BOSCH TELECOM	**Exhibit 8 -- User's Manual** Bosch Telecom Node Transmitter FCC ID: NNS3214823 Part Number: 3214823-003 (Vertically Polarized) 3214823-004 (Horizontally Polarized)

Information Provided in this Exhibit

Operating Instructions for the Transmitter (Stand-Alone Configuration)

The Bosch Telecom Node Transmitter, under operational conditions, is under control of the SpectraPoint® Element Controller and Network Management software which automatically determines 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 transmitter may be operated at maximum rated output power with automatic power control disabled and commanded to various operating frequencies within the allocated band of operation and 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 Single Transmitter

1.0 Scope

This document provides the tune-up instructions for operation of a single SpectraPoint Node Transmitter, when operated for test purposes (i.e., without the control of the SpectraPoint System for which it is intended to operate).

2.0 Introduction

Transmitters, when operating under control of the SpectraPoint System, are “automatically” commanded to the correct operating frequency (i.e., the correct intermediate frequency signal input, both tuned frequency and amplitude, and the correct local oscillator frequency) and provided with the correct reference frequency, to be caused to transmit at the appropriate RF output level for range and path conditions. However, for test purposes, control of these signals must be provided by test hardware and software which is defined in this document.

3.0 Interconnection of Support Equipment

The interconnection of the SpectraPoint Node Transmitter and support equipment is shown in Figure 8-1 and support hardware and software is contained in Table 8-1.

The Node Transmitter may be operated to produce a CW output (pilot tone for SpectraPoint System), a single QPSK phase modulated output (simulating single-channel QPSK used in the SpectraPoint System at service-provider-selectable bandwidths) or a multiple-channel QPSK phase modulated output (simulating multi-channel modem-generated signals).

Preliminary Release

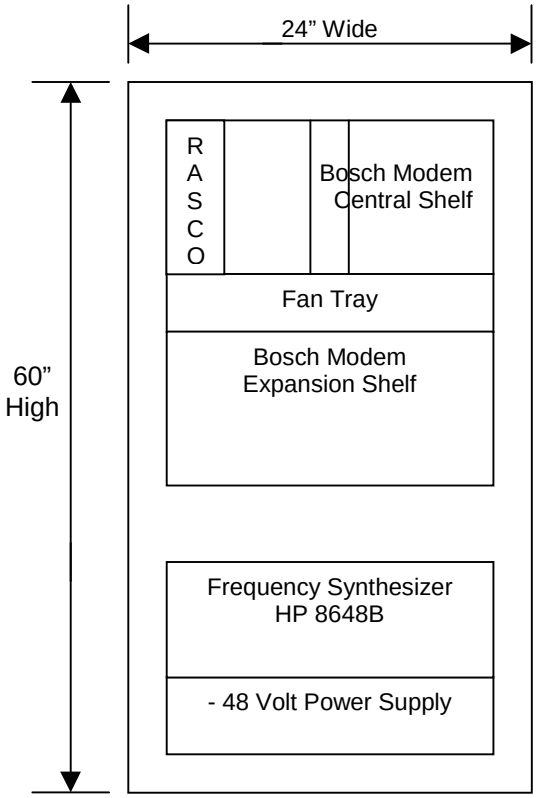

Figure 8-1: Bosch Modem Test Set

Preliminary Release

Table 8 - 1 Hardware and Software to Support Operation of the SpectraPoint Node Transmitter in Stand-Alone Test Configuration

Item	Description	Model Number	Manufacturer
1	Node Transmitter	3214823.00x	Bosch Telecom, Inc.
2	Frequency Synthesizer, 960 MHz at –5 dBm	HP 8648B (or equivalent)	Hewlett-Packard
3	Input Signal Source for CW Operation	HP 8648B (or equivalent)	Hewlett-Packard
4	Input Signal Source for Modem Operation	[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	NA-1 Test Software	Version X.X	Bosch Telecom, Inc.
8	SECO Test Software	Version X.X	Bosch Telecom, Inc.
9	IQSIM Test Software	Version X.X	Tektronix
10	Power/Command Cable Assembly	3214944-002	Bosch Telecom, Inc.
11	RF Cable (N/N) (IF Input Cable)	8000048-001	Bosch Telecom, Inc.
12	RF Cable (N/TNC) (Ref Tone Input Cable)	8000048-001	Bosch Telecom, Inc.

