Fiberoptic G.703 Codir - IEEE C37.94 converter, 21-216

Technical manual

About this manual

About the contents of this manual

The information in this document may be changed at any time without notice..

Table of Contents

Version and revision history.

Revision history for product:

Revision P1 (Prototype 1).
Valid for serial number: *FS-02434 and FS-02435 (2004-03-18).*

Revision R1.
Product released for serial production. 2004-08-13.

Revision R2.
Internal strappingarea function is added with a rotary switch on frontpanel.
Valid from serial number: *55032252 (2004-12-17).*

Revision history for this document.

Revision AK0.
2004-03-17, AnNy, document created.

Revision AK1.
2004-05-05, AnNy, description of LED-indications, and more.

Revision R1.
2004-08-08, AnNy, Product released for serial production. Pinning of Codir-port corrected.

Revision R2.
2004-12-16, AnNy, Product revision R2 released for serial production. Rotary switch for configuration.

Document properties.
Last saved: 2004-12-17 14:35
Filename: Technical Manual 90_20_0101_r2.doc

Author.
Created by Anders Nyström.
Last saved by Anders Nyström.

General description

Functional

The 21-216, Fiberoptic G.703 Codir – IEEE C37.94 converter is intended to extend distance and galvanic isolate the teleprotection equipment for substations connection to multiplexers.

IEEE C37.94

The standard "IEEE C37.94-2002, IEEE Standard for N times 64 Kilobit per Second Optical Fiber Interfaces between Teleprotection and Multiplexer Equipment" describes a fiberoptic intra-substation communication links between teleprotection equipment and multiplexers.

G.703 Codirectional interface - Codir

The standard "G.703 64kbit/s codirectional interface" describes a galvanic interface commonly used by teleprotection equipment for connection to multiplexers.

Features

Fiberoptic and data transfer protocol

Data speed	2.048Mbit/s

Optical data

Wavelength	820nm
Fiber optical connector	ST
Optical System budget	13dB with multimode fiber, (62.5/125 um) 9dB with multimode fiber, (50/125 um)
Typical distance	2km (6dB systemmargin for 62.5/125 and 3dB margin for 50/125).

Power Supply.

48V DC to 250V DC, $\pm$ 20%
110V AC to 230V AC, 50Hz, $\pm$ 20%.
AC connector IEC 320, 3 pin.
Power consumption <20W.

Physical size

The unit is intended to be mounted in a 19" rack.
By adjusting, the rack mount brackets, the unit can also be mounted on a wall or similar.

Height	45 mm
Width	483 mm (380 mm without rack mount brackets).
Depth	173 mm (from front to back, connectors excluded).
Weight	3 kg

Environmental conditions

Operating temperature	-25 to +55 °C
Storage temperature	-40 to +85 °C

Unpacking.

Check that all packing material has no damage. If damages are discovered on packing material, contact your shipping company, before unpacking.

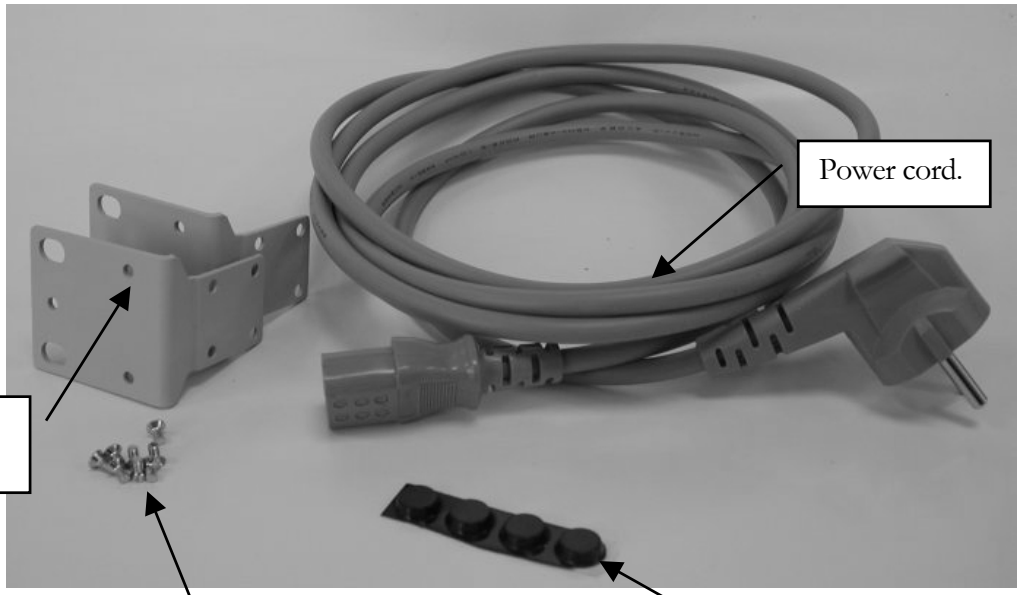
The delivered product consists of several parts. Check that all part are present according to list, and have no damage.

