The CPU I/O Module
FEC FC34-FST

• **Powerful AMD processor**
  AM186 (20 Mhz, 2 Mips) with 16-bit memory access, 512 Kbytes of RAM

• **Flash disk**
  Approx. 100 Kbytes free

• **Ethernet 10BASE T**
  Telnet, TFTP, TCP/IP, Web Server
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Foreword

Customer service experience

As far as we are concerned, our company’s reputation as an innovative source of ideas represents confirmation of our standards and also an obligation to maintain them. Our reputation is based on communicating with our customers and carefully monitoring the market.

Our customers make extremely high demands with regard to reliability, service life, flexibility, ease of operation and environmental compatibility. They also expect expert advice, rapid service, qualified support and product training.

We have been providing software, hardware, service and information for industrial PC’s and automation equipment for 15 years. Reliable delivery and service are combined with a continuously expanding product range and ever-decreasing intervals between new innovations.

Our target is customer satisfaction. Our customers’ success, and therefore our own, is based on consistent quality management, a unique range of products and highly motivated staff who are full of ideas.
About this manual

We would like to thank you for choosing to buy the FEC FC34-FST module. We are pleased to welcome you as one of our customers.

Please read through this manual carefully before beginning with the installation. The FEC FC34-FST module is designed to be a low-cost, versatile industrial controller that is quick and easy to install and can be operated by personnel with limited experience of programmable controllers.

This manual contains text, diagrams and explanations that show the reader how the module is correctly installed and safely used and operated. Before installing the module the contents of this manual must have been read and understood. If in doubt about the operation or use of the module, please contact your nearest BECK IPC GmbH office.

FEC FC34-FST - The Control CPU

Pure control technology, 12 inputs, 8 outputs with status LED, network, with fast counter inputs, with connection facility for an FST-PLC as an I/O module (direct switching of 230 V!). All of this fits into an FC34-FST!
**CE Confirmation**

Manufacturer BECK IPC GmbH declares in sole responsibility that the product

**FEC FC34-FST**

complies with directive 89/336/EWG in harmonisation with the following standards:

- **Noise immunity**  EN 50082-2
- **Emitted interference**  EN 50081-2

This is a class A device. It can cause transmission interference in built-up areas. In this case it is the responsibility of the user to take appropriate measures and bear any costs incurred by problems of this nature.

**Important installation instructions**

A shielded cable must be used. Cables with a braided shield (80% coverage) are suitable. The shield should be connected at the module end over a large area and have low resistance.

The device complies with protection class III.

Please only use power supplies that guarantee safe separation of the operating voltage as per IEC742/EN60742/VDE055, PELV with at least 4 kV of insulation strength. Switching power supplies with safety insulation as per EN60950/VDE 0805 are permitted.
User safety and device protection

This manual is intended for the use of trained specialists when installing the FEC FC34-FST module. Safety guidelines are defined in the European directives for machinery, low voltage and EMC. Throughout this manual, symbols are used to highlight information relating to the user’s personal safety and the safeguarding of the machine’s integrity. Whenever any of these symbols are encountered, the associated note should be read and understood.

Warnings

- The identified danger could possibly cause damage to persons or property.
- Point of further interest or more detailed explanation.
Installation and use

Area of use

The FEC FC34-FST is an FEC component that has been designed for process control.

Scope of delivery

The scope of delivery of the module includes:

• one FEC FC34-FST module

Up-to-date information such as example programs and/or drivers etc. can be obtained from Internet address

http://www.beck-ipc.com
The dimensions of the FEC

- Length: 130.0 mm
- Width: 122.5 mm
- Height: 53.0 mm
- Depth: 80.0 mm
- Height of the power connector: 4.0 mm

The diagram shows a control module with various labels:
- **POWER**
- **24V 0V**
- **SENSOR SUPPLY**
- **IN**
- **OUT**
- **TP**
- **RUN STOP**

The module has ports for external connections (EXT. COM) and indicators for status (POWER, RUN).
Start-up requirements

- One FEC FC34-FST module (scope of delivery)

- PS1 PSE4 power supply

- SM14 connecting cable between FEC FS34-FST and external computer, consisting of a null modem cable (PS1 ZK11) and an adapter cable (PS1 ZK36).

- External computer such as PC, laptop, to etc. with a free COM port (preferably a Windows system).

- Module-specific software with drivers and example programs. This software can be downloaded from Internet address [http://www.beck-ipc.com](http://www.beck-ipc.com)

