EXHIBIT I

FCC TYPE ACCEPTANCE REPORT

INFORMATION TRANSMISSION SYSTEMS CORP.

MODEL 6452A

FCC ID-CJJ79XITS-7041

BROAD BAND TRANSLATOR

Date Filed 5/25/2000

This application is filed in compliance with
Part 2, Part 21 and Part 74
of the FCC Rules and Regulations.

ADC Telecommunications
102 Rahway Road
McMurray, PA 15317

Rev. 1.0

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1.0 IDENTIFICATION OF APPLICANT AND EQUIPMENT

1.1 Applicant:

ADC Telecommunications
102 Rahway Road
McMurray, PA 15317

The above name and address is printed on a label attached to the rear panel of the equipment.

1.2 Equipment and Model Number: 6452A

This information is provided on the front panel of the equipment.

1.3 ADC Telecommunications shall manufacture this product in quantities necessary to satisfy market demand.

2.0 TECHNICAL DESCRIPTION - MODEL 6452A

2.1 Introduction

The 6452A is a multi-channel translator/linear amplifier intended to be used as a multi-channel translator in the MMDS/ITFS frequency band (2500.00 to 2690.00 MHz).

The multi-channel super band (222.00 to 408.00 MHz) input signal enters the system at the input of the translator where it is translated to the MMDS/ITFS frequency band and amplified to the rated output power of the unit.

The 6452A incorporates automatic level control to maintain the constant output power within the limits of the output amplifiers and GaAS FET amplifier modules for amplification of the RF signal.

The tray is shipped in a standard 19-inch rack mount assembly and is supplied with or without a cabinet. The unit is supplied complete with mounting hardware and cabinet slides.

Parameters and specification for operation of the 6452A are provided on the following pages, and a complete circuit description and alignment procedure is also included in this report. Refer to the overall system block diagram and the particular referenced schematics in the attached circuit description section of this report.

2.0 TECHNICAL DESCRIPTION

2.2 Technical Specifications

Type of Emissions .... TRANSLATOR (Digital)

Frequency Range .... 2500 to 2690 MHz

DC voltage and total current of final amplifier stage .... 10 volts DC at 9.8 amps
(Class A - Not RF power dependent)

Total Output Power Capability .... 3.0 Watts peak envelope
Adjustable in the translator tray (0.5 Watts total average)

2.3 Performance Specifications

RF output (average):
- 4 Channels .... 125.0 mW/Channel
- 8 Channel .... 62.5 mW/Channel
- 12 Channels .... 41.7 mW/Channel
- 16 Channel .... 31.25 mW/Channel
- 24 Channels .... 20.8 mW/Channel
- 31 Channel .... 16.1 mW/Channel

Nominal Input Signal Range (average power): .... -32 to -17 dBm/Channel
- Connector .... Type N
- Impeadance .... 50 ohm

Out-of-Band Power .... Per FCC Rules (21.908)
- -25 dB max (at band edges):
- -40 dB max (250.00 KHz above and 250.00 KHz below band edges):
- -50 dB max (3.00 MHz above and 3.00 MHz below band edges):
- -60 dB max (20.00 MHz above and 20.00 MHz below band edges):

Unoccupied Channel Emissions .... Per FCC Rules (21.908)
- -25 dB max (at unoccupied channel edges)
- -40 dB max (250.0 KHz above and 250.0 KHz below occupied channel edges)
- -50 dB max (3.0 MHz above and 3.0 MHz below occupied channel edges)

Harmonic Products .... -60 dB max

Electrical Requirements

Power Line Voltage .... 110 VAC ±10%, 60 Hz/240 VAC ±10%, 50/60 Hz

Power Consumption (System) .... 435 Watts

Environmental

Maximum Altitude (System) .... 12,000 feet (3,660m)
Ambient Temperature (system) .... 0° to 50°C

2.0 TECHNICAL DESCRIPTION

2.3 Performance Specifications-continued

Mechanical

Dimensions (WxDxH): .... 19" x 21" x 8.75" (48.3cm x 53.3cm x 22.2cm)

Weight: .... 55 lbs. (24.9 kgs)

2.0 TECHNICAL DESCRIPTION

2.4 Circuit Description

The ITS-6452A Multi-Channel Translator can be subdivided further as follows:

- Superband Bandpass Filter
- VHF Generator
- Frequency Multiplication
- Automatic Level Control
- Bias Circuits
- Amplifier Modules
- Power Detectors
- Control Logic
- Status Indicators
- Power Supplies

2.0 TECHNICAL DESCRIPTION

2.4 Circuit Description

The superband multi-channel input signal is applied to the input of the translator (J4) and fed to the SuperBand Bandpass Filter w/ Amplifier module (1509-1107) which consist of two lumped element bandpass filters and two MAV-11 amplifiers. The output of this module is padded and applied to the IF input of the mixer (ZFM-15) where it is mixed with the LO signal.

The LO signal is generated on the VHF Generator Board (1500-1102). This board is comprised internally of a voltage controlled crystal oscillator circuit that is a modified Colpitts design . The crystal is mounted in an oven set at 60° C and operates at 1/24 of the local oscillator frequency. A PLL circuit on the VHF generator board divides a sample of the channel VCXO frequency and compares it to a divided down reference frequency generated by the 10 MHz Oscillator module (1519-1037) or to an external precise reference. The difference between the phase of the reference frequency and the divided down VCXO frequency sample causes the PLL IC to create an error output voltage or Automatic Frequency Control (AFC) voltage which is used to bias a variable capacitor in the VCXO circuit.

The output signal from the VHF Generator board is applied to the input of the X* Multiplier Board (1607-1109) which consist of three x2 broadband doublers ($2^3 = 8$). The output signal is applied to a X3 Multiplier board which consist of multiplier board that generates harmonics if the input signal and a two-section cavity filter tuned to select the third harmonic. The LO (2278 MHz) output signal of the X3 Multiplier is fed to the LO input of the mixer where it is mixed with the IF signal to produce the RF output signal.

The RF output of the mixer is fed to a Four Section Bandpass Filter (2140-1033) then to the Broadband Filter Module (2500-2700). The output of the filter is fed to the Amplifier Attenuator Module (1132-11509) input (J1). The input signal is AC coupled and amplified then applied to a "tee" configuration Pin Diode attenuator circuit. By controlling the gain of this attenuator, the output power can be regulated, maintaining a constant output regardless of minor changes in the input signal.

An external ALC bias voltage is generated by the Peak/Average Detector Board (1510-1105), which detects the peak envelope power of the combined output signal. This bias voltage is fed to the input (J1) of the ALC Control Board (1510-1103).

On this board the signal is amplified and adjusted in level by ALC potentiometer R9 and buffered to three output jacks (J2, J5, and J6). One output (J5) is fed to the input of the ALC Fault Sense Board (1132-1501). The ALC Fault Sense Board compares the ALC bias voltage to reference voltages, set by on board potentiometers, and will light front panel LED indicators should an out of range ALC condition occur.

