Protection Schemes

301. The 9500 MPR supports the following types of protection:
- Radio Protection Switching (RPS-RX)
- Traffic Peripherals Protection (EPTS)
- Core Protection (EPTS)
- Transmission Protection Switching (TPS)

302. The Radio Protection Switching (RPS) for the RX is implemented in Guineas FPGA of the Radio interface peripheral. In 1+1 RPS configurations, only one logic is active. The slot identifier is used to define which RPS logic is active. The scheme provides up to 3 independent RPS protection schemes for 1+1 configurations.

303. Switching criteria and operator commands are used to select the best radio channel, then the RPS command selected by logic is sent for execution to the Main RPS-RX switch and to the Spare RPS-RX switch in both radio interface peripherals. See diagram in Figure 1.

304. List of switching criteria:
- Early Warning
- High BER
- Dam Fail
- Loss of Frame (LOF) radio signal main path
- Loss of Frame (LOF) radio signal alternate path

![Diagram](image)

Figure 1

305. For Traffic Peripheral Protection (EPTS), all of the switching criteria coming from all traffic peripherals must be available to the FPGA of the Core modules, and to the microprocessor that implements the logic of all the protection schemes. There are 3 independent traffic peripheral pairs available.

306. The best peripheral is selected by switching criteria and operator command logic. The two different situations evaluated are: Radio traffic peripherals and POH access traffic peripherals.

307. To support Radio Traffic peripherals protection, the following must be supported on the transmit side:
- The local access in the radio peripherals, where the packets to be sent to the core and then to the radio protected peripherals are generated and managed, the packets must be sent to the Core, (or both in case of core protection) using destination address, the multicast MAC address of the radio protected peripherals.
- Upon receiving the address resolution table, the Ethernet switches are able to send these packets to both peripherals in protection. Then both peripherals receive the same signal from the Core.

308. Furthermore, in order to send the same data over the air, and to perform on the remote OC, RPS-RX and RPS-Tx switching must be supported on each radio interface peripheral. This protection logic is the same for radio traffic peripheral protection (EPTS). The RPS-Rx peripheral must send the outgoing signal to the other peripheral. Also, both RPS-Tx switches must select the same signal driven by the protection switching criteria.
Core Protection

401. The Core offers 2 types of protection:
- Traffic/Services and Control platform protection. This protection logic is sent to each access and radio peripherals. The Core switching criteria is relative to each peripheral for decision making at the peripheral level. The type of signals sent from main and spare Core to each peripheral are:
  - Payload traffic, services, maintenance, and sync clock signal.

Peripheral Protection

402. The following alarms that peripheral select on active Core by, one:
- Core card fail, Core card missing, Control platform operational status failure, and Flash card failure.

Peripheral Protection

403. The radio peripherals send the packets to the Core (or both Core if Core protected), and the Ethernet switch sends the packets to both peripherals in which one peripheral is made active and the other peripheral inactive.

404. All the Trib DS1 signals come into the protection panel and are split to feed two tributaries in adjacent slots.

Signal Flow Diagrams
Transmission Protection Switching

501. Hot Standby protection is implemented via the software in the MSS. Switching criteria from both radio channels are sent to the logic. The logic then selects the transmitter to be connected to the antenna.

502. The switching is performed by making either of the ODU transmit RF active, (HSB commands on/off).

503. The logic does not switch to an ODU, while it is in reconfiguration phase (i.e. after replacement of the main ODU in revertive mode).

504. In other radio configurations, the ODU transmit RF is squelched only if a failure in the transmit section of the ODU is detected.

505. The switching criteria:
   - MOD 300 card fail (switching the card off included)
   - MOD 300 card missing
   - MSS−ODU cable loss
   - ODU Tx chain alarm – OR function for the following alarms: LOS at ODU input, ModFail, TxFail, ODU CardFail

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**HSB Transmission Protection**

- Frame Management
- MOD 300 Channel # 1
  - RPS TX
- ODU Chan #1

- Frame Management
- MOD 300 Channel # 0
  - RPS TX
- ODU Chan #0

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**Signal Flow Diagrams**
MOD 300 ODU Radio Module

601. In the Transmit direction, the MOD 300 radio module generates the IF signal to be sent to the ODU. The signal contains a constant bit rate built with ethernet packets coming from the Core.

602. In the Receive direction, the MOD 300 radio module terminates the IF signal coming from the ODU extracting the original ethernet packets given to the Core which will distribute them to the proper module.
ODU (Outdoor Unit) Function

701. The quadrature modulated 311 MHz IF signal from the MOD300 in the MDS shall be extracted at the N-FLXR and passed via a cable to an I/Q Modulator/Demodulator.

702. The 311 MHz IF signal is demodulated to derive the separate I/Q signals using the 10 MHz synchronizing reference signal from the MOS.

703. The I/Q signals modulate the Tx IF, which has been set to a specific frequency between 1700 and 2300 MHz, so that when mixed with the Tx local oscillator signal (LO) in the subsequent mixer stage, it provides the selected transmit frequency. Both IF and Tx local oscillators are synthesized type.

704. Between the I/Q modulator and the mixer, a variable attenuator provides software adjustment of Tx power.

705. After the mixer, the transmit signal is amplified in the PA (Power Amplifier) and passed thru the diplexer to the antenna feed port.

706. A microprocessor in the ODU supports configuration of the synthesizers, transmit power, and alarm and performance monitoring. The ODU microprocessor is managed under the NOC microprocessor, with which it communicates via the telemetry channel.

707. A DC-DC converter provides the required low voltage DC rails from the −48 VDC supply.

708. In the receive direction, the signal from the diplexer is passed thru the LNA to the IF mixer, where it is mixed with the Rx local oscillator (RXLO) input to provide an IF between 1700 and 2300 MHz. The signal is then amplified in a gain controlled stage to compensate for fluctuations in receive level, and in the IF mixer, is converted to a 126 MHz IF for transport via the ODU cable to the MSS.

709. The offset of the transmit frequencies at each end of the link is determined by the required Tx/Rx separation. The separation options are based on the ANSI channel plans for each frequency band. The actual frequency range per band and allowable Tx/Rx separation are range limited within 9500 MPR to prevent incorrect user selection.

710. A power monitor circuit is included in the common port of the diplexer assembly to provide measurement of transmit power. It is used to confirm transmit output power for performance monitoring purposes, and to provide a closed loop for power level management over the specified ODU temperature and frequency range.

711. The ODU consumes approximately 30 Watts of power.