Equivalent equipment may be substituted

Preliminary Release

4.0 Description of the test and support equipment

4.1 Bosch Modem Test set

The Bosch modem test set consists of the central shelf, expansion shelf and a -48Vdc power supply. The expansion shelf consists of slots for 14 modem circuit cards (plus two spares), a combiner circuit card and a power supply module. The central shelf consists of RASCO module, six modem circuit cards, one broadcast modem circuit card, one combiner circuit card, a power supply module and an IF translator module. In a typical operation (and for test) only 20 modems are used. A diagram of this test set is shown in Figure 8.1. On the RASCO, there is a DB-25 connector labeled as Serial Port 2.

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

DB-9, COM1	DB-25, RASCO	Signal
Pin 2	Pin 3	Tx
Pin 3	Pin 2	Rx
Pin 5	Pin 7	Gnd

This cable is used for communication with the modems and the translator through the RASCO using the Bosch Sector Controller program (SECO).

4.2 AWG-2021 & SMHU-58 Test Set

This test set is used to generate an arbitrary waveform at the desired IF frequency to produce a simulated QPSK signal at any specified code rate or channel bandwidth. The channel bandwidth may be 30, 40 or 50 MHz depending on the type of communication. 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 signal for input to the node transmitter. Both AWG-2021 and SMHU-58 are connected to a PC by HP-IB cable to the PC. Tektronix software (IQSIM) is used to generate the I and Q signals and download these signals to the SMHU-58.

4.3 Junction Box

The junction box provides the mechanical interface and the electrical connectivity to provide -48Vdc and control signals to the node transmitter utilizing actual system cabling.

4.4 Reference Tone Generator

A CW generator (HP 83640L or equivalent) is used to generate a continuous tone at 960 MHz to provide a reference frequency to the node transmitter simulating the reference signal from the Frequency Reference System in the Control and Monitor rack. The normal power level of the reference input to the transmitter is –5 dBm (range is -7 to 0 dBm).

4.5 Node Transmitter

The transmitter consists of a local oscillator module, HPA/Upconverter module, a waveguide filter, an antenna, and a polarizer mounted in a chassis. For some tests, the antenna and the polarizer may be removed and a waveguide adapter plate (part number 3214985) connected directly to the waveguide filter. The transmitter, the equipment under test (EUT), upconverts an L-Band IF input signal to produce a Ka-Band RF output signal and provides power amplification. It receives the IF signal from either the Modem Test Set or from the SMHU-58 and the LO reference from the reference tone generator via coaxial cables. The power and control signals are provided through the junction box through a multi-conductor cable.

4.6 Waveguide Directional Coupler

A waveguide directional coupler (Millimeter Products 559A-20/599, or equivalent) is attached to the waveguide adapter plate at the output of the transmitter to facilitate the measurement of the output power and spectral analysis. A power meter is connected to the 20dB-coupled port and a spectrum analyzer is connected to the through-port of the waveguide.

4.7 Power meter

An RF power meter (Anritsu ML2438A, or equivalent) is used to measure the output power of the transmitter. All the test measurements are taken at the maximum output power from the transmitter, which is +30dBm. The maximum power which the power meter can handle is +20dBm, therefore, it is connected to the coupled port of the waveguide which is 20dB down from the input port.

4.8 Spectrum Analyzer

A spectrum Analyzer (HP 8564E) is used to monitor the output of the transmitter and measure power spectral density, channel power and occupied bandwidth. A DC block is used on the input to the spectrum analyzer for protection. Sufficient series attenuation should be used to protect the spectrum analyzer.

5.0 Instructions for setting up the system and software

This test system was designed to support two types of tests, one with AWG-2021 and SMHU-58 (Test 1) which can provide a variable bandwidth single-channel QPSK signal and the other with the Bosch modem rack (Test 2) which has a fixed 30MHz multi-channel bandwidth but with different code rates for individual modems. Refer to Figure 8-2.