Product 21-216 consists of:

	Quantity	Part number	Description
1	1	21-216	Fiberoptic G.703 Codir – IEEE C37.94 converter *(Part number includes all parts in this list).*
2	2	60-00-5387	Rack Mounting Bracket
3	8	50-65-1673	Screw, MFX-H M3x5 FZB
4	1	50-65-0106	Power cord, 1.8m European connector.
5	4	50-65-5030	Rubber feet
6	1	90-20-0101	This manual

21-216, *(Part number includes all parts in list above).*

21-216 revision 2, *(Part number includes all parts in list above).*

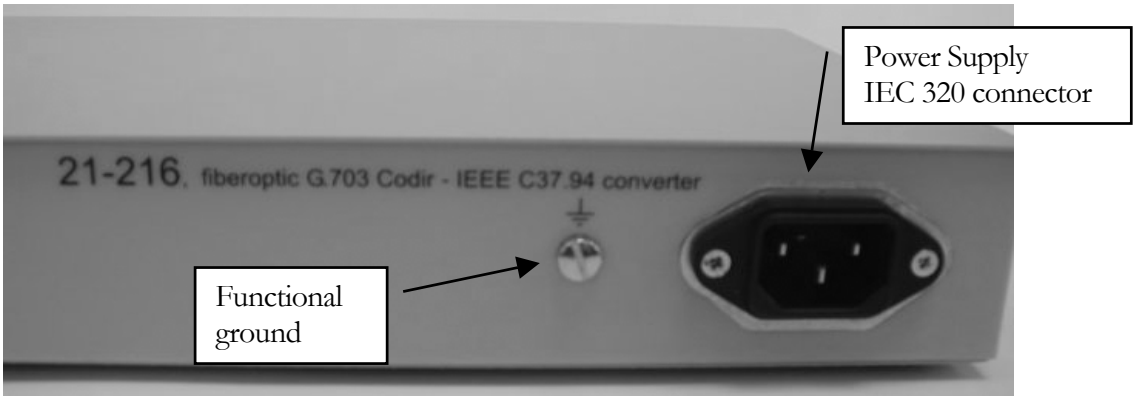

Power cord.
2 Rack mounting brackets
8 screws for rack mounting brackets
4 Rubber feet

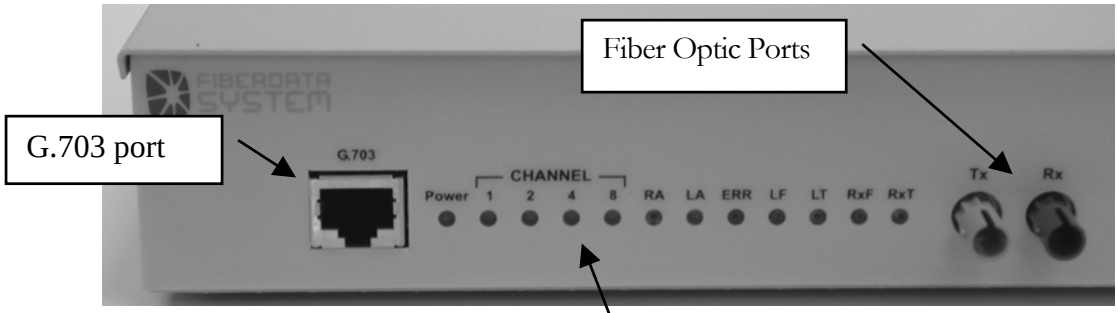
Installation.

