

**DOCUMENT NUMBER:** TP1910329 Rev. A

**DESCRIPTION:** VxS-250 Final  
Test Procedure  
(S-band)

ECO NUMBER: \_\_\_\_\_

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Proj Eng. \_\_\_\_\_

Mfg Mgr. \_\_\_\_\_

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Purchasing \_\_\_\_\_



**Scope:** The following procedure covers the final test of the VxS-250 (S-band) video transmitter module.

**Test Equipment required:**

| Item                               | Critical parameter                                      | Suggested        |
|------------------------------------|---|------------------|
| Power supply                       | 0-20V @ 1 amps min.                                     |                  |
| DC Ammeter                         | $R_s \leq 0.5 \Omega$                                   | Fluke 8062       |
| Function generator                 | 20 Mhz min., 75 Ohm output                              | Wavetek Model 90 |
| RF Power meter                     | 2.5 Ghz min.  | HP437            |
| Spectrum analyzer                  | 7.5 Ghz min.  |                  |
| NTSC video pattern generator       | Multi-burst, 75% Color bars, and pulse-and-bar patterns | Tektronix TSG100 |
| Microwave signal generator         | +10 dBm min. , 2.5Ghz                                   | Marconi 2041     |
| Double balanced diode mixer        | 2.5 GHz   | Mini Circuits    |
| Video Modulator/demodulator        | 525 line deemphasis                                     | HP3717A          |
| Color video monitor                | None  |                  |
| Video waveform analyzer            | VM700   | Tektronix VM700  |
| 20 dB attenuator                   | 1 watt, 2.5 GHz   |                  |
| Microphone connector shorting plug | none  | custom           |

**Preliminary Setup:**

1. Install a tuning cover on the front (channel select switch) side in place of the standard cover. The tuning cover will remain in place throughout the entire testing sequence.
2. Set the DC supply to 10.0 Vdc, current limit to 1.0 amps. Set the supply power switch to OFF.
3. Except as noted, the spectrum analyzer controls should be set to AUTO.

Note: Throughout this procedure, items shown **bold** refer to controls on the DUT.

**Alignment:**

| STEP | PROCEDURE  | MEASURED AT    | USING             | NOTES   |
|------|--|----------------|-------------------|---|
| 1.   | Set the DUT <b>power switch</b> to <b>OFF</b> .<br>Set up the test equipment as shown in Fig. 1.<br>Connect the DUT output to the spectrum analyzer. |                |                   |   |
| 2.   | Set the power supply to <b>ON</b> .  |                |                   |   |
| 3.   | Set the DUT <b>power switch</b> to <b>ON</b> .   |                |                   |   |
| 4.   | Set the channel select switch to 4.  |                |                   | This sets the RF output frequency to mid-band, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.<br><br><u>mid-band frequency:</u><br>S-band : Fo=2450 MHz                                |
| 5.   | Set the function generator to ON to modulate the carrier.  |                |                   | <u>Function generator settings:</u><br>Amplitude = 457mV pp<br>Frequency = 761 kHz  |
| 6.   | <b>Set the FM deviation.</b><br><br>Adjust R109 to achieve a Bessel null in the output signal frequency spectrum.                                    | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 1 MHz / div.<br>Center Freq. = 2450 MHz.<br><br>The level of the nulled carrier should be at least 40 dB below the level of the unmodulated carrier. |
| 7.   | Set the function generator to OFF.   |                |                   |   |
| 8.   | Connect the DUT output to the RF power meter.  |                |                   |   |
| 9.   | Measure the RF output power while alternately selecting channels 1, 4, and 7. Select the channel that has the lowest output power.                   | J5 (RF output) | RF power meter    | Make sure the PA tuning cover is installed.   |
| 10.  | <b>Set the RF output power.</b><br><br>Adjust R73 to set the output power to 270 - 280 mW.   | J5 (RF output) | RF power meter    |   |

