



## 10024/./.

## Enhanced communication module (ECM)

### Description

The 10024/./.

 enhanced communication modules (ECM) are used for:

- communication between redundant Central Parts in an FSC configuration,
- communication between a master FSC system and slave FSC systems,
- external communication with distributed control systems (DCSs) and peripherals such as printers, and
- external communication with the FSC user station.

To achieve these functions, the 10024/./.

 enhanced communication modules support serial communication links for either RS-422, RS-232C, RS-485, or glass fiber.

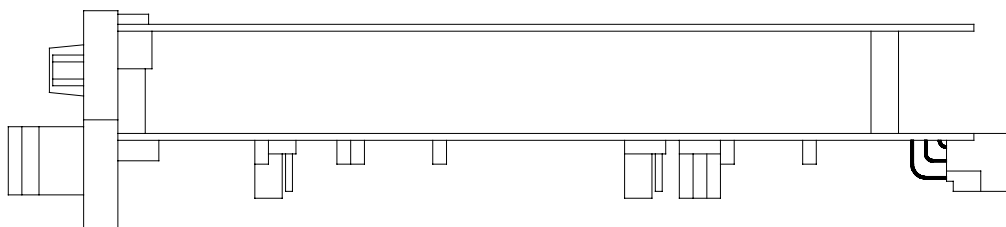
### Module layout

A 10024/./.

 enhanced communication module will always take up two card positions in a rack. It consists of two parts (see Figure 2):

- the main board (10024/1/1, right), and
- two communication interfaces (10024/x/1, left).

Figure 1 and Figure 2 below show what a 10024/./.

 module looks like. The right half is the main board, and the left half accommodates the communication interfaces.

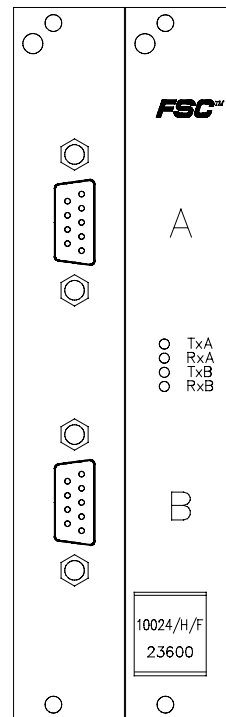


Figure 2 Front view of 10024/H/F enhanced communication module with two interfaces

## Main board

The main board of a 10024/H/F enhanced communication module has its own processor and memory to relieve the central processor and to offer optimum support for the external equipment. The 10024/H/F module supports both EPROMs and flash memory.

## Features

The extensive memory capacity of this module allows many special features to be included in the software, e.g.:

- communication protocols:
  - FSC-FSC
  - FSC-DS
  - ModBus RTU
  - ModBus H&B
  - RKE3964R
- sequence of event recording (SER),
- report generation, and
- support of printers.

## LEDs

The LEDs on the module front indicate activity on the channel.

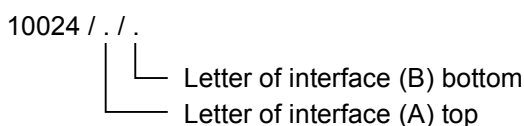
## Jumpers on system bus

Please note that when you are installing a new communication module, you need to remove a jumper from the Central Part system bus (7-SBUS, 12-SBUS, or 17-SBUS). For details refer to the Central Part system buses data sheet in Section 3 of the FSC Hardware Manual.