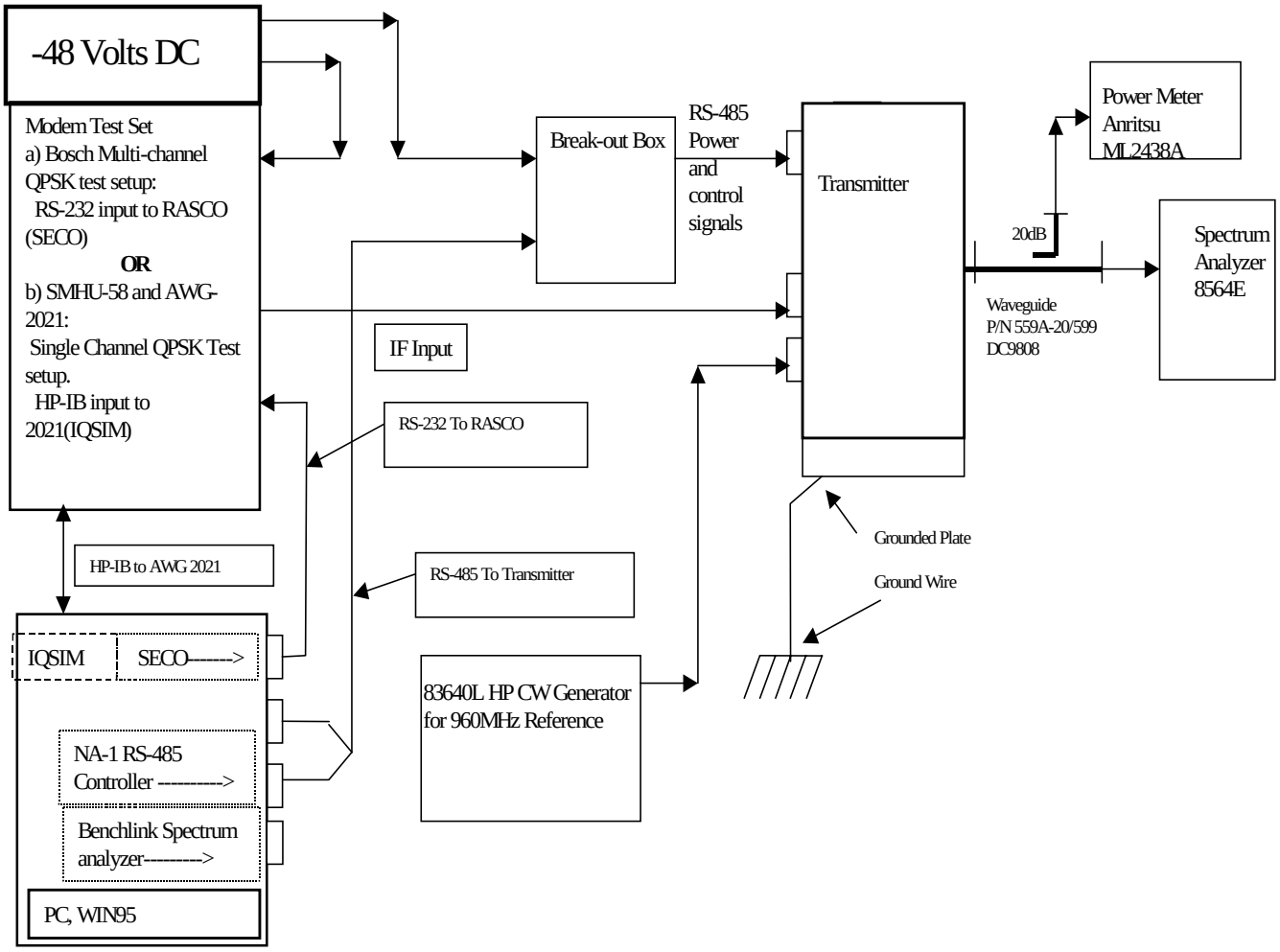

Figure 8-2 Test Arrangement of Equipment to Support Stand-Alone Testing of Transmitter

