BOSCH TELECOM	**Exhibit 9 -- User's Manual** Bosch Telecom Customer Premises Equipment Roof Unit FCC ID: NNS3214864 Part Number: 3214864-001

Information Provided in this Exhibit:

Operating Instructions for the CPE Roof Unit Transceiver (Stand-Alone Configuration)

The Bosch Telecom Customer Premises Equipment (CPE) Roof Unit transceiver, under operational conditions, is under control of the SpectraPoint® Element Controller and Network Management software which automatically determine the operating frequencies and power levels and monitors the performance of the system.

For stand-alone testing such as functional checkout or compliance testing, the Roof Unit transceiver may be operated at maximum rated output power with automatic power control disabled. In addition, the Roof Unit may be commanded to various operating frequencies within the allocated band of operation and modulated with actual and simulated IF input signals.

The User Manuals delivered with the SpectraPoint® System describes installation of the entire system but does not include stand-alone operation of the individual components of the system. Therefore, this document describes the equipment setup and operation employed for stand-alone operation of the Transmitter, as applicable to compliance testing.

Preliminary Release

Tune-Up Instructions for Operation of a CPE Roof Unit Transmitter

1.0 Scope

This document provides the tune-up instructions for operation of a single SpectraPoint® Customer Premises Equipment (CPE) Roof Unit when operated stand-alone for test purposes (without the control of the SpectraPoint® System).

2.0 Introduction

The CPE Roof Units, when operating under control of the SpectraPoint® System, receive an RF reference tone and QPSK modulated RF signals (downstream T1 telephony, digitized video or digital data) from one or more SpectraPoint® Node transmitters (LMDS Hub). The CPE Roof Unit likewise transmits a QPSK modulated RF signal (upstream) from the CPE Network Interface Unit (NIU) to the SpectraPoint® Node receivers (LMDS Hub).

For test purposes, the QPSK modulated input signal to the Roof Unit transmitter, at the appropriate center frequency, modulation, bandwidth and level must be provided by test hardware and software which is defined in this document.

3.0 Interconnection of Support Equipment

The interconnection of the CPE Roof unit with the test fixture and support equipment is shown in Figure 9-3. Figure 9-4shows the interconnection of the CPE Roof Unit with the NIU supplying the IF signal instead of the Test Fixture. The support hardware and software is shown in Table 9-1.

The Roof Unit will produce a single QPSK phase modulated output at user-selectable bandwidths (as in the SpectraPoint® System).

4.0 Description of the test and support equipment

4.1 Bosch Network Interface Unit (NIU)

The Bosch NIU consists of a Radio Unit (containing a QPSK modem and a frequency translator) and power supply. The NIU operates from 110 – 240 VAC, 50 – 60 Hz commercial power.

The modem converts upstream T1 telephony to QPSK modulated baseband and converts downstream QPSK baseband to T1. The translator upconverts the modulator output (baseband) signal to L-band and downconverts the L-band signal to baseband. A pictorial of NIU is shown in Figure 9.1.