| STEP | PROCEDURE  | MEASURED AT               | USING             | NOTES   |
|------|--|---------------------------|-------------------|---|
| 11.  | Set the channel select switch to 1.  |                           |                   | This sets the RF output frequency to the lower band-edge, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.<br><br><u>lower band edge frequency:</u><br>S-band : Fo=2400 MHz              |
| 12.  | <b>Measure the RF output power.</b><br>Record the value on the data sheet.   | J5 (RF output)            | RF power meter    | RF output power must be 270 mW minimum.   |
| 13.  | <b>Measure the DUT total current.</b><br>Record the value on the data sheet.                                       | Multi I/O connector pin 2 | Digital ammeter   | Total current must be 220 mA. max.  |
| 14.  | Set the channel select switch to 4.  |                           |                   | This sets the RF output frequency to mid-band, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.<br><br><u>mid-band frequency:</u><br>S-band : Fo=2450 MHz                                |
| 15.  | <b>Measure the RF output power.</b><br>Record the value on the data sheet.   | J5 (RF output)            | RF power meter    | RF output power must be 250 - 315 mW.   |
| 16.  | <b>Measure the DUT total current.</b><br>Record the value on the data sheet.                                       | Multi I/O connector pin 2 | Digital ammeter   | Total current must be 220 mA. max.  |
| 17.  | Set the channel select switch to 7.  |                           |                   | This sets the RF output frequency to the upper band-edge, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.   |
| 18.  | <b>Measure the RF output power.</b><br>Record the value on the data sheet.   | J5 (RF output)            | RF power meter    | RF output power must be 250 - 315 mW.   |
| 19.  | <b>Measure the DUT total current.</b><br>Record the value on the data sheet.                                       | Multi I/O connector pin 2 | Digital ammeter   | Total current must be 220 mA. max.  |
| 20.  | Connect the DUT output to the spectrum analyzer.   |                           |                   |   |
| 21.  | Set the channel select switch to 1.  |                           |                   | This sets the RF output frequency to the lower band-edge, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.<br><br><u>lower band edge frequency:</u><br>S-band : Fo=2400 MHz              |
| 22.  | Set the function generator to ON to modulate the carrier.  |                           |                   |   |
| 23.  | <b>Measure the modulation linearity.</b><br>Measure the depth of the Bessel null. Note the test on the data sheet. | J5 (RF output)            | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 1 MHz / div.<br>Center Freq. = 2400 MHz.<br><br>The level of the nulled carrier should be at least 20 dB below the level of the unmodulated carrier. |

| STEP | PROCEDURE   | MEASURED AT    | USING             | NOTES   |
|------|---|----------------|-------------------|---|
| 24.  | Set the function generator to OFF.  |                |                   |   |
| 25.  | <b>Check the levels of the audio subcarriers.</b><br>Measure the levels of the two audio subcarriers. Note the test on the data sheet.            | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 2 MHz / div.<br>Center Freq. = 2400 MHz.<br><br>The subcarriers should be between -25 and -30 dBc.   |
| 19.  | <b>Check spurious output levels.</b><br>Measure the levels of the 2 <sup>nd</sup> and 3 <sup>rd</sup> harmonics. Note the test on the data sheet. | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 500 MHz / div.<br>Center Freq. = 4800 MHz.<br><br>The level of the harmonics should be -45 dBc or less.  |
| 26.  | Set the channel select switch to 4.   |                |                   | This sets the RF output frequency to mid-band, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.<br><br><u>mid-band frequency:</u><br>S-band : Fo=2450 MHz                                |
| 27.  | Set the function generator to ON to modulate the carrier.   |                |                   |   |
| 28.  | <b>Measure the modulation linearity.</b><br>Measure the depth of the Bessel null. Note the test on the data sheet.                                | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 1 MHz / div.<br>Center Freq. = 2450 MHz.<br><br>The level of the nulled carrier should be at least 30 dB below the level of the unmodulated carrier. |
| 29.  | Set the function generator to OFF.  |                |                   |   |
| 30.  | <b>Check the levels of the audio subcarriers.</b><br>Measure the levels of the two audio subcarriers. Note the test on the data sheet.            | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 2 MHz / div.<br>Center Freq. = 2450 MHz.<br><br>The subcarriers should be between -25 and -30 dBc.   |
| 31.  | <b>Check spurious output levels.</b><br>Measure the levels of the 2 <sup>nd</sup> and 3 <sup>rd</sup> harmonics. Note the test on the data sheet. | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 500 MHz / div.<br>Center Freq. = 4900 MHz.<br><br>The level of the harmonics should be -45 dBc or less.  |
| 32.  | Set the channel select switch to 7.   |                |                   | This sets the RF output frequency to the upper band-edge, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.   |
| 33.  | Set the function generator to ON to modulate the carrier.   |                |                   |   |

