

OPV Series II Radio Unit Connection to RFL 9745 (X-21)

Description

This application note covers the OPV Series II X-21 Synchronous Serial connection to the RFL 9745 Teleprotection Channel.

Both transmit and receive data are timed to a single clock generated by the OPV Radio Units. The timing through the OPV system is synchronised end to end by having a slave (defined through CCMS) synchronise to a master.

When configured for X-21 the OPV Series II Radio Unit provides a 64 kbps data path, operating as a DCE and hence the RFL 9745 is required to operate as a DTE.

The provided 64 kHz system timing is typically ± 5 ppm or better while Jitter at the slave is $\pm 0.1\%$. Latency is better than 6 ms while asymmetry is better than 125 us.

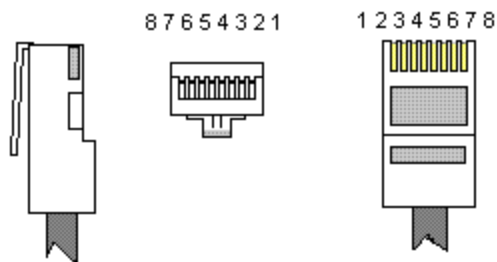
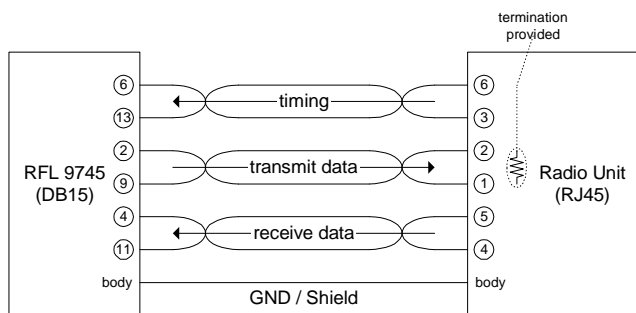
Cable Wiring

The recommended cable is shielded twisted pair similar to Belden 1868E fitted with a shielded RJ-45 plug.

The following table outlines the required connections.

| RFL 9745 (DTE) | | | OPV SII (DCE) | | |
|----------------------|--------------|---------------------|-------------------|--------------|----------|
| Termination required | Signal | Pin – DB15 (female) | Pin – RJ45 (male) | Signal | In / Out |
| N/A | Tx Data A | 2 | 2 | Tx Data A | I |
| | Tx Data B | 9 | 1 | Tx Data B | |
| N | Timing A | 6 | 6 | Timing A | O |
| | Timing B | 13 | 3 | Timing B | |
| N | Rx Data A | 4 | 5 | Rx Data A | O |
| | Rx Data B | 11 | 4 | Rx Data B | |
| --- | --- | N/C | 8 | Not Used | I |
| | --- | N/C | 7 | Not Used | |
| N/A | Shield / GND | Body | Body | Shield / GND | N/A |
| N/A | Chassis GND | 1 | N/C | --- | --- |
| N/A | Signal GND | 8 | N/C | --- | --- |
| N/A | Control A | 3 | N/C | --- | --- |
| N/A | Control B | 10 | N/C | --- | --- |

Termination: Although operation will not normally be prevented if the connecting cable is incorrectly terminated at the user equipment end, proper termination is strongly advised. As well as ensuring maximum signal integrity over longer cables, correct termination is necessary to ensure that compliance with CISPR22/EN55022 EMC standards is maintained.



Shielded RJ-45 plug

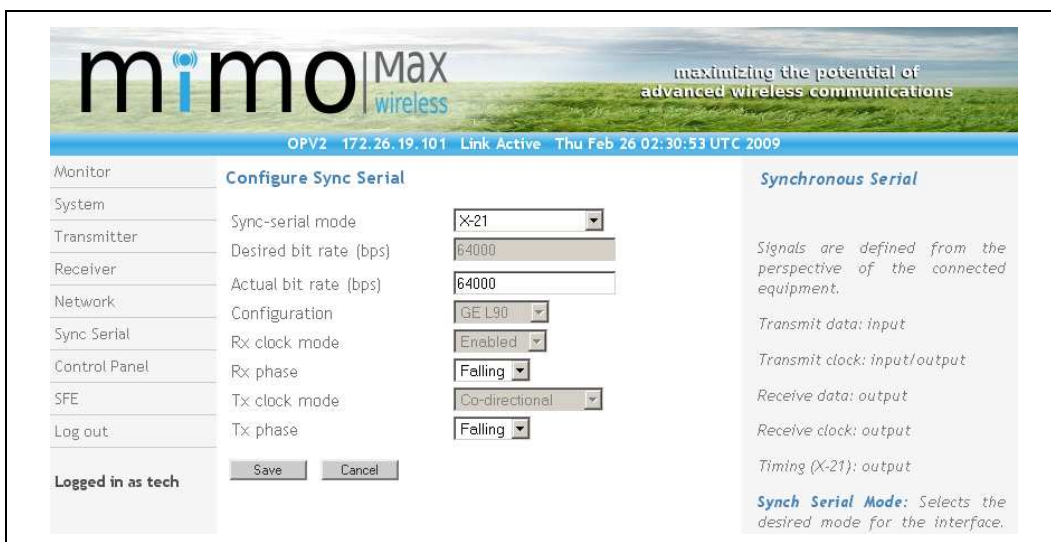
Grounding: The Synchronous Serial drive circuitry is isolated from chassis ground (to 1500 VRMS) by means of opto-couplers and transformers. This is intended to prevent the possibility of ground loops. Therefore grounding of the shield at the RFL 9745 (DTE) is required to prevent the shield and Synchronous Serial ground from floating.