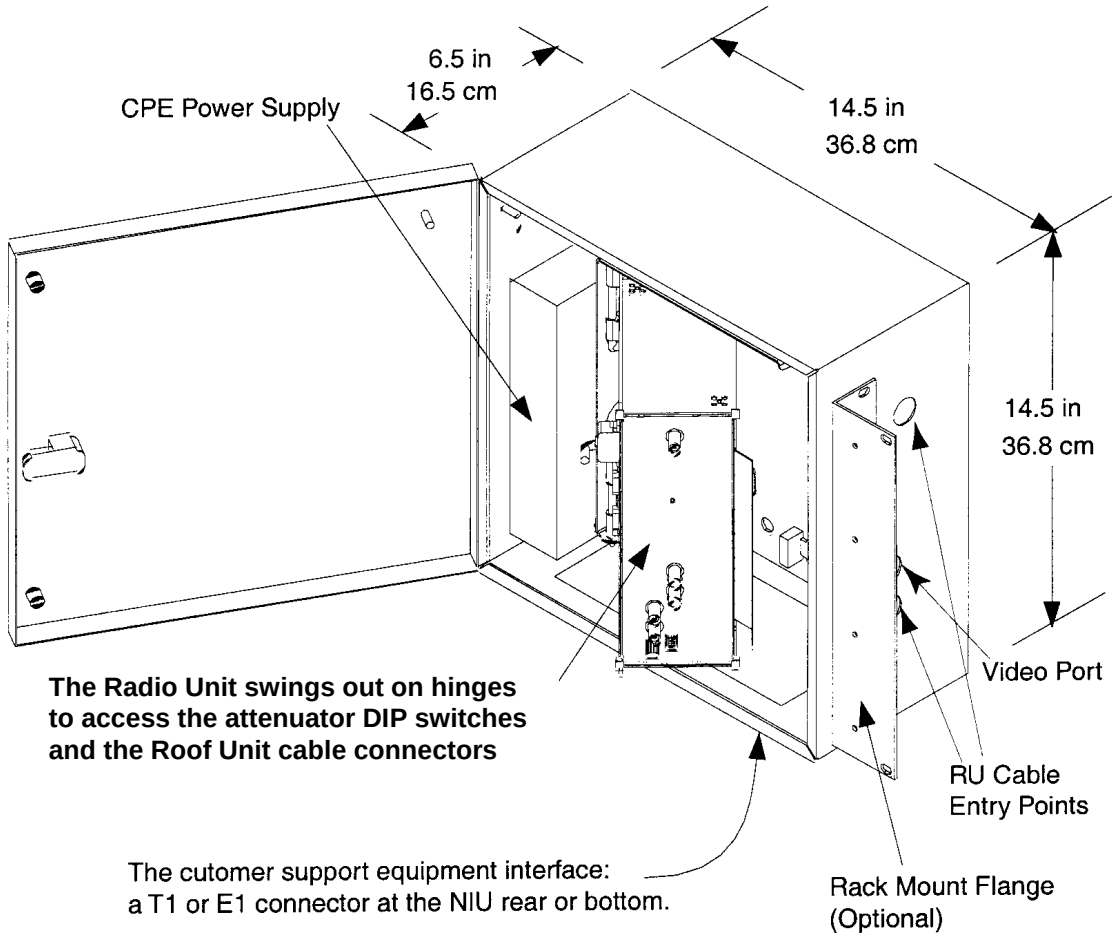

Figure 9-1 Customer Premises Equipment (CPE) Network Interface Unit (NIU)

The Radio Unit has three multi-pin connectors – dc power, RS-232 command data (serial port) and T1 interface. The translator module has three type F coaxial connectors -- I/F output/dc power to the Roof Unit, I/F input/transmit enable from/to the Roof Unit and Video out to remote equipment (e.g., cable converter).

An RS-232 cable should be connected between the COM port on the Radio Unit and the COM1 port (DB-9 connector) on a PC running Windows95. Only three pins on this port are required for communication as shown in the following table:

DB-9, COM1	DB-9, NIU	Signal
2	3	Tx
3	2	Rx
5	7	Gnd

This cable is used for communication with the modems and the translator through the RASCO (**R**adio **A**ccess **S**ystem **CO**ntroller) by using the Bosch Sector Controller program (SECO).

4.2 AWG-2021 & SMHU-58

This test set is used to generate an arbitrary waveform at the desired IF frequency to produce a simulated QPSK signals at any specified code rate or channel bandwidth. The Tektronix AWG-2021 generates the filtered I and Q signals which are applied to the Rohde & Schwarz SMHU-58. The SMHU-58 uses the I and Q signals to produce a phase modulated L-Band IF for input to the Roof Unit transmitter through a Roof Unit test fixture. Both AWG-2021 and SMHU-58 are connected to a PC by HP-IB cable. Tektronix software (IQSIM) is used to generate the I and Q signals and transfer these signals to the SMHU-58.

4.3 Roof Unit Test Fixture

The Roof Unit Test Fixture consists of a power supply, two bias-T's, two 50-to-75 ohm transitions, and a resistive voltage divider transmit enable circuit as shown in Figure 9-2.

The dc power for the Roof Unit transmitter is sent to the Roof Unit transmitter via the *Receive* coaxial cable. The Transmit Enable signal is sent to the Roof Unit transmitter via the *Transmit* coaxial cable. A toggle switch on the Test Fixture allows the operator to turn the transmitter on or off.

The Roof Unit Transmitter is designed for 75 ohm input and output. The 50-to-75 ohm transitions match the 50 ohm input or output of the associated test equipment to the 75 ohm impedance of the Roof Unit.