## Communication interfaces

The full type code of the 10024/./. module is determined by the communication interfaces that are used. The following interfaces are supported:

- **F-interface:** Tri-state RS-232C interface
- **G-interface:** Glass fiber interface
- **H-interface:** RS-422 interface with readback
- **I-interface:** Isolated RS-485/RS-422 interface



For example, 10024/H/F is a communication module with:

- Top interface (A): H-interface (RS-422 interface with readback)
- Bottom interface (B): F-interface (tri-state RS-232C interface)

Table 1 Supported interface combinations

| Type code | Top interface (A)                | Bottom interface (B)             |
|-----------|----------------------------------|----------------------------------|
| 10024/F/F | Tri-state RS-232C interface      | Tri-state RS-232C interface      |
| 10024/F/G | Tri-state RS-232C interface      | Glass fiber interface            |
| 10024/G/G | Glass fiber interface*           | Glass fiber interface            |
| 10024/H/F | RS-422 interface with readback   | Tri-state RS-232C interface      |
| 10024/H/G | RS-422 interface with readback   | Glass fiber interface            |
| 10024/H/I | RS-422 interface with readback   | Isolated RS-485/RS-422 interface |
| 10024/I/F | Isolated RS-485/RS-422 interface | Tri-state RS-232C interface      |
| 10024/I/G | Isolated RS-485/RS-422 interface | Glass fiber interface            |
| 10024/I/I | Isolated RS-485/RS-422 interface | Isolated RS-485/RS-422 interface |

\* Requires special guiding of the optic cable.

Each of the communication interfaces is discussed in more detail below.



**H-interface  
(10024/H/.)**

The H-interface (RS-422 with readback) is only used for internal communication in redundant Central Part configurations. In case of an internal communication failure, the correct functioning of the interface is tested. If an interface is faulty, the Central Part with the faulty interface will be switched off.  
The H-interface has no galvanic isolation, and may therefore not be used for external communication links.

**Cable lengths**

The H-interface is suitable for cable lengths up to 1.5 m (4.9 ft) at 2 Mbaud using Belden 9728 or Belden 8314 cable.

**Pin allocation**

Figure 7 shows the pin allocation of the male H-interface connector.

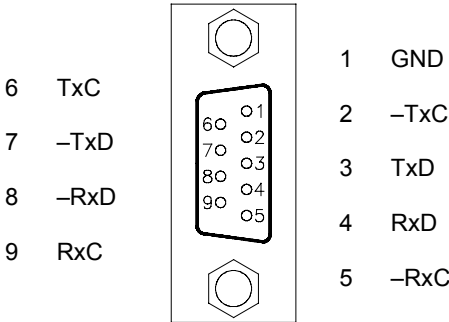


Figure 7 Front view of H-interface connector



## I-interface (10024/I/.)

The I-interface (isolated RS-485/RS-422) can be used to connect the FSC system to, for example, the FSC user station and/or other FSC systems.

The RS-422 option provides a duplex communication link between the FSC system and one other device.

The RS-485 option provides a simplex or duplex communication link between several other devices.

The RS-422 master with RS-485 slave option provides a duplex communication link between the master and any slave in a multidrop FSC network. The slaves can only communicate with the master.

The RS-485 interface can be used to connect the FSC user station or a DCS, to both Central Parts in a redundant configuration. In that case the Central Parts decide between each other which Central Part will answer if a communication request is made to the FSC system. This will guarantee optimum availability if an I-interface goes faulty. An on-board watchdog circuit disconnects the communication line when the communication processor (on the ECM's main board) goes into software hangup or hardware reset.

The I-interface provides galvanic isolation, which allows connecting 230 Vac powered devices according to IEC 61010 (VDE 0160/0110).

## Cable lengths

The maximum cable length for the I-interface (RS-422/RS-485) depends on the communication baud rate:

- $\leq 100$  Kbaud: 1.2 km (0.75 mi)
- 125 Kbaud: 1 km (0.63 mi)
- 1 Mbaud: 120 m (131.2 yd)
- 2 Mbaud: 60 m (65.6 yd)

## Pin allocation

Figure 8 shows the pin allocation of the male I-interface connector.

