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Overview

**Proprietary notice**

The specifications or information contained in this document are subject to change without notice due to continuing introduction of design improvements. If there is any conflict between this document and compliance statements, the latter will supersede this document.

The purpose of this description is to support the user of the CFM modular IDU (multiplexer or modular Ethernet bridge) with the detailed information on the generic and technical issues regarding the installation, commissioning and configuration of the V.35 interface module.

**General Features**

The V.35 interface module is a device intended for use in the CFM modular Multiplexer Indoor Units in order to expand it with an additional V.35 traffic interface for data transmission at speeds from 64 kbps up to 8 Mbps.

V.35 interface module is provided with M.34 standard connector.

The V.35 module terminates 2, 4, 6, or 8 Mbps from modular multiplexer (from modular Ethernet bridge multiplexer only 2 Mbps) and provides user selectable data rates of 64 kbps, 128 kbps, 256 kbps, 512 kbps, 1024 kbps, 2048 kbps, 4096 kbps, 6144 kbps or 8192 kbps to V.35 interface port on M.34 connector.

*Figure 1. The V.35 Interface Module appearance*
The capacity of the module can be configured using the following methods:
- Using the IDU LCD/keypad;
- Using the Telnet or ASCII console;
- Adjusting jumpers on the module board. This method should only be used if the other two are not available (e.g. old management software version, none of the consoles are available).

Because of the lack of space the LEDs on V.35 module are multifunctional, basic meanings are:
- C (DCD) – Data Carrier Detect;
- D (Data, both TxD and RxD);
- S (Send, both RTS – Request to Send, CTS – Clear to Send);
- R (Ready, both DSR – Data Set Ready, DTR – Data Terminal Ready).

Normal operation is indicated in case if all LEDs are green.

For more detailed description of LEDs please refer to *Hardware Features*.

**Typical applications**

Typical applications of CFM V.35 interface are illustrated in the Figure 2.

![Figure 2. Applications of CFM series V.35 interface module:
 a) Interconnection of LANs;
 b) Interconnection of LANs or DTEs through any transmission (backbone) network providing E1 interfaces (Radio, fiber optics, SDH, etc).](image)
One of the major advantages of using CFM series interface modules is potential savings on cost of equipment when it is required to interconnect two LANS or DTEs between two different network types. An example below depicts one of the possible connections between two LANs. The IDU connected to the E1 DCN substitutes the functions of E1/V.35 converter providing E1 interface.

![Diagram of E1 DCN and LAN connection](image)

*Figure 3.*
# V.35 Interface Module LEDs

<table>
<thead>
<tr>
<th>LED</th>
<th>Description</th>
</tr>
</thead>
</table>
| C (DCD) | **Green** – carrier is detected – normal operation  
**Red** – carrier is NOT detected – radio malfunction  
**Flickering yellow and green (7:1)** – loopback is set and carrier is detected;  
**Flickering yellow and red (7:1)** – loopback is set and carrier is NOT detected;  
**Flickering yellow (7:1)** – loopback is set and cable is damaged;  
**Flickering green (7:1)** – carrier is detected, cable is damaged, loopback is NOT set; |
| D (RxD, TxD) | **Green** – both received and transmitted data signals are OK,  
**Off** – both data signals are absent,  
**Flickering green** – just one data signal is present (TxD:RxD = 7:1),  
**Yellow** – loopback is set; |
| S (RTS, CTS) | **Green** – both signals (RTS, CTS) are active,  
**Off** – both signals are inactive,  
**Flickering green** – one control signal is present, another is absent (RTS:CTS = 7:1),  
**Blinks yellow and red** – module has set the CTS signal but the returned signal is dissimilar to that set by the module, - indicates cable fault; |
| R (DSR, DTR) | **Green** – both signals are active,  
**Off** – both signals are inactive,  
**Flickering green** – one control signal is present, another is absent (DSR:DTR = 7:1),  
**Blinks yellow and red** – module has set the DSR signal but the returned signal is dissimilar to that set by the module, - indicates cable fault. |

