

User Manual



CRT441 & CRR441

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CFO441 Singlemode 4 Channel Digital Units for Uni-directional Video, Bi-directional Data, Audio and CC, In-band Management

Introduction

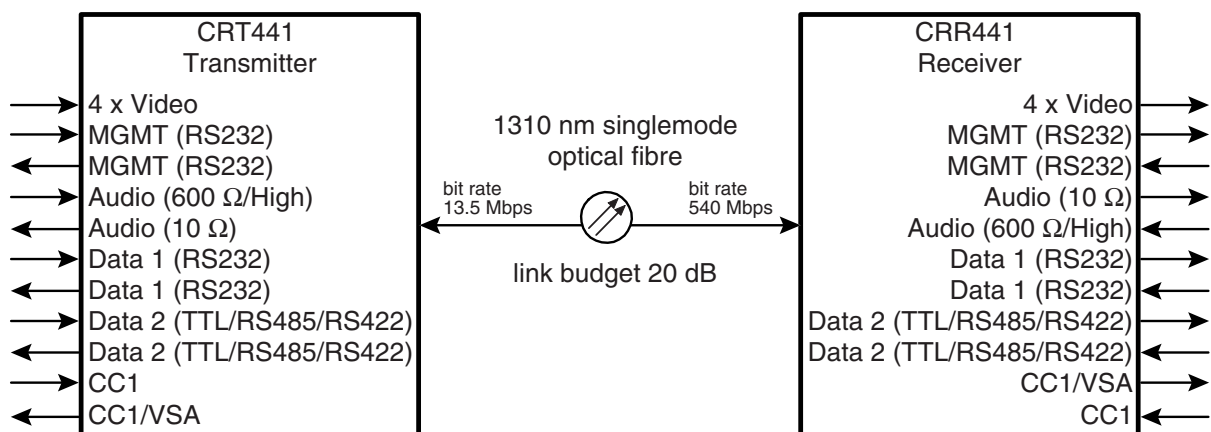
The **CFO441** is a four channel uni-directional video link with two bi-directional data, one audio and one contact closure channels.

PAL, NTSC and SECAM video formats are supported to provide a transparent video transmission. It is also possible to transmit **S-video** channels (2 pcs) that comprises separate luminance (Y) and chrominance (C) signals.

All common data protocols are supported as well and are easily configured by terminal software interface.

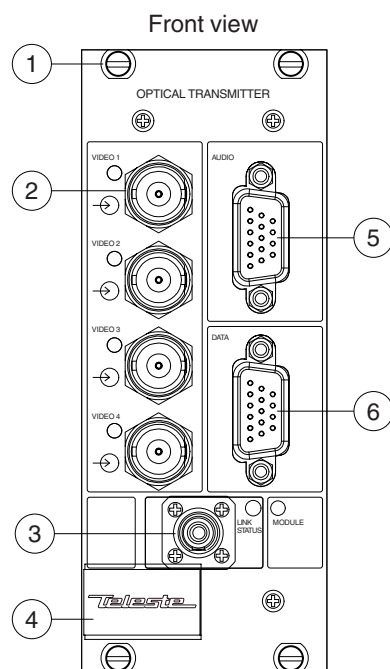
Optical transmission is based on FP laser operation. The multiplexed data stream of 540 Mb/s enables a full quality and a real-time video transmission in one singlemode fiber up to 50 km typical transmission distance.

All CFO441 units are compatible with all CFO rack systems. Stand-alone options are available with the CMA021 module adapter and a separate mains adapter.



OPTICAL TRANSMITTER CRT441 (version E & F)

CAUTION:
THIS OPTICAL UNIT USES CLASS 1 LASER DIODE.
DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH
OPTICAL INSTRUMENTS. APPLICABLE STANDARD
IEC825-2: 1993



Picture 1.

CRT441 Video Transmitter

- 1) Locking screw.
- 2) Video input (BNC female) and video indicator.
- 3) Optical input/output (FC/PC).
- 4) Handle.
- 5) AUDIO / MGMT* connector (HD15 female).
- 6) DATA / MGMT connector (HD15 female).

* Only in F version

GENERAL

The **CRT441** is a four channel optical transmitter for uni-directional video transmission with two bi-directional data, one audio and one contact closure channel in a singlemode fibre. The current consumption is max. 800 mA (+12V DC).

