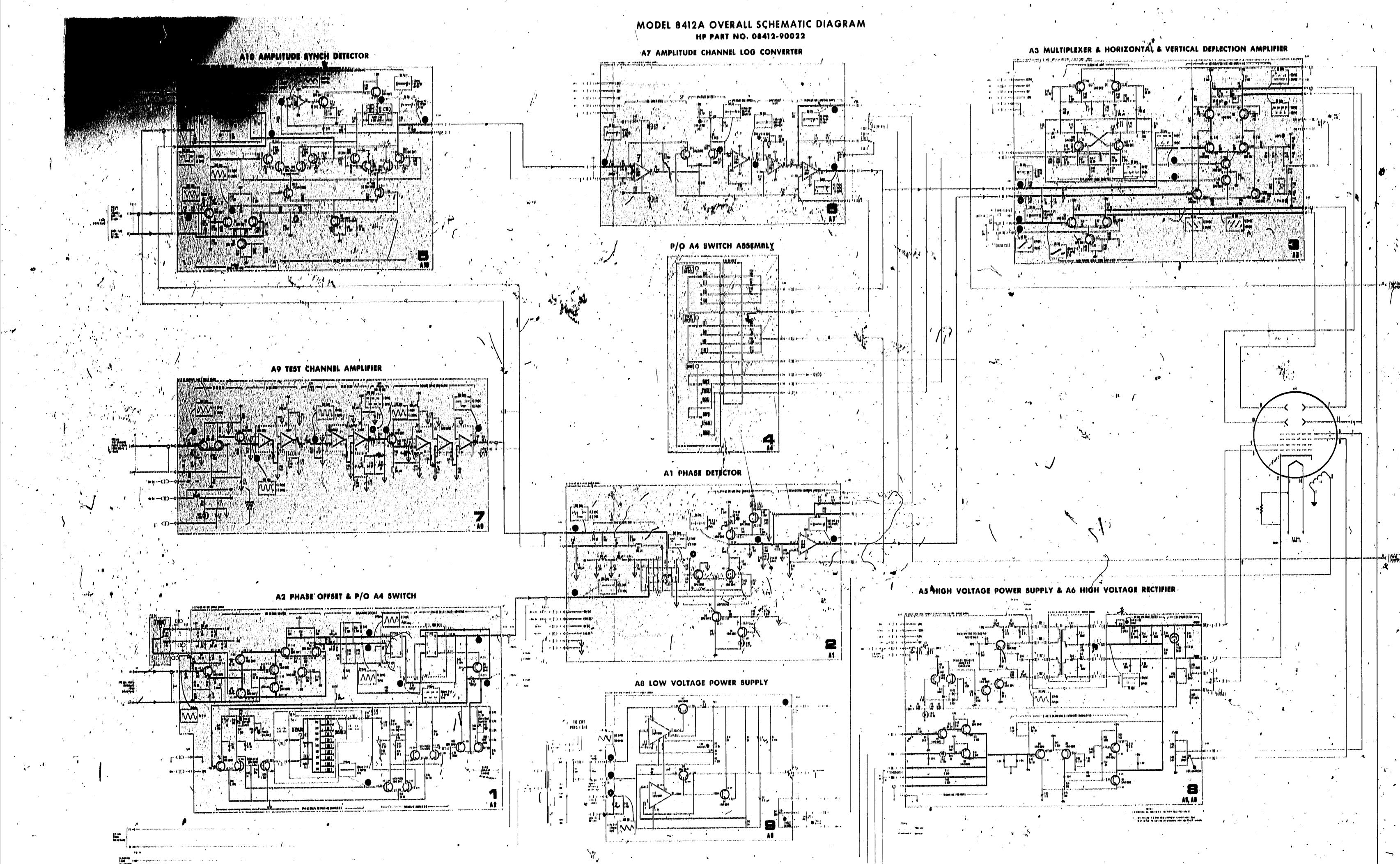


Figure 7-22. High-Voltage Power Supply A5, and Rectifier A6, Schematic Diagram (Change E, Serial Nos., 945-00131 through 957-00245)





## OPTIONS

## DPTION HO7 MANUAL AUPPLEMENT

### 11-1. INTRODUCTION

This supplement describes the difference in the Model 6412A Phase-Magnitude Display with Option 107. It also describes the manual changes necessary to document the addition of Option 1107.

### noirun oeac

The Model 6412A Option 1107 provides digital resdout capability. This allows interacing with 11P Model 5326B Timer/Counter/DVM. The frequency, phase, and magnitude of the parameter being measured by the network analyzer is then displayed digitally. No special procedures are needed when the rear panel REF and TEST outputs are not being used.

### NOTI

When the rear-panel REF or TEST putputs are being used; the load impedance should be greater than one magohinshunted by 25pf or less. Calibration of the 8412A Option HO7 must be done with rear-panel REF and TEST outputs. loaded.

### MANUAL CHANGES TO INCORPORATE OPTION

Page 5-4, Table 5-3; Page 5-12, Table 5-4; Page 5-30, Table 5-6; Page 5-26, Table 5-7;
Add to PROCEDURE OF STEP 1:

### NOTE

Calibration of the 84 MA Option 1107 must be done with the rear-panel REF and TEST outputs loaded. Load impedance should be greater than one megolim shunted by 25pf or loss.

### Page 6-10, Table 6-1;

Add C2 and C3 HP Part No. 0150-0084; C: FXD CER .1 at +80 -20% '100VDCW... Add W1 HP Part No. 08412-62001; CABLE ASSEMBLY: REF output (color coded gray, red, white, includes 37).