| STEP | PROCEDURE   | MEASURED AT    | USING             | NOTES   |
|------|---|----------------|-------------------|---|
| 34.  | <b>Measure the modulation linearity.</b><br>Measure the depth of the Bessel null. Note the test on the data sheet.                                | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 1 MHz / div.<br>Center Freq. = 2500 MHz.<br><br>The level of the nulled carrier should be at least 20 dB below the level of the unmodulated carrier.                   |
| 35.  | Set the function generator to OFF.  |                |                   |   |
| 36.  | <b>Check the levels of the audio subcarriers.</b><br>Measure the levels of the two audio subcarriers. Note the test on the data sheet.            | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 2 MHz / div.<br>Center Freq. = 2500 MHz.<br><br>The subcarriers should be between -25 and -30 dBc.   |
| 37.  | <b>Check spurious output levels.</b><br>Measure the levels of the 2 <sup>nd</sup> and 3 <sup>rd</sup> harmonics. Note the test on the data sheet. | J5 (RF output) | Spectrum analyzer | <u>Spectrum analyzer settings:</u><br>Span = 500 MHz / div.<br>Center Freq. = 5000 MHz.<br><br>The level of the harmonics should be -45 dBc or less.  |
| 38.  | Set up the equipment as shown in Fig. 2.  |                |                   |   |
| 39.  | Connect the video modem output to the VM700 analyzer.   |                |                   |   |
| 40.  | Set the channel select switch to 4.   |                |                   | This sets the RF output frequency to mid-band, Mic 1 subcarrier to 7.5 MHz, Mic 2 subcarrier to 6.0 MHz.  |
| 41.  | Set the video pattern to generate a multiburst pattern.   |                |                   |   |
| 42.  | Set the VM700 analyzer to measure the transmitter frequency response.   |                |                   | <u>VM700 analyzer keystrokes:</u><br>-Adjust the analyzer to view a line in the range of 21 to 262 (field 1 or 2)<br>-press <MEASURE>, then select MULTIBURST from the lists on the display<br>-select averaging ON |
| 43.  | <b>Check the video response.</b><br>Note the test on the data sheet.  | J5 (RF output) | VM700             | The video signal should measure $0 \pm 0.5$ dB from 0.5 to 4.2 MHz.   |
| 44.  | Set the video pattern to generate a 75% color bar pattern.  |                |                   |   |
| 45.  | <b>Check performance with color bar pattern.</b><br>Observe the demodulated Video picture on the video monitor. Note the test on the data sheet.  | J5 (RF output) | Video monitor     | The picture should be clean and free of noise or distortion.  |
| 46.  | Set the video pattern to generate a pulse and bar pattern.  |                |                   |   |

| STEP | PROCEDURE  | MEASURED AT    | USING         | NOTES  |
|------|--|----------------|---------------|--|
| 47.  | <p><b><i>Check performance with pulse and bar pattern.</i></b></p> <p>Observe the demodulated Video picture on the video monitor. Note the test on the data sheet.</p> | J5 (RF output) | Video monitor | The picture should be clean and free of noise or distortion. |
| 48.  | End of test.   |                |               | Remove the tuning cover from the DUT.                        |