2.0 TECHNICAL DESCRIPTION

2.4 Circuit Description -continued

A second output from the ALC Control Board (J6) is fed to the front panel meter providing external monitoring. The third output of the board (J2) provides the ALC bias voltage for the PIN Diode attenuator in the Amplifier/Attenuator Module (1132-1509). The ALC circuit may be bypasses by moving W1 on J8 to the manual position. When the ALC is disabled, the loss through the PIN Diode attenuator is adjusted by the Manual Gain potentiometer R12, which then directly controls the output in a manual fashion.

The output of the Amplifier/Attenuator Module is connected to the Three Stage Amplifier Module (1510-1106) driver amplifier, which consist of three cascaded GaAs FET amplifiers (FLLFSX52WF driving a FLL171ME driving a NES2527-20B-3) with an overall gain of approximately 40 dB. The output of the Three Stage Amplifier Module is fed to the input of a Four Pole Bandpass Filter (2140-1033) then to the input of the 25 Watt Amplifier Module (1510-1163).

The signal is input to the 25 Watt Amplifier Module at J1 and amplified by GaAs FET Q101 (FLL105MK). Then the signal is split equally two ways by a Wilkinson in phase coupler and amplified by two parallel GaAs FET amplifiers, Q201 and Q301 (both FLFLL20IB-3's). The signal is then combined by another Wilkinson in phase coupler and fed to the RF output of the module at jack J2.

A 20 dB microstrip directional coupler provides a forward and reflective power samples of the final output signal. Both samples a sent to the Peak/Average Detector Board which detects both samples and produces a forward and reflected metering voltage which drives the booster's front panel meter.

The DC bias drain to source currents of each FET within the Three Stage Amplifier Module and the 25 Watt Amplifier Module are set by adjusting the negative gate to source voltages which are adjusted by potentiometers located next to the corresponding FET.

The Six Section Bias Protection Board (1500-1104) supplies the two amplifier modules with both +10 VDC (operating voltage) and -5 VDC (bias voltage).

The Transmitter Control Board (1510-1103) provides the capability to control and monitor the operating status of the translator. The board is designed to protect the booster in the event of the following faults: over temperature, loss or reduction in output power and loss of the -5 VDC GaAs FET bias voltage. The Transmitter Control Board also provides the capability to remotely control and monitor the translator status through remote operate/standby commands and remote forward power metering.

2.0 TECHNICAL DESCRIPTION

2.4 Circuit Description -continued

The unit may be configured to be powered by either a 115 VAC/60 Hz or 230 VAC/50 Hz source. The AC source enters the tray at jack J1 and is distributed to a terminal block (TB2). Varistors VR1, VR2, VR3 and VR4 provide transient and over voltage protection to the booster. The rear panel circuit breaker (CB1) applies AC voltage to the input of the toriod transformer.

The Toroid transformer provides two 15 VAC secondary windings. The first winding is sent to a full wave bridge rectifier which supplies a positive 18 VDC to several positive voltage regulators located on the ±12 VDC Power Supply Board (1500-1145). The second winding is supplied to a full wave bridge rectifier circuit located on the ±12 VDC who's output is sent to a negative voltage regulator. One +12 VDC switching supply (SPL250-1012), rated at 21 amperes, is used to supply the GaAs FET amplifier modules with power.

2.0 TECHNICAL DESCRIPTION

2.5 Alignment Procedure

In the following procedure, the complete multi-channel translator is adjusted for optimum performance. This alignment procedure is performed by adjusting each circuit for its specified performance while observing the appropriate output parameters of the board or subassembly being adjusted.

Because of the broadband nature of the amplifier stages, this is a straightforward procedure, easily accomplished is RF test equipment is available. In this procedure, the input signals are first connected and each circuit is adjusted in sequence by connecting the test equipment to the specified point.

Equipment required:

1. Spectrum Analyzer (with tracking generator)
2. Network Analyzer
3. Power Meter
4. Multi-channel test signal
5. 30 dB Coupler
6. Attenuators
7. Digital Multimeter (DMM)
8. Frequency Counter

VHF Generator, X8 Multiplier, UHF Bandpass Filter, X3 Multiplier
(A28, A29-1, A30, A31) 1500-1102, 1067-1109, 1107-1101, 1003-1004

1. Connect frequency counter to 10 MHz input cable (J3) of VHF Generator Board and adjust the 10 MHz oscillator for 10 MHz ±1Hz..
2. With J2 and J3 jumpers removed, adjust R19 for –3.0 volts at TP3.
3. Monitor J15 with a spectrum analyzer and J16 with a frequency counter.
4. Adjust L3, .L4, C12 and C21 to peak output signal at J15.
5. Adjust C11 for the correct frequency ±20Hz.
6. Reconnect jumpers on J2 and .J3 and reconnect J15.
7. Visually monitor DS1 to verify PLL locks. If the PLL remains unlocked, use oscilloscope to minimize spikes on chip U1 by adjusting R46.
8. Monitor J2 on X8 Multiplier assembly with spectrum analyzer with center frequency set to eight times the crystal frequency.

2.0 TECHNICAL DESCRIPTION

2.5 Alignment Procedure - continued

9. Maximize the eighth harmonic (10 to 13 dBm) and minimize the seventh and ninth harmonic by adjusting C4, C6, C10, C12, C18 and C20.

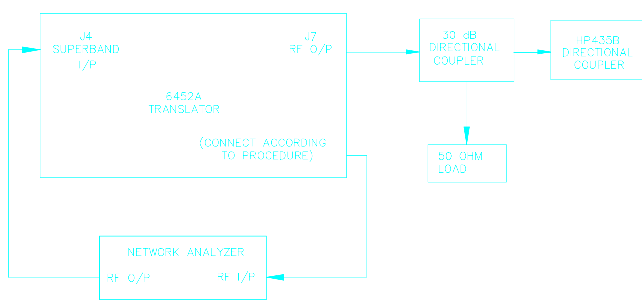
10. Reconnect J2 and connect analyzer to the output of the UHF Bandpass Filter (A30).

11. Tune filter to maximize the eighth harmonic of the crystal. Seventh and ninth harmonic should be at least 55 dB below eighth harmonic peak.

12. Monitor the output of the X3 Multiplier and tune filter to peak the LO (2278 MHz) signal.

Superband Bandpass Filter, 4 Section Bandpass Filter, 3 Section Broadband Filter
(A24-A1, A26, A11) 1509-1107, 2140-1043, 2500-2700

1 . Normalize cables of the network analyzer and connect the analyzer as shown below. Set analyzer to sweep the input frequency range. Note: The analyzer will be used to monitor various points throughout the translator.



2. Connect the RF input of the analyzer toJ3 of the Super band Bandpass Filter (A24-A1) and tune C2, C3, C4 C10, C11 and C12 to flatten the response of the module..

