Vitacom

INSTALLATION AND OPERATION

MANUAL

2/5/10/20/30/40/50/70 WATT TRANSCEIVER

STANDARD C-BAND

EXTENDED INTELSAT C-BAND

MANL 021100

Revision 1/14/03

CHAPTER ONE EQUIPMENT DESCRIPTION

The Vitacom Systems' C-band transceiver family is designed to provide low-cost, high-performance solutions for satellite communications networks. These transceivers are all designed with industry-standard 70 MHz interfaces to be able to interface with a wide range of commercially available modems, including the Vitacom Systems' M-5000 family of modems.

The transceivers are designed to operate over the standard C-band with an input frequency of 70 MHz and a transmit frequency coverage of 5925 to 6425 MHz. Optionally, the transceivers are available to operate over the extended Intelsat band of 5850 to 6425 MHz.

On the receive side, a separate LNA (low-noise amplifier) is mounted directly to the antenna to provide low-noise amplification of the receive signal over the 3700 to 4200 MHz band (other bands optionally covered). The output of the LNA is fed to the receive side of the transceiver, where the signal is downconverted to the 70 MHz band for the modem.

The transceiver is provided with an RS-232 local console connection for direct local monitoring of the transceiver. This port can be used during installation by the field engineer and can also be cabled indoors for connection to an M&C system.

This chapter presents a description of the operation of the overall transceiver and of the individual modules in the transceiver.

ODU FREQUENCY PLAN

The transceiver is designed to accept a transmitted modem signal at a nominal frequency of 70 MHz +/- 18 MHz. This 70 MHz signal is upconverted twice to reach the final output frequency range of 5.925 to 6.425 GHz. The first upconversion is driven by a fixed frequency phase-locked oscillator operating at a frequency of 11112.5 MHz. The resultant IF frequency is 1182.5 MHz +/- 18 MHz.

The second upconversion is driven by a synthesized frequency source which operates over the range of 4742.5 MHz to 5242.5 MHz. The synthesizer operates with steps of 2.5 MHz, allowing the output to cover the frequency range of 5925 to 6425 MHz in 2.5 MHz steps. The actual frequency of operation of the synthesizer will be determined by the transponder frequency to which the user has been assigned. In normal practice, the synthesizer is set for operation at the center of the transponder with the modem set to 70 MHz, allowing for the modem to cover the entire 36 MHz transponder without retuning the transceiver synthesizer.

UPCONVERSION

The upconversion consists of nine operations to convert the 70 MHz input signal to the output frequency of 5925 MHz to 6425 MHz. These nine operations are as follows:

- Amplification
- First Upconversion
- Amplification
- Filtering
- Variable Attenuator
- Amplification
- Low-Pass Filtering
- Second Upconversion
- Amplification

Amplification: The signal is amplified by one MMIC amplifier to provide 19 dB of gain at the 70 MHz frequency. The MMIC amplifier provides a flat gain response over the input frequency range.

First Upconversion: The 70 MHz signal is upconverted by a diode mixer to the IF frequency of 1182.5 MHz. The mixer is driven by a fixed LO (Local Oscillator) of 1112.5 MHz.

Amplification: The upconversion is followed by a MMIC amplifier to provide a gain of 11 dB at the 1182.5 MHz frequency band.

Filtering: Filtering is used to eliminate unwanted signals. After the first upconversion, a microstrip bandpass filter with a passband of 1182.5 MHz +/- 18 MHz is used to filter out the spurious signals. The unwanted signals include the 1112.5 MHz LO leakage through the mixer, and the image of the mixing process at 1042.5 MHz, as well as other harmonic products of the signal mixing.

Variable Attenuator: A MMIC attenuator is provided in the upconverter to control the gain of the unit over both temperature and frequency. During the manufacture of the unit, the unit is operated over the full specified temperature and frequency ranges. The drive levels to the MMIC attenuator required to keep the gain constant over frequency and temperature are measured and stored. The MMIC attenuator drive levels are then downloaded to an EPROM and read out during operation.

Amplification: The variable attenuator is followed by a MMIC amplifier providing 11 dB of gain at the 1182.5 MHz frequency.

Low-Pass Filter: The MMIC amplifier is followed by a low-pass filter designed to filter out the second and third harmonic outputs of the 1182.5 MHz signal.

Second Upconversion: The second upconversion uses a diode mixer to upconvert the 1182.5 MHz signal to the final transmit band of 5925 to 6425 MHz. The mixer is driven by a synthesizer operating in the 5 GHz range.

Amplifier: The second upconversion is followed by a MMIC amplifier which provides 10 dB of gain over the 6 GHz transmit band.

POWER AMPLIFIER

2, 5, 10, 20, 30, 40, 50, 70 Watt Options The transceiver can be provided with power amplifiers operating at output powers of 2, 5, 10, 20, 30, 40, 50, or 70 watts. The power amplifier is designed to accept the 5.925 to 6.425 GHz output from the upconverter and amplify the signal(s) to its final output level. The power amplifier includes multiple amplifier stages. MMIC amplifiers are used for all of the low and intermediate level gain stages. These MMIC amplifiers are already matched to 50 ohms over the transmit frequency range and provide extremely repeatable performance from unit to unit.

MMIC Gain Stage: A MMIC gain stage is used at the input of the power amplifier to provide 10 dB of low-level gain.

Intermediate Power MMIC: An intermediate power MMIC is used to amplify the low-level signal to a level of approximately 1/2 watt. This MMIC amplifier provides a gain of approximately 23 dB.

Isolator: The intermediate power MMIC is followed by an isolator to provide a clean 50 ohm load for the MMIC, and to provide a 50 ohm load as seen by the input of the first power stage.

Power Stages: The output stages of the power amplifiers use IMFET's, or Internally Matched Field Effect Transistors to meet the power requirements.

Power Detector: At the output of the power amplifier is a dual diode detector for measuring the output power of the transceiver. Power is coupled to the diode detector via a directional coupler driving one of the diodes. The second diode is used for temperature compensation of the detector circuit.

Output Isolator: An isolator is used at the output of the power amplifier to insure that full-rated power is delivered into the antenna load, and to provide mismatch protection for the amplifier. The

output isolator is external to the power amplifier housing, but is located inside the transceiver housing.

DOWNCONVERSION

The transceiver includes a dual downconverter that is designed to receive the signals from the LNA (Low Noise Amplifier) and downconvert the signal of interest to the 70 MHz frequency band. The downconverter uses two, or dual downconversions to convert from the 3700 to 4200 MHz band down to 70 MHz. The purpose of the dual downconversion is to provide better filtering of any unwanted signals, insuring that the signal of interest is not corrupted by any other signals.

The dual downconverter uses nine operations to convert the 3700 MHz to 4200 MHz input signal to the output frequency of 70 MHz. These nine operations are as follows:

- LNA Bias
- First Downconversion
- Band Pass Filtering
- Amplification
- Gain Control
- Second Downconversion
- Low Pass Filtering
- Amplification
- Low Pass Filtering
- Impedance Matching

LNA Bias: The LNA receives DC power over the center conductor of the coaxial cable used to also carry the amplified signal from the output of the LNA to the downconverter. The downconverter inserts this bias voltage onto the center conductor of the cable via a microwave inductor, which prevents the RF signal from traveling into the power supply.

First Downconversion: The first downconversion uses a Gilbert-cell mixer to downconvert the received signal to the intermediate frequency of 1042.5 MHz. The mixer is driven by the synthesizer, operating at a frequency of 4742.5 MHz to 5242.5 MHz. The synthesizer is tuned to downconvert the transponder of interest to 1042.5 +/- 18 MHz.