FRAME INSTALLATION

The module is to be pushed along the guide rails into the installation frame (e.g. **CSR216** or **316** series) and secured with the four locking screws. The unit can be freely positioned in any slot in the frame. The empty positions in the frame should be blanked off with cover plates.

The supply voltage is to be provided by a **CPS384** power supply unit.

STAND-ALONE INSTALLATION

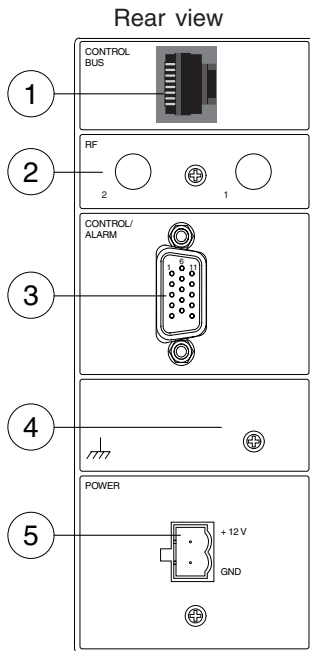
The unit can be installed for stand-alone use by using a **CMA021** module adapter (see picture 2). The module should be mounted to a vertical surface. The 12V DC supply voltage is supplied by the means of a separate mains adapter with a regulated output, (e.g. **CPS221**).

The permitted supply voltage range is 10.5...14V DC. The current consumption is 800 mA (max). The permitted operational temperature range is from -10...+55 °C.

VIDEO INPUTS AND INDICATOR LEDS

The impedance of the video inputs (BNC female) is 75 Ω. The nominal input level is 1 Vpp.

Each video input is equipped with the dual colour VIDEO led on the front panel. In case a video signal is present and in nominal level (and the unit detects video synchronization pulses), the VIDEO led is green. If there is no video signal, or the video level is too low, the VIDEO led is yellow.



Picture 2.

CMA021 Module Adapter

- 1) RJ-45 female connector, not in use.
- 2) Control / alarm interface connector (HD15 female).
- 3) Supply voltage connector.

Pin	Signal
1-4	Not used
5	+12 V DC output
6	A - alarm
7	B - alarm
8	CTRL1 (cfo address bus data)
9	CTRL2 (cfo address bus clk)
10	No connection
11-15	Not used

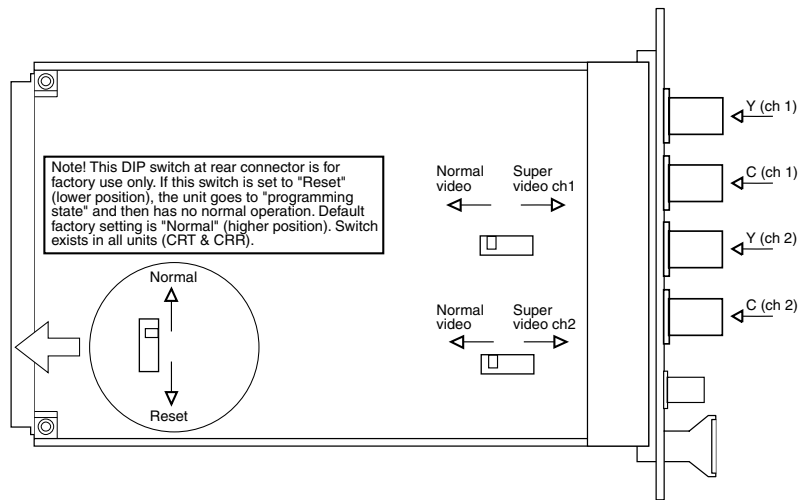
Table 1.

Pin information for the HD15 female connector of the CMA021 module adapter (with **CRT441** installed).

SUPER VIDEO CONNECTION

It is also possible to transmit **S-video** signal that comprises separate luminance (Y) and chrominance (C) signals. This, however, uses two channels per one transmission channel as shown in picture 3 below. The video inputs are switched to **S-video** settings by **DIP** switches on the left-hand side of the unit (default factory setting is normal video).

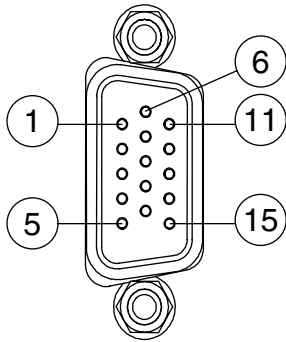
Note! The video LEDs on the front panel are locked to the synch pulse transmitted in the Y channels.