Serial number.

The products serial number is the best way for Fibersystem to identify the product. If the serial number is not noted on your delivery notes, please add the serial number to your own product documentation. This will be useful at future contact with Fibersystem.

Front Panel.





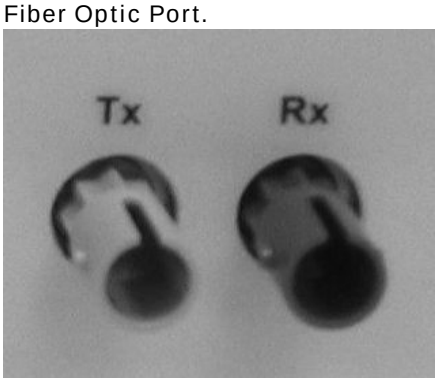
21-216 revision 1.

21-216 revision 2

Back Panel.

There are no connections or indications on the back panel.

Fiber Optic Port.

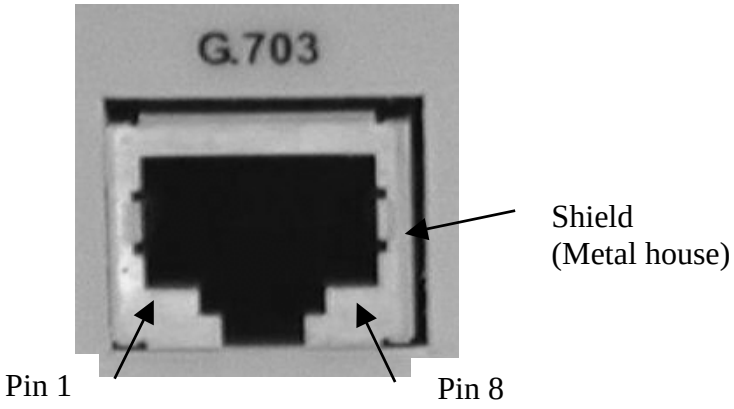


The fiber optic connector is of ST type.

Confirm that the attenuation of the fiber optic cable, including splices and patch cables, doesn't exceed the system budget. Don't forget to add a safety margin. Minimum safety margin is 3dB.

Make sure that the local fiber optic transmitter, marked Tx, is connected to the remote units fiber optic receiver, marked Rx.
And local Rx shall be connected to remote Tx.

G.703 64kbit/s Codir Port.



Pinning of Codir port:

RJ45 pin	Name	Direction
1	Tx+ (TIP-out)	From 21-216 to multiplexer
2	Tx- (RING-out)	From 21-216 to multiplexer
4	Rx+ (TIP-in)	From multiplexer to 21-216
5	Rx- (RING-in)	From multiplexer to 21-216
Metalhouse	Shield	Cables shield must be connected

Use a cable with twisted pairs and a high quality shield. Only foil shielding is not enough.
Rx+ and Rx- should form one twisted pair - Tx+ and Tx- another twisted pair.
A Cat5 S/FTP-cable, (Shielded/Foil Twisted Pair) used for example in Ethernet communication is a good cable. The outer shield is a braided mesh around the cable. In addition every twisted pair has a foil-shielding.

If a S/FTP patchcable for Ethernet is used, be aware that a cross-connected cable has only the pairs on pin 1-2 and 3-6 cross-connected, the two remaining pairs are not cross-connected.

Clock configuration switch.

From 21-216 revision 2 and later, a rotary switch is added to the front panel, to ease installation and testing.

Functional earth/ground.

To the left of the IEC 320 power supply connector, a reference ground/earth screw is available.
Protective ground shall be connected to the IEC 320 power supply connector.
Chassis ground and internal signalground, can be connected together with an internal jumper.