The Bias-Ts allow DC power and Transmit enable to be coupled to the 75 ohm coaxial cables.

The test fixture operates from a 120VAC 60 Hz power source.

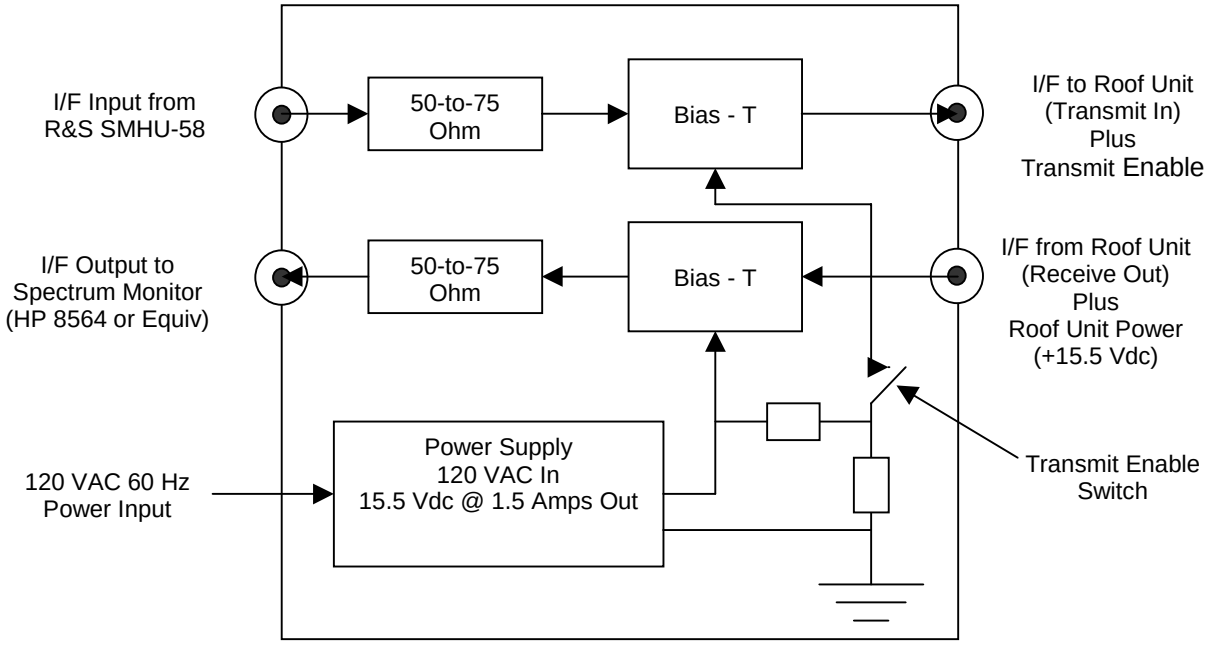

Figure 9-2 Roof Unit Test Fixture

4.4 Pilot Tone Simulator

A CW signal source (HP 83640L Frequency Synthesizer, or equivalent) provides a continuous tone at 27510 MHz to the Roof Unit receive port to simulate a pilot tone input. The nominal power level of this reference is -55dBm.

4.5 CPE Roof Unit

The roof unit is the central piece of equipment for this test. It upconverts a QPSK modulated IF signal (from either the NIU or from the SMHU-58) to a Ka band channel and provides power amplification. The roof unit contains an Electronics Board (consisting of a local oscillator, upconverter, downconverter, and power amplifiers. The antenna waveguide/feedhorn assembly and reflector are mounted on the chassis. The antenna feedhorn assembly will generally be removed removed for testing.

4.6 Waveguide Directional Coupler

A waveguide directional coupler (P/N 559A-40/599, or equivalent) is attached to the Roof Unit at the transmit output waveguide port to facilitate the measurement of output power, occupied bandwidth and other spectral analysis. A power meter is connected to the 40dB coupled port and a spectrum analyzer is connected to the through port of the waveguide directional coupler.

4.7 Power meter

An RF power meter (Anritsu ML2438A, or equivalent) is used to measure the output power of the roof unit transmitter. All the test measurements are taken at the maximum output power, +20dBm. The maximum limit for the power meter is +20dBm, therefore it is connected to the coupled port of the waveguide directional coupler which is 20dB down from the input port.