Radio Unit Configuration

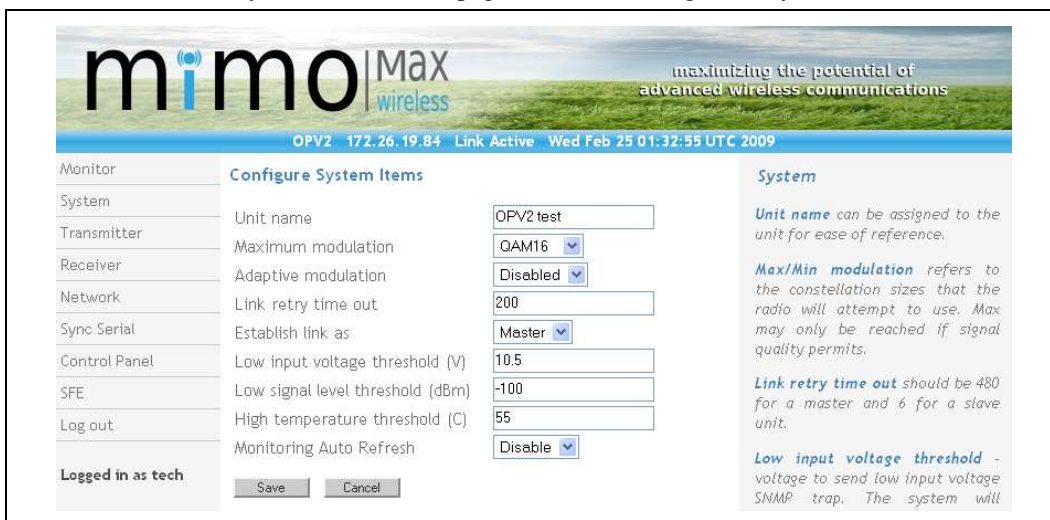
Following are the CCMS settings required. NOTE: Only those relative to X-21 configuration are shown.

| | |
|--------------------------|-------------------------------------|
| End A | |
| CCMS – Mode Select | X-21 |
| CCMS – Clock Phase | Falling |
| CCMS – Establish link as | Master (a system control parameter) |

| | |
|--------------------------|------------------------------------|
| End B | |
| CCMS – Mode Select | X-21 |
| CCMS – Clock Phase | Falling |
| CCMS – Establish link as | Slave (a system control parameter) |



Radio Unit CCMS ‘Synchronous Serial’ page. Access is through the ‘Sync Serial’ tab.



Radio Unit CCMS ‘Configure System Items’ page showing selection as a Master.

Access is through the ‘System / Configuration’ tab.

Note: The ‘Establish link as’ parameter will not normally require setting as it also defines radio functionality where if set incorrectly will adversely affect radio operation.

RFL 9745 Configuration

The following shows the “configuration and software version display” as reported by the RFL 9745 during testing.

```

9745 Configuration:
070 Software ID      4.81 BAPT; (c) 1994-98 RFL Electronics
071 BIOS ID         3.1; (c) 1994 RFL Electronics
072 System Date     11/24/1998 17:29
073 BIOS Date       03/27/1995 13:17
074 Primitive ID    EA GENERIC - BLOCK, ACCN, 2*INTERTRIP PRIMITIVE
075 Alarm Logic ID  DIGITAL - DUAL I/O WITH SEPARATE ALARMS
076 Annunc Outputs  Not Installed
077 Local Address   123
078 Remote Address  123
083 Channel Type    Digital: RS 449 or X.21
084 Data Rate       64 K bits/sec
9745>
    
```

The OPV Series II Radio Unit simply provides a transparent data path and therefore only requires the connected port to be correctly configured. The Radio Unit operates as a DCE and as such requires the RFL 9745 to operate as a DTE. Additionally timing must always be sourced from the Radio Unit.