

**OPV Series II Radio Unit Connection to Areva DIP 5000 (X-21)**

**Description**

This application note covers the OPV Series II X-21 Synchronous Serial connection to the Areva DIP5000.

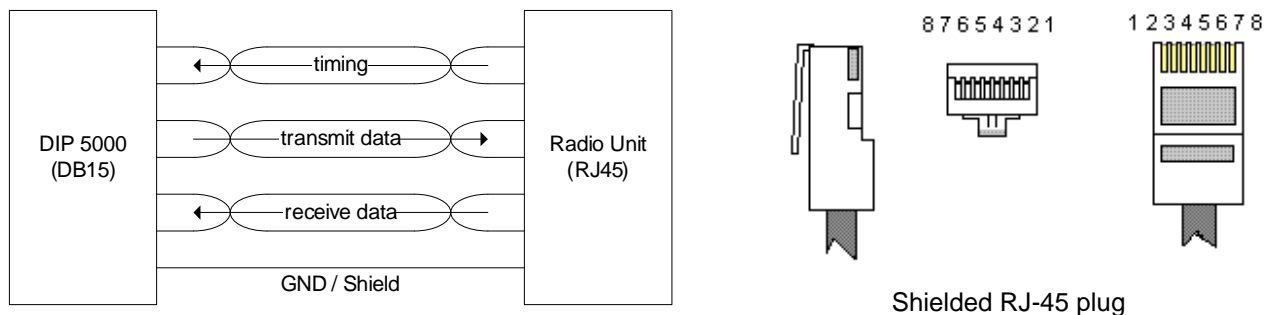
When configured for X-21 the OPV Series II Radio Units provide a 64 kbps data path with both operating as DCE, hence the GARD 8000 is required to operate as a DTE.

Both transmit and receive data are timed to a single clock generated by the Radio System. The timing end to end is synchronised by having one Radio Unit act as a slave synchronising to the other Radio Unit acting as a master.

The provided 64 kHz system timing is typically  $\pm 5$  ppm or better while Jitter at the slave is  $\pm 0.1\%$ . Latency is better than 6 ms (typically 5.1 ms) while asymmetry is better than 125 us.

**Serial Cable Wiring**

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



**Cable 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. The DIP5000 provides internal termination for the X21 signals and therefore additional termination is not required. The Radio Unit provides internal termination for Tx Data.

**Grounding:** The Synchronous Serial drive of the OPV SII 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 DIP5000 is required to prevent the shield and Synchronous Serial ground from floating.

The following table outlines the required connections for X-21.

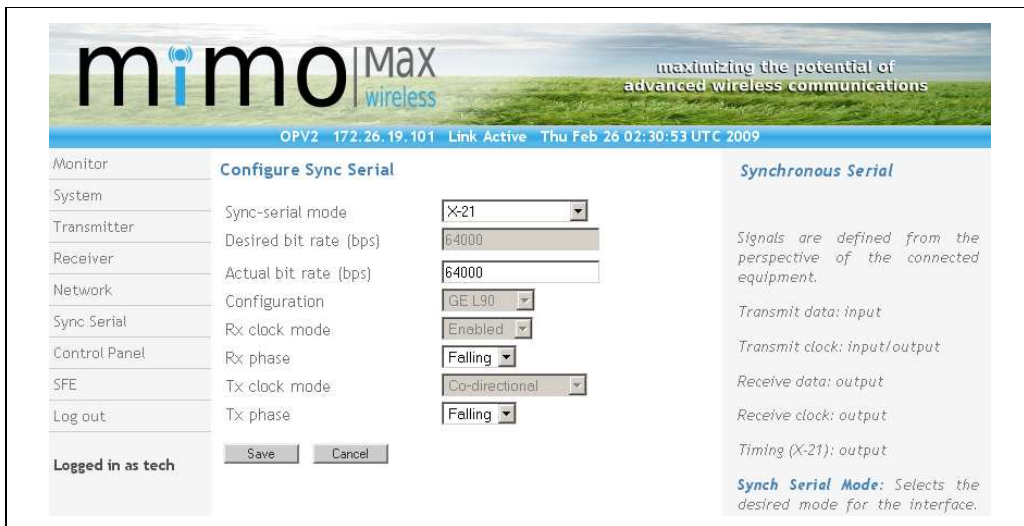
| DIP5000              |              |                   | OPV SII           |              |          |
|----------------------|--------------|-------------------|-------------------|--------------|----------|
| Termination required | Signal       | Pin – DB15 (male) | Pin – RJ45 (male) | Signal       | In / Out |
| N                    | 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/A                  |              | N/C               | 7                 | Not Used     | N/A      |
|                      |              | N/C               | 8                 | Not Used     |          |
| N/A                  | Shield / GND | Body              | Body              | Shield / GND | N/A      |