Configuration

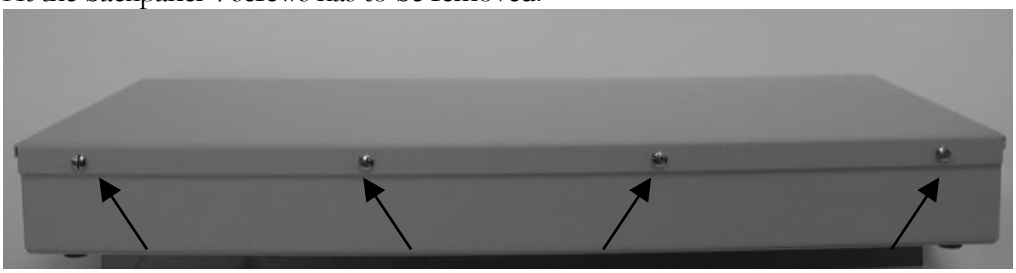
Strappingarea.
The 21-216 can be used for several applications and situations.
The different applications need to be configured.
For product revision 1, this is done with a strapping area inside the unit has to be configured.
From 21-216 product revision 2, some configuration also can be done with a 16 position rotary switch on the front panel.

WARNING – High Voltage !

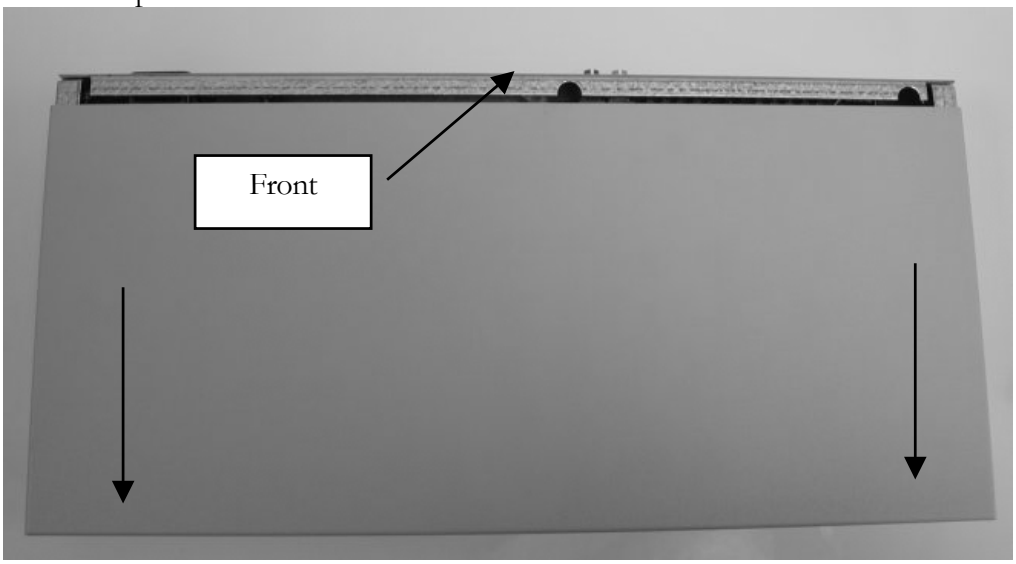
WARNING: When you remove the cover you will expose live parts and accessible terminals, which can cause death.

Disconnect mains cable before opening the 21-216.

Opening the 21-216. (If necessary!).
At the backpanel 4 screws has to be removed.