Band Pass Filter: The mixer is followed by a bandpass filter designed to pass only the 1042.5 MHz +/- 18 MHz signal. Signals at other frequencies are rejected by the filter.

Amplification: The band pass filter is followed by a MMIC amplifier providing 11 dB of gain.

Gain Control: A variable gain MMIC is used to set the gain of the downconverter to the specified value. The MMIC is driven by a value generated from a look-up table in the EPROM, then converted via a D to A process to an analog voltage that in turn drives the gain control MMIC.

Second Downconverter: The amplifier is followed by a second Gilbert-cell mixer used to downconvert the IF (intermediate frequency) signal. The signal is driven by a fixed LO operating at a frequency of 1112.5 MHz. The downconverted frequency is 70 MHz +/- 18 MHz.

Low Pass Filter: The second downconversion is followed by a low pass filter designed to pass only the signals up to 88 MHz, while filtering out higher frequency signals such as the LO leakage signal at 1112.5 MHz.

Amplification: The low pass filter is followed by two MMIC amplifier stages which provide 36 dB of gain.

Impedance Matching: The amplifier stages are followed by passive impedance matching circuitry designed to present a clean 75 ohm impedance at the receive output of the transceiver. This 75 ohm impedance matches the input impedance of the demodulator.

Low Pass Filter: The impedance matching circuitry is followed by a second low-pass filter also designed to filter out any unwanted signals.

FREQUENCY GENERATION

The transceiver uses three oscillators to generate the necessary signals to drive the upconversion and downconversion processes. These signals include a 10 MHz crystal-controlled oscillator, a fixed LO (local oscillator) operating at 1112.5 MHz, and a synthesizer operating in the 5 GHz range. Following is a description of each of these elements.

Reference Oscillator: The reference oscillator is a temperature-stabilized crystal oscillator which operates at a frequency of 10 MHz. The unit provides a highly-stable frequency reference signal for phase-locking of the local oscillator and the synthesizer. This 10 MHz reference oscillator controls the accuracy of both the transmission frequency and the reception frequency of the transceiver. It is important that this frequency source be both highly accurate and highly stable. If not, it would be possible for the transceiver to transmit at an incorrect frequency, interfering with the operation

of adjacent signals on the satellite. A frequency error might also prevent the demodulator from acquiring the desired receive signal.

To control the frequency of the reference oscillator, it is operated at a very closely-maintained temperature. This temperature stability is maintained by a heating element wrapped around the crystal oscillator, which is controlled by a feedback loop. The entire oscillator/oven assembly is then enclosed by thermally-insulating foam to provide excellent thermal isolation from the outside environment. This foam mounting provides two benefits. First, by maintaining the temperature at the crystal oscillator very constant, it allows the entire unit to achieve a highly-accurate output frequency. Second, the foam mounting provides isolation from outside vibration signals which otherwise could cause microphonics in the output signal.

The reference oscillator outputs a single 10 MHz signal, which is then split by a resistive power divider on the synthesizer board into the two signals necessary for phase-locking of the LO and the synthesizer.

Fixed Frequency Local Oscillator: The fixed frequency local oscillator operates at an output frequency of 1112.5 MHz. The local oscillator is phase-locked to the 10 MHz reference signal to provide the high frequency stability of the reference signal. However, the loop bandwidth of the phase-locking circuit is kept relatively narrow to gain the benefits of the low phase noise of the local oscillator at frequency offsets greater than 10 kHz from the carrier frequency.

Synthesizer: The synthesized frequency source operates over the frequency range of 4742.5 MHz to 5242.5 MHz.

The synthesizer operates at a fundamental frequency of 1580.833 MHz to 1747 MHz. The output of the synthesizer is followed by a frequency tripler which multiples the initial frequency of the signal to the final output frequency. The tripler is followed by a bandpass filter to select only the x3 output of the multiplier and to reject the other signals.

Phase Noise: The transceiver is designed to provide low phase noise. Low phase noise is extremely important because phase noise can cause a degradation in the quality of the signals. This degradation can cause bit errors in the data, or in the worst case prevent the operation of the transceiver.

To insure low phase noise, the transceiver is designed to meet the phase noise standards for transceivers as set by Intelsat. Refer to chapter 2 of this manual for the phase noise specifications of the transceiver.

POWER SUPPLY

The transceiver is designed to be operated from an input voltage of 110 volts AC or 220 volts AC. The 2, 5, 10, 40, 50, and 70 watt units all use autoranging power supplies. The 20 and 30 watt transceivers must be operated only at 110 volts or 220 volts AC as specified at time of order.

The AC voltage is first converted to a high voltage DC signal via a rectification process. That rectified voltage is then converter to a 19 volt DC output via a DC to DC converter. In the DC version, 24 volts DC is fed directly from the indoor unit.

In the transceiver, the 19 volts is regulated via both linear and switching power supplies to provide the necessary voltages for operation of the transceiver. A 15 volt linear supply is used to provide a clean voltage source for the microwave oscillators and phase-locking circuitry. A high-current 10 volt supply is used to provide power for the power amplifier, while a separate negative supply is used to provide gate bias for the power devices. A switching power supply is used to supply the 8 volts for the RF gain devices. Finally, another switching power supply is used to provide 5 volts for the operation of the digital parts in the transceiver.

The power supply functionality is distributed in the transceiver. A power supply circuit board with the high power dissipation regulators is mounted directly to one of the covers for optimum heat transfer. Lower power dissipation regulators are mounted on the M&C board.

MONITOR AND CONTROL

A microprocessor-based M&C board is provided in the transceiver to monitor and control the operation of the transceiver. In a standard non-redundant transceiver configuration, the M&C board provides the following controls and monitor points:

Type	Description	
Control	Synthesizer Frequency	2.5 MHz Steps
Control	Transmit Gain	1 dB Steps
Control	Receive Gain	1 dB Steps
Control	Power Amplifier	On/Off
Control	Transmit Gain Stability	D to A Voltage
Monitor	Oscillator Phase Lock	
Monitor	Synthesizer Phase Lock	
Monitor	LNA Current	
Monitor	Power Amplifier Power	
Monitor	Power Amplifier Temperature	
Monitor	Summary Current	

Synthesizer Frequency: There are five points in the transceiver that can be controlled by the user. The first control point is the Synthesizer Frequency. The synthesizer frequency is used to set both the transmission and reception frequencies of the transceiver. Because a common synthesizer is used for transmit and receive, these frequencies cannot be selected independently. The user can enter either the transmit or the receive frequency and the other will be set automatically. (Note: dual synthesized radios are available as an option from Vitacom Systems).

Transmit Gain: The second control point is transmit gain. There is a variable attenuator in the upconverter that is used to control the transmit gain of the unit. The attenuator provides 0 to 15 dB of attenuation in 1 dB steps.

Receive Gain: The third control point is receive gain. There is a variable attenuator in the downconverter that is used to control the receive gain of the unit. The attenuator provides 0 to 15 dB of attenuation in 1 dB steps.

Power Amp On/Off: The third control point, Power Amp On/Off, is used to turn on and off the power amplifier. The power amplifier is controlled by turning on or off the drain voltages of the amplifier devices. The power amplifier is normally left in the "On" mode, with turn off used during installation or maintenance.

The software in the transceiver is also designed to automatically turn off the power amplifier in the event of a fault in the frequency generation chain. This automatic turn-off is provided to insure that

the transceiver does not transmit at an incorrect frequency and hence interfere with other signals on the satellite.