### Radio Unit Configuration

Following are the OPV SII CCMS settings required for X-21 operation.

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

| End B                    |   |
|--------------------------|---|
| CCMS – Mode Select       | X-21                                      |
| CCMS – Clock Phase       | Falling                                   |
| CCMS – Establish link as | Slave (a preset 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.

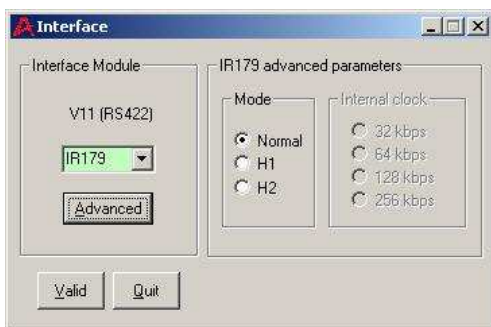
In the context of X.21 the Master/Slave settings only indicate which end generates the timing and which end regenerates it. The parameters themselves require additional parameters unrelated to X.21 to be correct for the system to function correctly.

**DIP5000 Configuration**

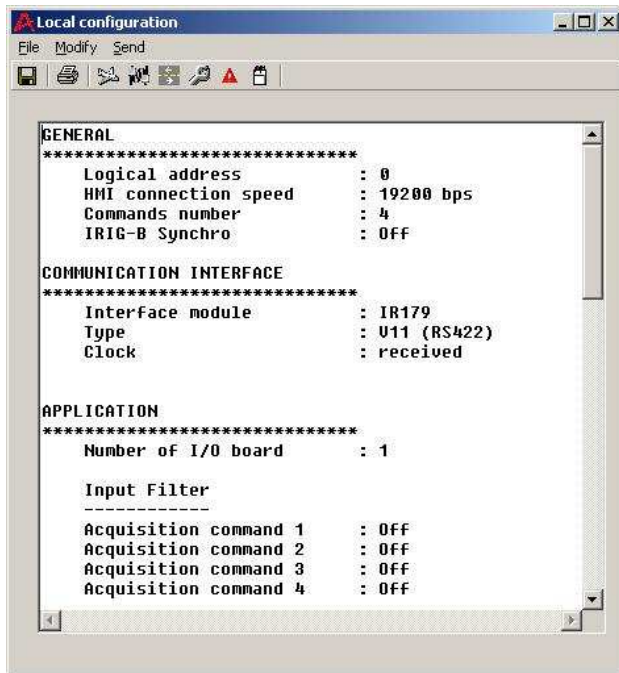
The proper version of ‘Avera DIP5000 Digital Teleprotection Setup Tool’ should be installed on a PC in order to configure, commission and maintain the DIP5000. The IR179 V11/X24 communication interface needs to be installed on the DIP5000. The interface needs to be configured as ‘normal mode’ for both local and remote DIP5000 units. The relevant settings are listed in the following table.

| Communication Configuration |            |
|-----------------------------|------------|
| Interface Module            | IR179      |
| Type                        | V11(RS422) |
| Mode                        | Normal     |

By clicking ‘Configuration’ in the ‘Read’ menu, the current configuration can be reported. Configuration of the communication interface can be changed by using the ‘Modify’ menu. The setting for X-21 is shown in the following dialog box.



The following image is the resulting DIP5000 configuration.



After the link is setup, check the alarm list in the Digital Teleprotection Setup Tool. Make sure it is alarm free. For further information on the Teleportation Setup Tool, please refer to the DIP5000's document DIP5K/EN HI/C11 (Human Machine Interface).