

S E R V I C E N O T E

SUPERSEDES: None

HP 37717A PDH/SDH/Jitter Test Set**Serial Numbers:** n/a**Build Status:** 1.00 and above**Replacing the Processor Assembly (CPU)****To be Performed by:** Qualified Service Personnel**Parts Required**

| Description | HP Part Number | Quantity |
|-----------------------------|-----------------------|-----------------|
| Replacement Processor Board | 37714-60004 | 01 |

Situation

This Service Note gives information on parts and instructions required when changing a processor on the HP 37717A

Action

When changing the processor order the appropriate part from the table above and use the following procedure to fit.

Continued

DATE: October 1996

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:

DBG

ENTITY:

E610

ADDITIONAL INFORMATION:

Procedure

Use these instructions when fitting a new CPU Board Assembly into an HP 37717A.

The instructions cover the following;

- Fitting some special parts from the old CPU Assembly onto the new CPU Assembly. These parts need to be transferred as they are not shipped with the new assembly.
- Initializing the new CPU data storage eeprom.
- Entering the instrument serial number and a list of all the firmware options fitted. This needs to be done because this data is stored in the above eeprom on old CPU Assembly which cannot be transferred to the new CPU Assembly.
- Setting the current time and date.

This must be done for the calibration to run and timestamp correctly.

- Recalibrating the 10 MHz Reference Oscillator, VCX0 and Jitter Transmitter Modules.

This needs to be done because this data is stored in the above eeprom on old CPU Assembly which cannot be transferred to the new CPU Assembly.

CAUTION

This procedure should only be carried out by qualified Service Personnel. Anti-static precautions must be observed at all times. Use the anti-static wrist-strap provided in this kit if an anti-static work-area conforming to Corporate Standard 741.808 is unavailable.

Read the anti-static documentation at the end of this procedure.

Removing the old CPU Assembly.

Remove the old CPU Assembly as follows:

1. Switch off the instrument and disconnect the power cord and any interconnecting cables.
2. Place the instrument face down on the workbench.
3. Remove the 4 screws securing the rubber feet to the rear panel.
4. If Optical Modules are fitted (option UH1 or UH2) unscrew the optical shield from the input and output connectors.
5. Withdraw the outer cabinet sleeve back and out of the instrument.
6. Remove the two clamp screws on the top and bottom right-hand side of the chassis which secure the CPU module.
7. Withdraw the CPU Module using the two knobs to help with removal.

Transferring Parts and Fitting the New CPU Assembly.

The following parts need to be transferred from the CPU board on your old module;

- Metalwork - fit the Module Front Panel from the old CPU. This is retained to the board by two screws.

NOTE

If the RS232 or HP-IB board (37714-60015) is fitted, this will need to be removed to gain access to these two screws.

- A4 U14 - fit this 8-pin DIL IC from the old CPU board. It is fitted in a socket.
- ROM Drawer Runners - Fit the two plastic runners from the old CPU. These are located with two screws and nuts each.
- ROM Drawer - Fit the A5 ROM Drawer from the old CPU. It is recommended that new eeproms are fitted in this board. Refer to Service Note 37717A-02B or contact the HP QTO Division Product Support Engineer to find out the latest part numbers for these eeproms..
- NVM Battery - A new battery (HP part number 1420-0380) should be fitted. If not available, you may fit the old battery provided the voltage is greater than 3.55 volts - TAKE CARE TO GET THE POLARITY CORRECT.

Once all these parts have been fitted, check the switches on the new CPU Assembly are set as follows;

| Assembly Description | Switch Number | Finger Number | Position |
|--------------------------|---------------|---------------|-----------|
| A4 Processor Assembly | SW1 | 1 & 2 | Closed |
| A4 Processor Assembly | SW1 | 3 & 4 | Open |
| A4 Processor Assembly | SW2 | 1,2,3,4,5,6,7 | Closed |
| A4 Processor Assembly | SW2 | 8 | Open |
| A15 HP-IB/RS232 Assembly | S1 | 1,2,3,4 | see board |
| A5 ROM Drawer Assembly | S1 | 1 & 3 | Open |
| A5 ROM Drawer Assembly | S1 | 2 & 4 | Closed |

After checking the switches, fit the new CPU Module into the rear slot in the instrument

VERY IMPORTANT PRECAUTION

Use Module Replacement Tool HP part number 03776-00024 (or a piece of THIN cardboard 130mm x 130mm) when fitting the CPU module. Place this tool over the RFI strip on the module to the left side of the processor. This will prevent the RFI strip from being dislodged as the CPU module is inserted into the Mainframe. When the CPU is fully home, remove the module replacement tool (or cardboard). See Figure 1.

