Overview

Figure 1-1 Powerwave Wideband Radio Head (WRH)

Powerwave WRH-Vs work as bi-directional on-frequency amplifiers used to extend coverage into uncovered areas in wireless mobile systems such as base station fringe areas, tunnels, convention centers, airports and buildings. It receives, amplifies, and transmits signals to/from a base transceiver station (BTS) to/from mobile stations (MS) with both directions being served simultaneously. Connections to the WRH-V are made with N-type or 7/16" male connectors.

WRH-Vs are microprocessor controlled with alarm and operational status LEDs visible on the front cover. Cooling is provided through convection heat dissipation. Operational parameters, such as gain and power levels are set using a PC running Powerwave OM-Online software which communicates with the WRH-Vs either locally or remotely via modem. Remote operation can be performed via PSTN or a GSM net. The Operation and Maintenance System (OMS) provides for Network Operations Center (NOC) configuration and alarm monitoring.

WRH-Vs can be configured in many combinations depending on the wireless system, single or double system operation, and output power. The following paragraphs provide a description of the different models of WRH-Vs available.

The WRH-V is a fiber fed system designed to provide a high output power level and comes equipped with a MCPA in the downlink path. The MCPA restricts the number of bands to one in the cabinet and one additional band if a high cover is used. The MCPA is located in the cabinet and is supplied from the existing PSU.

Chassis Design

The WRH-V is housed in a cast aluminium waterproof chassis, class NEMA4 / IP65, approved for outdoor use but is also suited for indoor installations. The chassis consists of a cabinet and a cover attached with hinges. The cabinet contains the WRH-V circuitry. The cover comes as either a low or high version. The high cover can be used as an empty cover or be equipped as a part of the WRH-V or an independent WRH-V unit. A WRH-V with a high cover that is equipped as two independent units can, for example, be equipped for channel selective operation in the cabinet and band selective operation in the cover.

Inside the WRH, a number of amplifier PCBAs are individually shielded and located under a metal cover that can be opened outward. These PCBAs are of different types depending on the supported system.

Sub Unit Overview

A number of amplifier PCBAs are individually shielded and located under a metal cover inside the WRH-V. This cover can be opened outward for access. These amplifier PCBAs are of different types depending on the supported system. All of the WRH-Vs are built up with a number of sub units which are described in the following sections.

Wideband Amplifier PCBA (WBA)

WRH-Vs can handle multiple carriers over a wide band. Each band requires one WBA for the uplink and downlink, and one associated PA or MCPA for the downlink. The cabinet can be equipped with up to two WBAs along with two PAs supporting two bands or one MCPA supporting one band. Positions 1 and 3, shown in Figure 1-6, are assigned for a WBA.

Multi-Carrier Power Amplifier PCBA (MCPA)

The MCPA is used to amplify the output signal from the WBA. Each MCPA can handle one band in the downlink direction. It requires an extra heat sink element on the outside of the cabinet or high cover to dissipate the heat generated. The MCPA occupies positions 2 through 4 in the cabinet and 6 through 8 in a high cover, as shown in Figure 1-6.

Distribution PCBA (DIA)

The DIA is the core distribution PCBA to which all other PCBAs and units connect in the cabinet with the exception of the PA. Figure 1-2 shows a DIA PCBA. A shielded metal frame on the DIA provides the mounting location for the CU, ALI and RCIs, if used.