Transmit Gain Value: The fourth control point, Gain Value, is used to set the voltage drive level to the variable attenuator in the upconverter. This voltage level determines the gain of the transmit chain of the transceiver. The gain value is used to compensate for changes in the transmit gain of the transceiver with both temperature and frequency, insuring stable gain of the transceiver.

The gain values are programmed at the factory and loaded into an EPROM that is part of the M&C board. The gain values can be changed in the field, but should only be changed by a qualified maintenance engineer.

MONITOR POINTS

There are six monitor points in the standard non-redundant transceiver. These monitor points are designed to present an overview of the operational status of the transceiver.

Fixed Frequency PLL: The first monitor point, Fixed Frequency PLL, monitors if the fixed frequency LO (local oscillator) is phase-locked to the 10 MHz reference oscillator. The LO should always be phase-locked to the reference, otherwise the transmit frequency of the transceiver would no longer be accurately maintained.

Variable Frequency PLL: The second monitor point, Variable Frequency PLL, monitors if the synthesizer, or variable frequency PLL, is phase-locked to the 10 MHz reference oscillator. The synthesizer should always be phase-locked to the reference, otherwise the transmit frequency of the transceiver would no longer be accurately maintained.

LNA Current: The third monitor point, LNA current, monitors the current drawn by the +15 volt power supply providing the DC power to the LNA.

PA Power: The fourth monitor point, PA Power, monitors the transmit power of the power amplifier in the transceiver. Note that this monitor point has an accuracy of +/- 2 dB and hence is not a substitute for a power meter when a highly accurate measurement is required (for example during earth station acceptance testing). However, the monitor point does show if the earth station is transmitting and at what power level.

PA Temperature: The fifth monitor point, PA Temperature, monitors the temperature of the transceiver. This monitor point serves two purposes. First, the temperature is used by the M&C board to set the gain of the upconverter to keep the transmit power of the earth station constant

over temperature. Second, the monitor point indicates that the cooling system of the transceiver is operating correctly and that the transceiver is not being operated outside of its rated range.

Summary Current: The sixth monitor point, Summary Current, monitors the current drawn by the devices operating from the +8 volt power supply. The devices operating from the +8 volt line include all of the RF devices except for the oscillators. A change in the summary current would indicate the failure of one or more of the RF devices. Note that the summary current will change over temperature, and hence any comparison of current readings should be made at a constant temperature.

MONITOR AND CONTROL INTERFACES

The transceiver has an external RS-232 port for local and remote monitor and control. Following is a description of the interface:

RS-232 Control: The transceiver can be locally or remotely monitored and controlled via an external connector providing an RS-232-based terminal port. A terminal or computer running a terminal emulation program can be connected to this port, labeled "M&C". This port is normally used during installation and maintenance of the earth station. Because of the limited distance capability of RS-232 signaling, this port is normally not cabled indoors for long distance runs. In the case of long runs, it may be necessary to use limited distance modems. Chapter seven of this manual provides pin-out and set-up detail for connecting to the M&C port, while chapter eleven provides detailed information on the M&C commands that are available.

CHAPTER 2 SPECIFICATIONS

Following are the nominal specifications for the transceivers. Transceivers can optionally be provided with tighter or additional specifications; contact Vitacom Systems for additional information. The following specifications apply to the transceiver operating over the 5925-6425 MHz transmit band

TRANSMIT RF INPUT

Frequency Range:	52-88 MHz
Connector:	Type N Female
Impedance:	75 Ohms nom 50 Ohm optional
VSWR:	<1.50:1
Input Level for P1dB	-25 dBm nom (75 ohm) -30 dBm nom (50 ohm)

TRANSMIT RF OUTPUT

Frequency Range:

Std Band	5925-6425 MHz
Ext Band (option)	5850-6425 MHz
Bandwidth	36 MHz Instantaneous

Power Level, 1 dB GCP

2-Watt transceiver	+33 dBm min
5-Watt transceiver	+37 dBm min
10-Watt transceiver	+40 dBm min
20-Watt transceiver	+43 dBm min
30-Watt transceiver	+44.8 dBm min
40-Watt transceiver	+45.5 dBm min
50-Watt transceiver	+46 dBm min

70-Watt transceiver	+47.5 dBm min
Gain Flatness	+/- 2 dB/36 MHz
Gain Stability	
-40 C to +50 C	+/- 1.5 dB
24 Hour, Constant Temp	+/- 0.25 dB
Frequency Stability, -40 C to +50 C	+/- 5 x10-7
Frequency Aging	
Per Day	+/- 2 x 10-8 max
Per Year	+/- 1 x 10-7 max
Spurious Outputs	
Dependent, at rated power	-50 dBc max
Independent	-10 dBm max
Harmonic Outputs at Rated Power	-30 dBc max
Third Order IMD Products	-30 dBc (relative to each carrier) with 2 carriers each at -10 dB rel to rated 1 dB GCP and -20 dBc for 2 carriers each at -6 dB rel to rated 1 dB GCP
Output Connector	Type-N Female
Output VSWR	1.5:1 max

RECEIVE INPUT

Frequency Range:	3.7-4.2 GHz
Ext Band Option:	3.625 GHz to 4.2 GHz
Input Level (from LNA):	-65 dBm nom

Input Impedance:	50 ohm nom
Connector:	Type-N F
LNA Bias:	+15 volts on center conductor

RECEIVE OUTPUT

Frequency Range:	52-88 MHz
IF Bandwidth:	36 MHz Instantaneous
Transfer Gain:	40 dB min, without LNA
Output Level, 1 dB GCP	+10 dBm min 1 dB GCP
Gain Flatness, 36 MHz:	+/- 2 dB max
Receive Output Impedance	75 ohm nom
Receive Output Connector	Type-N female

LOW NOISE AMPLIFIER

Frequency Range:	3.7-4.2 GHz
Input Level	-115 dBm nom
Input Impedance	50 ohm nom
LNA Input Connector:	WR-229 CPR-G
LNA Output Connector:	Type-N F

SYNTHESIZER

Specifications apply to transmit at 6 GHz and receive at 4 GHz.

Step Size:	2.5 MHz
Phase Noise:	

Offset	Level
0.1 kHz	-60 dBc/Hz
1 kHz	-70 dBc/Hz
10 kHz	-80 dBc/Hz
100 kHz	-90 dBc/Hz
1000 kHz	-100 dBc/Hz

Intelsat Phase Noise Mask Compliance Compliant

MONITOR AND CONTROL SYSTEM

Monitor and Control, Local

Signal Level:	RS-232
Emulation:	VT-100
Data Rate:	9600 baud
Data:	8 data bits, 1 stop bit no parity

Monitor and Control, Synchronous Partyline (optional)

Signal Level:	RS-422
Coding:	Manchester
Type:	Synchronous
Interface:	Vitacom SDMS
Distance	1000 ft max

INPUT POWER, AC TRANSCEIVER

Input Voltage

2, 5, 10, 40, 50, 70 Watt	115 VAC / 230 VAC auto

20, 30 Watt	Factory Set 115 VAC or 230 VAC
Input Frequency	47 to 63 Hz
Input Power	
2,5,10-Watt transceiver	200 Watts max
20, 30 Watt Transceiver	250 Watts max
40, 50 Watt Transceiver	400 Watts max
70 Watt Transceiver	600 Watts max

ENVIRONMENTAL CONDITIONS

Temperature Range	-40 deg C to +50 deg C
Humidity	100%, Condensing

CHAPTER 3 INSTALLATION

The following chapters of the manual deal with the installation of the transceiver and the connection of the various signals to the transceiver. All of the installation sections should be thoroughly understood before attemp ting any installation.