3. Move the input to the analyzer to the output of the Superband Bandpass Filter (J2) and retune capacitors for flat response

4. Disconnect analyzer and set to sweep from 2500 to 2700 MHz. Normalize cables then connect analyzer output to the input of the 4 Section Bandpass Filter (A26). Connect the analyzer input to J5 on the rear panel.

5. Tune the 4 Section Bandpass Filter to flatten response.

6. Connect the RF input of the analyzer to the output of the 3 Section Broadband Filter (A11) and tune the filter for flat response.

2.5 Alignment Procedure - continued

ALC Control Board, Amplifier Attenuator Module
(A17, A12) 151510-1103, 1132-1509

1 . Set S1 on ALC control Board to Manual Mode and adjust R12 for 1.6V at FL3 of Amplifier Attenuator Module (A12).

2. Connect the RF input to the analyzer to the output of the Amplifier Attenuator Module (J2). Place the translator into the operate mode and tune the module to flatten the response.

Three Stage Amplifier Module (A13-A1) 1510-1106

This amplifier does not contain any RF tuning adjustments. The module contains three cascaded broadband GaAsFET amplifier stages providing a nominal gain of 36 dB. The operating current for the first two stages (Q101, Q201) is controlled by a pot mounted on a bias board within the module and can be set by measuring the voltage drop across the across a resister located next to each FET. The bias for the third stage (Q301) is set by measuring the voltage drop across the 0.05 ohm resistor located on the Four Section Bias Protection Board (1500-1114).

1. With no RF signal applied and with the translator off, unsolder the drain leads located near the ferrite beads of Q201 and Q301. Connect a digital voltmeter across R104 located next to Q101. Apply AC power to the transmitter and place the transmitter into the Operate mode.

2. Adjust the bias control resistor (R102) for a reading of 5.5 mV across R104. This voltage represents a bias current of 55 mAmps on Q101.

3 . Place the translator into the standby mode and then turn the translator off. Unsolder the drain lead of Q101 and resolder the drain lead of Q201. Apply AC power to the transmitter and place the transmitter into the Operate mode. Adjust the bias control (R202) for a reading of 60 mV across R204 located next to Q201. This voltage represents a bias current of 0.6 amps on Q201.

4. Place the transmitter into the standby mode and then turn the transmitter off. Resolder the drain leads of Q101 and Q301. Apply AC power to the transmitter and place the transmitter into the Operate mode. Adjust the bias control potentiometer R303 for a reading of 100 mV across R1 on the Four Section Bias Protection Board. This represents a bias current of 2.0 amps on Q301.

The output of this amplifier is fed to the 25 Watt Amplifier Module (A13-A2).

2.0 TECHNICAL DESCRIPTION

2.5 Alignment Procedure - continued

Four Pole Bandpass Filter (A13-A5) 2140-1033

The output of the Three Stage Amplifier Module is fed through a Four Pole Bandpass Filter. This filter eliminates any intermodulation products (IMD) created in the amplifier. This filter has been factory tuned, no user adjustments are necessary.

25Watt Amplifier Module (A13-A2) 1500-1164

This amplifier does not contain any RF tuning adjustments. The module contains two cascaded broadband GaAsFET amplifier stages (one FLL105MK driving two parallel FLL200IB-3's). The operating current for each device (Q101, Q201, Q301) is controlled by a pot mounted near each device within the module and can be set by measuring the voltage drop across the 0.05 ohm resistor located on the Four Section Bias Protection Board (1500-1114).

GaAS FET Transistor	Potentiometer Adjustment	Bias Protection Board Resistor	Voltage Across Bias Protection Resistor	Drain Current Calculated
Q101	R106	R2	9.0 mV	180 mA
Q201	R202	R3	240.0 mV	4.8 A
Q301	R302	R4	240.0 mV	4.8 A

The voltages needed to operate the amplifier modules are provided by the + 12V/21 A switching supplies (A6 and A8) and the ±12 VDC Power Supply board (A3) which produces the –5VDC bias voltage.

The –5 VDC supply is non-adjustable with a regulated output. To prevent damage to the GaAs FET amplifiers, the +12VDC switching supplies will not turn on until the –5VDC bias supply is present.

The +12VDC/21A switching, regulated regulated power supplies do not require any adjustment.

Four Pole Bandpass Filter (A13-A6) 2140-1033

The output of the 25W Amplifier module is fed through a Four Pole Bandpass Filter. This filter eliminates any intermodulation products (IMD) created in the amplifier. This filter has been factory tuned, no user adjustments are necessary.

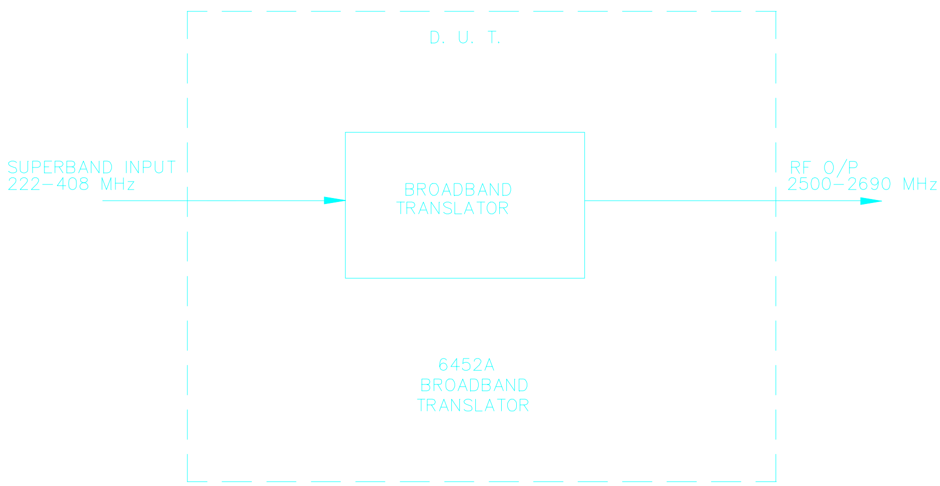
The output of the Four Pole Bandpass Filter is connected to the RF output jack (J7) on the rear of the tray. Connect the RF output (J7) of the to a RF power meter through a suitable directional coupler. Connect the main output of the coupler to a suitable load.

2.0 TECHNICAL DESCRIPTION

2.6 Block Diagrams

The following is a system block diagram for the 6452A Multi-Channel Translator. Detailed Block Diagrams and Schematics are included in Exhibit II.