4.8 Spectrum Analyzer

A Spectrum Analyzer (model HP 8564E, or equivalent) is used to monitor the output of the roof unit transmitter and measure its power spectral density and occupied bandwidth. A DC block must be used on the input to the spectrum analyzer for protection. Also, sufficient series attenuation should be used to protect the spectrum analyzer from high power levels.

5.0 Instructions for setting up the system and software

This test system will support two types of tests, one with AWG-2021 and SMHU-58 (Simulated Operation) which can provide a variable bandwidth single-channel QPSK signal and the other with the Bosch Network Interface Unit (companion unit delivered with the Roof Unit as subscriber equipment) which can provide single-channel QPSK signals at three operator-selectable bandwidths.

Hardware and software required to support stand-alone testing of the CPE Roof Unit is listed in Table 9-1.

Table 9-1 Hardware and Software to Support Operation of the SpectraPoint Roof Unit in Stand-Alone Test Configuration

Item	Description	Model Number	Manufacturer
1	Roof Unit	3214864-001	Bosch Telecom, Inc.
2	Frequency Synthesizer, 960 MHz at –5 dBm	HP83640B (or equivalent)	Hewlett-Packard
4	Roof Unit Test Fixture	[TBD]	Bosch Telecom, Inc.
5	Input Signal Source for Simulated QPSK Operation with Arbitrary Waveform Generator	SMHU-58 AWG 2021	Rohde & Schwarz Tektronix
6	Personal Computer with Dual RS-485 and IEEE-488 Interface Cards	133 MHz Pentium Processor	Gateway
7	SECO Test Software	Version X.X	Bosch Telecom, Inc.
8	IQSIM Test Software	Version X.X	Tektronix
10	RF Cables (2) (75 ohm “F”/”F”) (IF Input & Output)		Bosch Telecom, Inc.
12	SERSI Test software	Version X.X	Bosch Telecom, Inc.

Equivalent equipment may be substituted

5.1 Test Equipment Setup for Simulated QPSK Modulation

The following instructions present a step-by-step procedure for setting up the system with the AWG2021 and SMHU58. Refer to Figure 9-3.

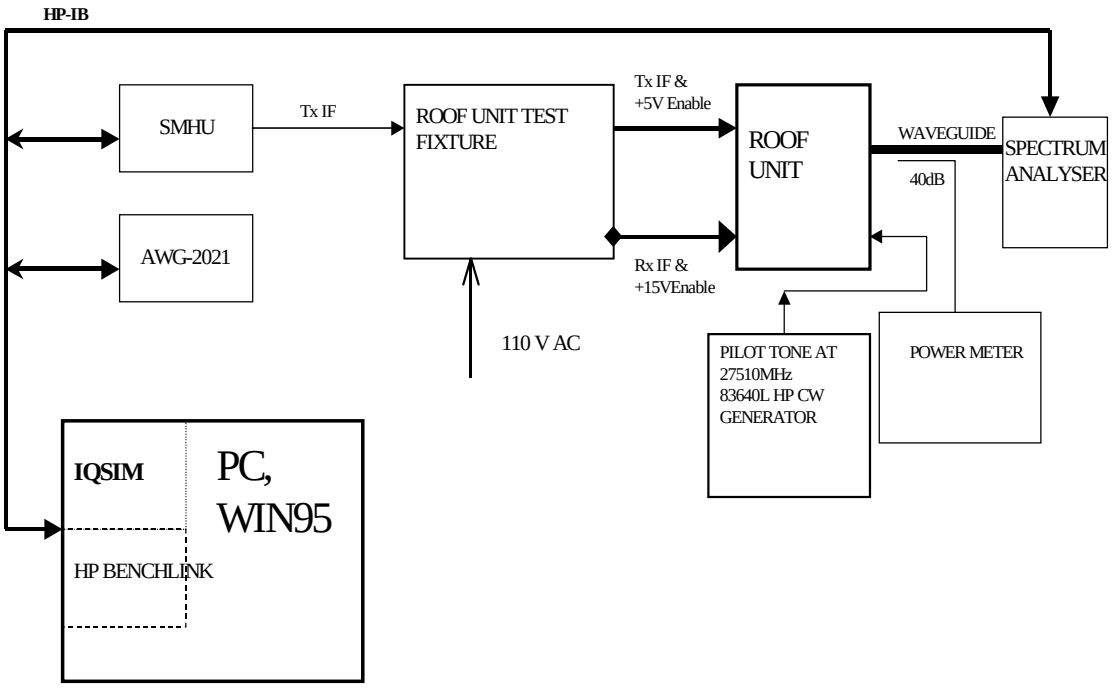

Figure 9-3 Setup For Testing the Roof Unit Using QPSK Modulation from a Simulated Source