Replace all other parts as a direct reversal of the removal procedure.

Eeprom Initialization.

1. Switch on the instrument and check for a valid power-up routine on the HP 37717A.
2. Make the following key sequence to obtain the MODULE DEBUG page on the HP 37717A.

Press [OTHER]; [<^]; [MORE]; [<^]; [MORE]; [<^]; [MORE]; [OTHER].

Press [MORE] until MODULE DEBUG appears in the softkey menu.

CAUTION

When using the MODULE DEBUG display only modify parameters shown below. Altering other parameters can cause damage to the instrument - prevent accidental damage by leaving the Module Debug Page after setting up.

3. Move the cursor to [EEPROM INITIALIZE] field and press initialize.
4. After a short time, [OFF] will be displayed beside the [EEPROM INITIALIZE] field indicating that the initialization is complete.
5. Press [OTHER] key to exit the MODULE DEBUG page.

Internal Clock - setting the Date and Time

Before performing calibration, you will need to set the HP 37717A internal clock to the correct time and date as this is used to log calibration information.

1. Switch on the instrument.
2. Press OTHER key, then [MORE] softkey until [TIME & DATE] softkey is displayed..
3. Press [TIME & DATE] softkey then move the cursor to CLOCK MODE.
4. Select [SETUP] then move the cursor to TIME. Set the clock to the correct time using [<],[>], and [INCREASE DIGIT], [DECREASE DIGIT] softkeys.
5. Move the cursor to DATE. Set the clock to the correct date using [<],[>], and [INCREASE DIGIT], [DECREASE DIGIT] softkeys.

6. Return the cursor to CLOCK MODE and press [RUN].

The HP 37717A internal clock is now set.

Restoring the Instrument Serial Number

The instrument serial number will need to be entered into the eeprom on the new CPU Assembly before the firmware options can be added.

Note

Restoring the serial number and options requires a special Codeword to be entered via the front panel. This Codeword is unique to every 37717A unit and can only be obtained by contacting the HP QTO Division Product Support Engineer.

Enter the serial number by carrying out the following procedure.

1. Switch on the HP 37717A.
2. Make the following key sequence on the HP 37717A to obtain the OPTION ENABLE display.

Press [OTHER]; [<^]; [MORE]; [<^]; [MORE]; [<^]; [MORE]; [OTHER].

Press [MORE] until OPTION ENABLE appears in the softkey menu.

3. Press OPTION ENABLE softkey.
4. Move cursor down one place and select SERIAL NUMBER.
5. Move cursor down one place and enter the serial number (as shown on the rear panel label) using [<],[>], and [INCREASE DIGIT], [DECREASE DIGIT] softkeys.
6. Move cursor to CODEWORD field and insert the special codeword into this field using the [<],[>], and [INCREASE DIGIT], [DECREASE DIGIT] softkeys.
7. Move the cursor to TOGGLE TO SET OPTION field and enter the serial number by pressing the [SET OPTION] softkey. The display will flash momentarily and the message "Option Structure Changed" will be displayed. The unit will assume Default Settings.

NOTE

If an incorrect CODEWORD has been entered, the unit will freeze in the [OPTIONS ENABLE] page. If this happens, cycle the power by switching the HP 37717A off then on again. You can then re-enter the CODEWORD.

Restoring Firmware Options.

Restore the firmware options by carrying out the following procedure.

1. Return to FIRMWARE OPTION on the OPTION ENABLE page.
2. Enter the first option you need to restore (i.e US1).
3. Move cursor to CODEWORD field and insert the special codeword into this field using the [<],[>], and [INCREASE DIGIT], [DECREASE DIGIT] softkeys.
4. Move the cursor to TOGGLE TO SET OPTION field and enter the new option by pressing the [SET OPTION] softkey. The display will flash momentarily and the message "Option Structure Changed" will be displayed. The unit will assume Default Settings.