  The software is also available on CD.
**FEC components**

1. Sensor supply 24 V DC 100 mA
2. Sensor supply 0 V
3. RUN/STOP switch
4. Analog potentiometer (trimmer)
5. Link/traffic LED for network activity
6. Power LED (power supply LED indicator)
7. 10BASE T network connection
8. RUN LED (LED indicator for run/error)
9. Power supply 24 V DC
10. Power supply 0 V
11. Function earth
12. Relay/transistor supply 24 V DC
13. Relay/transistor supply 0 V DC
14. Connector for expansions (EXT)
15. Serial interface (COM)
<table>
<thead>
<tr>
<th></th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Input E0.0</td>
</tr>
<tr>
<td>17</td>
<td>Input E0.1</td>
</tr>
<tr>
<td>18</td>
<td>Input E0.2</td>
</tr>
<tr>
<td>19</td>
<td>Input E0.3</td>
</tr>
<tr>
<td>20</td>
<td>Input E0.4</td>
</tr>
<tr>
<td>21</td>
<td>Input E0.5</td>
</tr>
<tr>
<td>22</td>
<td>Input E0.6</td>
</tr>
<tr>
<td>23</td>
<td>Input E0.7</td>
</tr>
<tr>
<td>24</td>
<td>Common earth E0</td>
</tr>
<tr>
<td>25</td>
<td>Input E1.0</td>
</tr>
<tr>
<td>26</td>
<td>Input E1.1</td>
</tr>
<tr>
<td>27</td>
<td>Input E1.2</td>
</tr>
<tr>
<td>28</td>
<td>Input E1.3</td>
</tr>
<tr>
<td>29</td>
<td>Common earth E1</td>
</tr>
<tr>
<td>30</td>
<td>Common earth A0</td>
</tr>
<tr>
<td>31</td>
<td>Relay output A0.0</td>
</tr>
<tr>
<td>32</td>
<td>Relay output A0.1</td>
</tr>
<tr>
<td>33</td>
<td>Transistor output A0.2</td>
</tr>
<tr>
<td>34</td>
<td>Transistor output A0.3</td>
</tr>
<tr>
<td>35</td>
<td>Transistor output A0.4</td>
</tr>
<tr>
<td>36</td>
<td>Transistor output A0.5</td>
</tr>
<tr>
<td>37</td>
<td>Transistor output A0.6</td>
</tr>
<tr>
<td>38</td>
<td>Transistor output A0.7</td>
</tr>
</tbody>
</table>
During installation

When you are installing the FEC FC34-FSt module, please pay attention to the ambient conditions in which the device will normally be operating.

Please do not install the FEC FC34-FST module

- in areas that are subjected to excessive amounts of dust, oil spray, conductive dust or corrosive gas;
- in areas that are subjected to shock or vibration;
- in areas that are subjected to high temperatures, direct sunlight, moisture or rain;
- near high voltage devices or cables.
During mounting

Always install the device as far away as possible from high voltage devices and large power supplies.

Please ensure that no pieces of wire, fillings or swarf fall into the device when you are drilling holes or connecting wires.

Do not install the device immediately above a heat-generating source, such as a heater, current converter or high wattage resistor.

If the ambient temperature in the switch cabinet is above 55°C, a ventilator must be installed in order to provide external ventilation.
The COM Programming Interface

Connect the FEC FC34-FST module to the development computer using the SM14 connecting cable. In order to do this, connect one end of the cable to the socket marked COM. Connect the other end to a free serial interface on your development computer.
Example connection (FC34 to external computer)

1. FEC FC34
2. SM14 connecting cable
3. External PC (Laptop)
Writing and testing a program

Write a program using a PC that is equipped with the Festo FSTIPC/FEC program.

Check the program. A syntax check is carried out automatically as soon as you load the project from the programming device into the FEC. Existing program errors that are found by the syntax check must be rectified before the project can be loaded.

In order to test the wiring or the output devices, each output can be forced on and off using the programming device whilst the FEC FC34-FST is not running a program.

A loaded program is run by setting the RUN/STOP switch to RUN. The status LED changes colour from orange (or red) to green.

Operation and testing

Current: ON, FEC FC34-FST: STOP

The FEC FC34-FST module is fitted with an internal RUN-STOP switch. A so-called remote RUN/STOP switch can be used as an additional option. This remote RUN/STOP switch is an external switch that is connected to one of the module’s inputs. If this facility is to be used, this input can be defined in the configuration as an additional RUN/STOP switch.
Current: ON, FEC FC34-FST: RUN

If the RUN/STOP switch is set to RUN (if no remotely operated RUN/STOP switch is being used), the status LED turns green and the module starts program execution. The timer, counter and data register settings can be defined as an additional RUN/STOP switch in the configuration.

If the RUN/STOP switch is set to STOP (even if a remotely operated RUN/STOP switch is being used) the status LED turns orange (or red if an error has occurred).

Flags or digital outputs can be modified during operation using CI commands. However, these values may be changed again by the program.
Expanding the FEC’s to 40 I/O channels

The RUN/STOP switch on the remote unit (FEC FC20/30 without its own control program) must always be set to STOP.

It should be ensured that the remote unit does not have any files called “PROJECT.RUN” and “STARTUP.BAT” in the directory on drive B (delivery state).

Procedure for checking the memory contents:

• Start FSTIPC
• Utilities › Program execution › Host <-> IPC file transfer
• F1: from PC
• F7: Enter IPC drive “B”
• Check whether the “PROJECT.RUN” and “STARTUP.BAT” directories are present.
• If yes, delete both files using F1
• Press F8: Exit to exit terminal program
• Switch FEC FC20/30 off and on again

Expansion cables should only be connected and disconnected when the power is switched off.
The power supply for the master/remote system must be provided from the same voltage source and should be on the same fuse. The use of separate power supplies for the master and the remote is **not** permitted.
### COM and EXT interface pin assignment

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Signal name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5 V</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>TXD</td>
</tr>
<tr>
<td>4</td>
<td>RXD</td>
</tr>
<tr>
<td>5</td>
<td>CTS</td>
</tr>
<tr>
<td>6</td>
<td>RTS</td>
</tr>
</tbody>
</table>
Example crossover cable connection

The FEC FC20 or FEC FC30 inputs and outputs can be added to those of the FEC FC34 using a FEC KSD4 crossover cable, whereby it is important to note that the FEC FC34 must be used as the master and the FEC FC20 or FEC FC30 must be used as a slave (remote unit). Drive B on the remote unit must not contain an application program.