1) Connect a GPIB cable (IEEE-488) between the SMHU-58 and AWG-2021.
2) Connect a GPIB cable between the Personal Computer and the AWG-2021.
3) Connect equal-length (i.e., within 0.25 inches) 50 ohm BNC cables between the I and Q output ports on the front of the AWG2021 and the I&Q input ports on the back of the SMHU58.
4) Turn on the PC, AWG2021 and the SMHU-58.
5) Verify that the address on the AWG2021 is set to 14

6) Verify that the address on the SMHU-58 is set to 28.
7) Double-click on the IQSIM icon on the computer to start the IQSIM software.
8) The IQSIM window should come up and acknowledge that the PC is connected to the AWG2021 and SMHU58. Click **OK.**
9) On the IQSIM File menu, select **Load File**.
10) Select **2.04M-QPSK.IQS**. Click **OK.**
11) Select the **modulation** menu **-> Mod. Type -> PSK -> QPSK**
12) The filter function in the SpectraPoint System is a raised cosine. **Select modulation -> Filtering -> Filter Function -> \/‾‾COS**.
13) To set α of 0.3, select **modulation -> Filtering -> Filter Function -> parameter**. Type **0.3** in the box and click **OK.**
14) To set the symbol rate, select **Modulation -> Symbol Rate** and type **2.04MHz** and click **OK.**
15) Select **'Transfer to AWG2021'** from the transfer menu. After a few seconds, the computer responds by indicating that the transfer is complete.
16) Set the desired IF frequency and power level on the SMHU58.
17) The power level is set such that the roof unit output power indicated on the power meter is +20dBm (with correction for waveguide and cable losses).
18) Connect a coax cable from the output of the SMHU58 to the QPSK IN port on the Roof Unit Test Fixture.
19) Proceed to section 5.3.

5.2 Test Equipment Setup for Operation with Network Interface Unit (NIU)

The following instructions present a step-by-step procedure for setting up the system with the Bosch NIU.

The interconnection of different parts is shown in Figure 9-4.