NOTE

If an incorrect CODEWORD has been entered, the unit will freeze in the [OPTIONS ENABLE] page. If this happens, cycle the power by switching the HP 37717A off then on again. You can then re-enter the CODEWORD.

5. Repeat steps 1 to 4 for each additional firmware option you need to add. Note that a different Codeword is required for each option.

Checking Firmware Options are Now Fitted.

After you have entered all the firmware options, check they have been correctly installed as follows;

6. Switch OFF the HP 37717A.
7. Press the OTHER key then [MORE] softkey until softkey labeled [OPTIONS] is displayed.
8. Press the [OPTIONS] softkey and ensure that the required option has now been added.

Calibration Procedures**NOTE**

Carry out the following procedures only after fitting the new parts, initializing the CPU eeprom, setting the time and date, entering the serial number and restoring all firmware options.

Warm-Up Time

To ensure accuracy, the equipment must be switched on for a minimum of 30 minutes before carrying out these calibration procedures.

Calibration Sequence

The calibration should be performed in the sequence given below.

10MHz Reference Clock Frequency and VCXO Calibration

The 10MHz Reference Clock Source is calibrated by connecting to a Frequency Counter and adjusting within limits. The VCXO Calibration is automatic.

Equipment

| | |
|-------------------|------------------|
| Frequency Counter | HP 5335A Opt 001 |
| 10:1 Scope Probe | HP 10435A |

Procedure

10 MHz Reference Clock Frequency

1. Select the CALIBRATION function on the OTHER display.
2. Select CALIBRATE PASSWORD and using the DECREASE DIGIT and INCREASE DIGIT softkeys set the password to [1243].
3. Select CALIBRATION ITEM : [10MHz] and MODE : [MANUAL].
4. Select FREQUENCY A and 1 Mohm input impedance on the Counter.
5. Connect the Counter Input A via the 10:1 Divider Probe to TP14 on the HP 37717A CPU Assembly (A4). Ground the probe on TP7 (GND) on this assembly. These Test Points are accessible through a slot on the bottom of the instrument.
6. Adjust A4 R1 to obtain a reading of 10,000,000Hz on the counter.
7. Select the MEASURED FREQUENCY field on the HP 37717A display and enter the counter frequency reading using [INCREASE DIGIT] AND [DECREASE DIGIT] softkeys.
8. Disconnect the Counter.

VCXO Calibration

9. Select CALIBRATION [VCXO's] and press RUN/STOP to start the calibration routine.
10. After approximately 5 minutes, the Calibration Complete message for each of the VCXO's should appear at the bottom of the HP 37717A display.
11. Disconnect all test equipment.

Jitter Transmitter and Receiver Calibration

Description

The Jitter Transmitter Calibration is semi-automatic and is performed by using a special internal calibration routine and a Spectrum Analyzer. The HP 37717A TX PDH OUTPUT is connected to the Analyzer (via 75/50 ohm Matching Pad) and set to the first calibration point in the routine. With the Analyzer set to display the transmitted data spectrum, a Bessel Null should be observed. The HP 37717A DAC output is adjusted using the calibration routine to optimise this Bessel Null. This sets the transmitted jitter to exactly 0.765UI. This process is repeated for all other Calibration points in the routine.

The Jitter Receiver Calibration is fully automatic and uses a special internal calibration routine to measure and adjust the received jitter amplitude values with respect to the known transmitted values. Because receiver calibration relies on the accuracy of the transmitted jitter levels, the Jitter Transmitter calibration must be performed before the Jitter Receiver calibration.

Equipment

| | |
|------------------------|-----------|
| Spectrum analyzer | HP 8568B |
| 75/50 ohm Matching Pad | HP 11852B |

Pre-Adjustment Setup

Before carrying out Jitter Calibration, you will need to perform the following pre-adjustment setup.

1. Recall the HP37717A Default Settings with the following key sequence;

Press OTHER key, then [STORED SETTINGS] softkey.