1 Local sensor supply +24 V DC
2 Local voltage supply +24 V DC
3 Crossover cable FEC KSD4
4 FEC FC34 as (master)
5 FEC FC30 as slave (remote)
Network connector (TP) pin assignment

<table>
<thead>
<tr>
<th>Pin no.</th>
<th>Signal name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TD+</td>
</tr>
<tr>
<td>2</td>
<td>TD-</td>
</tr>
<tr>
<td>3</td>
<td>RD+</td>
</tr>
<tr>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>RD-</td>
</tr>
<tr>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>-</td>
</tr>
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</table>
Networking of two FEC’s

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TD+</td>
</tr>
<tr>
<td>2</td>
<td>TD-</td>
</tr>
<tr>
<td>3</td>
<td>RD+</td>
</tr>
<tr>
<td>4</td>
<td>no used</td>
</tr>
<tr>
<td>5</td>
<td>no used</td>
</tr>
<tr>
<td>6</td>
<td>RD-</td>
</tr>
<tr>
<td>7</td>
<td>no used</td>
</tr>
<tr>
<td>8</td>
<td>no used</td>
</tr>
</tbody>
</table>
Network configuration with 10BASE T

9  FEC FC34
10  Hub (star distributor)
11  Twisted pair cable
Network communication

FEC FC34-FST module network communi-
cation is supported by two drivers: the Field PC
Net driver and the TCP/IP driver. In order to
use these drivers the following must be obser-
ved:

For Field PCNet functionality (only with the
3.43 ms timer) the following files must be
present in directory FBLIB.FEC:

- mpme
- mprcv
- mpregt
- mpsucc
- mpxmit
- mpcnv
- mpstat
- mpver

In the RUNTIME.FEC directory:

- fpcniof.exe
- fpcnudp.com
- fpcnudp.dsc
- tmr13_3.com
- fpcnudp.hlp (German version)
- fpcnudp.g.hlp (English version).

Segment lengths

Max. segment length: 100 m
Max. number of transceivers per segment: hub-dependent
Min. distance between transceivers: any
For TCP/IP functionality (Internet) (also with the 4.58 ms default timer) the following files must be present in the RUNTIME.FEC directory:

- tcpipdrv.exe
- tcpipdrv.dsc (tcpipfec.dsc)
- tcpip_d.hlp (German version)
- tcpip_gb.hlp (English version)

If required the TCP/IP modules can also be used (IP_IP, IP_ALIVE etc.).

Update files can be found on the enclosed data medium.

Field PC Net Communication

Field PC Net is used to network several stations. Each station has its own project. Enter the "FPCNUDP" driver in each project using the driver configuration tool.

The system can be configured from these stations using the Field PC Net configuration tool (a constituent of Festo Software Tool). Define the components to be transferred and save the project.
TCP/IP communication

The FEC FC34-FST module can be linked (networked) to the in-house network using the TCP/IP driver. The FEC FC34-FST can then be accessed by other computers using the TCP/IP protocol. To do this, enter the “TCPIPDRV” (“TCPIPFC34FEC”) driver in the driver configuration tool.

Festo Windows applications for TCP/IP communication.

In order to carry out TCP/IP communication between the FEC FC34-FST and external computers you need a program on the external computer that creates a DDE interface to an Excel application. This program is called the “IPC DATA Server” and is installed from Windows folder “Festo Software”. Another useful program is called “IPC TCPIP Application”. This program contains a facility for carrying out small tests using TCP/IP communication and sending CI (Command Interpreter) commands to FST computers with TCP/IP functionality.

Remote expansion.

If you would like to expand the FEC FC34-FST it is possible to use the FEC FC20-FST or FEC FC30-FST as a remote expansion. The following items must be observed:
- The FEC FC34-FST may not be the slave.

- The default 4.58 ms timer must be loaded on the FEC FC34-FST. The remote expansion will not work with the 3.43 ms timer.

- The remote expansion cannot currently be used at the same time as network operation.

**During wiring**

Install the input and output signal wires in separate cable conduits and avoid bunching them together.

Do not use the same multi-core cable for wiring the signal inputs and outputs.
### Warning

If the power supply terminals are wrongly connected, a short circuit between the incoming direct current wires and the power supply cable or a short circuit within the outgoing wires can cause considerable damage to the module.

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<table>
<thead>
<tr>
<th>Caution:</th>
</tr>
</thead>
</table>

Please ensure that the power is switched off before you replace cables or carry out other work.

If you need to measure the maximum insulation voltage and the insulating resistance of the FEC FC34-FST module, disconnect the incoming and outgoing wires and the power cable from the module and carry out the measurements across all the terminals and the earth terminal using a common point.

Before switching on the power, check the power supply and earth connections and the incoming and outgoing connections.

Please ensure that none of the installation screws are loose. Make sure that no screw terminals for external connections are loose. There must be no visible damage to external connections.
Transistor output wiring diagram

1) Analog current restriction to 4 A / 200 ms
   Analog short circuit/overload protection, thermal only
Relay output wiring diagram

- +5 V
- Output OUT 0 ... OUT 1
- -24 V
- 0 V
- Power supply

Components:
- KS
- C0
- C+
- C-
Output behaviour if overload/short circuit occurs

Transistor outputs A0.2 to A0.7 are independently protected against short circuits and overloads.