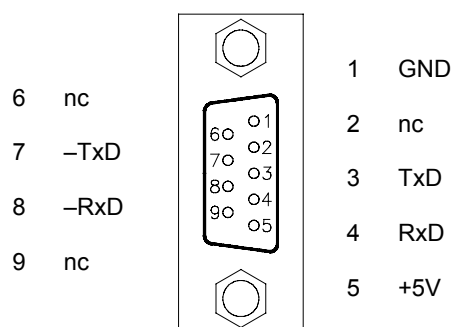


Figure 8 Front view of I-interface connector



## Connections

There are several types of communication connections:

1. Between an FSC system and another FSC system,
2. Between both Central Parts in a redundant FSC configuration,
3. Between an FSC system and the FSC user station,
4. Between an FSC system and a DCS,
5. Between an FSC system and a printer.

Each of these is explained in more detail below.

## Wire colors

The wire colors in the drawings on the next pages refer to Belden cable type 8723. IBM P/N 4716748 (IBM N<sup>o</sup>1) cable may also be used, as well as TKF cable type 4 x 2 x 0.5 PVLVDVmb-2af (see Table 2 for wire assignment and colors). Make sure that you only use one cable type per communication loop.

Table 2 Color reference and terminator resistor

| Wire         | Belden 8723 | IBM N <sup>o</sup> 1 | TKF       |
|--------------|-------------|----------------------|-----------|
| TxD          | Red         | Orange               | White (1) |
| –TxD         | Black       | Black                | Black (1) |
| RxD          | White       | Red                  | White (2) |
| –RxD         | Green       | Green                | Black (2) |
|              |             |                      |           |
| Term. res. R | 56 Ohm      | 150 Ohm              | 100 Ohm   |

## Considerations for I-interface

For connections that are made using the I-interface, the following considerations apply:

- In RS-422 applications, use one terminator resistor (R) and two 1-kOhm resistors per wire pair.
- In RS-485 applications, use two terminator resistors (R) and two 1-kOhm resistors per wire pair.
- The terminator resistors should be placed at the cable ends. The 1-kOhm resistors must be placed on the master side of the communication cable. Resistor types: 5%, 0.25 W.
- The shield must be connected to instrument earth close to the master.

## 2: Central Part ↔ Central Part

A connection between both Central Parts in a redundant FSC configuration requires an **H-interface** (RS-422 with readback). The connections are as follows:

### RS-422 (H-interface)

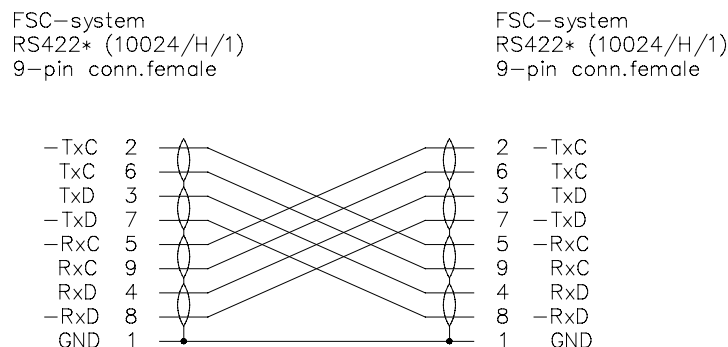


Figure 14 Connection between two Central Parts in redundant FSC configurations (using an H-interface)

## 3: FSC system ↔ FSC user station

A connection between an FSC system and the FSC user station requires an **F-interface** (Tri-state RS-232C) or an **I-interface** (isolated RS-485/RS-422). Several connections are possible:

- **RS-232** communication (using an **F-interface**):
  - Using a 25-pin connector without hardware handshake (see Figure 15).
  - Using a 25-pin connector with hardware handshake (see Figure 16).
  - Using a 9-pin connector without hardware handshake (see Figure 17).
  - Using a 9-pin connector with hardware handshaking (see Figure 18).
- **RS-485** communication (using an **I-interface**):
  - Using a simplex communication cable (see Figure 19).

## 4: FSC system ↔ DCS

A connection between an FSC system and a DCS requires an **F-interface** (Tri-state RS-232C) or an **I-interface** (isolated RS-485/RS-422). Several connections are possible:

- **RS-232** communication (using an **F-interface**):
  - With hardware handshake (see Figure 20).
  - Without hardware handshake (see Figure 21).
- **RS-485** communication (using an **I-interface**) (see Figure 22).