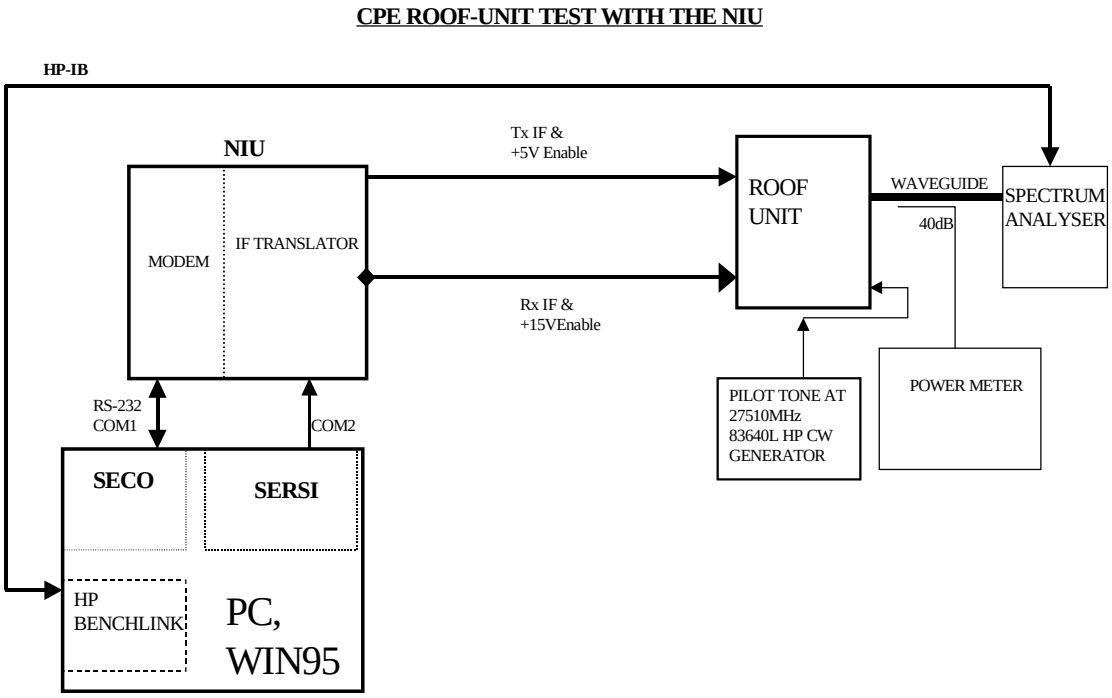

Figure 9-4 Setup For Testing the Roof Unit Using QPSK Modulation from the NIU

1) Verify a modem card and a translator module are properly installed in their respective slots in the Radio Unit of the NIU.
2) Connect the RS-232 cable between the COM1 port on the Personal Computer (PC) and the Radio Unit DB-9 connector.

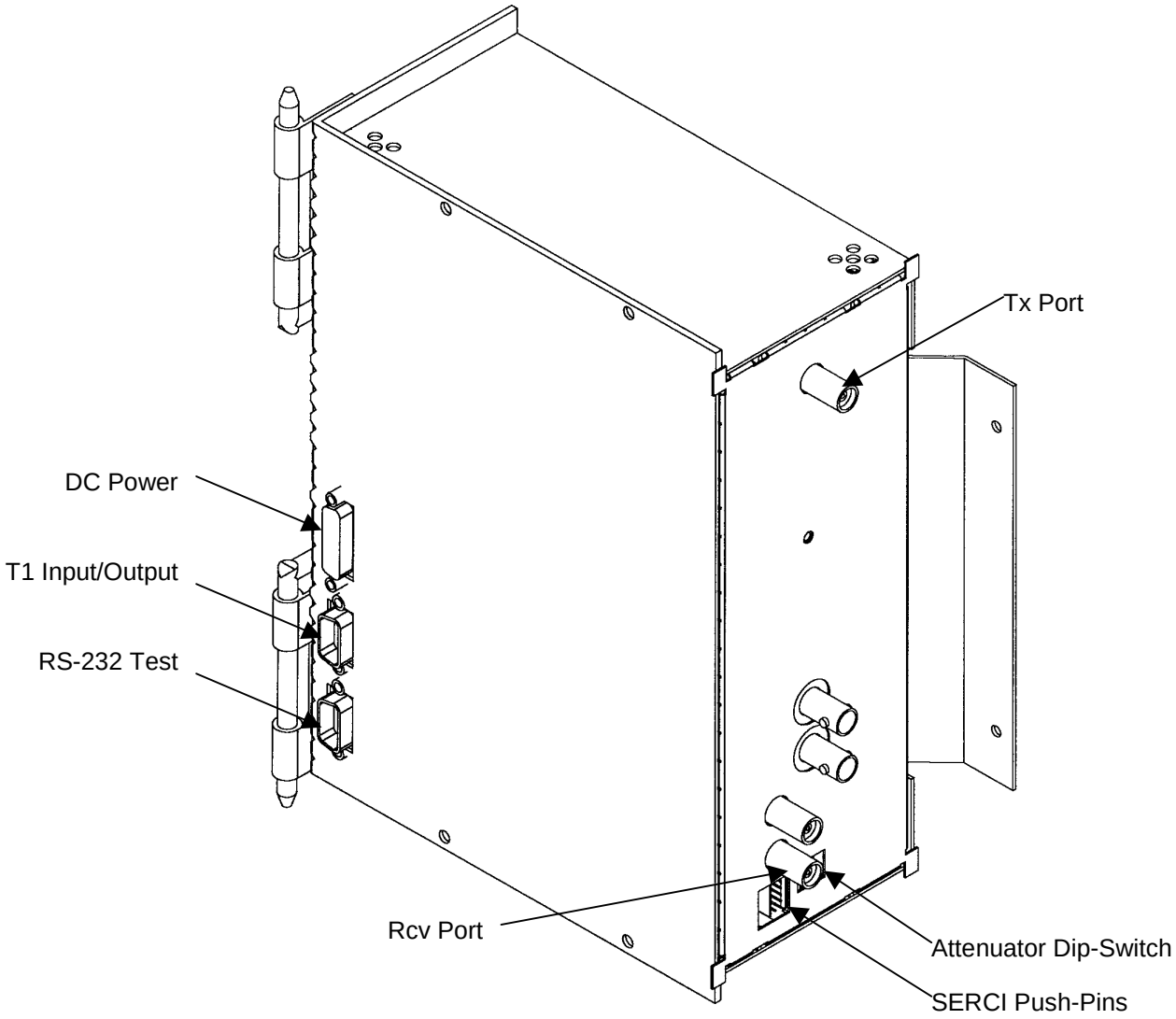

Figure 9-5 Location of Connectors, Push-Pins and Attenuator Dip-Switches on the NIU Radio Unit