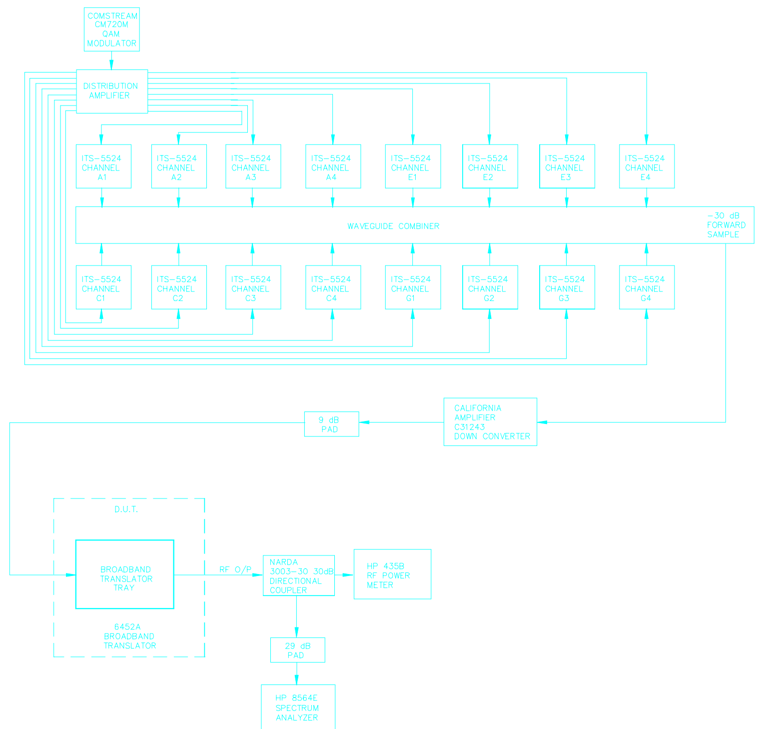
System Block Diagram:



3.0 ENGINEERING DATA

3.1 RF Power Measurements

The following block diagram illustrates the test equipment set-up for RF power measurement:



Before testing the 6452A multi-channel translator, the ITS-5724 transmitters (FCC ID# CJJ79SITS-7026) used to generate the multi-channel input signal to the translator were tested and observed to meet specifications. Then, the translator was tested and observed, as illustrated in the following sections, to reliably reproduce the transmitted signals in accordance with the rules set forth in the Rules and Regulations.

3.0 ENGINEERING DATA

3.1 RF Power Measurements - continued

With sixteen QAM carriers present, the output power of the 6452A translator was adjusted to full rated output power (500 mWatts total average) as observed on the RF power meter. With the power level properly set to 500 mWatts, all required tests were performed and recorded in the following sections.

Number of channels	Average power/channel	Total Average Power
16	31.25 mW	500 mW

Note: The peak envelope power has been determined and observed to be six times, or 7.8 dB, above the total average power. Therefore, the maximum peak envelope power for the 6452A is approximately 3.0 watts. In addition, for multi-channel loading, a doubling in the number of channels requires a 3 dB back off in the peak power per channel. Also, in the case of 8 or more channels, the total average power remains constant at 500 mwatts. The average power per channel is 500 mwatts divided by the number of channels.

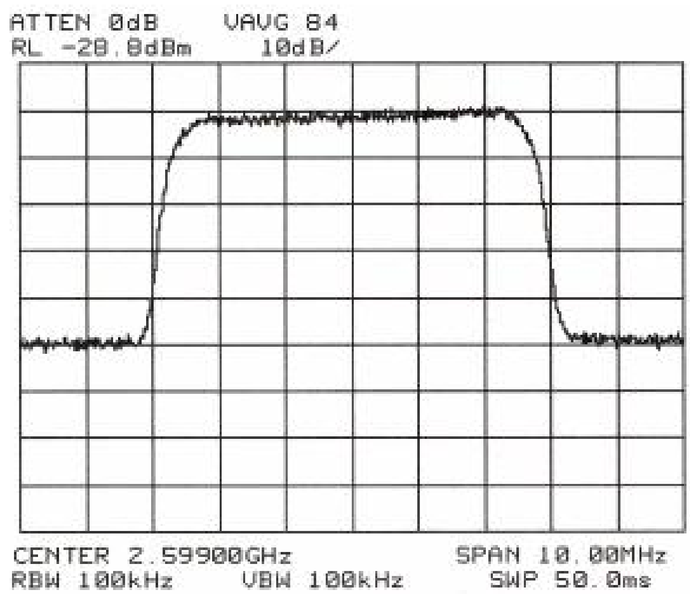
3.0 ENGINEERING DATA

3.2 Occupied Bandwidth

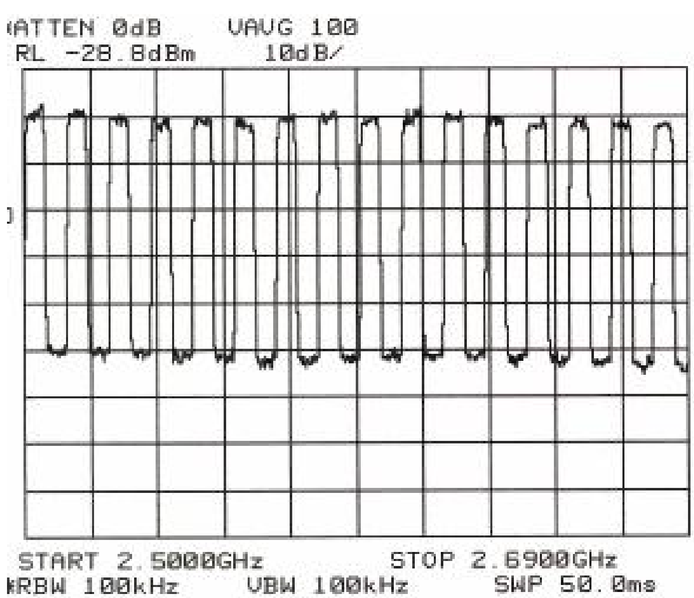
Using the test set-up in Section 3.1, with the unit operating at 500 mW (total average) output power and with sixteen input signals (A1, A2, A3, A4, C1, C2, C3, C4, E1, E2, E3, E4, G1. G2, G3, and G4) present, the analyzer was set to a span of 10 MHz and a reference level was established (see plot below). Then the analyzer was adjusted to a span of 190 MHz and the occupied bandwidth (2500.0 MHz – 2690.00 MHz) was observed and recorded below.

Note: The 190 MHz bandwidth permits a maximum of thirty one 6MHz channels.