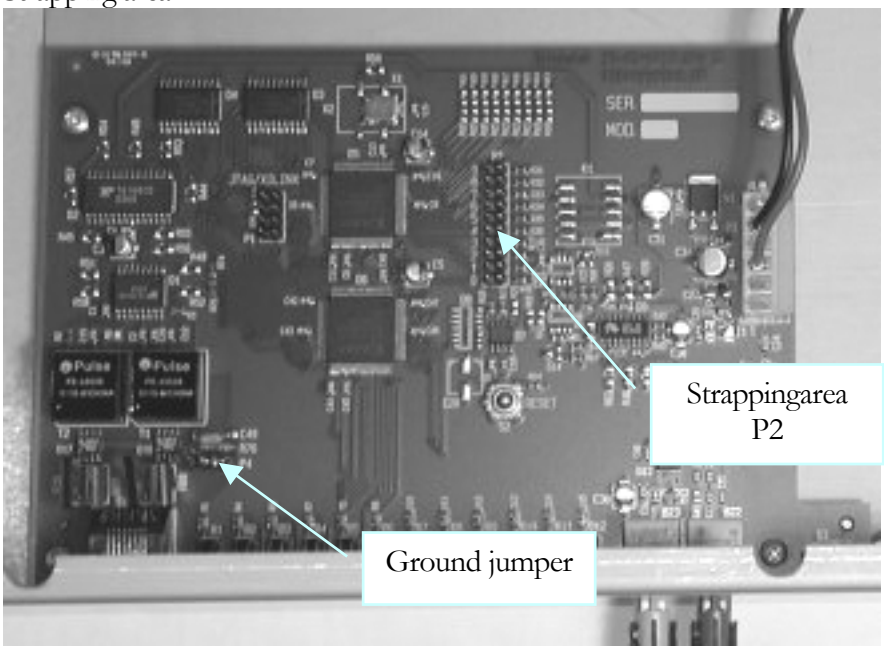
Slide the top lid backwards.



Lift lid in back.

If necessary, disconnect protective earth cable.

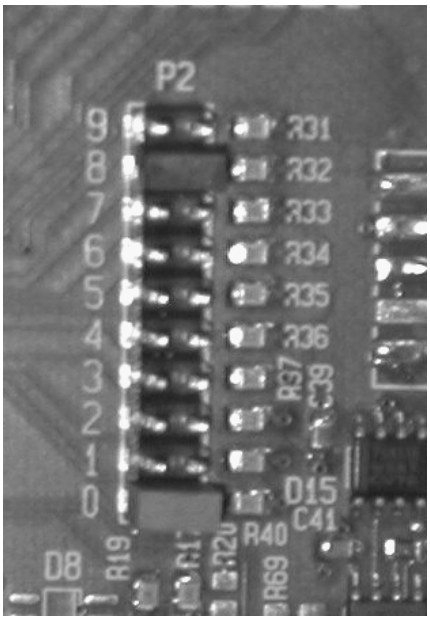
Strapping area



CAUTION – ESD sensitive parts !

Electrostatic charges, and their resulting discharges (ESD - electrostatic discharge), present severe risks to the life of electronic equipment in general, and to semiconductor components in particular.

Use conductive wrist straps or similar protective aids, to prevent any risk for electrostatic discharges.



On the strapping area P2, there are 10 jumper positions. 0 – 9.

Channel configuration

Position 0 – 3, selects the IEEE C37.94-channel for data, (fiber).
There are 12 channels available.
The four jumpers form a hexadecimal number corresponding to the channel.

Jumper 0 LSB	**Jumper 1**	**Jumper 2**	**Jumper 3 MSB**	**Selected channel**
Empty	Empty	Empty	Empty	0 – Not used!
Jumper	Empty	Empty	Empty	1
Empty	Jumper	Empty	Empty	2
Jumper	Jumper	Empty	Empty	3
Empty	Empty	Jumper	Empty	4
Jumper	Empty	Jumper	Empty	5
Empty	Jumper	Jumper	Empty	6
Jumper	Jumper	Jumper	Empty	7
Empty	Empty	Empty	Jumper	8
Jumper	Empty	Empty	Jumper	9
Empty	Jumper	Empty	Jumper	10 – (0A Hex)
Jumper	Jumper	Empty	Jumper	11 – (0B Hex)
Empty	Empty	Jumper	Jumper	12 – (0C Hex)
Jumper	Empty	Jumper	Jumper	13 – Not used!
Empty	Jumper	Jumper	Jumper	14 – Not used!
Jumper	Jumper	Jumper	Jumper	15 – Not used!

The jumper positions correspond to the LED-area "CHANNEL" on the frontpanel. Jumpers 4 , 5 and 6 are not used for configuration. (Can be used for spare jumpers).