Picture 3.

DIP switch settings for Super Video transmission.

Note! No adjustments are needed on the receiver **CRR441 for the **S-video** reception.**



Picture 4.
The DATA connector (HD15 female).

DATA CONNECTIONS

The DATA connector contains two bi-directional data channels (CRR <--> CRT). The connector in use is a **HD15 female** connector (see picture 4 and table 2 for detailed description). The recommended cable for DATA connection is **CIC103** (HD15 female / open wires).

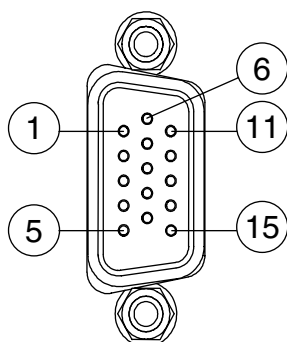
Data channel 1 is always in **RS232** mode. The desired data mode for data channel 2 can be selected by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software). The default factory settings are **RS485 - 2 wire + Dwell time 75 µs**. See table 3 for available data modes for data channel 2.

Pin	Signal	TTL	RS422	RS485	RS485-4w
1	Ch2		in (-)	in/out (-)	in (-)
7	Ch2	in	in (+)	in/out (+)	in (+)
10	Ch2		out (-)		out (-)
14	Ch2	out	out (+)		out (+)
4	Ch1 output (RS232)				
5	Ch1 input (RS232)				
3, 15	Ground				

Table 2.
Data connector's pinout.

Mode	Input termination options
TTL	None
RS422	No term (only failsafe) Hard bias Line bias (120 Ω line impedance)
RS485 - 2 wire	No term (only failsafe)+ Dwell time adjustable 50...10000µs Hard bias Line bias (120 Ω line impedance)
RS485 - 4 wire	No term (only failsafe) Hard bias Line bias (120 Ω line impedance)

Table 3.
Available datamodes for channel 2.



Picture 5.
The AUDIO/DATA connector (HD15 female)

Pin	Signal
2	MGMT output
3	Ground
12	MGMT input

Table 4.
MGMT connection's pinout (HD15 female).

Pin	Signal
2	MGMT output (only in F version)
3	Ground
1, 11	Audio ground
4	Non-inverted input
5	Inverted input
10	Non-inverted output
12	MGMT input (only in F version)
14	Inverted output

Table 5.
AUDIO connector's pinout (HD15 female).

Pin	Signal
3	Ground
8	CCL output + (version E)
	CCL output (output relay, version F)
13	CCL output - (version E)
	CCL output (output relay, version F)
6	CCL input + (version E)
11	CCL input - (version E)
	CCL input (version F)
15	Ground

Table 6.
CCL connection's pinout (HD15 female).

MANAGEMENT (MGMT) DATA CONNECTION

The DATA connector (version E) or DATA and AUDIO connectors (version F) contains one bi-directional MGMT data channel (**RS232**). The management connection allows locally or remotely (CRT <--> CRR, bi-directional in-band connection via fibre) configuration and monitoring of **CFO441** unit by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software).

The connector in use is a **HD15 female** connector (see picture 5 and table 4 for detailed description).

The recommended cable for terminal connection is **CIC403** (HD15 female / D9 female, see table 7 for detailed description).

Pin	HD15 female	D9 female
2	MGMT output	MGMT input
3	Ground	MGMT output
5	-	Ground
12	MGMT input	-

Table 7.
CIC403 cable's pinout (HD15 female / D9 female).

AUDIO CONNECTION

The AUDIO connector contains one bi-directional audio channel line (CRR <--> CRT, and one bi-directional MGMT data channel, only in version F). The audio input impedance can be set to high impedance (>10 k Ω) or 600 Ω with the terminal software (see separate documentation for **CFO441** terminal software). The default factory setting is 600 Ω . The audio output impedance is constant and cannot be adjusted. The audio output impedance is 10 Ω .

The connector in use is a **HD15 female** connector (see picture 5 and table 5 for detailed description). The recommended cable for AUDIO connection is **CIC103** (HD15 female / open wires).