**Notes:**

**General color meanings:**
- **Green** – normal operation
- **Yellow** – information for service modes
- **Red** – fault indication
- **Not lit** – no signal
- **Flickering** – additional information
## Signal Types and Pinouts

### Description of V.35 interface signal types

<table>
<thead>
<tr>
<th>Data transfer signals</th>
<th>Direction (DCE ↔ DTE)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TxC (SCT)</td>
<td>→</td>
<td>Transmit timing</td>
</tr>
<tr>
<td>SCTE</td>
<td>←</td>
<td>Timing of the transmitted data</td>
</tr>
<tr>
<td>TxD</td>
<td>←</td>
<td>Transmitted data</td>
</tr>
<tr>
<td>RxC</td>
<td>→</td>
<td>Timing of the received data</td>
</tr>
<tr>
<td>RxD</td>
<td>→</td>
<td>Received data</td>
</tr>
</tbody>
</table>

Note: All data transfer signals are balanced;  
DTE - Data Terminal Equipment  
DCE - Data Communications Equipment

<table>
<thead>
<tr>
<th>Control signals</th>
<th>Direction (DCE ↔ DTE)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSR</td>
<td>→</td>
<td>Data Set Ready - DCE is ready.</td>
</tr>
<tr>
<td>DTR</td>
<td>←</td>
<td>Data Terminal Ready - DTE is ready.</td>
</tr>
<tr>
<td>RTS</td>
<td>←</td>
<td>Request to Send (DTE is ready to send)</td>
</tr>
<tr>
<td>CTS</td>
<td>→</td>
<td>Clear to Send (DCE is ready to receive)</td>
</tr>
<tr>
<td>DCD</td>
<td>→</td>
<td>Data Carrier Detect: DTE monitors if the DCE is intact.</td>
</tr>
</tbody>
</table>

Note: All control signals are unbalanced.
**V.35 Interface Connector Pinouts**

There are 17 of 34 pins expedient on M34 connector.

<table>
<thead>
<tr>
<th>Signal</th>
<th>M34 Pin</th>
<th>60 Pin Cisco*</th>
<th>Interconnectable pinouts at the Cisco equipment side:</th>
</tr>
</thead>
<tbody>
<tr>
<td>P GND</td>
<td>A</td>
<td>46</td>
<td>48 &amp; 49</td>
</tr>
<tr>
<td>S GND</td>
<td>B</td>
<td>45</td>
<td>50 &amp; 51 &amp; 52</td>
</tr>
<tr>
<td>RTS</td>
<td>C</td>
<td>42</td>
<td>53 &amp; 54 &amp; 55 &amp; 56</td>
</tr>
<tr>
<td>CTS</td>
<td>D</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>DSR</td>
<td>E</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>DCD (RLSD)</td>
<td>F</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>DTR</td>
<td>H</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>TxD+</td>
<td>P</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>TxD-</td>
<td>S</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>RxD+</td>
<td>R</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>RxD-</td>
<td>T</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>SCTE+</td>
<td>U</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>SCTE-</td>
<td>W</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>RxC+ (SCR+)</td>
<td>V</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>RxC- (SCR-)</td>
<td>X</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>TxC+ (SCT+)</td>
<td>Y</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>TxC- (SCT-)</td>
<td>AA</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

* This information is for the user’s reference only

P GND – Protection Ground

S GND – Signal Ground

---

**Figure 4. V.35 interface Male connector pin layout (not to scale)**
Master/Slave Mode

The difference between master and slave modes is in a principled way illustrated in the Figure 5. If the DTE works as in slave mode then the DCE, when set as master, states the data transfer speed to the opposite direction by generating the clock signal from a built in generator. When set as slave, the DCE recovers clock (RxC) from the received data signal (from WAN) and sends it to DTE.

\[\text{Figure 5}\]

Depending on the DTE there may be three scenarios:

- the DTE receives TxC, recovers it and sends it to the DCE (as SCTE);
- the DTE ignores TxC and generates its own unique clock;
- the DTE does not transmit SCTE, the data reception from the DTE within the DCE is internally clocked.
When referring how to connect the module within the network, there are three common scenarios possible:

1. Interconnection of two DTEs that are not rooted to any far-flung or built-in independent clock, i.e., when both DTEs work in slave mode in term of synchronization. A typical example is the connection of two LANs where both DTEs work as in slave mode. The data transfer speeds from DCE1 to DCE2 and from DCE2 to DCE1 are unequal if both DCEs are set as masters (both DCEs state their own transfer speed to the opposite DCE), and speeds are equal if one DCE is set as master and other as slave.