Clock synchronization configuration

Jumpers 7 , 8 and 9 configures the clock selection.

A jumper on position 9 selects clock from codir interface.

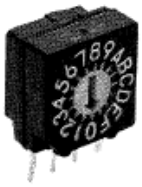
A jumper on position 8 selects clock from fiber interface.

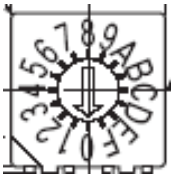
A jumper on position 7 inverts the clock received from fiber..
In some applications it is necessary to adjust the phase between the received clock on fiber and the galvanic clock. This is done, by inverting the clock received from fiber.

If both position 8 and 9 are left empty the internal clock in the 21-216 is selected.

For 21-216 R2 , (revision 2), or later also a rotary switch on the frontpanel can be used for clock synchronization configuration.

The rotary switch has 16 positions, (HEX-switch).



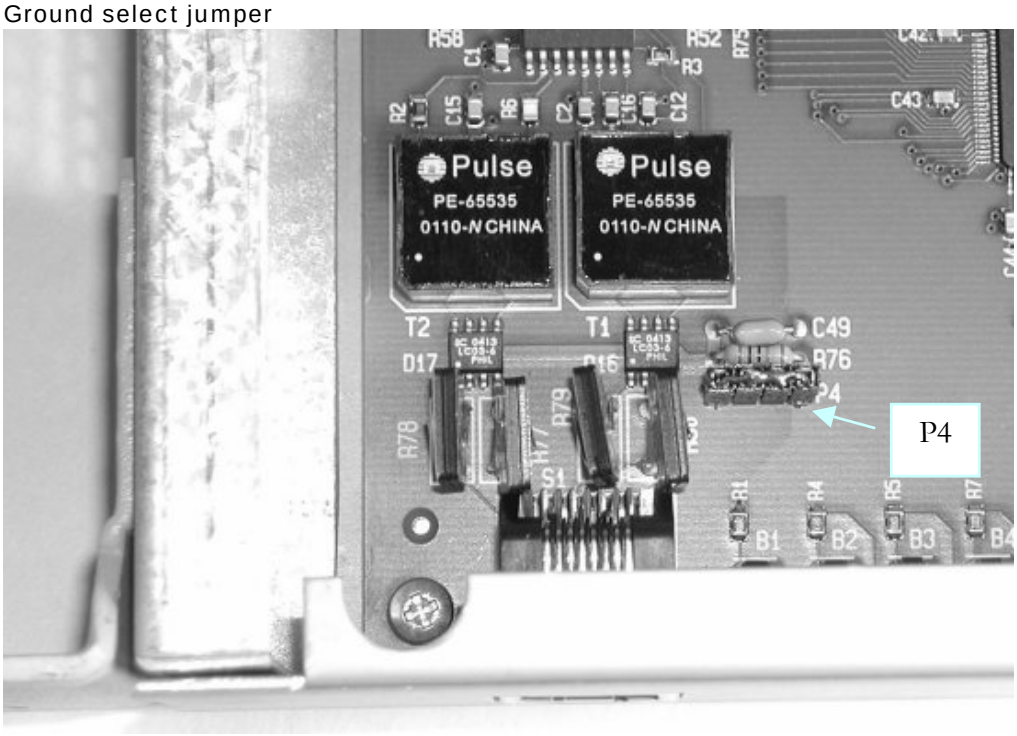


At position 0 the switch's arrow, visible through the adjusting hole, points strait down.

Position	Function
0	Jumpers 7,8 and 9 configure clock selections
1	Jumpers 8 and 9 configure clock source selections, inverts the clock received from fiber, (overrides setting of jumper 7).
2	Internal clock is selected, (overrides settings of jumpers 8 and 9).
3	Internal clock is selected, inverts the clock received from fiber (overrides settings of jumpers 7, 8 and 9).
4 – 7	Reserved for future use
8 - 15	Reserved for factory testing

When a "not used" channel is selected or if both codir and fiber clock are selected, the ERR – LED on the frontpanel is lit.