Preliminary Release

5.1 Test Equipment Set-up for Simulated QPSK Modulation

The following instructions provide a step-by-step procedure for setting up the system with the AWG2021 and SMHU58:

1. Connect an HP-IB cable between the SMHU-58 and AWG-2021.
2. Connect an HP-IB cable between the PC and the AWG-2021.
3. Connect equal-length (i.e., within 0.25 inche) 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 GPIB address on the AWG2021 is set to 14
6. Verify that the GPIB address on the SMHU-58 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 AWG2021 and SMHU58. Click **OK**.
9. On the IQSIM File menu, select **Load File**.
10. Select **30M-QPSK.IQS**. Click **OK**.
11. To set the modulation, select the **modulation** menu **-> Mod. Type -> PSK -> QPSK**
12. The filter function in the SpectraPoint system is raised cosine. **Select modulation -> Filtering -> Filter Function -> √‾COS**.
13. To select an **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**, type **30MHz** 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. Connect a coax cable from the output of the SMHU58 to the IF IN port of the transmitter.
17. Set the desire IF frequency and power level on the SMHU58. The power level is set such that the transmitter output power indicated on the power meter +30 dBm (with correction for cable, attenuator and waveguide losses).
18. Proceed to section 5.3.

5.2 Test Equipment Set-up for “Actual” QPSK Modulation

The following instructions provide a step-by-step procedure for setting up the system with the Bosch Modem Test Set.

1. Verify there are 6 modems and 1 broadcast modem present in the central shelf of the rack. The Broadcast modem is next to the translator.
2. Verify there are 14 modems in the expansion shelf.
3. Turn on the power supply.
4. Double-click on the SECO icon on the computer.
5. On the right-hand side of the main window, verify that the RASCO box is checked. If not check that box. (If a ‘check’ is added to the box, the SECO will ask for a conformation. Click 'Continue').

   A message stating 'THE CONNECTION IS UP NOW' should be displayed on the lower part of the main window. If this message is not present, the SECO is not communicating with RASCO; check the cable connections and start at step 1 again.

7. Click ‘BRC Modems’ in the SECO main window. A new window should appear with modem information on line 1. Select this modem by clicking on the cell under the index column containing the serial number.
8. ‘Click’ the **Modify** button on the right side of the window. A new window (‘Selected BRC Modem: 1’) should appear. Parameters for this modem may be modified.
9. ‘Check’ the Carrier and Modulator boxes.
10. Select 1300.0 MHz from the drop-down menu for the Tx frequency to set the broadcast frequency for the broadcast channel.
11. Set the Tx Power Delta to 12dB and the Power Compensation Factor to 0dB.
12. ‘Click’ **OK** and close the broadcast modem window.
13. ‘Click’ the “BST Modems” box in the SECO main window.
14. To modify modem operating parameters, select each modem in the BST Modems window and click the ‘**Modify**’ button.
15. ‘Check’ the **Carrier** and **Modulator** boxes.
16. ‘Check’ **ESF** in the Frame mode section.
17. ‘Check’ **B8ZS** in the line code section.
18. ‘Check’ the **Symmetrical Tx+Rx** parameters box.
19. ‘Check’ the **Tx Timeslot** button. A new window will open showing the timeslots for transmit and receive; ‘check’ the ‘**Set All’** button. The values for Tx and Rx should read ‘**0xffffff**’.
20. Verify that **symmetrical** and **hexadecimal** buttons are checked and ‘click’ OK.

Preliminary Release

21. The only values to be entered are the frequencies, Tx power Delta and modulation type. The frequencies are unique for each modem and are entered per Table 7-2 (shown below). The Tx Power Delta and the modulation type for different code rates should also be entered as shown in Table 8-1, below.