### RS-232 (F-interface), handshake

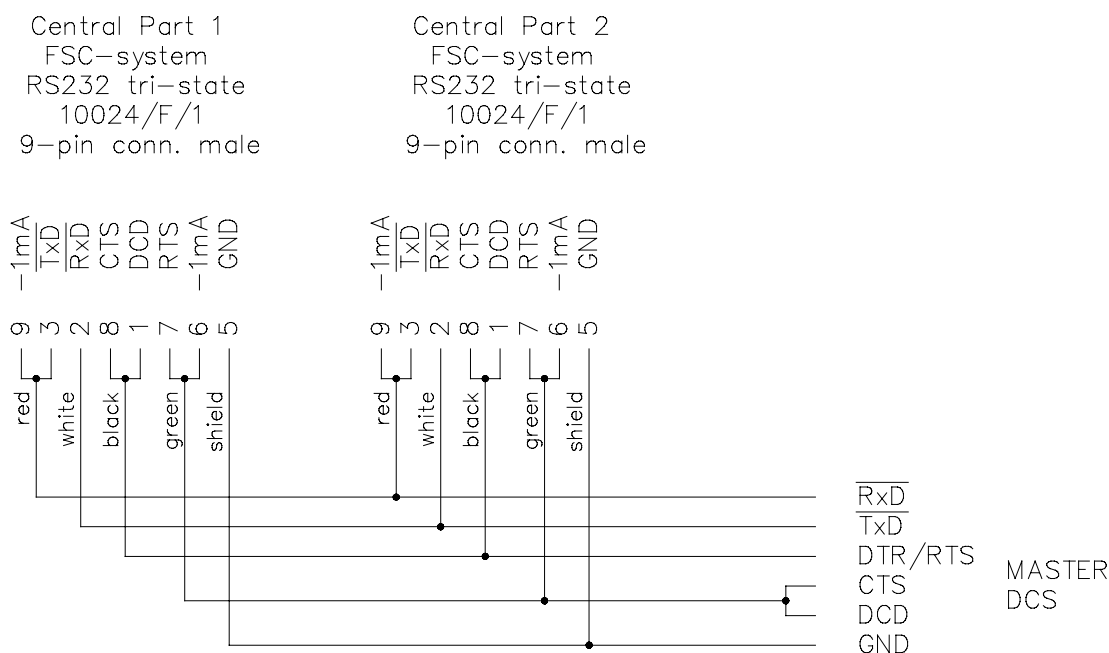
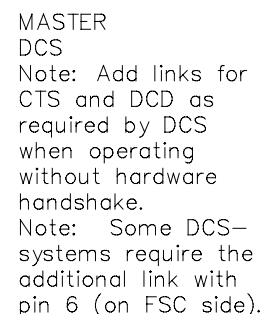


Figure 20 Connection between FSC system and DCS:  
with hardware handshake, using an F-interface (RS-232)



|                  |                  |
|------------------|------------------|
| Central Part 1   | Central Part 2   |
| FSC-system       | FSC-system       |
| RS232 tri-state  | RS232 tri-state  |
| 10024/F/1        | 10024/F/1        |
| 9-pin conn. male | 9-pin conn. male |