CONTACT CLOSURE LOOP (CCL) CONNECTION

The DATA connector contains one bi-directional contact closure channel line (CRR <--> CRT). The CCL input/output is TTL level voltage (version E) or a normal dry contact closure on/off - signal (pin 11 to ground, version F) between connector's contact pins. The connector in use is a **HD15 female** connector (see picture 5 and table 6 for detailed description). The recommended cable for CCL connection is **CIC103** (HD15 female / open wires). The CCL output channel can be alternatively configured for VSA usage (see page 7). The default factory setting is CCL usage (**CC1=CC1**).

LINK STATUS AND MODULE INDICATOR LEDS

When the optical input signal level is adequate and in synchronisation to input data is achieved, the LINK STATUS led is green. If optical input signal level is adequate, but no synchronization is achieved the LINK STATUS led blinks green/yellow. If optical input signal is missing or it's level is too low, the the LINK STATUS led is yellow.

When the supply voltage is not in the permitted range (10.5...14 V DC) or there is a transmitter laser failure, the MODULE led colour on the front panel is red. During normal operation MODULE led is blinking green (blinking indicates embedded software is working properly).

ALARM CONNECTIONS

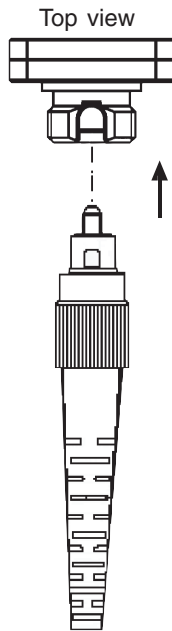
All alarms at the rear connector of the unit are low open collector outputs, with the capability of 30 V/10 mA switching.

Alarm	Description	Reason
A	Hardware failure	TX Laser failure Supply voltage is not in the permitted range
B	Link status alarm	Input optical signal too low No synchronisation achieved to input data

Table 8.

Open collector alarms.

*Note! At the rear of unit is located a **DIP** switch for factory use only (see picture 3). If this switch is set to "Reset" (lower position), the unit goes to "programming state" and then has no normal operation. Default factory setting is "Normal" (higher position).*



Picture 6.
FC/PC Connectors
 Make sure the key is aligned in the slot properly before tightening!

VIDEO SOURCE ALARM (VSA)

The CCL output channel can be alternatively configured for VSA usage. When VSA mode is enabled and CRT's video input is missing (link otherwise operates normally, but e.g. only the camera is broken), the CCL output pins are closed. VSA have no effect to CRT's CCL input i.e. it can be used normally to transmit CCL information to CRR if VSA is not activated at CRR. In case when VSA is enabled at the same time in both CRT and CRR, then CCL channels are not available for other use.

The VSA function can be set on/off by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software). The default factory setting is CCL usage (**CC1=CC1**).

Note! Video detection has 20 sec delay before VIDEO SOURCE ALARM is activated / inactivated.

FIBRE CONNECTION

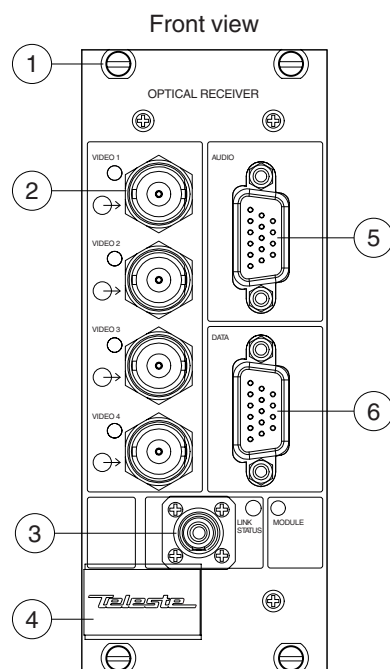
The optical connector is of the type **FC/PC** (see picture 6). The optical output level is constant and cannot be adjusted. The nominal optical output level is -1 dBm (maximum optical input level for return signal is -1 dBm). The link budget for both transmission directions is 20 dB. The operating wavelength is 1310 nm.

When installing the fibre optic cable, do not exceed the minimum bending radius when connecting cable to the system.

Note! For correct optical operation ensure that all optical connectors are cleaned immediately before mating. Connectors should always be cleaned using high purity alcohol (e.g. methyl or isopropyl alcohol). Dry the surfaces using clean compressed air or other equivalent pressurised gas. The optical connectors on the equipment should always be protected with dustcaps when there is no fibre inserted.