Vitacom Systems Co has trained assemblers available to perform installations at any location. Contact Vitacom Systems for additional information.

Vitacom Systems Company also offers installation kits to adapt the transceiver to a variety of commercially-available antennas. These kits are available for domestic Prodelin, Vertex, Channelmaster and Andrew antennas as well as certain foreign-made antennas. Contact Vitacom Systems Company for a list of installation kits currently available.

The following chapters present the installation information for the transceiver:

Chapter 4	AC Power
Chapter 5	Signal Connections
Chapter 6	Monitor and Control Connections
Chapter 7	transceiver Mounting
Chapter 8	Operation
Chapter 9	Operation

CHAPTER 4 AC POWER

The AC power supply in the transceiver isdesigned to operate from 115 VAC (nominal) or 230 VAC (nominal). The transceiver should always be connected to a filtered, UPS-fed power source. Voltage transients on the AC power line can cause errors in the transmission of the customer data, and in the worst case, can damage the transceiver. The transceiver should also not be connected to a power source shared by other equipment that inserts noise onto the power line. Again, the power line noise can cause errors in the data transmission.

This chapter of the manual discusses the following items:

- AC Power Connector
- AC Power Cabling
- AC Breaker Box
- AC Power Source

AC POWER CONNECTOR

AC Power is supplied to the transceiver through the connector labeled “AC Power". The connector is a five-pin Bendix male connector with the pin-outs as shown on the following table.

Pin	Connection
A	Ground
B	Neutral
C	Neutral
D	Hot
E	Hot

Table 4-1 AC Power Connection to the transceiver

The connector used on the transceiver has the following P/N information:

Description	Vitacom P/N	Mfg	Mfg Part Number
115/230 VAC Connector	005042	Bendix	PT07C14-5P

Table 4-2 AC Power Connector Specifications

AC POWER CABLING

The transceiver should be cabled to a nearby AC power source using the AC power cable. This power cable (or power cables, as required) is supplied as part of the transceiver installation kit, optionally available from Vitacom. The power cable can also be purchased separately from Vitacom. Following are the P/N's for the AC power cables:

Description	Vitacom P/N
115/230 VAC Cable:	016843-180

Table 4-3 AC Power Cable Part Numbers

The standard cables have lengths of 180 inches (15 feet). Optionally, other cable lengths are available.

If the customer plans to supply the AC power cable, following is the connector information for the Bendix connector necessary to interface with the transceiver. The other end of the power cable is normally either hardwired into an AC circuit breaker or connectorized with a standard power cord connector.

Description	Vitacom P/N	Mfg	Mfg Part Number
115/230 VAC Connector	005043	Bendix	PT06AH14-5S(SR)

Table 4-4 AC Power Connectors for Cables

AC BREAKER BOX

The transceiver should be connected to an AC breaker box located within fifteen feet of the transceiver. This breaker box should include a receptacle for the AC power, and should include a fifteen Amp circuit breaker for power disconnect.

During installation of the earth station, the AC power is normally also used for the connection of test equipment. Hence the breaker box should have one receptacle for the transceiver and at least one additional receptacle for test equipment.

AC POWER SOURCE

The transceiver should always be connected to a UPS (Uninterruptible Power Supply) that not only provides back-up power in the event of a total power loss, but also filters out line transients such as spikes and brown-outs. Vitacom can optionally supply UPS units or can assist in the customer selection of the UPS unit.

CHAPTER 5 SIGNAL CONNECTIONS

Signal connections need to be made to the transceiver both to connect to the indoor equipment (modem or modems) and to connect the transceiver to the antenna port. This chapter provides the necessary information on how to make these connections.

The transceiver is designed to interface to the modem or modems with an impedance of 75 or 50 ohms. Hence it is necessary to use either 75 or 50 ohm impedance cables and connectors when making these connections. The 70 MHz Tx In transceiver ports is designed with Type-N connector so that fast and reliable crimp or solder connectors can be used on the mating cable.

The transceiver connection to the transmit port of the antenna operates over the 5925 to 6425 MHz band.

The 2. 5, and 10-watt transceiver uses a Type-N female output for the transmit connection to the antenna. The 20, 30, 40, 50, and 70 Watt transceivers use a WR-137 waveguide output for the 6 GHz output.

This chapter presents detailed installation information for connecting to the following ports on the transceiver:

Modem Signal Connections
6 GHz Transmit Output
4 GHz Receive Input

MODEM SIGNAL CONNECTION

There are two RF signal connections required to be made to connect the transceiver to the modem or modems. Following is a table detailing the connections:

Connector Label	Connector	To/From
70 MHz TX IN	Type-N Female	Modem Tx Output
70 MHz RX OUT	Type-N Female	Modem Rx Input

Table 5-1 Modem Signal Connections

Cabling: For the connection to the modem transmit and receive ports, it is recommended a high quality, double-shielded, 100% shield coverage cable be used. The cable should have a loss of no more than 1 dB/100 feet.

70 MHz Tx In: The "70 MHz TX IN" connection connects the modem transmit output signal to the transceiver upconverter input

70 MHz Rx Out: The “70 MHz RX OUT” connection connects the receive output of the transceiver to the receive input of the modem(s).

70 MHz Cable Loss: The modem signal level when received at the transceiver is expected to be -25 dBm to produce the rated output power from the transceiver for 75 ohm units and –30 dBm for 50 ohm units.

TRANSMIT OUTPUT CONNECTION

For the 2. 5, and 10-watt transceiver, the output of the 6 GHz signal is Type-N female. Low loss coaxial cable can be optionally supplied with the installation kit to connect the power amplifier to the antennna.

For the 20, 30, 40, 50, and 70-watt transceivers, the output of the 6 GHz signal is WR-137. The signal can be connected to the antenna feed via WR-137 waveguide, or a Type-N adapter can be used to convert to coaxial cable. If a waveguide run is used, it is important that the waveguide be pressurized to avoid moisture entry in to the waveguide.

RECEIVE INPUT CONNECTION

The LNA is mounted directly to the antenna feed. Hence the output of the LNA needs to be connected to the 4 GHz input of the transceiver. Low loss coaxial cable can be optionally supplied with the installation kit to connect the LNA to the transceiver.

The length of this cable is dependent on the type and size of antenna used.

CHAPTER 6 M&C CONNECTIONS

Connections need to be made to the transceiver for the monitoring and control of the unit. This chapter details how to make these connections for the various M&C configurations.

The port labeled "M&C" on the transceiver is an RS-232 port designed for local connection of a terminal or PC running terminal emulation software. This port is normally used by field engineers during installation or maintenance of the earth station, or for remote monitoring of the equipment.

The port labeled “Partyline” on the transceiver is designed for monitor and control from the Vitacom SDMS.

This chapter presents detailed installation information for connecting to the following ports on the transceiver:

RS-232 M&C Connection

Party Line Connection

M&C PORT

A terminal or PC running terminal emulation software can be connected directly to the transceiver to provide monitor and control of the unit. This RS-232 connection is typically used by a field installer or maintenance engineer when working out at the antenna/transceiver site, or can be connected to an indoor M&C terminal.

M&C Connector Pin-Outs: The RS-232 connection is labeled “M&C” on the transceiver and physically is provided through a 10-pin Bendix male connector. Following is the pin-out information for the connector:

Pin	Function
A	RS-232 Console Tx Data
C	Gnd
E	RS-232 Console Rx Data
K	Gnd

Table 6-1 M&C Connector Pin-Outs

Vitacom can supply a cable that will connect the M&C port to a computer or terminal. This cable is not normally supplied as part of any installation kit, however it can be ordered directly from Vitacom. The Vitacom P/N for the cable is P/N 017693-108.