Table 7-2 Modem Operating Parameters

Index	Factory ID	Tx Frequency (MHz)	Tx Modulation	Tx Code Rate	Tx Power Delta(dB)
1	978228779	1.961	QPSK	3/4	13.2
2	978228859	3.320	QPSK	3/4	12.5
3	978228795	4.679	QPSK	3/4	11.9
4	978228865	6.038	QPSK	3/4	11.5
5	978228773	7.397	QPSK	3/4	11.1
6	978228838	8.756	QPSK	3/4	11
7	978228834	10.115	QPSK	3/4	10.6
8	978228878	11.377	QPSK	7/8	8.6
9	978228803	12.542	QPSK	7/8	8.6
10	978228862	13.706	QPSK	7/8	8.6
11	978228775	14.871	QPSK	7/8	8.5
12	978228809	16.036	QPSK	7/8	8.2
13	978228820	17.201	QPSK	7/8	8.2
14	978228768	18.366	QPSK	7/8	8.2
15	978228800	19.691	QPSK	7/8	8.2
16	978228839	20.856	QPSK	7/8	8.2
17	978228811	22.02	QPSK	7/8	8.5
18	978228789	23.622	QPSK	1/2	12.8
19	978228783	25.66	QPSK	1/2	13
20	978228771	27.699	QPSK	1/2	13

25. Minimize the **BST Modems** window.

26. 'Click' **RASCO** in the SECO main Window.

Preliminary Release

27. Select index 1. 'Click' on **Parameter** menu and select **IF unit** from the list.
28. 'Check' the **ON** box for the HPA mode. This causes power to be applied to the HPA.
29. 'Check' **TWT** in the transmitter type.
30. Select 1310.926MHz for the outbound channel and 1720.926 for the inbound channel.
31. Set **Tx Gain** at 35.5% on the scale and 'click' OK.
32. Verify that all the attenuators on the lower right-hand side of the IF Translator are turned off (DIP-switches toward the left side).
33. Connect a 75-to-50 ohm adapter to the TX IF port of the translator.
34. Connect a 50 ohm coaxial cable between the 50 ohm side of the 75-to-50 ohm adapter on the translator TX IF port and the IF input connector (type N) of the transmitter.
35. Proceed to section 5.3

5.3 Transmitter Setup

1. Place the transmitter (3214823.XXX) on a waveguide bench and attach the test waveguide directly to its waveguide filter.
2. Connect an RS-485 cable from the Junction box to the Transmitter.
3. Connect an RS-485 cable from the Junction box to the RS-485 controller card in the PC. The cable has two DB-9 connectors, one for Data (orange) and the other for Reset (blue).
4. Connect the IF cable from either the Bosch modem test set or from the SMHU58 to the IF input connector on the transmitter.
5. Connect the Reference Signal from the HP83640L CW generator to the Reference Frequency input on the transmitter. Verify the level of the reference signal is -5dBm.
6. Connect the ML2438A power meter to the coupled port of the waveguide. Enter the exact coupled loss after calibrating the waveguide as an offset in the power meter to allow the output of the transmitter to be read directly off the power meter.
7. Connect 8564E Spectrum Analyzer to the output port of the waveguide with a 16dB attenuator. The spectrum analyzer is used to observe the behavior of the signals, for troubleshooting or to take measurements.
8. 'Double-click' on the **NA-1 RS-485 Controller** icon on the PC.
9. Verify that the PC Data Comm port is set to 5 and the Reset port is set to 6.
10. 'Click' on the **Solid State Transmitter** box under the Node section.
11. Set the **STX address** in the new window to **129**.
12. Set **Light** to **OFF**
13. Set **ALC** to **Disabled**.

Preliminary Release

14. Set **RF BIT threshold** to **12 dBm**.
15. Set **Power Control** to **ON**.
16. Set **LO frequency** to **26550 MHz**.
17. Set **IF attenuation** to **40 dB**.
18. Close the window.
19. Verify that the light at the back of the transmitter digital board is green. If it is not green, check the settings in the Solid State Transmitter window again.
20. Set the center frequency of the spectrum analyzer to the signal of interest. Set the resolution BW to 30KHz and Video BW to 300KHz.
21. Increase the IF power level to obtain an RF output of +30dBm as indicated on the RF power meter.
22. The system is now ready to take measurements.