If short circuit or overload current is applied, the switching transistor heats up. The over-heating fuse switches the output concerned off, meaning that the switching transistor can cool down again. Subsequently the output concerned is reactivated. If overload current is still present after reactivation, the process starts again from the beginning.

The process cycle time depends on the magnitude of the load. If there is only a minimal overload, the cycle time can be up to several minutes, and if there is a major overload this time may be less than 1 second.
Important notes

• The maximum signal voltage at the digital inputs may not exceed the supply voltage

• Do not connect any of the unused terminals.

• If loads such as forward/backward motor contactors are present that may be dangerous if they are switched on simultaneously, external locking mechanisms and programmable locks should be provided in order to prevent such loads from being activated simultaneously.

• For EMERGENCY STOP functions the output loads should be switched off using a switch outside the module that disconnects the current from the output terminals.

• If you connect an EMERGENCY STOP circuit, please be sure to comply with local wiring and safety regulations.

• Connecting a power surge suppressor parallel to an inductive load reduces the generation of electrical interference.
• The supply voltage is not protected against reverse polarity. Check the polarity of the supply voltage before starting up.
Limited PC compatibility

The AM186ES/ED chip set that is used in the FEC FC34-FST module is only PC compatible to a limited extent.

<table>
<thead>
<tr>
<th>Component</th>
<th>PC compatible</th>
<th>If yes</th>
<th>If no</th>
<th>Workaround (SW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>x86 core</td>
<td>✔️</td>
<td>80186</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8250 UART</td>
<td></td>
<td></td>
<td>AMD-specific</td>
<td>Fossil driver</td>
</tr>
<tr>
<td>-FIFO</td>
<td>n/a</td>
<td></td>
<td></td>
<td>Serial port DMA</td>
</tr>
<tr>
<td>8254 PIT</td>
<td></td>
<td></td>
<td>AMD-specific</td>
<td>PS1 service interrupt</td>
</tr>
<tr>
<td>8259 PIC</td>
<td></td>
<td></td>
<td>AMD-specific</td>
<td>PDS1 service interrupt</td>
</tr>
<tr>
<td>CMOS RAM</td>
<td></td>
<td></td>
<td>XT</td>
<td>Flash memory</td>
</tr>
<tr>
<td>6845 CRTC</td>
<td>n/a</td>
<td></td>
<td></td>
<td>Remote console</td>
</tr>
<tr>
<td>8042 KEYB</td>
<td>n/a</td>
<td></td>
<td></td>
<td>Remote console</td>
</tr>
<tr>
<td>8272 FDC</td>
<td>n/a</td>
<td></td>
<td></td>
<td>Flash disk</td>
</tr>
<tr>
<td>IDE</td>
<td>n/a</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td>FC34 ✔️</td>
<td></td>
<td>NE2000</td>
<td>Packet driver</td>
</tr>
<tr>
<td>Power on LED</td>
<td>✔️</td>
<td></td>
<td>Status LED</td>
<td>PS1 service interrupt</td>
</tr>
<tr>
<td>BIOS</td>
<td>✔️</td>
<td></td>
<td>DL MiniBIOS</td>
<td></td>
</tr>
</tbody>
</table>
Software requirements

**BIOS:** Datalight MiniBIOS

**DOS:** Datalight ROM-DOS 5.0 (equivalent to MS-DOS 5.0); no INT 2Fh support

<table>
<thead>
<tr>
<th>Function</th>
<th>Sub funct.</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>10h</td>
<td>0Eh</td>
<td>TTY char output</td>
</tr>
<tr>
<td>11h</td>
<td></td>
<td>Get equipment</td>
</tr>
<tr>
<td>12h</td>
<td></td>
<td>Get memory size</td>
</tr>
<tr>
<td>14h</td>
<td></td>
<td>Serial I/O (Fossil-Treiber)</td>
</tr>
<tr>
<td>16h</td>
<td>0</td>
<td>Ready TTY char</td>
</tr>
<tr>
<td>16h</td>
<td>1</td>
<td>Get TTY status</td>
</tr>
<tr>
<td>16h</td>
<td>2</td>
<td>Get TTY flags</td>
</tr>
<tr>
<td>19h</td>
<td></td>
<td>Reboot system</td>
</tr>
<tr>
<td>1Ah</td>
<td>0</td>
<td>Get tick count</td>
</tr>
<tr>
<td>1Ah</td>
<td>1</td>
<td>Set tick count</td>
</tr>
<tr>
<td>1Ch</td>
<td></td>
<td>Timer tick (DOS = 55 ms) FST = 13ms)</td>
</tr>
</tbody>
</table>
Differences to industry standard PC

- Datalight MiniBIOS with reduced BIOS support (see previous page for list of BIOS functions)
- Datalight ROM DOS (equivalent to MS-DOS 5.0)
- No keyboard and video controller/video RAM available
- Standard I/O diverted to a terminal using serial interface (DOS INT 21 and BIOS INT 10)
- Approx. 480 Kbytes of free RAM available

- On-board flash disk (approx. 100 KB free)
- Programming of "On-chip peripherals" (PIC, timer, UART) completely different from standard PC
- Different IRQ number assignments

Additional features compared to industry standard PC

- Service interrupt support of FC34 functions (digital I/O, counters, Ethernet network, status LED).
### Special functions

#### RUN/STOP switch

The RUN/STOP switch is used to influence the execution of the application program. If the switch is set to RUN the program is executed, and if it is on STOP the program is halted.