Reference Level Plot/10 MHz Span (500 mWatts total average):



Occupied Bandwidth Plot/190 MHz Span (500 mWatts total average):

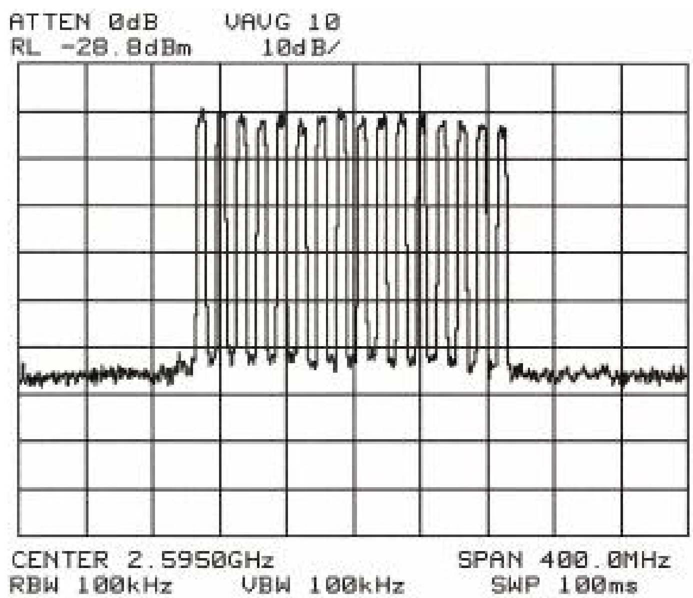


3.0 ENGINEERING DATA

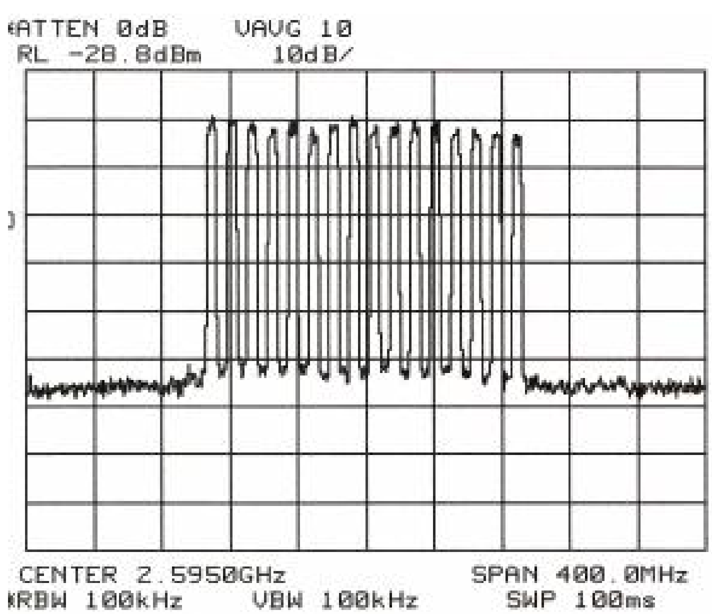
3.3 Out-of-Band Power

Using the test set-up of section 3.1, with the output power adjusted to 500 mW total average and with 16 input signals ranging from the lowest to highest channel frequencies (A1 to G4), the spectrum outside of the specified band was observed and data was taken at band edges, ±250 KHz from band edge and ±3.0 MHz from band edge. These spectral points were measured at the same resolution bandwidth used to establish the reference level on the analyzer (see spectrum analyzer plots below).

Out-of-Band Power Plot/400 MHz Span (500 mW total average):



Out-of-Band Power Plot/500 MHz Span (500 mW total average):



3.0 ENGINEERING DATA

3.3 Out-of-Band Power - continued

2480 MHz (-20 MHz from band edge) Measurement:

When measuring multi-channel QAM input signals, the dynamic range of the spectrum analyzer is reduced with increasing number of input signals. With 16 QAM input signals, the dynamic range of the analyzer is less than 60 dB. Therefore, to make an accurate measurement, bandpass filters tuned to the spectral points of interest were used to limit the input power to the analyzer and thereby increase the dynamic range of the measurement. The out-of-band emission power was then subtracted from the average in band channel power to determine the actual emission level.

Two cable assemblies were used for the following measurements. Cable assembly 1 consisted of two cables and a 29 dB pad (see test set-up below). Cable assembly 1 was used to limit the power to the analyzer when measuring average in band channel power. Cable assembly 2 consisted of two cables and a bandpass filter tuned to the spectral point of interest. Cable 2 was used to limit the power input to the analyzer by passing a 12 MHz frequency band centered at the spectral point of interest.

With the bandpass filter of cable 2 tuned to 2480 MHz, the difference in cable loss (L) between cable 1 and cable 2 at 2480 MHz was observed on the network analyzer and recorded.

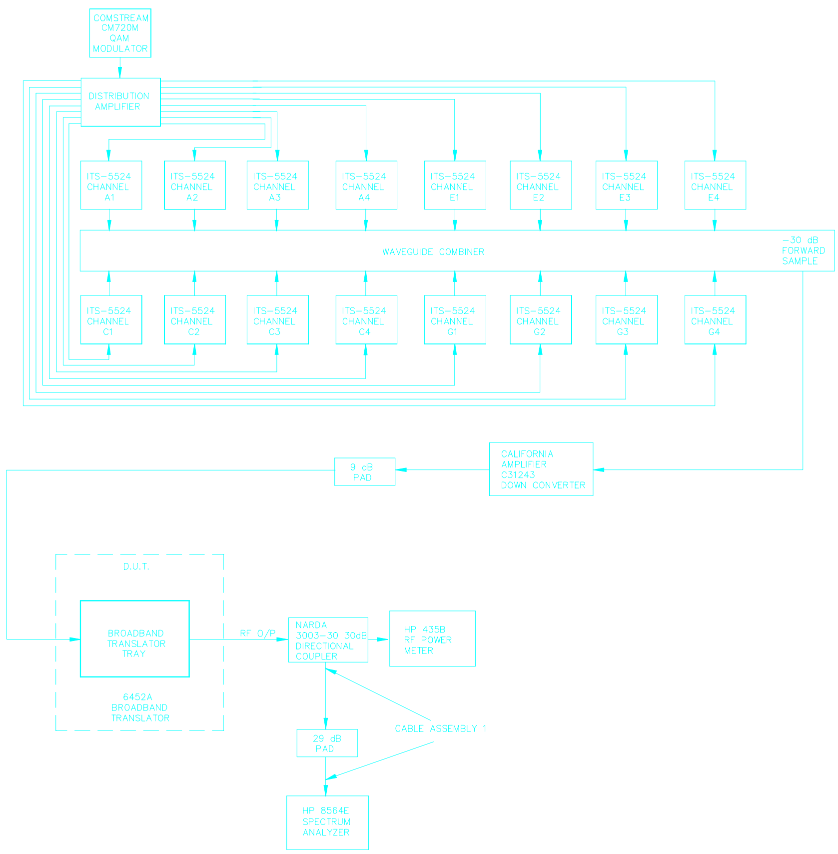
$$L = \text{Cable 1 loss} - \text{Cable 2 loss} = 24.65 \text{ dB}$$

The difference in cable loss will be added to the difference in channel signal power (S) and noise power (N) to determine the signal to noise ratio (SNR).

3.0 ENGINEERING DATA

3.3 Out-of-Band Power - continued

Using the test set-up below, the channel signal power of an occupied channel in the center of the band (E1 = 2599 MHz) was measured over a bandwidth of 5.1 MHz using the Channel BW function of the analyzer. The 5.1 MHz BW is the equivalent noise power BW of a QAM signal through a Nyquist filter as used in the modulator. The 5.1 MHz BW is also the half power points of a QAM signal.