2. Interconnection of two DTEs that are clocked independently from a built-in or an external far-flung clocking source (Figure 7), i.e., when both DTEs work as masters in term of synchronization. Both DTEs ignore the TxC clocking signal from DCEs, hence it is unimportant whether DCEs are set as masters or slaves.
3. Interconnection of two DTEs where one DTE works in master mode and the other in slave mode. In this case to ensure synchronization between DTEs so as to have an equal transfer speed from DCE1 to DCE2 and conversely, the DCE2 should be set as slave but the setting of DCE1 does not affect the transmission.

**Figure 8**

The master/slave mode can be set using Telnet/ASCII terminal or from IDU LCD:

- If using Telnet or ASCII management console the following command line should be used: `Mod {slot#} setV35 {Master | Slave}`
  Slot# - MUX slot number, example: `Mod 2 setV35 slave`

- If setting through the IDU management interface proceed as follows:
  Press “ENTER” to enter setup mode → select: “Modules” → select “Module # V35” → select “V.35 Clock” → “Change Mode”, choose the mode and confirm as prompted.
Polarity Shift of the Clock Signal

Depending on the DTE, there may be necessity to invert phase of the transmission timing signal (TxC) allowing the sampling of data on its rising or falling edge. This is necessary if sampling of the receiving data signal at the DTE synchronizes at the instants of its phase shift (see Figure below).

![Diagram of TxC and RxD signals with and without polarity shift](image)

*Figure 9.*

The phase of the TxC signal can be changed from a Telnet/ASCII console using the following command line:

```
Mod {slot#} setV35 phase {Normal | Inverse}
```

Slot# - MUX slot number, example: `Mod 4 setv35 phase normal`
Installing the V.35 Interface Module

**Required Tools**
The installation requires solely the hex-head nut driver (torx 10) that is not provided as standard equipment with the module.

**Inserting the Module**
The following enumerates the operations for installing the V.35 module in the IDU on step-by-step approach:

1) Unscrew the cover of free slot or unscrew and draw out an unused module (2 hex-head screws)
2) Insert the module, - both side margins of the module board should be fitted in furrows on both sides of the slot,
3) Screw up the module with 2 hex-socket screws; this completes the physical installation of the module.

After the installation it is essentially to perform installation test by setting loopback in the V.35 interface module. For information on setting loopbacks please refer to page 16.
Configuring and Maintaining the V.35 Module

Configuring capacity

The capacity of V.35 interface can be adjusted using the following methods: using IDU LCD/keypad, using remote Telnet or ASCII management console or using jumpers on the module board.

Adjusting capacity using jumpers

The V.35 interface module has three jumpers on the board. These jumpers are used for adjusting the traffic capacity of the user port.

The data transfer rate is determined by the combination of three resistors, which can be switched in the circuit with the corresponding jumpers. The adjustments should be done in accordance with the table below.