The cable provides the required Bendix connector on one end and a female 9-pin submin D connector on the other end, which allows for connection to the serial port of most standard PC's. For information on configuring the PC terminal emulation software, refer to chapter 10 of this manual

PARTYLINE CONNECTION (Optional)

The second monitor and control port on the radio is the partyline connection, which can be optionally supplied. This port is designed specifically to interconnect with the Vitacom SDMS (Stand-alone Diagnostic Monitoring System). The partyline utilizes an RS-422 signaling format with Manchester encoding to support indoor to outdoor entrance link distances of up to 1000 feet.

Partyline Connector Pin-Outs: The partyline connection is labeled "Partyline" on the transceiver. The physical connector is a Bendix 10-pin female connector with the following pin-outs:

Pin	Description
A	Synchronous Partyline +
E	Synchronous Partyline -
F	Ground

Table 7-2 Partyline Connector Pin-Outs

If an SDMS is ordered with the transceiver, then Vitacom will supply an installation kit which includes the correct connector to interface with the Bendix 10-pin connector. If the customer supplies the connector directly, following is the part information:

Part	Vitacom P/N	Manufacturer	Mfg Part Number
Connector	005044	Bendix	PT06A12-10P (SR)

Table 7-3 Partyline Mating Connector Specification

Partyline Cable: The partyline port of the transceiver should be connected to the SDMS using Belden 9729 or 9730 cable. This cable is low-capacitance cable designed specifically for supporting the high-speed signaling over long distances. The partyline has been tested for operation over cabling with lengths of 1000 feet, using the above-specified Belden cable.

CHAPTER 7 TRANSCEIVER MOUNTING

Vitacom has designed installation kits to mount the transceiver to a wide range of available antennas. These installation kits include detailed drawings and installation procedures for installing the transceiver on specific antennas. If an installation kit is not available from Vitacom for a specific antenna, then in many cases Vitacom will design a suitable kit for the application. Contact Vitacom for additional information.

Installation kits are currently available for the following antennas:

- Prodelin 2.4 Meter C-Band
- Prodelin 3.7 Meter C-Band
- Prodelin 3.8 Meter C-Band
- Channelmaster 1.8 Meter C-band
- Channelmaster 2.4 Meter C-band
- Andrew 3.7 Meter F-1
- Andrew 4.5 Meter F-1
- Vertex 6.1 Meter

This chapter provides general guidelines for the mounting of the transceiver. The following topics are covered in this chapter:

- Location on Antenna
- Transceiver Mounting Points
- Transceiver Mounting Bracket

The information in this chapter should be treated as general information. In all cases the drawings and instructions provided with the specific installation kits should be used for the actual installation.

LOCATION ON ANTENNA

The 1, 2, 5, and 10-watt transceivers weigh approximately 22.5 lbs, and hence are not suitable for direct mounting to the antenna feed in most cases. The transceiver is typically mounted to the antenna kingpost, feed support arm (offset-fed antennas), in the hub, or on the back of the reflector

structure. Vitacom engineering can provide assistance in determining the best location for mounting of the transceiver.

The 20, 30, 40, 50 and 70 watt transceivers weigh approximately 60 lbs each. These can only be mounted to the antenna kingpost or in some cases to the back of the reflector support. Consult with Vitacom Systems for specific mounting advice.

The transceiver should be mounted as close to the feed as possible to minimize the loss in the cabling running from the 6 GHz transmit output port of the transceiver to the antenna feed. Any loss in the cable will directly subtract from the available output power of the earth station.

The transceiver is designed to operate directly in the environment and hence does not need to be shielded from the sun or from precipitation. However, mounting of the transceiver in a shielded location, such as under the reflector, will provide for any easier maintenance environment.

Note: In no case should the transceiver be painted. The transceiver is supplied with a white paint that is designed to maximize heat transfer from the unit. Painting of the unit will cause the internal temperature of the unit to rise, causing possible damage to the unit and voiding the warranty.

TRANSCEIVER MOUNTING POINTS

On each end of the transceiver, four 1/4-40, 50, and 70 mounting holes are provided for mounting of the transceiver. On each side two additional ¼-40, 50, and 70 mounting holes are provided. These mounting points allow a wide range of mounting configurations for the transceiver. No additional mounting holes should be drilled in the transceiver, otherwise damage to the unit may result and the warranty would be voided.

Note: the 2, 5, and 10 watt transceiver each are mechanically packaged in a single housing for converter and power amplifier. The higher power units each use a separate housing for converter and power amplifier. For the two-box design, each box is mounted per these instructions.

MOUNTING BRACKET

Vitacom can optionally provide a mounting bracket to facilitate the installation of the transceiver. This mounting bracket is designed to be attached to the antenna, either using U-bolts or by direct attachment. The mounting bracket is provided with a wide variety of holes so that it can function as a universal mounting bracket. The bracket is designed to be mounted to the antenna, then the transceiver can be attached to the bracket. Hence the mounting bracket does not need to be

removed during any required transceiver changes. The following parts can be ordered directly from Vitacom for attachment of the transceiver:

Part	Vitacom P/N	Qty
Mounting Bracket	016384	1 (2)
1/4-40, 50, and 70 x 1/2 Hex SST Machine Screw	002909	8
1/4 Stainless Steel Flatwasher	002910	8
1/4 Split Stainless Steel Lockwasher	002906	8

Table 7-1 Transceiver Mounting Parts

CHAPTER 8 INSTALLATION SEQUENCE

A recommended installation sequence is provided with the optional transceiver installation kit. If the installation kit has not been purchased, then the following installation sequence should be followed:

1. Determine the mounting location of the transceiver.

2. Attach the transceiver mounting bracket to the antenna.

3. Mount the transceiver to the transceiver mounting bracket.

4. Connect all cables to the transceiver:

   AC Power
   70 MHz Tx In
   70 MHz Rx Out
   Partyline (optional)
   M&C (for installation)
   Tx Out

5. Tie-wrap the cables in place.

CHAPTER 9 OPERATION

This chapter presents information on how to operate the transceiver. It is important that the transceiver be operated correctly, because otherwise it is possible that interference could be caused to other users of the satellite, or damage to the transceiver itself could result.

INITIAL POWER-UP

At the initial power-up of the transceiver, certain precautions should be followed to insure that the transceiver does not transmit at an incorrect frequency, or that excess signal level is not applied to the transceiver. During the initial power-up, the transceiver should be monitored through one of the three available M&C interfaces. The following power-up sequence should be followed:

1. Verify that the transceiver is installed and all cables connected correctly.

2. Insure that the modem transmit output signal is muted via software control of the modem.

3. Apply the AC power to the transceiver.

4. Verify that the frequency synthesizer is set to the correct frequency of operation. The actual frequency of transmission and reception is calculated as follows:

The transmit frequency that is set on the transceiver can be in the range of 5.925 to 6.425 GHz. The frequency of transmission is set assuming that the modem is operating at an output frequency of 70 MHz. For example, if the modem is set to 70 MHz and the transmit frequency is set to 6.175 GHz, then the frequency of transmission will be 6.175 GHz. If the modem transmit frequency is set to 60 MHz and the transceiver transmit frequency is set to 6.175 GHz, then the actual transmission frequency will be 10 MHz less than 6.175 GHz, or 6.165 GHz.