#### Status LED

The status LED indicates the current program execution status:

<table>
<thead>
<tr>
<th>Color</th>
<th>Status Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green</td>
<td>if the program is running correctly</td>
</tr>
<tr>
<td>Orange</td>
<td>if the application program has been stopped or has terminated</td>
</tr>
<tr>
<td>Red</td>
<td>if an error has occurred</td>
</tr>
</tbody>
</table>

#### Fast counters

Inputs E1.2 and E1.3 can be independently configured as fast counter inputs and used to count counter pulses up to a frequency of 2 kHz. The counters are 16-bit (0 to 65535) and are configured and evaluated using the provi-
ded program library. Inputs that are configured as counters can also be read in as normal digital inputs.

**Interrupt inputs**

Inputs E1.0 and E1.1 can be individually configured as interrupt inputs. Like the counter inputs, the interrupt inputs can be software configured and high level language user routines used for interrupt handling. Inputs that can be configured as interrupt inputs can also be read in as normal digital inputs.

**Incremental encoder**

The FEC FC34-FST has a 16-bit software incremental encoder (see AB direction detection) that can process counter pulses of up to 200 Hz. Connection takes place using the two interrupt inputs E1.0 and E1.1. An optional reference switch can be connected using input E0.7.

The incremental encoder is configured and evaluated using the program library.
The timer function

The FEC FC34-FST has an extremely flexible timer function that makes it possible to configure up to 32 32-bit timers. The time base for each timer can be adjusted in multiples of 4.58 ms using a configurable 16-bit distributor. This means that times ranging from 4.58 ms to (theoretically) several years can be measured.

The timers are configured and evaluated using the program library.

Extension interface/remote expansion

The FEC FC34-FST module has an extension interface via which the FC20/FC30 module can be connected as a remote expansion or another serial device with max. 115 Kbaud can be actuated.

In order to connect an FC20/FC30 as a remote expansion you require an FEC KSD4 cable. The remote expansion is configured and actuated using the provided program library. The module (FEC FC34-FST) on which the remote function is software-activated acts as a master station and contains the control program. The master station has read/write access to the
inputs and outputs and the RUN/STOP switch on the remote and slave stations. The slave station cannot have its own control program.

Since both stations are connected via a TTL interface, this may only be implemented using an original FEC KSD4 cable (max. 30 cm). If the cable is any longer, reliable operation of the remote connection is no longer guaranteed. If strong EMC radiation is present, both of the connected stations should be installed in a screened switch cabinet.

If a serial device is to be connected to the extension interface, please remember that the interface produces TTL signals and is not galvanically separated. If you wish to convert the signal to a level of 24 V, for example, you must do this yourself using suitable hardware depending on the application.

The extension interface is actuated by a supplied driver and the provided program library.

**Ethernet network**

The FEC FC34-FST has network functions that can be used using the 8-pin RJ45 connector (10Base T).
The communication interface can be used by the user for TCP/IP communication or in a comprehensive network (particularly for ST - so-called Field PC Net communication).

The standard settings are:

- Interrupt 3
- Port 0x300
Fault fixing

Troubleshooting information

Please ensure that the installation instructions in the manual have been correctly followed. Check whether the FEC has been connected using undamaged cables that comply with the relevant standards. Furthermore, you should also make sure that the FEC is being provided with the correct supply voltage.

What do I do if.....

Problem
The FEC FC34-FST module doesn’t react.

Remedy
Restart the module. Disconnect the power supply to the module for several seconds.

Problem
No green status LED when the RUN/STOP switch is set to RUN.
**Remedy**

Check whether an executable program has been integrated into the FEC FC34-FST module.

**Problem**

The status LED goes green as soon as the RUN/STOP switch is set to RUN, but the program does not start working.

**Remedy**

Perform the following test: check your remote RUN/STOP switch settings (configured in the programming software). This RUN/STOP switch may be set to “STOP”.

**Problem**

The status of the I/O control LED does not correspond with the actual output status.
Remedy

Check whether the output device is working correctly. Check whether the required voltage is present at the output terminals.

Problem

The operating status of the input device does not correspond with the status of the I/O control LED’s for this input.

Remedy

Check that the input device is working correctly, check for loose contacts or other irregularities.

An input that is switched on or off within a time period that is shorter than the operating cycle or the module sampling time may not be detected.

Problem

Status LED is red.

Remedy

This indicates a program error or an internal error. The error number can be read out using the CI (Command Interpreter test system in the FEC FC34-FST module) in the FSTIPC/FEC software package or the service unit (optional).
Error word

At present there is no automatic detection of errors in the connected inputs and outputs. In applications where this can lead to problems, appropriate measures must be taken (an additional program with a function test, external signal detection, signal feedback etc.). Suitable additional error numbers could also be produced in the application program.

List of error numbers generated by system

The following error numbers are currently generated by the FEC FC24-FST module operating system:

<table>
<thead>
<tr>
<th>No.</th>
<th>Error text</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Program 0 not found at start</td>
</tr>
<tr>
<td>7</td>
<td>Program not found</td>
</tr>
<tr>
<td>9</td>
<td>Unable to start program</td>
</tr>
<tr>
<td>11</td>
<td>I/O error</td>
</tr>
<tr>
<td>34</td>
<td>Arithmetic error (zero division)</td>
</tr>
<tr>
<td>36</td>
<td>Illegal module call</td>
</tr>
<tr>
<td>57</td>
<td>Project not found</td>
</tr>
</tbody>
</table>
If an error handling program is activated when an error occurs, this must be defined in the configuration. The error program is a program written by the user in the form of a list of instructions or a contact plan. This program should not be active during normal operation (see FSTIPC/FEC software documentation for more information).