<table>
<thead>
<tr>
<th>Jumper layout</th>
<th>V.35 module throughput, [kbps]</th>
<th>MUX slot throughput</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>8192*</td>
<td>8 Mbps</td>
</tr>
<tr>
<td></td>
<td>6144</td>
<td>6 Mbps</td>
</tr>
<tr>
<td></td>
<td>4096</td>
<td>4 Mbps</td>
</tr>
<tr>
<td></td>
<td>2048</td>
<td>2 Mbps</td>
</tr>
<tr>
<td></td>
<td>1024</td>
<td>2 Mbps</td>
</tr>
<tr>
<td></td>
<td>512</td>
<td>2 Mbps</td>
</tr>
<tr>
<td></td>
<td>256</td>
<td>2 Mbps</td>
</tr>
<tr>
<td></td>
<td>128</td>
<td>2 Mbps</td>
</tr>
<tr>
<td></td>
<td>64</td>
<td>2 Mbps</td>
</tr>
</tbody>
</table>

Notes:

- A, B and C correspondence to jumpers is depicted in the figure above (on the right);
- - terminated jumper;
- For rates under 2 Mbps, the multiplexer slots must be configured on 2 Mbps;
- * - Can be set from Telnet/ASCII consoles only;
- The software setting has a priority over the jumper setting.
Configuring capacity using IDU LCD/Keypad

From status display mode do the following:
Press “ENTER” to enter setup mode → select “Modules” → select “Module # V35” → select “V.35 Speed” → “Change Speed”, choose the capacity and confirm as prompted.

Configuring capacity through the Telnet/CLI/ASCII terminal

The capacity is configured using the following command line:

```
Mod # setv35 speed {64|128|256|512|1024|2048|4096|6144|8192}
```

# - IDU slot number,
{}
values in braces separated with bars are possible arguments, - capacity in kbps.

Note: Make sure the MUX slot speed configuration correctly conforms the speed setting of V.35 module.
Performing Loop Test

The loopback mode is activated/deactivated using Telnet or ASCII management console or from the IDU using LCD and keypad.

- Using "**Mod # setV35 loop {on|off}" command line from the Telnet or ASCII terminal, # - MUX slot number,

  Example: mod 3 setv35 loop on 2

- Using IDU LCD/keypad, - from status display mode do the following: Press “ENTER” to enter setup mode → select “Modules” → select “Module # V35” → select “V.35 Loopback” → “Change Loopback”, switch over to ON and confirm.

![Figure 10. Dual loopback mode](image)

The loopback mode of V.35 interface module is dual. The interface module is interconnected with the management module through the I^2C data bus.

The loopback is dual if activated using one of above-mentioned methods however it can also be set manually by interconnecting the appropriate interface connector pins (see Figure 11), in this case the loopback is local (not dual).

![Figure 11.](image)
Troubleshooting

In case of failure the following procedures should be performed as means of fault tracing or detection and diagnosing:

- Checking for conformity of pinouts,
- Analysis of interface status LEDs at the DCE and DTE sides,
- Performing loopback tests.

The user should himself draw consequences on the reasons of malfunction using the above-mentioned methods.

If interface loop test is negative, - DTE does not detect it (or produces dissatisfactory results) the user should take heed on interface status LEDs and pinout compatibility:

- Check if any of LEDs is in red (constant or flickering) including radio alarm LEDs and resolve accordingly. For information on LEDs refer to page 6.
- Check if the connector pinouts match the cable pinouts and replace the cable or modify connectors if necessary. This is the most common fault. For information on V.35 interface connector pinouts refer to page 8.
- Make sure the port of DTE is properly configured and port LEDs do not indicate any faults.
- Check if the master/slave setting of the module is correct.
- Change the phase of the clock signal (refer to page 9).

The following lists more prospective causes of malfunction:

- Cable between DTE and DCE is faulty,
- Pinout incompatibility between DTE and DCE,
- MUX slot speed configuration does not match the module speed setting,
- Incorrect master/slave settings between DTE and DCE;
- Wrong sampling of the receiving data signal at DTE – the phase of the clocking signal should be inverted.
Mechanical data

<table>
<thead>
<tr>
<th>Weight [g]</th>
<th>Dimensions HxWxD [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>43x59x139</td>
</tr>
</tbody>
</table>

Figure 12. Dimensions of the V.35 interface module
Abbreviations

DCE  Data Communications Equipment
DCN  Digital Communications Network
DTE  Data Terminal Equipment
IDU  Indoor Unit
ODU  Outdoor Unit
LAN  Local Area Network
MUX  Multiplexer
SAF Tehnika Contacts

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