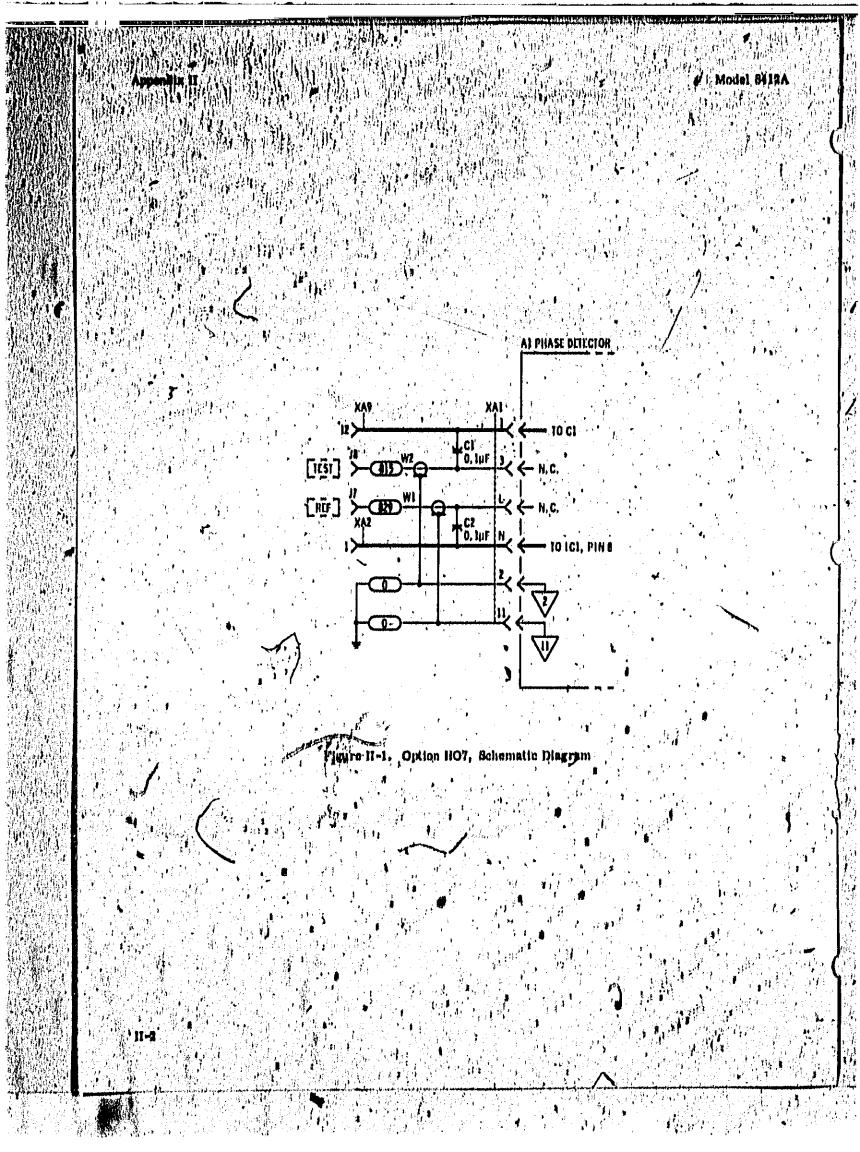
Add W2 HP Part No. 08412-02002; CABLE ASSEMBLY: TEST output (Color coded gray, brown, green, Includes 38).

### Page 6-11, Table 6-11

Change part 10 to HP Part No. 08412-22010; Sub-panel: Rear. Change part 20 to HP Part No. 08412-02102; Panel: Rear. Change Part 28 to HP Part No. 08412-02007; Plate: Identification.

### Page 7-0, Figure 7-10:

Change schematic diagram per following partial schematics



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	- MANUAL IDENTIFICATION OF	
This supplement contains in nationality impro	mportant information for correcting manual errors and for adapting the manual to previous made after the printing of the manual.	
To use till supplement		
Make all appropriate agric	ersons at humber belated changes indicated in the tables below.	
Berial Profix or Humber	Berial Prefix or Number Make Manual Changes (1997)	
1821A		
> NEW ITEM		
ERRATA		
Page 6-5, Table 6-2) Change ASC7 to HP Part	No. 0160-2055, C:FXD GER 0.01 µF+80-20% 100 VDCW, Mr. Code 56289,	
Mir Part No. C028F10	・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・	
	A4A1)" after description for A4.	
かけい 一元 一日から こうけいしょき 子裏 東 さんなお こうかん 美	ANGE ASSEMBLY for A4. A4)" after descriptions for A4A1 and its REBUILD EXCHANGE ASSEMBLY.	
Page 6-7, Table 6-2; Chance A5R2 to HP Part	No. 0757-0466, R:FXD MET FLM 110K OHM 1% 1/8W, MA Code 28480.	
Mir Part No. 0767-040		
Delete PACTORY SELEX	OTED PART under Description for A5A2 No. 0767-0441, R:PXD MET PLM 8.25K OHM 1% 1/8W, Mfr Code 28480,	
Mr Parl No. 0767.044		

Page 7-15, Figure 7-16; Change A10R1 to A10R3, 12,1K. Change A10R3 to A10R1, 8,25K. Change A10R6 to A10R42.

Manual mange supplements are revised as often as pecessary to keep manuals as surrent. Hewlett-Packard recommends that you periodically request the latest edition of this supplement from all HP offices. When requisiting copies quote the manual identification information from your aumber and print date from the title page of the manual.



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K. W. J. W. Halling