Ground select jumper



The strappingarea/jumper P4 selects how internal signalground and chassisground are referenced together.
With a jumper between P4's terminals chassieground and signalground are directly tied together.
Without a jumper on P4 chassisground and signalground are connected together with a 100kOhm resistor in parallel with a 100nF capacitor.

Reassemble.

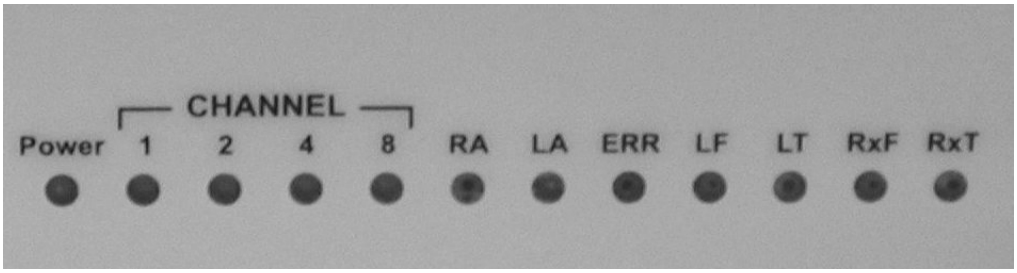
After jumper selecting, reassembling is done in the reverse order as described above.
Don't forget to reconnect protective earth cables.

Start and usage.

Power on.
Connect the power cord to the 21-216 and then connect to mains.

If the link doesn't work, try to cross-connect the fibers at one end.

LED-status.
There are 12 LED-indicators at the front panel.



Power
A green LED lit when power is connected to the unit.

CHANNEL
Four yellow LED's representing the channel chosen by jumpers at installation.
The channel is "calculated" by adding the lit LED's.
For example if LED **1** and LED **2** are lit ➔ 1+2=3 ➔ Channel 3 is chosen.
This means that data to/from G.703 codir-port is sent and received on the IEEE C37.94 protocol on the fiber.
The fiber protocols bits for N, named p,q,r,s in the IEEE37.94 standard are always set to N=1, (0,0,0,1). This means that 21-206 will send 1 channel and active data will be sent on channel 3. The remaining 11 channels will have idle data - all ones. 21-206 will also accept data on channel 3.

RA
Remote Alarm. A red LED indicating that the remote unit has encounter a fault condition and has set the "Yellow Alarm bit" in the IEEE C37.94 protocol.

LA
Local Alarm. A red LED indicating that the 21-206 has encounter a fault in the received IEEE C37.94 protocol – LOS Loss Of Signal. The "Yellow Alarm bit" is set in the outgoing IEEE C37.94 protocol.

ERR
Error. A red LED indicating that the 21-216 has detected an internal error.
The ERR-LED also indicates that a not allowed setting of jumpers is made.

LF
Link Fiber. A green LED indicating that the 21-216 receives correct IEEE C37.94 frames, (no LOS).

LT
Link Twisted pair/G.703 codir. A green LED indicating that 21-216 receives G.703 codir 64kbit/s protocol.

RxF
Receive data on Fiber. A green LED indicating that 21-216 receives data in IEEE C37.94 format.

RxT
Receive data on Twisted pair/G.703 codir.. A green LED indicating that 21-216 receives data in G.703 codir protocol.

Clock synchronization configuration

Clock synchronization configuration can be done "on the fly" with the rotary switch on the frontpanel. Se chapter "Configuration".

Technical support

Before contacting technical support, we beg you to first read the manual once again.. If you still have problems or questions, don't hesitate to contact help desk. Please gather all relevant information, including serial number, about your installation before contacting help desk.

Our technical support can be reached at:
Fibersystem AB
Gardsfogdevagen 18B
S-16866 Bromma
Sweden
Telephone: +46-8-564 828 80 • telefax: +46-8-28 33 50
Web: http://www.fibersystem.se/
E-mail addresses can be found on our web-site.

CE - mark

The product described in this manual , is designed to apply to the specifications of the EMC directive 89/336/EEC and to low voltage directive 73/23/EEC

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