In a normal installation the transceiver transmit frequency is set to the center frequency of the transponder on which the earth station is operating. Then the modem is tuned over the 52-88 MHz range to set the actual operating frequency on the transponder.

5. Set the modem output power to its minimum level.

6. Turn on the transceiver power amplifier.

SETTING THE OPERATING LEVEL

With the transceiver turned on and operating per the instructions in the previous section, increase the modem output power until the transceiver reaches its specified operating power. This can be determined in one of three ways:

(1) The transceiver output power is monitored from the M&C system. Increase the modem output power until the transceiver forward power monitoring point reaches its nominal assigned level.

(2) Using a spectrum analyzer, monitor the signal to the noise of the transmitted carrier. Increase the modem output power until the signal to noise reaches its assigned level.

(3) Monitoring the modem at the far end of the link, increase the modem output power until the received Eb/No reaches its assigned level.

Normally the operator of the satellite will determine how the transceiver power is adjusted. Any power adjustment should be done only in coordination with the satellite operator.

POWER-DOWN

When a transceiver is powered-up, its power-up configuration will be determined by the last saved configuration when it was operating. Hence before powering down a transceiver, the desired operating configuration should be saved in memory. (Refer to chapter 11 for the save procedure). Once the correct configuration has been saved, then the transceiver can be powered down safely.

To power-down the transceiver, simply turn-off the AC power source. There is no need to mute the power amplifier before power-down.

CHAPTER 10 LOCAL MONITOR AND CONTROL

The transceiver can be locally monitored and controlled via an external RS-232 terminal port, labeled “M&C”, provided on the transceiver. A terminal or portable PC running terminal emulation software can be locally connected directly to the transceiver.

The RS-232 terminal port is normally used by the field engineer during installation of the radio, or during maintenance of the earth station. The port can be used to set-up the transceiver parameters prior to turn-on, or can be used to monitor operation of the unit, or can be used during maintenance of the earth station system.

This chapter of the manual discusses the following items:

- RS-232 Terminal Port Set-Up
- Terminal Screen
- Control Parameters
- Monitor Parameters
- Maintenance Parameters

LOCAL M&C INTERFACE (RS-232) SET-UP

A terminal or PC running a terminal emulation program can be connected to the port labeled "M&C" on the transceiver for local monitor and control. The physical connection should be made per the instructions of chapter seven of this manual. That section provides information on the cabling/pin-outs required for the proper connection of the equipment.

The communications software setting of the terminal or PC should be configured per the following table.

Parameter	Setting
Emulation:	DEC VT-100
Date Rate:	9600 bps
Data Bits:	8
Stop Bits:	1
Parity:	None
Flow Control:	Off

Table 10-1 Comm Software Set-up

The connector used on the M&C port is a Bendix 10-pin weatherproof connector. Vitacom can optionally provide a cable which will allow the M&C port to be connected to the terminal or PC. The Vitacom P/N for the cable is P/N 017693-108. The cable provides the Bendix 10-pin connector on one end and a standard 9-pin female submin D connector on the other end.

TERMINAL DISPLAY

Once the terminal or PC has been connected to the M&C port and the transceiver has been powered up, the following monitor and control screen will be displayed:

Vitacom CX2000 Transmit/Receive Radio Rev. 1.11

(1) Site Name	0019A001	Serial Number	0019A001		
(2) Device #	00	Poll Counter	0		
(3) M&C Source	SPL	Missed Polls	5415		
		Monitor Points:	Value:	Status:	Hist:
(4) Local Control	Enabled	(A) Fixed Freq. PLL	LOCKED	GOOD	1
(5) Receive Freq	3.9500 GHz	(B) Var. Freq. PLL	LOCKED	GOOD	1
(6) Transmit Freq	6.1750 GHz	(C) PA Power	27.54 dBm	GOOD	1
(7) Power Amp	On	(D) PA Temperature	39.75 C	GOOD	1
(8) Configuration	Unsaved	(E) LNA Current	125 mA	GOOD	1
(9) System Type	40 W Ext PA	(F) Summary Current	540 mA	GOOD	1
(10) WG Switch Ctrl	Side A	WG Pos: (Rx/Tx)	(B/B)		
(11) Redundant Side	Inactive	Redundant Status	GOOD		
(12) Auto Mode	Enabled	Summary Status	GOOD		
(13) Limits					
(14) Power On Delay		Upconverter DTOA	2367		
(15) Password		Downconverter DTOA	3151		
(16) Atten Up/Down	8 dB / 8 dB				

Strike Number of Configuration Option to Change, ESC Key Aborts Selection.

Table 10-2 Main Screen of Terminal Display

Top Line: The top line of the display shows the year of copyright of the software.

Model/Software Revision: The second line shows the model of the transceiver and the firmware revision for the software on the M&C card.

Control Points: All of the items on the left side of the display, numbered 1 through 16, are control points and can be changed by the user. The main screen displays the current value of the control

point. By entering the number corresponding to a control point, a new value can be entered by the user.

Monitor Points: All of the items on the right side of the display are monitor points and read back the current value of the described parameter. The monitor points lettered A through G have limits associated with the points; these limits can be changed by the user.

CONTROL POINTS

Each of the control points is numbered, 1 through 16. After the number, a brief description of the control point is displayed, followed by the current setting. Any of the control points can be changed, by entering the number, followed by <CR>. Note that these control points can be changed only if the transceiver is set with Local Mode "Enabled", as described by control point #4.

Vitacom CX2000 Transmit/Receive Radio Rev. 1.11

(1) Site Name	0019A001	Serial Number	0019A001		
(2) Device #	00	Poll Counter	0		
(3) M&C Source	SPL	Missed Polls	5415		
		Monitor Points:	Value:	Status:	Hist:
(4) Local Control	Enabled	(A) Fixed Freq. PLL	LOCKED	GOOD	1
(5) Receive Freq	3.9500 GHz	(B) Var. Freq. PLL	LOCKED	GOOD	1
(6) Transmit Freq	6.1750 GHz	(C) PA Power	27.54 dBm	GOOD	1
(7) Power Amp	On	(D) PA Temperature	39.75 C	GOOD	1
(8) Configuration	Unsaved	(E) LNA Current	125 mA	GOOD	1
(9) System Type	2 W Int PA	(F) Summary Current	540 mA	GOOD	1
(10) WG Switch Ctrl	Side A	WG Pos: (Rx/Tx)	(B/B)		
(11) Redundant Side	Inactive	Redundant Status	GOOD		
(12) Auto Mode	Enabled	Summary Status	GOOD		
(13) Limits					
(14) Power On Delay		Upconverter DTOA	2367		
(15) Password		Downconverter DTOA	3151		
(16) Atten Up/Down	8 dB / 8 dB				

Strike Number of Configuration Option to Change, ESC Key Aborts Selection.

Table 10-3 Control Points

Site Name: The Site Name may be entered by the user. After selecting <1> followed by a <CR>, a site name of up to 25 characters can be entered. Enter the desired site name, then <CR>.

Device Number: The Device Number refers to the address of the transceiver on the synchronous party line. Any value can be entered from 0 to 250. For a standard non-redundant 2W/5W/10W transceiver, the SPL address is normally set at 0. For an outdoor redundant (ORJB) system, the address for one transceiver is set at 0, while the address for the second transceiver must be set at 1. Note that if two or more units attached to a common synchronous party line have the same address, then the functioning of the party line will be interrupted on an intermittent to permanent basis. To select, enter <2> followed by a <CR>. Next, enter the desired party line address followed by a <CR>.