Select STORED SETTINGS NUMBER [0].

Select ACTION [RECALL]

2. Couple the HP37717A transmitter and Receiver with the following key sequence;

Press OTHER key, then [SETTINGS CONTROL] softkey.

Select TRANSMITTER & RECEIVER [COUPLED]

3. Make the following key sequence on the HP 37717A to obtain the MODULE DEBUG display.

Press [OTHER]; [<^]; [MORE]; [<^]; [MORE]; [<^]; [MORE]; [OTHER].

Press [MORE] until MODULE DEBUG appears in the softkey menu.

CAUTION

When using the MODULE DEBUG display only modify parameters shown below. Altering other parameters can cause damage to the instrument - prevent accidental damage by leaving the Module Debug Page after setting up.

4. Press [MODULE DEBUG] and select MODULE [PDH MODULE] on the Display.
5. Select VCO CONTROL MODE [FIXED].
6. Select MODULE [JITTER MODULE] on the Module Debug Display.
7. Select TX CALIBRATION [OFF].
8. Select RX CALIBRATION [OFF].

CAUTION

The above pre-adjustment sequence will need to be performed again if power is cycled during Jitter Calibration, as MODULE DEBUG parameters return to default values when instrument power is cycled.

Jitter Transmitter Calibration Procedure

1. Connect the HP37717A Transmitter Output to the Spectrum Analyzer via the 75/50 ohm Matching Pad.
2. Set the Spectrum Analyzer as follows;

| | |
|--------------------------|----------------------------|
| Centre Frequency 2048kHz | Frequency Span 100kHz |
| Reference Level 0dBm | Sweep Time 1.0 seconds |
| Video Bandwidth 1kHz | Resolution Bandwidth 100Hz |
3. Press the OTHER key then [MORE] softkey (twice). Select the [CALIBRATION] function.
4. Select CALIBRATE PASSWORD and set to [1243] using the INCREASE DIGIT and DECREASE DIGIT softkeys.
5. Select the calibration item [JITTER Tx].
6. Press RUN/STOP key to start calibration. The Spectrum analyzer should display a symmetrical spectrum of lines similar to that shown in Figure 2. The central line is the transmission carrier.
7. Move the cursor to DAC and adjust the DAC value (using only the Least Significant Bit) until the carrier level displayed on the Spectrum Analyzer is at a minimum. (Bessel Null).
8. When the Bessel Null is obtained, move the cursor to TOGGLE WHEN AT ZERO POINT and press [ZERO POINT] softkey. This stores the value for the modulation frequency and the routine automatically moves on to the next calibration value.
9. Repeat steps 7 and 8 for each new calibration value. At each change of BIT RATE, set the Spectrum Analyzer center frequency to the new BIT RATE and re-adjust the span to optimise the spectrum around the carrier.

10. When finished, the HP 37717A display should indicate CALIBRATION PROCESS COMPLETE.
11. Press [OTHER] to return to normal operation then disconnect all test equipment.

Jitter Receiver Calibration Procedure

1. SWITCH OFF THE HP 37717A TO RESET CALIBRATION PARAMETERS.
2. Connect the HP 37717A Unbalanced 75 ohm PDH Signal Out to the Unbalanced 75 ohm PDH Signal In.
3. Press the OTHER key then [MORE] softkey (twice). Select the [CALIBRATION] function.
4. Select CALIBRATE PASSWORD and set to [1243] using the INCREASE DIGIT and DECREASE DIGIT softkeys.
5. Select the calibration item [JITTER Rx].
6. Press the RUN/STOP key to start calibration.

Calibration is automatic and takes around 30 minutes. When complete, the HP 37717A display will indicate CALIBRATION PROCESS COMPLETE.

7. Press [OTHER] to return to normal operation.

Testing

After the above calibration, ensure the instrument is operating correctly by carrying out all the selftests - see Calibration or Service Manual.

When a pass has been obtained on all selftests the instrument is ready for use.

