Adjustment: AM Level FE	HP8648B/C/D	YO4HFU – v1.0

Overview

This document describes the procedure to calibrate the AM Level adjustment of the Frequency Extension Module by GPIB, following the procedure specified in the HP8648 Operating and Service Guide Manual.
Applicable only to instruments fitted with “AM Level potentiometer” on A10 Frequency Extension Module.
Not used for serial prefixes ≥3847A/3847U. Some instruments may not have this pot. In this case abort the test.

Reference Instructions

AM Level: FE (8648B/C/D Only)

Not used for serial prefixes ≥ 3847A/3847U.

Description

This adjustment performs the AM Level adjustment on the frequency extension module by connecting the function generator and the DVM to motherboard connector J31.

This adjustment performs the two adjustments to the output board that require the use of the voltmeter. It sets up the multiplexer on the output board to measure dc voltages while the potentiometers are being adjusted.

Required Test Equipment

- Function Generator
- DVM
- J31 Test Point Extender (refer to the “Test Point Extender” section at the front of this chapter)

Procedure

Figure 7-14. AM Level: FE Test Setup 1

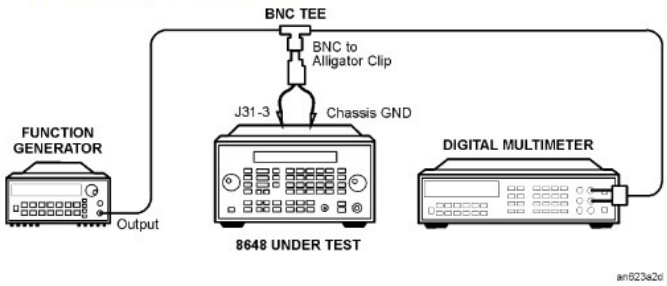


Figure 7-15. AM Level: FE Test Setup 2

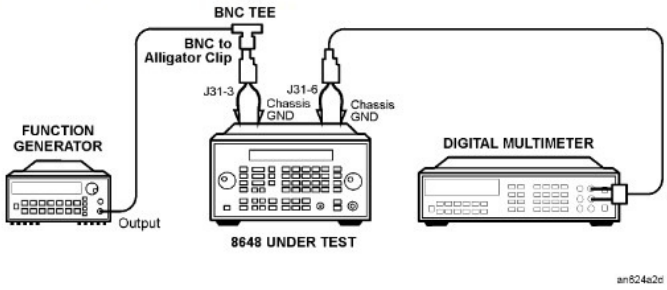
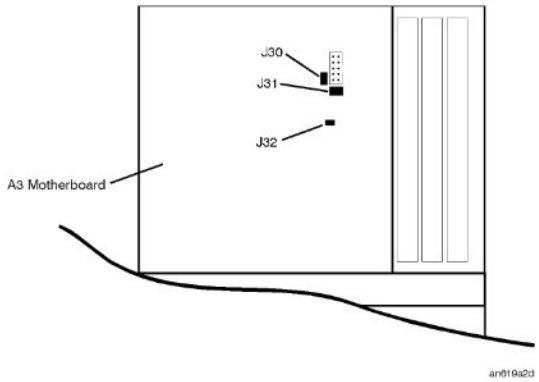


Figure 7-16. Location of J31 and J32 on the Motherboard



1. With the line power turned off, install the Test Point Extender on J31. (J31 pin 1 is the rear pin on the right edge of connector J31.)
2. If jumper J32 is installed on the motherboard, remove it.
3. Turn on the line power.
4. Connect the equipment as shown above.
5. Preset all of the equipment.
6. Follow the instructions as they are displayed on the PC.

GPIB sequence according to Agilent Service Support Software

```
SERV:PRODUCTION:PUP
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
FREQ 100.0000000000 MHZ
POWER:ATT:AUTO 1
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
POWER:AMPL -136.0000000000
AM:STATE 0
FM:STATE 0
PM:STATE 0
OUTPUT 1
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
POWER:AMPL 0.0000000000
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
FREQ 1200.0000000000 MHZ
OUTPUT 1
RESET
FUNC DCV
ARANGE ON
NDIG 3
*rst
APPL:DC
```

```
DIAG:LATCH:SELECT "atten_4GHz_rpp_reset"
DIAG:LATCH:VAL #H00

DIAG:LATCH:SELECT "fext_service_level_DAC"
DIAG:LATCH:VAL #H800

DIAG:LATCH:SELECT "atten_4GHz_am_mod_select"
DIAG:LATCH:VAL #H01

DIAG:LATCH:SELECT "atten_4GHz_rpp_reset"
DIAG:LATCH:VAL #H01

*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
SOUR:VOLT:OFFS -2.000000
SOUR:VOLT:OFFS -1.980000
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
TRIG AUTO
-1.9800+00
TRIG AUTO
-1.9800+00
SOUR:VOLT:OFFS -2.990000
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
TRIG AUTO
-2.9900+00
TRIG AUTO
-2.9900+00
SOUR:VOLT:OFFS -3.495000
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
TRIG AUTO
-4.000+00
TRIG AUTO
-4.000+00   //target voltage achieved

DIAG:LATCH:SELECT "fext_service_mux"
DIAG:LATCH:VAL #H03

TRIG AUTO
0.000+00
TRIG AUTO
0.000+00
TRIG AUTO
0.000+00  //adjust R707 to obtain 0.000V

SERV:PRODUCTION:PUP
*IDN?
Hewlett-Packard, 8648B, 3847A02762, B.04.09
```