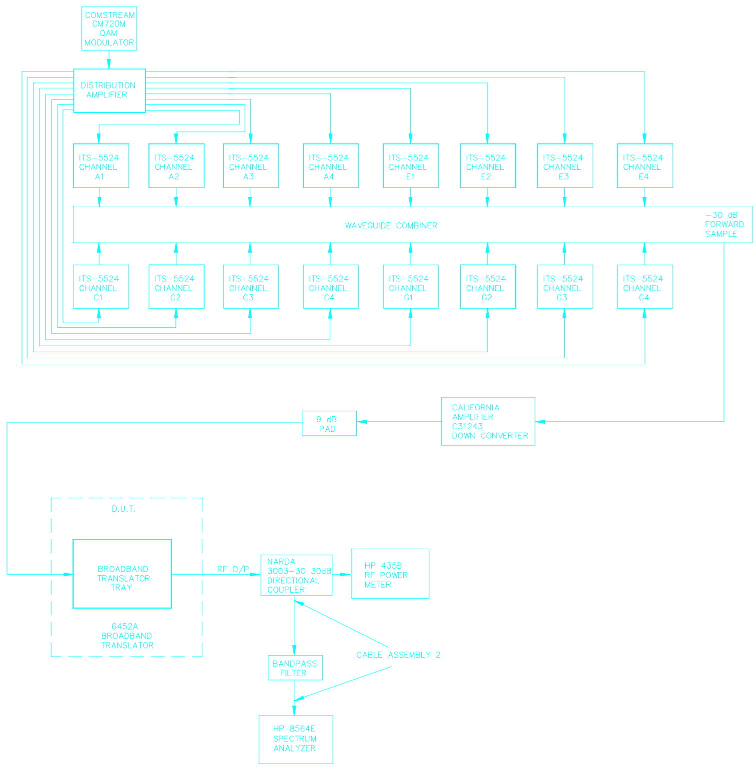


S = channel signal power = -27.7 dBm

3.0 ENGINEERING DATA

3.3 Out-of-Band Power - continued

After replacing cable 1 with cable 2 as show below, the noise power (N) was measured at 2480 MHz over the same 5.1 MHz bandwidth used to measure the channel signal power above.



N -= noise power @ 2480 MHz = -67.7 dBm

The SNR is equal to the channel signal power minus the noise power plus the difference in cable loss.

$$SNR = S – N + L$$

$$SNR = -27.7 \text{ dBm} –(-67.7 \text{ dBm}) + 24.65 \text{ dBm} = 64.7 \text{ dBm}$$

Therefore the emission level at the 2480 MHz spectral point is 64.65 dB below the in-band channel signal power.

3.0 ENGINEERING DATA

3.3 Out-of-Band Power - continued

After measuring the emission level at –20 MHz from band edge (2480 MHz), the filter was tuned to +20 MHz from band edge (2710 MHz) and the emission level was observed and recorded following the procedure outlined above.

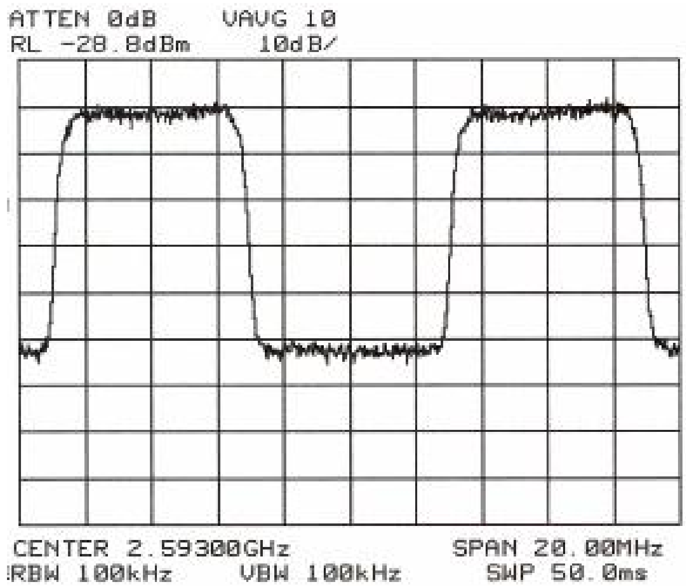
Frequency (MHz)	Source	Level Observed
2500 – 2690	operating band	0 dB (reference)
2500	lower band edge	-43.5 dB
2499.75	-250.0 KHz below band edge	-51.0 dB
2497	-3.0 MHz below band edge	-53.2 dB
2480	-20.0 MHz below band edge	-64.7 dB
2690	upper band edge	-51.2 dB
2690.25	+250.0 KHz above band edge	-51.3 dB
2693	+3.0 MHz above band edge	-53.0 dB
2710	+20.0 MHz above band edge	-69.0 dB
5000 – 5380	2nd harmonic frequencies	-61 dB (max)
7500 – 8070	3rd harmonic frequencies	-61 dB (max)
10000 – 10760	4th harmonic frequencies	-61 dB (max)
12500 – 13450	5th harmonic frequencies	-61 dB (max)
15000 – 16140	6th harmonic frequencies	-61 dB (max)
17500 – 18830	7th harmonic frequencies	-61 dB (max)
20000 – 21520	8th harmonic frequencies	-61 dB (max)
22500 – 24210	9th harmonic frequencies	-61 dB (max)
25000 – 26900	10th harmonic frequencies	-61 dB (max)

3.0 ENGINEERING DATA

3.4 Unoccupied Channel Emissions

Using the test set-up in Section 3.1, and with the translator adjusted to 500 mWatts total average output power, and with 16 input signals ranging from the lowest to highest channel frequencies (A1 to G4), the emissions within an unoccupied channel were observed. With the average inband signal set as the reference, the spurious emissions were observed recorded (see spectrum plot and table below).