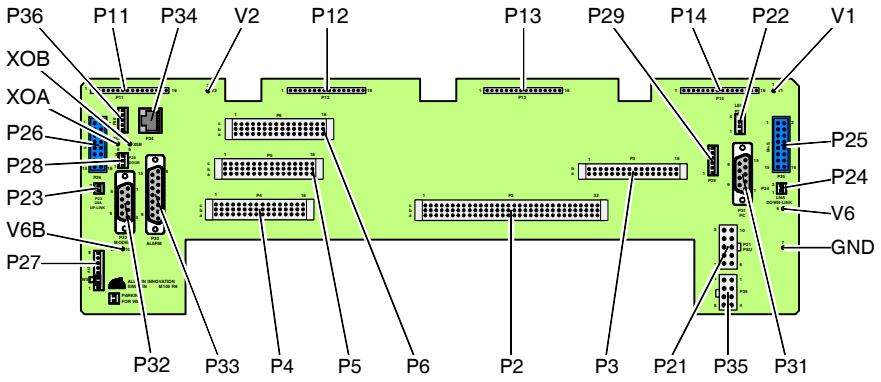

Figure 1-2 DIA PCBA

Control Unit PCBA (CU)

Figure 1-3 shows the CU, which is the core microprocessor controller in the WRH-V and is connected to P2 on the DIA. The CU contains a microprocessor, main memory, flash memory for the CU software, EEPROM memory for parameters, memory for the event log and statistics, a REFO reference oscillator, ports for local and remote communication, a battery powered real-time clock, and a MAC identity circuit. It supervises and controls operational parameters such as gain control and channel handling, alarms, the event log, the password and the logon. The CU is also a control interface for OM-Online and OMS. Software for the CU can be downloaded from OM-Online, either locally or remotely. It is located in the lower right part of the shielded DIA frame.

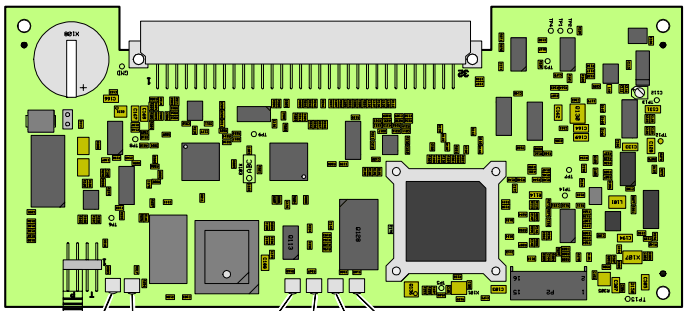

Figure 1-3 CU PCBA

Low Noise Amplifier (LNA)

LNAs are used on the uplink and are located at the top of the cabinet and the high cover, if equipped. An example of an LNA is illustrated in Figure 1-4. All of the coaxial connectors are SMA-type. Signals from the DPX output are fed to the LNA input connector (IN). The OUT1 and OUT2 outputs feed the WBAs in the UL direction. The signal level at these connectors is +20dB referenced to the antenna input. The other output, OUT LOW, is an expansion output for an additional LNA if the WRH-V is equipped with a unit in the cover part of the chassis. The gain to this connector is +2dB. The +7V input is used for +7V supply from the DIA PCBA and the ATT connection is for the control signal for a controllable attenuator in the LNA.

Figure 1-4 LNA

Duplex Filter (DPX)

DPXs are located on the metal cover sheet in the upper part of the cabinet.

Fiber Optic Unit (FOU)

The FOU is a metal plate mounted on top of the cover plate in the upper part of the WRH. The FON and fiber optic connectors are mounted on the FOU. Figure 1-5 illustrates an FOU with the FON and fiber optic connectors mounted on the plate. It can also be configured with combiners, splitters, and Wave Division Multiplexers (WDMs) to obtain a desired combination of several branches with double or single fiber.