Procedure Overview

1. Initial Hookup Summary

During power OFF state, remove J32 jumper located on motherboard.

Connect the Function Generator and DC Voltmeter to J31 pin 3 (signal) and chassis ground.

Set the HP8648 generator to 1200MHz, CW, RF output ON, 0dBm.

Reset reverse power protection (rpp), set "fext_service_level_DAC" to H800 (decimal 2048), set "atten_4GHz_am_mod_select" to state H01:

```
DIAG:LATCH:SELECT "atten_4GHz_rpp_reset"
DIAG:LATCH:VAL #H00

DIAG:LATCH:SELECT "fext_service_level_DAC" - (it seems incorrect, must be
"freq_ext_level_DAC")
DIAG:LATCH:VAL #H800

DIAG:LATCH:SELECT "atten_4GHz_am_mod_select"
DIAG:LATCH:VAL #H01

DIAG:LATCH:SELECT "atten_4GHz_rpp_reset"
DIAG:LATCH:VAL #H01
```

Set the Function Generator dc voltage mode, output –2.000V / 50 Ω. The actual voltage at the output will be approximately double due to the high-impedance load.

The algorithm will adjust the Function Generator output voltage until the DVM (used as a monitor) reads –4.0000V ±0.0025V.

The sequence will continue only after the target voltage has been achieved.

2. Set Fext MUX

Disconnect the voltmeter from J31 pin 3 and connect it to J31 pin 6. Keep the Function Generator output connected to J31 pin 3.

The DVM is now used to measure the voltage routed through "fext_service_mux" from the A10 Frequency Extension Module to Motherboard test point J31 pin 6.

```
DIAG:LATCH:SELECT "fext_service_mux"
DIAG:LATCH:VAL #H03
```

3. AM Level FE potentiometer adjustment

Adjust the AM Level Potentiometer R707 potentiometer on Frequency Extension Module (of the three potentiometers this is the closest to the back of the instrument) until the DVM reads 0.000V ±0.002V.
This completes the AM Level FE adjustment.

4. Reboot instrument

Reboot command `SERV:PRODUCTION:PUP`
Power OFF HP8648 and reinstall J32 jumper.

Remarks

As a side note, the high-cost HP3458A DVM and HP33120A Function Generator are the only instruments supported by Agilent Service Software. For example, HP34401A DVM is not compatible, as it uses different SCPI commands. GPIB emulation of the HP3458A was necessary to enable the Service Software to operate correctly, utilizing AR488 interface and a custom sketch.

Conclusion:

GPIB commands are used to switch the fext MUX, reset RPP, set "fext_service_level_DAC" and "atten_4GHz_am_mod_select", without writing any calibration constants to EEPROM. Adjustment is made manually with a screwdriver.

Note:
"fext_service_level_DAC" seems wrong command used by Agilent Service Software ☺, it is not recognized and “222: Data out of range error” will occur. The correct command is "freq_ext_level_DAC".

AM Level FE adjustment can be simplified by using a stable –4.0000V power supply instead of the Function Generator, together with an accurate DC voltmeter (4½ digits or higher).
The power supply can be any good voltage regulator trimmed to –4.0000V ±0.0025V. The required output current is extremely small.

Ensure that the J32 jumper is removed (open) during the AM Level FE adjustment.

Apply the external negative voltage (–4.0000V) to the J31 pin 3 test point header located on the motherboard. Connect the monitoring voltmeter to J31 pin 6, and set the "fext_service_mux" latch to value H03 via GPIB.

Adjust the AM Level FE “R707” potentiometer (of the three potentiometers this is the closest to the back of the instrument) until the voltmeter reads 0.000V ±0.002V. This completes the AM Level FE adjustment. Reinstall the J32 jumper.

73’s de Robert YO4HFU