OPTICAL RECEIVER CRR441 (version E & F)

CAUTION:
THIS OPTICAL SYSTEM USES CLASS 1 LASER DIODE.
DO NOT STARE INTO BEAM OR VIEW DIRECTLY WITH
OPTICAL INSTRUMENTS. APPLICABLE STANDARD
IEC825-2: 1993



Picture 1.

CRR441 Video Receiver

- 1) Locking screw.
- 2) Video output (BNC female) and video indicator.
- 3) Optical input/output (FC/PC).
- 4) Handle.
- 5) AUDIO / MGMT* connector (HD15 female).
- 6) DATA / MGMT connector (HD15 female).

* Only in F version

GENERAL

The **CRR441** is a four channel optical receiver for uni-directional video transmission with two bi-directional data, one audio and one contact closure channel in a singlemode fibre. The current consumption is max. 800 mA (+12V DC).

FRAME INSTALLATION

The module is to be pushed along the guide rails into the installation frame (e.g. **CSR216** or **316** series) and secured with the four locking screws. The unit can be freely positioned in any slot in the frame. The empty positions in the frame should be blanked off with cover plates.

The supply voltage is to be provided by a **CPS384** power supply unit.

STAND-ALONE INSTALLATION

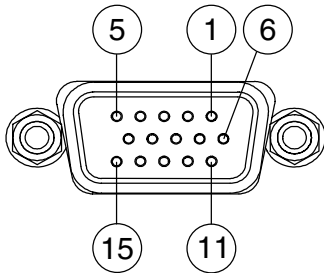
The unit can be installed for stand-alone use by using a **CMA021** module adapter (see picture 3). The module should be mounted to a vertical surface. The 12V DC supply voltage is supplied by the means of a separate mains adapter with a regulated output, (e.g. **CPS221**).

The permitted supply voltage range is 10.5...14V DC. The current consumption is 800 mA (max). The permitted operational temperature range is from -10...+55 °C.

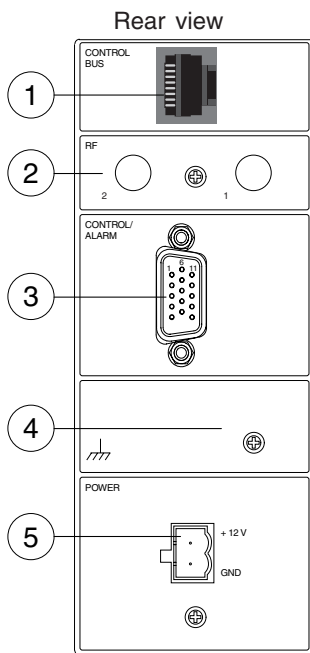
VIDEO OUTPUTS AND INDICATOR LEDS

The impedance of the video outputs (BNC female) is 75 Ω. The nominal output level is 1 Vpp.

Each video output is equipped with the dual colour VIDEO led on the front panel. In case a video signal is present and in nominal level, the VIDEO led is green. If there is no video signal, or the video level is too low, the VIDEO led is yellow.



Picture 2.
The DATA connector (HD15 female).



Picture 3.
CMA021 Module Adapter
1) RJ-45 female connector, not in use.
2) Control / alarm interface connector (HD15 female).
3) Supply voltage connector.

Pin	Signal
1-4	Not used
5	+12 V DC output
6	A - alarm
7	B - alarm
8	CTRL1 (cfo address bus data)
9	CTRL2 (cfo address bus clk)
10	No connection
11-15	Not used

Table 1.
Pin information for the HD15 female connector of the CMA021 module adapter (with **CRR441** installed).

DATA CONNECTIONS

The DATA connector contains two bi-directional data channels (CRR <--> CRT). The connector in use is a **HD15 female** connector (see picture 2 and table 2 for detailed description). The recommended cable for DATA connection is **CIC103** (HD15 female / open wires).

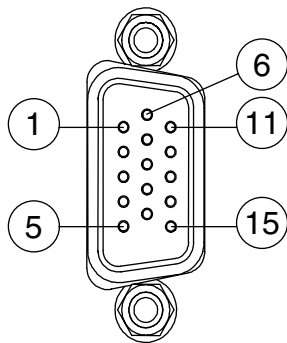
Data channel 1 is always in **RS232** mode. The desired data mode for data channel 2 can be selected by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software). The default factory settings are **RS485 - 2 wire + Dwell time 75 µs**. See table 3 for available data modes for data channel 2.