3) Verify a modem card and a translator module are properly installed in their respective slots in the Radio Unit of the NIU. (Refer to Figure 9-5).

4) Connect the RS-232 cable between the COM1 port on the Personal Computer (PC) and the Radio Unit RS-232 Test (DB-9) connector.

5) Remove the five push-pin jumpers (located just below the receive port of the translator in the Radio Unit) and connect the SERSI cable between these pins and the COM2 port of the PC.
6) Apply 120 VAC 60 Hz power to the NIU and turn on the PC.
7) Start the SECO software by double-clicking on SECO icon on the PC.
8) On the right-hand side of the main SECO window, verify that the CPE box is 'checked'; click on it to put a 'check' in it if it is not.
9) If you check the box, the SECO will ask for a conformation. Click **'Continue'**.
10) The message 'THE CONNECTION IS UP NOW' should be present on the lower part of the main window.

    Note: If this message does not appear, SECO is not communicating with the CPE. Check all cable connections and begin again at step 1.

11) Click on the **CPE** block of the main SECO window.
12) Click on the **OBJECT menu** and select **ADD NEW CPE MODEM**. A new window titled **'New CPE Modem: 1'** should open.
13) Enter the modem identification number. Click **OK**.
14) Select the modem and click on the **MODIFY** button on the right side of the window.
15) Click to put a "check" in the **Carrier** and **Modulator** boxes.
16) Click to put a "check" in **ESF** in the Frame mode section.
17) Click to put a "check" in **B8ZS** in the line code section.
18) Click to put a "check" in the **Symmetrical Tx+Rx** parameters box and enter **15 MHz** as the transmit frequency.
19) Click to put a "check" in the **Tx Timeslot** button. A new window will open showing the timeslots for transmit and receive. Click the **'Set All'** button. The values for Tx and Rx should read **'0xffffff'**.
20) Verify that the **symmetrical** and **hexadecimal** buttons are checked and click **OK**.
21) Click **OK** to close the window.
22) Click **OK** again to close the **Modify** window.
23) Verify that all the attenuator dip switches on the lower right-hand side of the IF Translator are turned off (positioned to the left side).
24) Connect the **Tx IF** port of the translator to the **Tx** port of the roof unit with a 75-ohm CATV coaxial cable.
25) On the PC, double-click on the **SERSI** icon to open the SERSI tool. (This program allows the IF frequency of the translator to be selected directly in steps of 5MHz instead of through SECO.

26) Select the Upconverter frequency from the menu on the screen.

27) Enter the IF frequency at which the system is to be tested.

28) Proceed to section 5.3

5.3 Setup for Antenna Conducted Measurements on the Roof Unit

1) Remove the radome cover and waveguide/feedhorn assembly from the Roof Unit.
2) Connect the waveguide directional coupler to the transmit waveguide port.
3) Connect a “K” to WR-28 coax-to-waveguide transition to the receive waveguide port.
4) Connect the IF cable from either the Bosch NIU (Translator Tx Output connector) or from the SMHU58 (RF Output connector) to the **TX IN** connector on the rear of the Roof Unit.
5) Connect the RF power meter probe to the coupled port of the waveguide. Enter the exact coupled loss of the coupled port as an offset in the power meter so that the output of the transmitter can be directly read directly from the power meter.
6) Connect 8564E Spectrum Analyzer to the through port of the waveguide directional coupler with a 16dB attenuator.
7) Set the center frequency of the spectrum analyzer to the signal of interest. Set the resolution bandwidth (RBW) to 30KHz and Video bandwidth (VBW) to 300KHz.
8) Increase the IF power level till the RF output (as measured on the power meter) indicates +20dBm.
9) The system is now ready to take measurements.