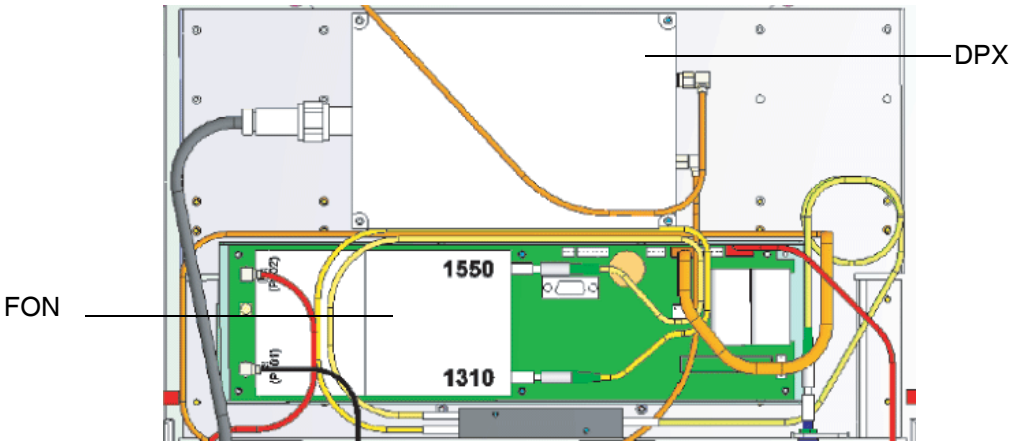

Figure 1-5 FOU in WRH-V

Fiber Optic Node (FON)

The FON is the main part of the FOU. It is a bi-directional electrical/optical signal converter and a node in a fiber network. In addition, the FON has all the functionality included in the CU PCBA and contains battery backup. It has also functionality for:

- Electrical and optical signal supervision
- Internal and external alarm handling
- RS232 interface for local PC control via an O&M software (OM-Online)
- Remote control via an O&M software (OM-Online or OMS)
- Interfaces for RCU and FLI
- Battery backup with charger

There are two versions of the FON; one with three SMA ports (UL, DL and RX Mon) and the other with four SMA ports (UL, DL, RX Mon and TX Mon). The FON also has two optical ports for DL and UL fiber connections.

Power Supply Unit (PSU)

The PSU supplies DC power to all of the components in the WRH-V.

Remote Control Unit (RCU)

The RCU is an optional communication unit for remote control of WRH-Vs via PSTN or RF modems. RCU types and details are described in Chapter 4.

Alarm Interface PCBA (ALI) and Remote Control Interface PCBA (RCI)

The ALI handles alarms and alarm communication. It is replace with an RCI if an RCU is used and provides an interface between the CU and an RCU for remote communication via modem. The RCI also handles alarms and alarm communication. Either unit is located in the lower left part of the shielded DIA frame.

Sub Unit Locations

The MCPA is located at positions 3 and 4 in the cabinet. A WRH-V is equipped for one band in the cabinet and, if required, an additional band in a high cover. PCBA positions are illustrated in Figure 1-6 and a block diagram is located in Appendix A.