M&C Source: The M&C Source control point allows the user to select between two M&C sources, the 300 baud modem from the modem IDU, or the SPL (synchronous party line) from the SDMS. To select either one of these selections as the M&C source, enter <3> followed by <CR>. A prompt will be displayed to enter <1> for the 300 baud modem, or <2> for the SDMS. Enter the desired selection followed by <CR>.

Local Control: When enabled, the Local Control command allows the user to change the parameters of the radio. With local control enabled, any of the control parameters (1-13) can be changed. If the user attempts to change any of these parameters without local control enabled, the following message will be displayed:

"Local Control Disabled! Press RETURN."

To enable local control, enter <4>, followed by a <CR>, then select <1> followed by a <CR> to enable local control.

Local control must be disabled when the installer or field engineer is completed with the set-up of the radio! If local control is not disabled, it will not be possible to control the radio remotely. To disable local control, enter <4> followed by <CR>, then select <2> followed by a <CR>.

Receive Frequency: Not functional.

Transmit Frequency: The Transmit Frequency control point allows the user to set the frequency of operation of the radio.

To select the transmit frequency, enter <6> followed by <CR>. The desired transmit frequency is then entered, followed by <CR>. Because the synthesizer operates in 2.5 MHz steps, the transmit frequency must be a multiple of 2.5 MHz. The software will prevent the frequency from being set to an invalid frequency.

Power Amp: The Power Amp control point allows the user to turn on or off the power amplifier. Note that when the power amplifier is turned off, the station cannot transmit. This control point is normally used only during set-up of the earth station.

To turn the power amp on or off, select <7> followed by <CR>. Then select <1> to turn on the power amp, or <2> to turn off the power amp, followed by <CR>.

Configuration: The Configuration control point allows the current configuration of the earth station to be saved to non-volatile memory, ie the EEPROM, or alternately to read the saved configuration from memory.

To save the current configuration of the earth station to memory, select <8> followed by <CR>. Then select <1> followed by <CR> to save the configuration. Once the configuration has been saved, then the display for the configuration parameter will change to "Saved". The parameter will remain saved until a change is made to the configuration of the earth station. When a parameter is changed, then the display will change to "Unsaved", and remain at unsaved until the next save to EEPROM is done.

To restore a saved configuration from EEPROM, select <8> followed by <CR>. Then select <2> followed by <CR> to restore the saved configuration.

Note that the Local Control command will always remain disabled on power-up, but will retain its saved state when using the restore command.

System Type: The System Type control allows the user to select the type of transceiver installed at the site, ie 1 watt, 2 watt, 5 watt, or 10 watt. To select the system type, enter <9> followed by <CR> Then enter <1>, <2>, <3>, or <4> respectively to set the system type at 1 watt, 2 watt, 5 watt, or 10 watt respectively, followed by a <CR>.

WG Switch Control: The WG Switch Control command allows the user to manually set the waveguide switch position such that side A or side B is the active (on-the-air) side. Note that this command is only valid for redundant earth station configurations.

To set the waveguide switch position to side A or side B, select <10> followed by <CR>. Then enter <1> to switch to side A, or <2> to switch to side B, followed by a <CR>. Note that this is only possible if Automode (Item 12) is disabled, i.e. automatic switching is turned off.

Redundant Side: The Redundant Side control command is used in outdoor redundant (ORJB) systems to define if the 1W/2W/5W/10W transceiver is the A-side or B-side unit. One of the two 1W/2W/5W/10W transceivers must be defined as the A-side unit, while the other must be defined as the B-side unit. For non-redundant systems, the redundant side entry should be "Inactive". To enter, select <11> followed by <CR>. Next, enter <1> for A-side, <2> for B-side, or <3> for inactive, followed by <CR>.

Auto Mode: The Auto Mode control command is used to enable or disable the auto mode function. In the auto mode, the 2W/5W transceiver will automatically compare monitored values to their respective limits, and take any actions as defined by the ACB (Action Control Byte) for a particular monitor point. In normal operation, the 2W/5W transceiver should always be left with the auto mode enabled. To select, enter <12> followed by <CR>. Next, enter <1> to enable the auto mode or <2> to disable the auto mode, followed by <CR>. See the flowchart at the end of this chapter for more information on fault checking.

Limits: The Limits control command presents the user with two choices for working with the monitor point limits. The first choice is that the user can choose to restore the limits to the factory default settings. The second choice is that the user can clear the fault history of the monitor points, ie to reset each of the history points to zero.

To restore the factory default limits, enter <13> followed by a <CR>. Then enter <1> followed by a <CR>.To clear the fault history, enter <13> followed by a <CR>. Then enter <2> followed by a <CR>.

Power On Delay: This parameter sets the delay after power-on before which the power amplifier will turn-on. The reason for the delay is to allow the 10 MHz reference time to warm-up, so that the unit does not beginning transmitting on an incorrect frequency. The default value is 30 seconds.

Password: This parameter allows the password to be changed. The default password is "<CR>" (type nothing, just hit the Enter-key). When changing the password, remember that it is case sensitive.

Atten Up/Down: This parameter allows the control of the transmit or receive attenuator. Each attenuator can be set to provide 0 to 15 dB of attenuation. After entering <16> for attenuation, enter <1> for transmit-side attenuation, or <2> for receive-side attenuation. Then enter the new

attenuation value, from 0 to 15. Note that with the transceiver, there is no downconverter, and hence the receive attenuator control is not functional.

MONITOR POINTS

The right half of the screen displays a number of points monitoring the configuration and current status of the transceiver. All of these points are read-back points and hence cannot be set or changed. However, the monitor points that are lettered A - G do have limit ranges associated with them and these limit ranges can be changed.

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(1) Site Name	0019A001	Serial Number	0019A001		
(2) Device #	00	Poll Counter	0		
(3) M&C Source	SPL	Missed Polls	5415		
		Monitor Points:	Value:	Status:	Hist:
(4) Local Control	Enabled	(A) Fixed Freq. PLL	LOCKED	GOOD	1
(5) Receive Freq	3.9500 GHz	(B) Var. Freq. PLL	LOCKED	GOOD	1
(6) Transmit Freq	6.1750 GHz	(C) PA Power	27.54 dBm	GOOD	1
(7) Power Amp	On	(D) PA Temperature	39.75 C	GOOD	1
(8) Configuration	Unsaved	(E) LNA Current	125 mA	GOOD	1
(9) System Type	2 W Int PA	(F) Summary Current	540 mA	GOOD	1
(10) WG Switch Ctrl	Side A	WG Pos: (Rx/Tx)	(B/B)		
(11) Redundant Side	Inactive	Redundant Status	GOOD		
(12) Auto Mode	Enabled	Summary Status	GOOD		
(13) Limits					
(14) Power On Delay	Upconverter DTOA	2367			
(15) Password	Downconverter DTOA	3151			
(16) Atten Up/Down	8 dB / 8 dB				

Strike Number of Configuration Option to Change, ESC Key Aborts Selection.

Table 10-4 Monitor Points

Serial Number: The Serial Number monitor point displays the serial number of the firmware on the M&C board. This serial number is assigned and installed at the factory during manufacture. It should correspond to the tracking number printed on the label affixed to the outside of the transceiver. If the software is upgraded, then this serial number would also be upgraded.

Poll Counter: The Poll Counter monitor point displays the number of polls received from the indoor M&C unit. These polls could come from either the modem IDU or from the SDMS, depending on the configuration of the earth station. In normal operation, the poll counter should increment approximately once per second.