Pin	Signal	TTL	RS422	RS485	RS485-4w
1	Ch2		in (-)	in/out (-)	in (-)
7	Ch2	in	in (+)	in/out (+)	in (+)
10	Ch2		out (-)		out (-)
14	Ch2	out	out (+)		out (+)
4	Ch1 output (RS232)				
5	Ch1 input (RS232)				
3, 15	Ground				

Table 2.
Data connector's pinout.

Mode	Input termination options
TTL	None
RS422	No term (only failsafe) Hard bias Line bias (120 Ω line impedance)
RS485 - 2 wire	No term (only failsafe)+ Dwell time adjustable 50...10000µs Hard bias Line bias (120 Ω line impedance)
RS485 - 4 wire	No term (only failsafe) Hard bias Line bias (120 Ω line impedance)

Table 3.
Available datamodes for channel 2.



Picture 4.
The AUDIO/DATA connector (HD15 female)

Pin	Signal
2	MGMT output
3	Ground
12	MGMT input

Table 4.
MGMT connection's pinout (HD15 female).

Pin	Signal
2	MGMT output (only in F version)
3	Ground
1, 11	Audio ground
4	Non-inverted input
5	Inverted input
10	Non-inverted output
12	MGMT input (only in F version)
14	Inverted output

Table 5.
AUDIO connector's pinout (HD15 female).

Pin	Signal
3	Ground
8	CCL output + (version E)
	CCL output (output relay, version F)
13	CCL output - (version E)
	CCL output (output relay, version F)
6	CCL input + (version E)
11	CCL input - (version E)
	CCL input (version F)
15	Ground

Table 6.
CCL connection's pinout (HD15 female).

MANAGEMENT (MGMT) DATA CONNECTION

The DATA connector (version E) or DATA and AUDIO connectors (version F) contains one bi-directional MGMT data channel (**RS232**). The management connection allows locally or remotely (CRR <--> CRT, bi-directional in-band connection via fibre) configuration and monitoring of **CFO441** unit by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software). The connector in use is a **HD15 female** connector (see picture 4 and table 4 for detailed description). The recommended cable for terminal connection is **CIC403** (HD15 female / D9 female, see table 7 for detailed description).

Pin	HD15 female	D9 female
2	MGMT output	MGMT input
3	Ground	MGMT output
5	-	Ground
12	MGMT input	-

Table 7.
CIC403 cable's pinout (HD15 female / D9 female).

AUDIO CONNECTION

The AUDIO connector contains one bi-directional audio channel line (CRR <--> CRT, and one bi-directional MGMT data channel, only in version F). The audio input impedance can be set to high impedance (>10 kΩ) or 600 Ω with the terminal software (see separate documentation for **CFO441** terminal software). The default factory setting is 600 Ω. The audio output impedance is constant and cannot be adjusted. The audio output impedance is 10 Ω.

The connector in use is a **HD15 female** connector (see picture 4 and table 5 for detailed description). The recommended cable for AUDIO connection is **CIC103** (HD15 female / open wires).

CONTACT CLOSURE LOOP (CCL) CONNECTION

The DATA connector contains one bi-directional contact closure channel line (CRR <--> CRT). The CCL input/output is TTL level voltage (version E) or a normal dry contact closure on/off - signal (pin 11 to ground, version F) between connector's contact pins.

The connector in use is a **HD15 female** connector (see picture 4 and table 6 for detailed description). The recommended cable for CCL connection is **CIC103** (HD15 female / open wires). The CCL output channel can be alternatively configured for VSA usage (see page 12). The default factory setting is CCL usage (**CC1=CC1**).

LINK STATUS AND MODULE INDICATOR LEDS

When the optical input signal level is adequate and in synchronisation to input data is achieved, the LINK STATUS led is green. If optical input signal level is adequate, but no synchronization is achieved the LINK STATUS led blinks green/yellow. If optical input signal is missing or it's level is too low, the the LINK STATUS led is yellow.

When the supply voltage is not in the permitted range (10.5...14 V DC) or there is a transmitter laser failure, the MODULE led colour on the front panel is red. During normal operation MODULE led is blinking green (blinking indicates embedded software is working properly).