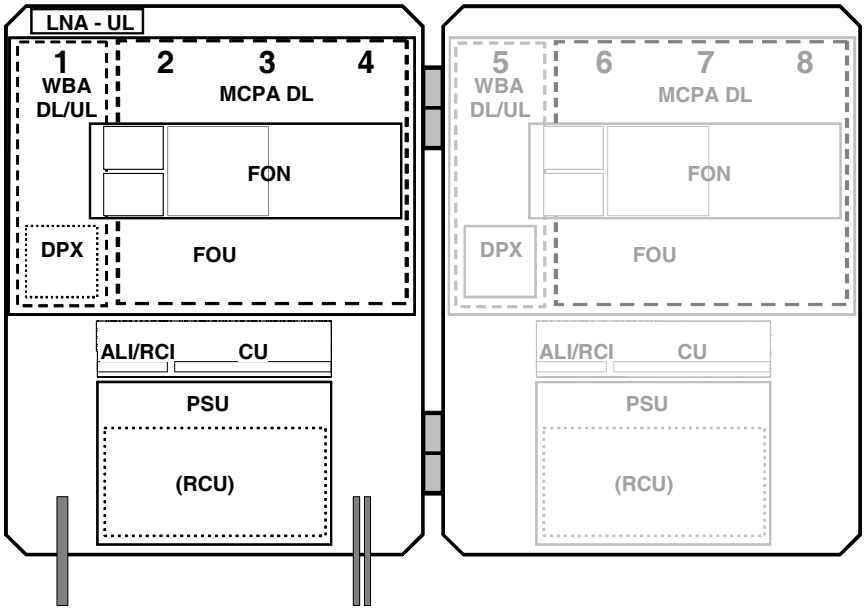

Figure 1-6 WRH-V Sub Unit Locations

Fiber Optic Distribution Networks

Fiber optic networks are setup identically to data networks. WRH-Vs are connected in a star configuration as illustrated in Figure 1-7. In this example, a Base Station Master Unit (BMU) is fed by a BTS via an RF cable. An Optical Converter Module (OCM) could also be used depending on the system configuration. The BMU or OCM contain three FONs and provide continuity to the FONs in the four WRHs. By using WDMs and Optical Splitters (OSPs) in the WRHs, the distribution net can be built up with a combination of star and daisy-chain connections using double or single fiber.

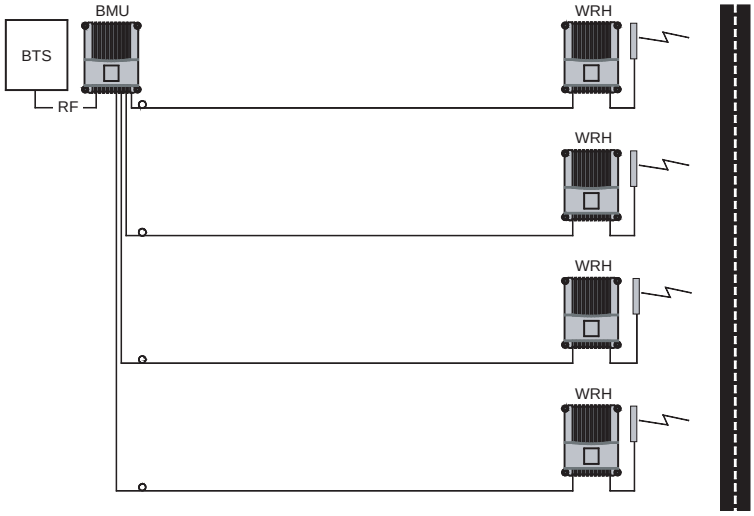

Figure 1-7 Fiber Optic Star Configuration

Multi-Operator Configurations

Multi-operator systems require the use of Point of Interconnect (POI) units and OCMs as illustrated in Figure 1-8. In this simple example, two operators have two sectors each. Each sector is connected to a POI and then to a RCM. The RCM is interconnected with an OCM via coaxial cables. The combined DL and UL signals are converted to optical signals in the OCM and then distributed to the WRHs-V.

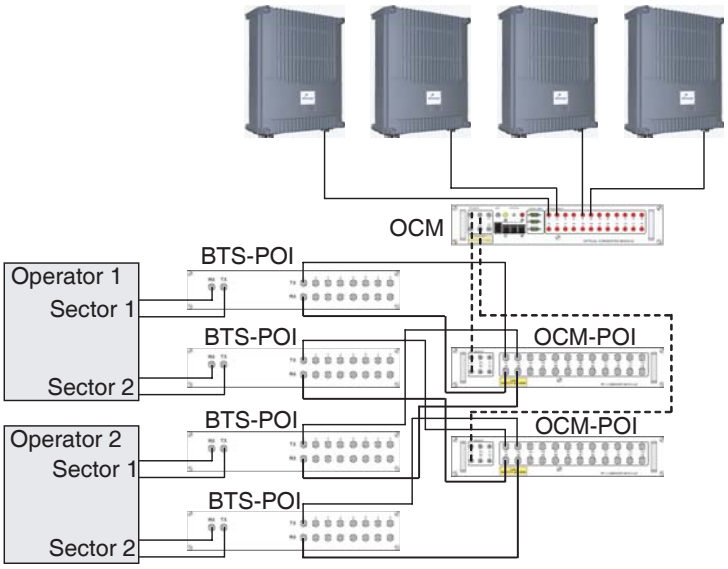

Figure 1-8 Multi-operator System

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