No Poll Counter: The No Poll Counter monitor point increments when no polls are being received from an indoor M&C unit. In a normal earth station configuration, the transceiver will be monitored

from either the modem IDU or from and SDMS. If one of these M&C units is present and the No Poll Counter is incrementing, then there has been some type of fault in the earth station preventing the M&C from operating correctly.

The next seven monitored points, lettered A through G, display current operational values of the transceiver. The current value is displayed in the **Value** column. Each of these seven monitor points has a high and low limit associated with the point. If the point is operating within the limit range established by the high and low limit, then the **Status** column will display the value "Good". If the point is operating outside of the limit range, then the status is determined by the software to be faulted, and "Fault" is displayed in the status column.

Each of the monitor points are polled approximately once per second, and the value, status, and history columns are updated once per second. If the status of the points is faulted, then the History counter for that monitor point is incremented by one, and the value in the **Hist** column is incremented by one.

Hence the Hist column provided a view of how the monitor point has been operating over time. As mentioned earlier in this section, the values in the Hist column can be cleared via Control point #13, Limits. The values in the Hist column will also be cleared on power up.

The Hist value has a maximum value of 255. If the 255 value is reached, then the counter will stop incrementing until cleared.

Changing Limits: The transceiver is shipped from the factory with preset limit ranges. In some cases it may be necessary to change the limits at the time of installation, or during operation. For example, the data rate of the earth station may be upgraded, requiring more transmit power. That change would necessitate a change in the limits of the forward power monitor point.

Note that changing limits should be undertaken only when necessitated by a change in operating conditions of the earth station. Limit changes should not be undertaken in the case of an alarmed earth station. In those cases the fundamental cause of the alarm must be addressed.

To change the limit range of a particular monitor point, enter the letter corresponding to the monitor point, followed by <CR>. The current values of the low and high limits will be displayed. Enter <1>, followed by <CR> to change the low limit, or <2> followed by a <CR> to change the high limit. Then the new limit value should be entered, also followed by a <CR>. Note that limit values can only be entered when the transceiver local control is enabled, and any changes in the limit values should always be saved.

Changing the ACB: The ACB is the Action Control Byte and is used to define what steps will occur if a particular monitor point is faulted. The ACT has 8 bits, with the following definition for each bit:

Bit 7 (MSB):	Spare, Not Used
Bit 6:	Spare, Not Used
Bit 5:	Spare, Not Used
Bit 4:	Spare, Not Used
Bit 3:	Spare, Not Used
Bit 2:	Summary Status to Fault
Bit 1:	Redundant Status to Fault
Bit 0 (LSB):	Mute Power Amplifier

The ACB can be changed for any of the monitored points by the following procedure:

Enter the letter corresponding to the parameter to be changed (ie E for LNA current), followed by <CR>. Next, enter <3> for the ACB selection, followed by <CR>. Finally, enter the 8 bits for the new ACB, MSB first, followed by <CR>.

The next two monitor points display the status of the redundancy mode of the earth station, if configured in a redundant configuration.

W/G Pos: WG Pos displays the current position of the waveguide switches for the transmit and receive legs of the earth station. When the waveguide switches are in the "A" position, then the "A" side of the redundant earth station will be in operation. When the waveguide switches are in the "B" position, then the "B" side of the redundant earth station will be in operation.

Redundant Status: The Redundant Status monitor point is used to display the condition of the transceiver as related to redundancy switching. There are four possible displays for this entry:

No value (all dashes) will be displayed for non-redundant systems.

AUTO MODE OFF" will be displayed when the auto mode is off, which disables automatic redundancy switching.

"GOOD" will be displayed if none of the monitor points in the transceiver which control redundancy switching are faulted. Note: ACB1 must be set to high to define if the particular monitor point will trigger redundancy switching.

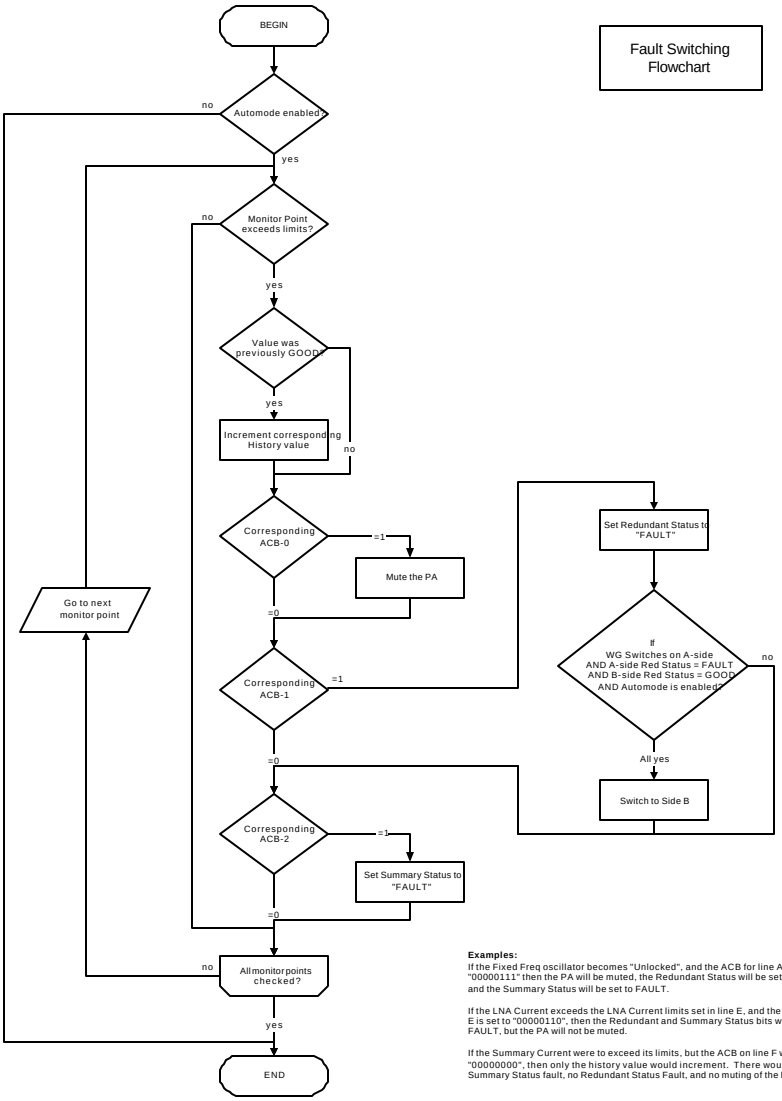
"FAULT" will be displayed if one or more of the monitor points in the transceiver which control redundancy switching are faulted

Summary Status: The Summary Status monitor point displays the current summary status of the transceiver. There are three possible displays for this point:

"AUTO MODE OFF" will be displayed when the transceiver is in the manual mode, ie auto mode (selection 12) is off..

"GOOD: will be displayed if no monitor points in the transceiver are faulted. Note: ACB2 must be set high to define if the particular monitor point will trigger a summary status fault.

"FAULT: will be displayed if one or more of the monitor points in the transceiver is faulted.



Examples:
If the Fixed Freq oscillator becomes "Unlocked", and the ACB for line A is set to "00000111" then the PA will be muted, the Redundant Status will be set to FAULT, and the Summary Status will be set to FAULT.

If the LNA Current exceeds the LNA Current limits set in line E, and the ACB on line E is set to "00000110", then the Redundant and Summary Status bits will be set to FAULT, but the PA will not be muted.

If the Summary Current were to exceed its limits, but the ACB on line F were set to "00000000", then only the history value would increment. There would be no Summary Status fault, no Redundant Status Fault, and no muting of the PA