ALARM CONNECTIONS

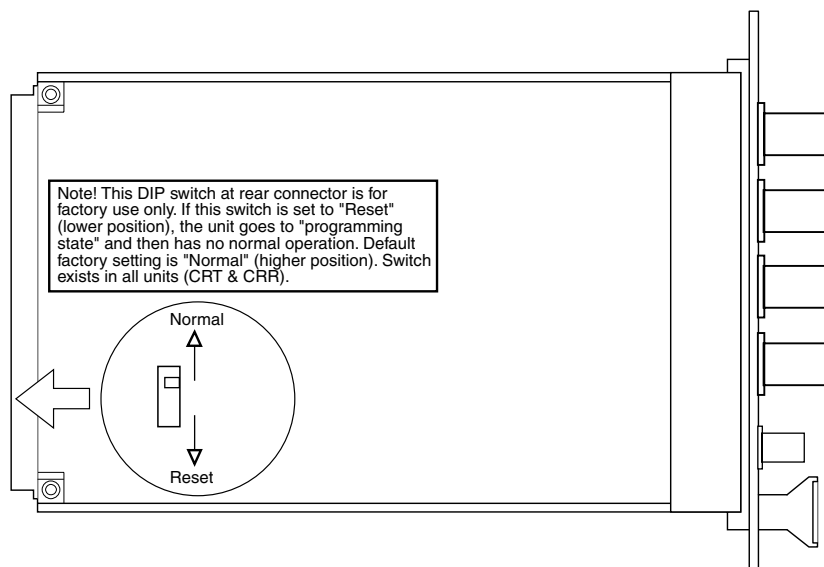
All alarms at the rear connector of the unit are low open collector outputs, with the capability of 30 V/10 mA switching.

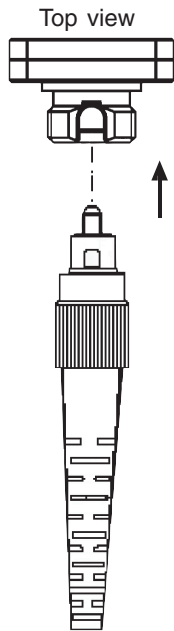
Alarm	Description	Reason
A	Hardware failure	TX Laser failure Supply voltage is not in the permitted range
B	Link status alarm	Input optical signal too low No synchronisation achieved to input data

Table 8.

Open collector alarms.

*Note! At the rear of unit is located a **DIP** switch for factory use only (see picture below). If this switch is set to "Reset" (lower position), the unit goes to "programming state" and then has no normal operation. Default factory setting is "Normal" (higher position). Switch exists in all units (CRT & CRR).*





Picture 5.
FC/PC Connectors
 Make sure the key is aligned in the slot properly before tightening!

VIDEO SOURCE ALARM (VSA)

The CCL output channel can be alternatively configured for VSA usage. In CRR units the VSA is only monitored by the CRT's video input. When VSA mode is enabled and CRT's video input is missing (link otherwise operates normally, but e.g. only the camera is broken), the CCL output pins are closed. VSA have no effect to CRR's CCL input i.e. it can be used normally to transmit CCL information to CRT if VSA is not activated at CRT. In case when VSA is enabled at the same time in both CRT and CRR, then CCL channels are not available for other use. The VSA function can be set on/off by using a PC and any terminal type communication software (see separate documentation for **CFO441** terminal software). The default factory setting is CCL usage (**CC1=CC1**).

Note! Video detection has 20 sec delay before VIDEO SOURCE ALARM is activated / inactivated.

FIBRE CONNECTION

The optical connector is of the type **FC/PC** (see picture 5). The maximum optical input level is -1 dBm (nominal optical output level for return signal is -1 dBm). The link budget for both transmission directions is 20 dB. The operating wavelength is 1310 nm.

When installing the fibre optic cable, do not exceed the minimum bending radius when connecting cable to the system.

Note! For correct optical operation ensure that all optical connectors are cleaned immediately before mating. Connectors should always be cleaned using high purity alcohol (e.g. methyl or isopropyl alcohol). Dry the surfaces using clean compressed air or other equivalent pressurised gas. The optical connectors on the equipment should always be protected with dustcaps when there is no fibre inserted.

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