Unoccupied Channel Emissions Plot (500 mWatts total average):



Note: The above plot shows unoccupied channel D4 (2593 MHz center channel)

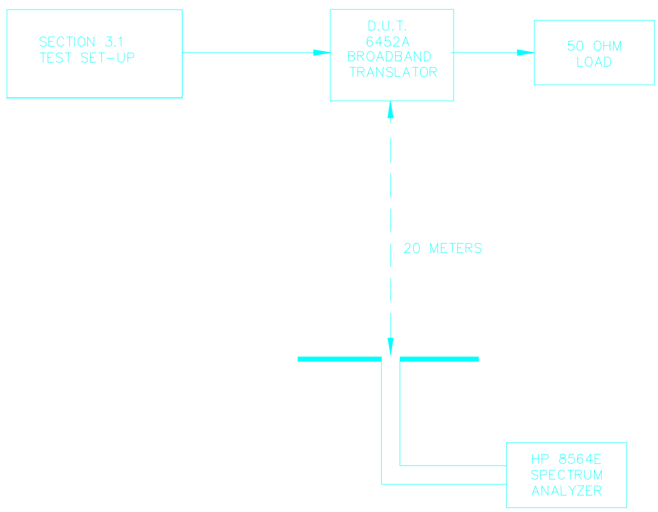
Frequency (MHz)	Source	Level Observed
2590.00	lower channel edge	-34 dB
2590.25	+250.0 KHz above lower ch edge	-48 dB
2591.00	+1.0 MHz above lower ch edge	-51 dB
2592.00	+2.0 MHz above lower ch edge	-52 dB
2593.00	center channel (3.0 MHz)	-52 dB
2594.00	-2.0 MHz below upper ch edge	-52 dB
2595.00	-1.0 MHz below upper ch edge	-51 dB
595.75	-250.0 KHz below upper ch edge	-50 dB
2596.00	upper channel edge	-37 dB

3.0 ENGINEERING DATA

3.5 Radiated Emissions

Using the test set-up below, with the translator operating at full output power (1.0 Watts total average) and with eight input signals, the spectrum analyzer was moved 20 meters from the translator and connected to a dipole antenna cut to the visual carrier frequency of A1 (2501.25 MHz). This antenna was oriented to maximize the received level, and the data was recorded. The antenna was then cut to the remaining seven center channel frequencies and the second through the tenth harmonic frequencies and all signals received were maximized by antenna orientation, and their absolute levels were recorded (see table below).

Test Set-up:



MEASURED LEVELS

Frequency (MHz)	Source	Level Observed (into 50 Ω)
2500 – 2690	operating band	None Observed
5000 – 5380	2nd harmonic frequencies	None Observed
7500 – 8070	3rd harmonic frequencies	None Observed
10000 – 10760	4th harmonic frequencies	None Observed
12500 – 13450	5th harmonic frequencies	None Observed
15000 – 16140	6th harmonic frequencies	None Observed
17500 – 18830	7th harmonic frequencies	None Observed
20000 – 21520	8th harmonic frequencies	None Observed
22500 – 24210	9th harmonic frequencies	None Observed
25000 – 26900	10th harmonic frequencies	None Observed

3.0 ENGINEERING DATA

3.5 Radiated Emissions - continued

Note: The spectrum analyzer had a maximum sensitivity of -100 dBm during these tests.

These levels were then compared to the following reference level:

If all of the transmitter's power (1.0 Watts) was radiated by an isotropic radiator, the power density at 20 meters would be:

$$Pd = 0.5/4\pi\ R^2 = 0.5/4\pi\ (20)^2 \cong 99.47x10^{-6}\ w/m^2$$

Using a dipole transmitting antenna increases this by 1.64 to:

$$1.64 * 99.47x10^{-6} = 163.13\ x10^{-6}\ w/m^2$$

If a dipole receive antenna of area 1.64 * $\lambda^2/4\pi$ is used to receive the signal, the received level would be:

$$163.13\ x10^{-6} * 1.64 * \lambda^2/4\pi = 302.31x10^{-9}\ w = -65.2\ dBw = -35.2\ dBm$$

Therefore, with a carrier reference level of –35.2 dBm, and an analyzer measurement threshold of -100 dBm, no measured values exceeded a level of:

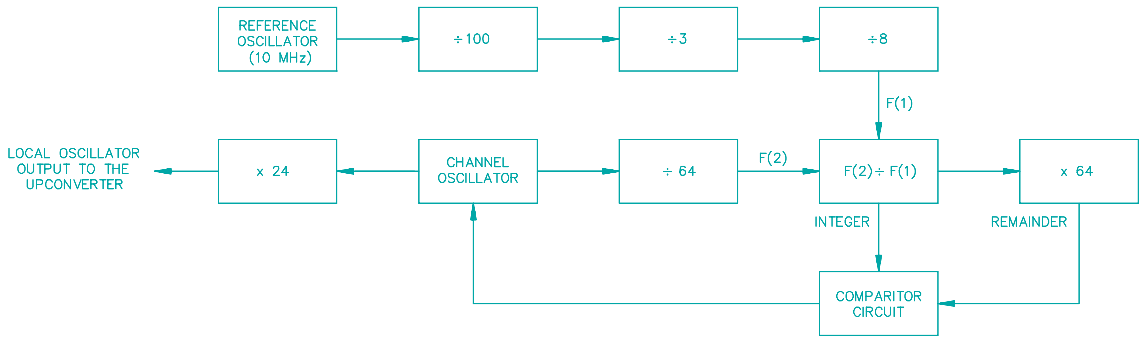
-100 dBm -(-35.2 dBm) = <u>-64.8 dBc</u>

3.0 ENGINEERING DATA

3.6 Frequency Stability

Channel Oscillator Analysis

The following is the functional block diagram for phase-locking the channel oscillator:



F_r = Reference oscillator frequency
F_{co} = Channel oscillator frequency
E_r = Reference oscillator error
E_{co} = Channel oscillator error

$F(1) = F_r/2400$
$F(2) = F_{co}/64$

$F(2)/F(1) = 37.5 \times (F_{co}/F_r)$ (Equation 1)

The comparitor circuit sends an error voltage to the channel VCXO, which maintains the value derived by equation 1. If error is introduced to the reference oscillator (E_r), the comparitor offsets the channel VCXO in a manner that preserves the relationship in equation 1. This offset is defined as the channel oscillator error (E_{co}). The following is an algebraic definition for the channel oscillator error:

$37.5 \times (F_{co} + E_{co})/(F_r + E_r) = 37.5 \times F_{co}/F_r$
$(F_{co} + E_{co})/(F_r + E_r) = F_{co}/F_r$
$F_r \times (F_{co} + E_{co}) = F_{co} \times (F_r + E_r)$
$F_r \times E_{co} = F_{co} \times E_r$

$E_{co} = E_r \times (F_{co}/F_r)$ (Equation 2)

The local oscillator (L.O.) frequency is 24 times the channel oscillator, or $24 \times F_{co}$. The RF output frequency is the upper product of mixing the L.O. with the superband input signal (F_{input}) The following is the algebraic expression for the output frequency:

$RF = [24 \times F_{co}] + F_{input}$ or,
$RF = [24 \times (F_{co} + E_{co})] + F_{input}$ (error introduced into the equation)

3.0 ENGINEERING DATA

3.6 Frequency Stability - continued

Based on the above equation, the following equation gives the expression for the error in the output RF:

$RF_{error} = [24 \times E_{co}]$

Substituting equation 2 into the above error equation yields the following:

$RF_{error} = [24 \times (E_r \times F_{co}/F_r)]$ (Equation 3)

Substituting the channel oscillator frequency (94.91667 MHz), and the reference oscillator frequency (10.0 MHz) into equation 3 yields:

$F_r = 10$ MHz $F_{co} = 113.625$ MHz $E_{if} = 440$ Hz

$RF_{error} = 227.80 \times E_r$ (Equation 4)

The 10 MHz reference oscillator was placed in a Thermotron temperature test chamber, and the temperature was varied from -30°C to +50°C. The frequency of the oscillator was measured at 10°C increments up to +50°C. The oscillator was allowed a reasonable amount of time to stabilize at each temperature increment. The data on the following pages records the reference oscillator frequency over the temperature range and a calculation of the output frequency error. This data indicates that the transmitter's output frequency is within the FCC tolerance for this service.