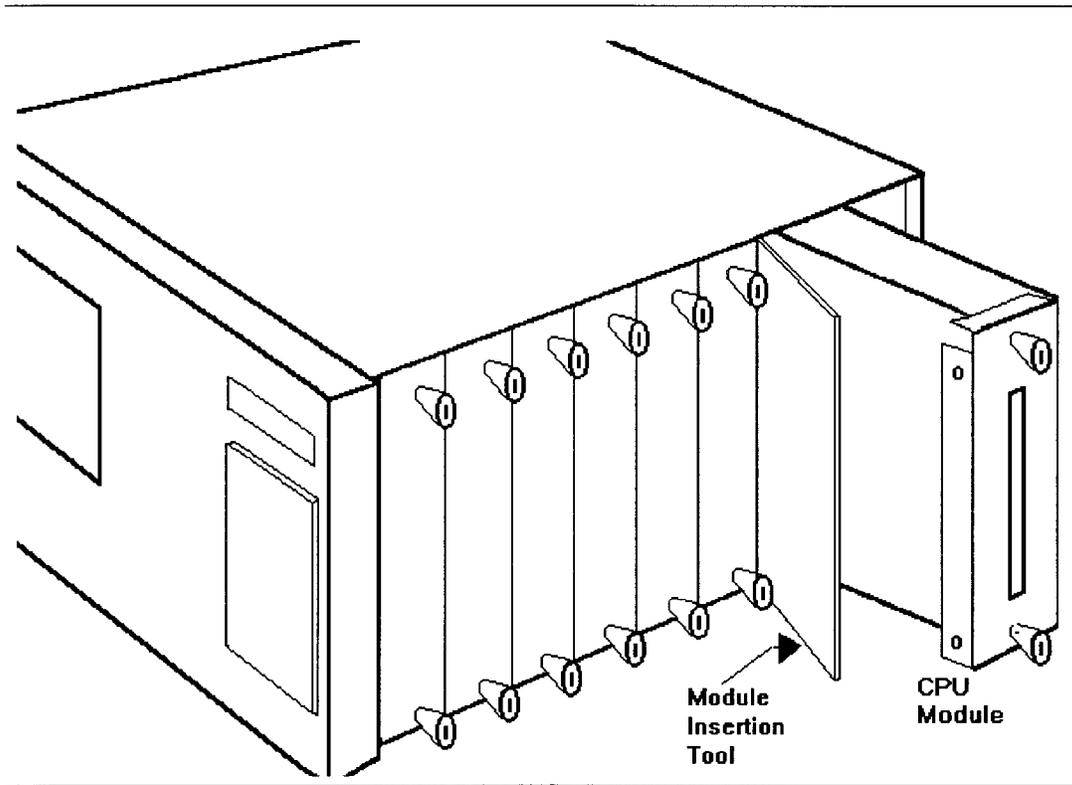


Figure 3 Position of Processor Module and Insertion Tool

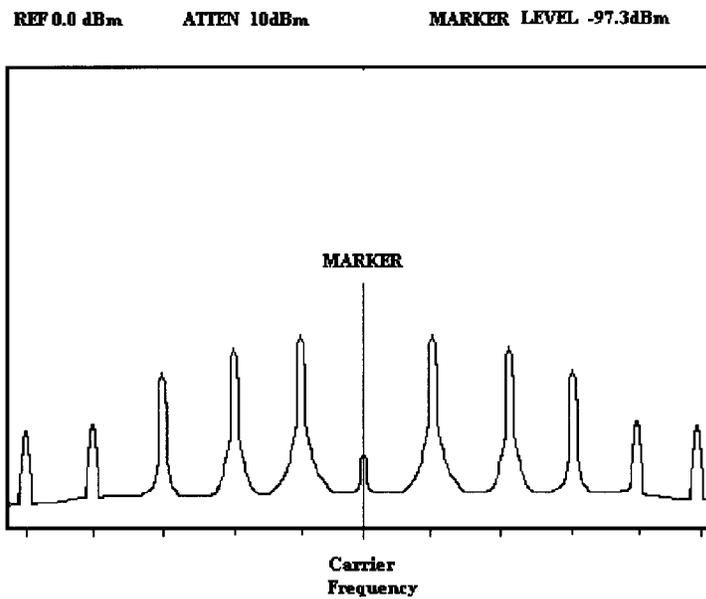


Figure 1 Typical Jitter Transmit Spectrum