The FEC FC34-FST module also allows an error output to be set if an error occurs. If this facility is being used, the output must also be specified in the configuration.
Programming

The Festo FST run-time kernel FSTPCR22.EXE for the FEC FC34-FST module is already installed and is started automatically. This contains PLC characteristics that are always required. The kernel is also responsible for loading and running the user program. Other parts of a PLC operating system can be subsequently loaded into the FEC FC34-FST module as modules and/or drivers together with a user project. This is done using a development computer (e.g. standard PC or laptop) and the Festo FST software. The development computer should be connected to the COM port of the FEC FC34-FST module via a null modem cable (see above).

The characteristics of the IPC PLC operating system and the FST software for producing industrial PC PLC programs are described in detail in the manuals supplied with the FST software. Here is a brief description of the contents thereof:
Programming in AWL and KOP

The AWL (instruction list) and KOP (contact plan) are programmed in accordance with the Festo FST software rules. A description of the FST software can be found in the relevant documentation accompanying the software. Manuals containing a detailed description of how to program instruction lists and contact plans are also available. More information can be obtained from your nearest Festo branch.

The Command Interpreter (CI)

All FESTO controllers have a command interpreter. It is usually referred to as the “CI”. The CI is a man-machine interface (MMI). However, it is also frequently used manually because it has an extremely easy-to-use interface. CI commands are a constituent of the Festo software tool. They are entered on the development computer and transferred to the FEC FC34-FST module via the link to the FEC as a PLC station using a COM port. The results are also transferred to the development computer by the module, where they are displayed. The CI can also be operated using a terminal or a terminal emulator via the serial interface (COM). The command interpreter on the serial interface (COM) is also used by the FST software for
many other tasks. The different program components of the FST software handle communication with the connected industrial PC automatically and provide considerably better, more convenient user interfaces.

Access to the controller can be password protected. If a password has been specified, all write access and driver access is blocked in the CI.

**Operands**

The FEC has the following operands, which can be accessed using the FST software or the CI.
<table>
<thead>
<tr>
<th><strong>Operand</strong></th>
<th><strong>Range</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Input word</td>
<td>EW0 to EW1 with EA0.0 to EA0.7</td>
</tr>
<tr>
<td>Output word</td>
<td>AW0 with EA0.0 to EA0.7</td>
</tr>
<tr>
<td>Error word</td>
<td>FW and F</td>
</tr>
<tr>
<td>Initialisation flag</td>
<td>Fl for each program</td>
</tr>
<tr>
<td>Flag words</td>
<td>MW0 to MW9999 with Mx.0 to Mx.15</td>
</tr>
<tr>
<td>Registers</td>
<td>R0 to R255</td>
</tr>
<tr>
<td>Function units</td>
<td>FE0 to FE255, FE32 to FE38 for each program</td>
</tr>
<tr>
<td>Timers</td>
<td>T0 to T255 (and TV and TW for each TE, TA timer)</td>
</tr>
<tr>
<td>Counters</td>
<td>Z0 to Z255 (and ZV and ZW for each counter)</td>
</tr>
<tr>
<td>Programs</td>
<td>P0 to P63</td>
</tr>
<tr>
<td>Program status</td>
<td>PS0 to PS63</td>
</tr>
<tr>
<td>Function modules</td>
<td>BAF0 to BAF99 (predefined by Festo)</td>
</tr>
<tr>
<td>Program modules</td>
<td>BAP0 to BAP99 (can be user-defined)</td>
</tr>
</tbody>
</table>
**Summary of residual operands**

<table>
<thead>
<tr>
<th>Operand</th>
<th>Operand number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output word (AW)</td>
<td>0 to 1</td>
</tr>
<tr>
<td>Register (Rx)</td>
<td>0 to 127</td>
</tr>
<tr>
<td>Timer selection (TV)</td>
<td>0 to 127</td>
</tr>
<tr>
<td>Counter (Zx)</td>
<td>0 to 127</td>
</tr>
<tr>
<td>Counter selection (ZV)</td>
<td>0 to 127</td>
</tr>
<tr>
<td>Counter word (ZW)</td>
<td>0 to 127</td>
</tr>
<tr>
<td>Flag word (MW)</td>
<td>0 to 255</td>
</tr>
</tbody>
</table>
Drivers and modules

The programming of drivers and modules is described in the FST IPC 3.2 manual.

Multitasking/program execution

The module’s PLC operating system has multitasking capability. It can sequentially work through the processing cycles (tasks) of several programs. During the execution of a program’s tasks the other programs are not running. However, the programs are executed so quickly and the change to the next program (task change) is so rapid that the programs seem to be running synchronously. This is known as pseudo-parallel program execution.

A PLC application can contain up to 64 programs that can also be synchronously executed. Program 0 is automatically started after
start-up. These in turn (i.e. any program) can activate, stop or reset other programs using the P/PS tool or modules.

**PLC programming languages**

In FST-IPC control programs can be formulated in the form of contact plans and instruction lists (with integrated interface programming). Program development is supported by a user-friendly editor, and another tool checks the syntax of the programs.