### RS-485 (I-interface)

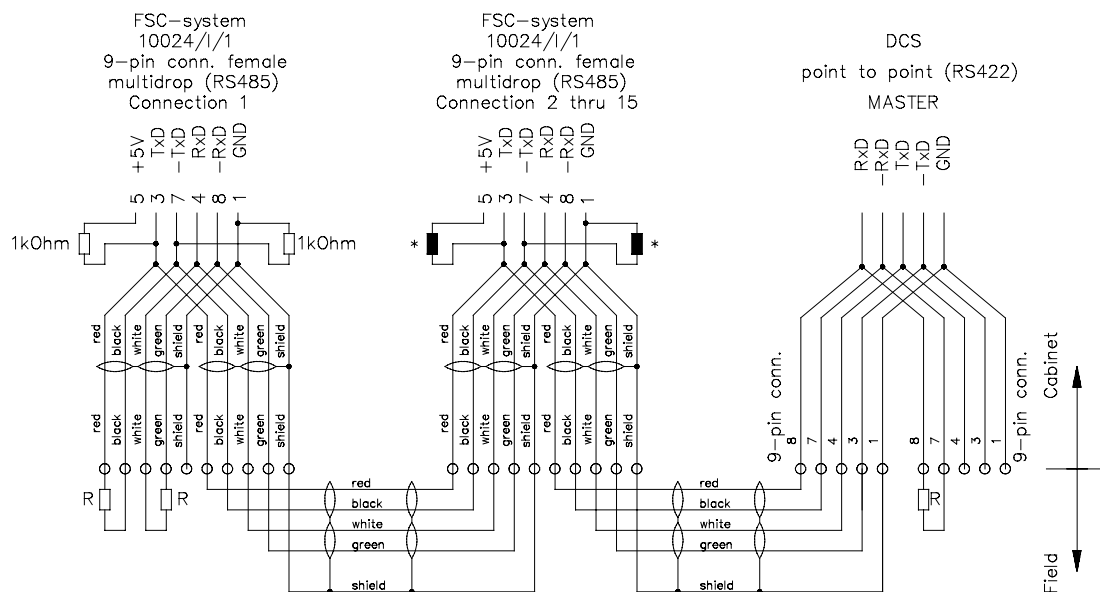


Figure 22 Connection between redundant FSC system and DCS using Belden 8723 cable and an I-interface (RS-485/RS-422)

- \* Place the black resistor pair (2 x 1 kOhm) in only one of the connections 2 to 15. For optimal availability, this resistor pair should be placed as far from connection 1 as possible.
- \*\* Figure 22 is only an example. The exact RS-485 connections between an FSC system and a DCS may vary, depending on the DCS connection requirements.



## Technical data (10024/H/I)

The 10024/H/I enhanced communication module has the following specifications:

|                      |                                           |                                                                            |
|----------------------|-------------------------------------------|----------------------------------------------------------------------------|
| <b>General</b>       | Type number:                              | 10024/H/I 26900                                                            |
|                      | Approvals:                                | CE, UL, TÜV                                                                |
|                      | Software versions:                        | ≥ 2.78f (configuration ≥ 530)                                              |
|                      | Space requirements:                       | 8 TE, 3 HE (= 8 HP, 3U)                                                    |
|                      | Maximum number of I-interfaces in system: | 16                                                                         |
| <b>Communication</b> | Maximum baud rate:                        |                                                                            |
|                      | – H-interface (A)                         | 2 Mbaud                                                                    |
|                      | – I-interface (B)                         | 1 Mbaud                                                                    |
| <b>Isolation</b>     | Galvanic isolation (I-interface only):    | > 6 kV                                                                     |
| <b>Cable lengths</b> | H-interface (A):                          | max. 1.5 m (4.9 ft) at 2 Mbaud<br>(using Belden 9728 or Belden 8314 cable) |
|                      | I-interface (B):                          |                                                                            |
|                      | – ≤ 100 Kbaud                             | max. 1.2 km (0.75 mi)                                                      |
|                      | – 125 Kbaud                               | max. 1 km (0.63 mi)                                                        |
|                      | – 1 Mbaud                                 | max. 120 m (131.2 yd)                                                      |
|                      | – 2 Mbaud                                 | max. 60 m (65.6 yd)                                                        |
| <b>Connectors</b>    | Connector type:                           |                                                                            |
|                      | – H-interface (A):                        | male, 9 pins                                                               |
|                      | – I-interface (B):                        | male, 9 pins                                                               |
| <b>Power</b>         | Power requirements:                       | 5 Vdc 675 mA                                                               |
|                      | Ripple content:                           | < 50 mV p-p                                                                |

### Note:

Do not remove or replace this module while the power to its Central Part is on.