3.0 ENGINEERING DATA

3.6 Frequency Stability - continued

OSCILLATOR TEMPERATURE STABILITY DATA

TEMP. (°C)	10.00 MHz Reference Oscillator	Reference Oscillator Error (E_r)	Output Frequency Error (227.80 x E_r)
-30	10.000001.2 MHz	1.2 Hz	273.46 Hz
-20	10.000001.0 MHz	1.0 Hz	227.80 Hz
-10	10.000000.8 MHz	0.8 Hz	182.24 Hz
0	10.000000.5 MHz	0.5 Hz	113.90 Hz
+10	10.000000.0 MHz	0.0 Hz	0.0Hz
+20	10.000000.0 MHz	0.0 Hz	0.0Hz
+30	10.000000.4 MHz	0.4 Hz	91.12 Hz
+40	10.000000.1 MHz	0.1 Hz	22.78 Hz
+50	10.000000.7 MHz	0.7 Hz	159.46 Hz

3.0 ENGINEERING DATA

3.6 Frequency Stability - continued

FREQUENCY STABILITY VS. LINE VOLTAGE

Line Voltage (VAC at 60 Hz)	10.00 MHz Reference Oscillator	Reference Oscillator Error (E_r)	Output Frequency Error (227.80 x E_r)
95V	10.000000 MHz	0 Hz	0 Hz
115V	10000000 MHz	0 Hz	0 Hz
135V	10000000 MHz	0 Hz	0 Hz

3.0 ENGINEERING DATA

3.7 Test Equipment

MODEL	MANUFACTURER	DESCRIPTION	SERIAL #
8564E	Hewlett Packard	Spect. Analyzer 9 KHz - 40 GHz	3619A02932
8714B	Hewlett Packard	Network Analyzer .01 GHz - 40 GHz	US35490400
3003-30	Narda	30 dB Directional Coupler	20873
300340	Narda	10 dB Directional Coupler	1453
435A	Hewlett Packard	RF Power Meter	1601A03842
8481B	Hewlett Packard	30 Watt Power Sensor	3318A09253
77	Fluke	Digital Multimeter	81000244
8401	Termaline	Coaxial Resistor	6622
C31243	California Amplifier	Low Noise Downconverter	24866

4.0 IDENTIVICATION LABELS/LABEL PLACEMENT AND PHOTOGRAPHS

4.1 Rear Panel FCC Identification Label:

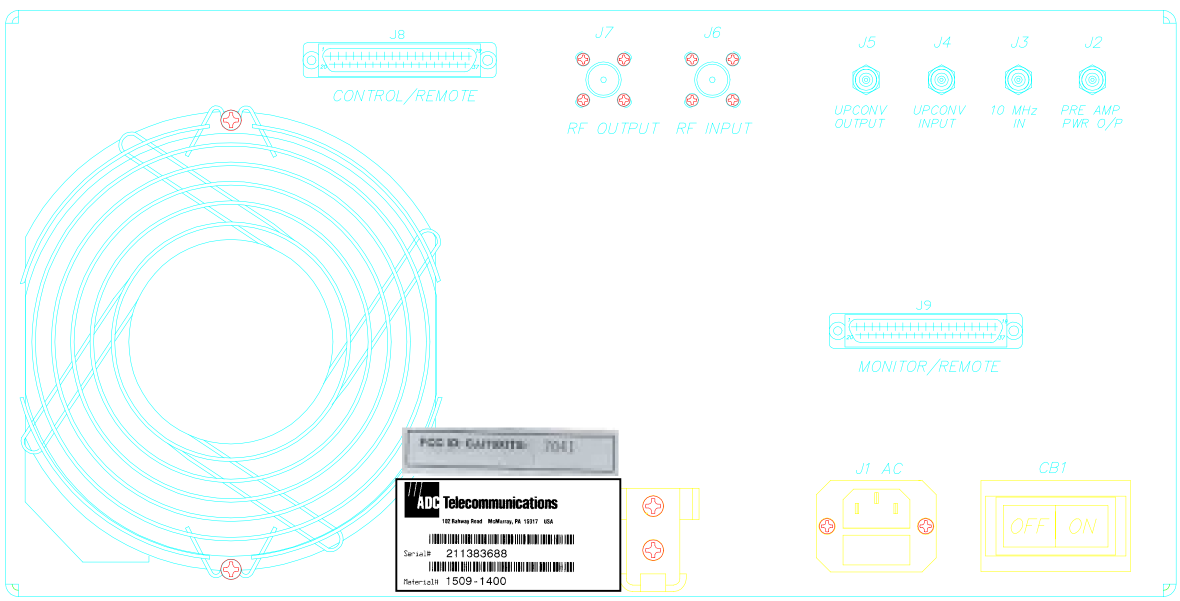
4.2 Rear Panel ADC Telecommunications Manufacturer's Labels:

Broadband Translator Tray

4.0 IDENTIFICATION LABELS/LABEL PLACEMENT AND PHOTOGRAPHS

4.3 Rear Panel Drawing (Label Placement)

Rear Panel (Broadband Booster Tray)



4.0 IDENTIFCATION LABELS/LABEL PLACEMENT AND PHOTOGRAPHS

4.4 Photograph List

Note: The following photos can be found in the external photos attachment:

4.4.1 Front view, 6452A Broadband Translator.
4.4.2 Rear view, 6452A Broadband Translator.

Note: The following photos can be found in the internal photos attachment:

4.4.3 Top view, flip plate (Filters/Amplifier Module/X3 Multiplier/Mixer).
4.4.4 Bottom view, flip plate (VHF Generator/10 MHz Reference/X8 Multiplier).
4.4.5 Top view, (Amplifier Modules/DC Power Supply /Translator Control).
4.4.6 Bottom view, (Switching Power Supplies).

5.0 CERTIFICATION OF TEST DATA

This equipment has been tested in accordance with the requirements contained in the appropriate Commission regulation. To the best of my knowledge, these tests were performed using measurement procedures consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards. Each unit manufactured, imported or marketed, as defined in the Commission's regulations, will conform to the sample(s) tested within the variations that can be expected due to quantity production and testing on a statistical basis. I further certify that the necessary measurements were made by ADC Telecommunications, 102 Rahway Road, McMurray, Pennsylvania 15317.

David Urban

Dave Urban, Chief Engineer

Todd Anderson

Todd Anderson, Engineer