**Error handling**

Errors can occur at any time in an automated system, whereby a distinction should be made between programming errors and system errors. An example of a programming error is a zero division, and an example of a system error is an I/O module failure.

The FST IPC PLC operating system detects many errors and deals with them in a defined manner. The user is provided with a facility for participating in error handling and possibly in solving the problem. This is done using the error word (FW) and the error program.
Network communication

FEC FC34-FST module network communication is supported by two drivers: the Field PC Net driver and the TCP/IP driver. In order to use these drivers the following must be observed:

For Field PCNet functionality (only with the 3.43 ms timer) the following files must be present in the FBLIB.FEC directory:

- mpme
- mpregt
- mpsucc
- mprcv
- mpstat
- mpver
- mpxmit

In the RUNTIME.FEC directory:

- fpcniof.exe
- fpcnudp.com
- fpcnudp.dsc
- tmr13_3.com
- fpcnudpd.hlp (German version)
- fpcnudpg.hlp (English version).

For TCP/IP functionality (Internet) (also with the 4.58 ms default timer) the following files must be present in the RUNTIME.FEC directory:

- tcpipdrv.exe
- tcpipdrv.dsc (tcpipfec.dsc)
- tcpip_d.hlp (German version)
- tcpip_gb.hlp (English version).
On request the TCP/IP modules can also be used (IP_IP, IP_ALIVE etc.).

Field PC Net communication

Field PC Net is used to network several stations. Each station has its own project. Enter the “FPCNUDP” driver each project using the driver configuration tool.

The system can be configured from these stations using the Field PC Net configuration tool (a constituent of Festo Software Tool). Define the components to be transferred and save the project. More information can be found in the “Field PC Net configuration tool” document.

TCP/IP communication

The FEC FC34-FST module can be connected to the in-house network using the TCP/IP driver. The FEC FC34-FST can then be accessed by other computers using the TCP/IP protocol. To do this, enter the ”TCPIPDRV” (“TCPIPFEC”) driver in the driver configuration tool.
The command interpreter (CI) provides monitoring functions for the entire control system. In the case of programs and operands the user can start and stop programs individually or display all programs display and modify operands.

Access to command interpreter (CI)

If a dialog device is connected to the FEC the user must proceed as follows in order to access the CI:

- Testing, service, diagnosis and start-up,
- Uploading and downloading files
• Connect FEC to power supply
• Switch on dialog device
• Access CI:

The dialog device should be set to the correct baud rate (default 9600 baud). The baud rate is automatically measured after a BREAK signal or after switching on the power if the system memory does not contain a valid baud rate.

Input format

CTRL T

The CI replies with:

IPCVm.n
(m.n = operating system no.)
> _

The CI can still be accessed if the controller displays an error. However, this error must be remedied before any other task can be performed.
**Command structure:**

A complete command always consists of a letter for identifying the command, nearly always a parameter and sometimes a parameter value.

The command is not case-sensitive and must be terminated with ‹CR›.

**Input format**

```
<CI Letter> [<Parameter> [Parameter value]]
```
Delete wrong entries

Wrong entries can be deleted with Backspace (CTRL H) before confirming with ‹CR›.

### Commands

The following list contains a selection of the FEC command interpreter commands

<table>
<thead>
<tr>
<th>Command letter and command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>D = DISPLAY</td>
<td>= display operands</td>
</tr>
<tr>
<td>M = MODIFY</td>
<td>= modify operands</td>
</tr>
<tr>
<td>R = RUN</td>
<td>= start or continue</td>
</tr>
<tr>
<td>S = STOP</td>
<td>Stop program</td>
</tr>
<tr>
<td>X = EXIT</td>
<td>Exit CI</td>
</tr>
</tbody>
</table>
Parameters

Various parameters must be entered depending on the operands with which a command is to be used.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A x.y</td>
<td>Output</td>
<td>0.0 to 0.7</td>
</tr>
<tr>
<td>A Wx</td>
<td>Output value</td>
<td>0</td>
</tr>
<tr>
<td>E x.y</td>
<td>Input</td>
<td>0.0 to 0.7; 1.0 to 1.3</td>
</tr>
<tr>
<td>EW x</td>
<td>Input value</td>
<td>0 to 1; 2 to 255 for trimmers and fast counters</td>
</tr>
<tr>
<td>F</td>
<td>Error</td>
<td></td>
</tr>
<tr>
<td>M x.y</td>
<td>Flag</td>
<td>0.0 to 9999.15</td>
</tr>
<tr>
<td>MW x</td>
<td>Flag word</td>
<td>0 to 9999</td>
</tr>
<tr>
<td>Parameter</td>
<td>Meaning</td>
<td>Parameter value</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>P x</td>
<td>Program</td>
<td>0 to 63</td>
</tr>
<tr>
<td>PS x</td>
<td>Program status</td>
<td>0 to 63</td>
</tr>
<tr>
<td>R x</td>
<td>Register</td>
<td>0 to 255</td>
</tr>
<tr>
<td>T x</td>
<td>Timer</td>
<td>0 to 255</td>
</tr>
<tr>
<td>TV x</td>
<td>Timer preselection</td>
<td>0 to 255</td>
</tr>
<tr>
<td>TW x</td>
<td>Timer word</td>
<td>0 to 255</td>
</tr>
<tr>
<td>Z x</td>
<td>Counter</td>
<td>0 to 255</td>
</tr>
<tr>
<td>ZV x</td>
<td>Counter preselection</td>
<td>0 to 255</td>
</tr>
<tr>
<td>ZW x</td>
<td>Counter word</td>
<td>0 to 255</td>
</tr>
</tbody>
</table>
CI example