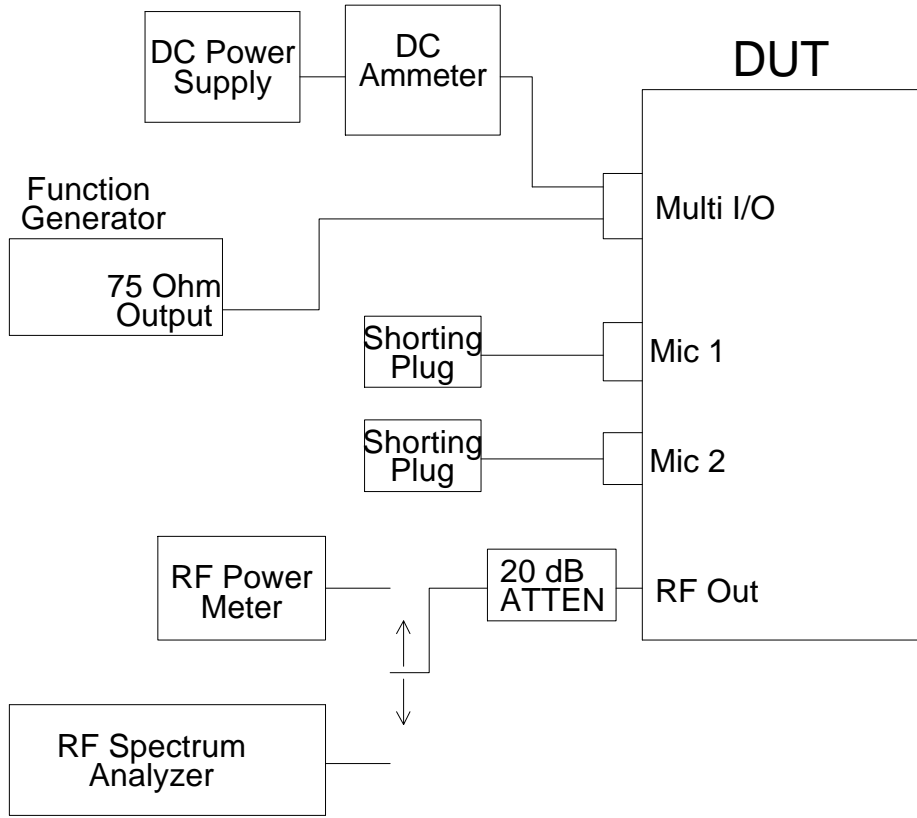


Figure 1

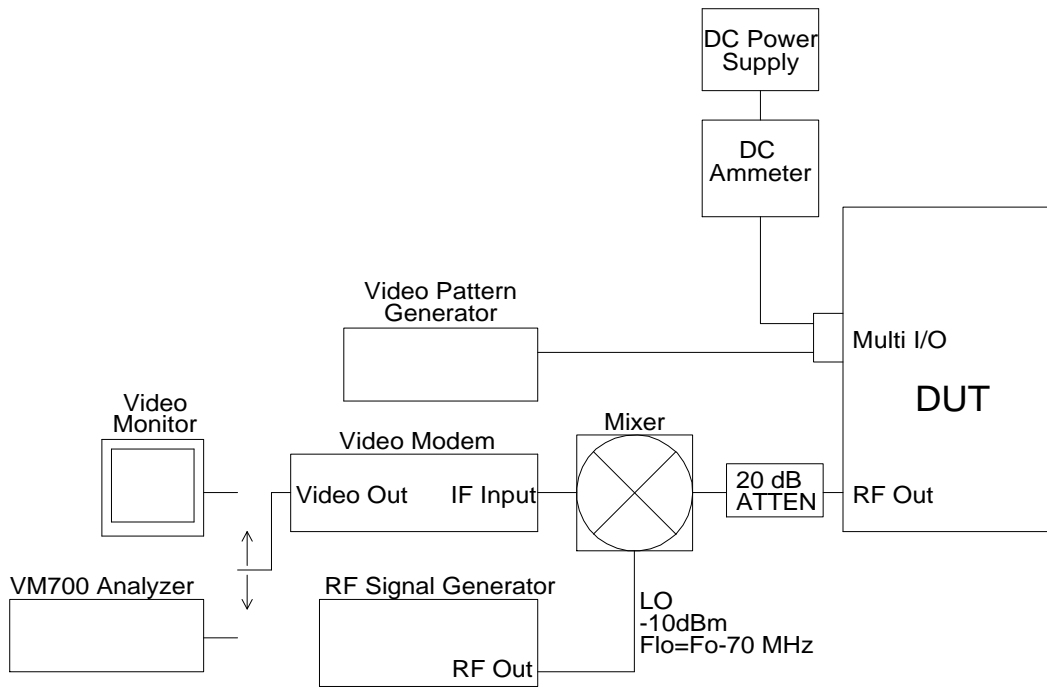


Figure 2