Displays

Display status of single-bit operands, output 0.6
DA0.6〈CR〉 CR reply = 0 or 1
Display status of single-bit operands, input 1.2
DE1.2〈CR〉 CR reply = 0 or 1
Display status of timer 20
DT20〈CR〉 CR reply = 0 or 1
Display flag 1000.15
DM1000.15〈CR〉 CR reply = 0 or 1

Modify

Modify contents of registers 0 to 255
MR0〈CR〉
CR reply = xxx: 255〈CR〉
xxx = old value; 255〈CR〉
Enter new value
## Appendix: General

### Manual change status

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>17.06.99</td>
<td>First version</td>
</tr>
</tbody>
</table>

### Hardware change status

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Hardware version</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>From PMFC34D1-1</td>
<td>H00</td>
<td>First version</td>
</tr>
</tbody>
</table>
Technical data

Climatic characteristics

- Transportation/storage (IEC 68-2-1/2): -25ºC to +70ºC
- Normal operation (IEC 68-2-1/2): 0ºC to +55ºC / 20 G
- Temperature change (slow change): IEC 68-2-14
- Relative humidity (DIN 40040): 75% on 30 days
  95% no condensation

Mechanical characteristics

- Weight: approx. 160 g
- Dimensions: 75x21x96 mm
- Vibration (sinusoidal oscillation): IEC 68-2-6
- Shock test (impact test) (IEC 68-2-6): 10 to 150 Hz, 2 G
Electromagnetic characteristics

- Electromagnetic compatibility (EMC) . . . . . : EN 50081/2 as per IEC 1131-2
- Electrostatic discharge (ESD) . . . . . . . : EN 61000-4-2 as per IEC 801-2
- High frequency electromagnetic fields (HFF) . . . . : EN 61000-4-3 as per IEC 801-3
- Fast transients (BURST) . . . . . . . . . : EN 61000-4-4 as per IEC 801-4
- Wire-conducted HF interference (LHF) . . . . : EN 61000-4-6
- Radio interference / interference strength . . . . : EN 55022 / A

Electrical characteristics:

- Maximum current consumption (at 5 V) . . . . . : 300 mA (typical)
- Power consumption . . . . . . . . . : 1.6 W (typical)

Inputs:

- Galvanic separation . . . . . . . . . . . . : Optocoupler
- Input voltage . . . . . . . . . . . . . . . . : 24 V DC, input current 7mA
• Delay time ...........................................: 5 ms
• Signal display ....................................: Green LED (after galv. separation)
• 2 fast counter inputs .............................: max. 2 kHz
• Incremental encoder ..............................: max. 200 Hz

Outputs:

• Supply voltage ....................................: +24V ± 20%
• Nominal load: ......................................: 700 mA 24 V DC
• Service life: ........................................: 100,000 hours
• Maximum switching frequency: ..................: 1 kHz

IEC / VDE safety information

• Protection class: ...................................: IP 41
• Insulation measurement .........................: VDE 0160
Hardware and software characteristics

- Processor: AM186 (20 MHZ), (Intel 80186-compatible)
- Program memory (compiled): 256 kBytes flash (read/write cycles > 10,000)
- Working storage: 512 kB DRAM, (480 kB free)
- Residual data: 2 kB in flash
- Program storage (drive B): 256 kB in flash memory (approx. 100 kB free)
- Terminal connection: Serial asynchronous TTL (RJ12 connector) (4-wire, max. 115 kBaud)
- Operating status display: Status LED (green, red, orange)
- Operating system: ROM DOS 5.0
- Network connection: 10BASE T (RJ45)
- Network communication display: Link/traffic LED
## Ordering information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Beck order no.</th>
<th>Festo order no.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEC FC34-FST</td>
<td>FEC 12 in/2 relay outputs, 6 trans. outputs, 24V DC, Ethernet, 10Base T, FST</td>
<td>FEC FC34-FST</td>
<td>00190587</td>
</tr>
<tr>
<td>PS1 SM14</td>
<td>ZK36 connecting cable + ZK 11 null modem cable</td>
<td>PS1 SM14</td>
<td>00188935</td>
</tr>
<tr>
<td>FEC KSD4</td>
<td>Network cable for 2 stations (30 cm) RJ12/RJ12</td>
<td>FEC KSD4</td>
<td>00183635</td>
</tr>
<tr>
<td>PS1 ZK44</td>
<td>AW G26 8-core modular cable for RJ45 (100 metres)</td>
<td>PS1 ZK44</td>
<td>00189682</td>
</tr>
<tr>
<td>PS1 ZC24</td>
<td>Modular connector RJ45, 8-pin (10)</td>
<td>PS1 ZC24</td>
<td>00190580</td>
</tr>
</tbody>
</table>
We try to keep our manuals up to date at all times. If you discover descriptions that are difficult to understand or even contain errors, please inform us, specifying the manual concerned and the version number to the following E-mail address (Internet):

ps1docu@beck-ipc.com

Please also send your suggestions and improvements.

We cannot reply to technical queries by E-mail. Please contact your retailer.

More information under:

http://www.beck-ipc.com