

C o m p u t i n g

S u r f a c e

The CS-2 Switch Module

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Safety Precautions

i

Federal Communications Commission (FCC) Notice

Warning: Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used with this unit to ensure compliance with the FCC Class A limits.

General Precautions

- Adhere strictly to the instructions and warnings provided in this documentation.
- Do not push objects into the interior of the equipment through any openings. Hazardous voltages and moving parts are present. Conductive objects could cause electric shock, fire, or damage to the equipment.
- It is not permitted to make mechanical or electrical modifications to the equipment. The manufacturer is not responsible for regulatory compliance of equipment that has been modified. You may also invalidate your warranties if you make unauthorised changes to your equipment.
- A lithium battery is installed on some of the boards in the module — it is an integral component of the non-volatile RAM (or NVRAM). Lithium batteries are not customer replaceable. If they are mishandled there is a danger that they may explode. Always consult Meiko if you suspect that the battery needs replacing. Never dispose of lithium batteries in a fire or attempt to dismantle.
- Many of the electronic components fitted in the module are fragile or static sensitive. They should only be handled by trained engineers. You must observe anti-static precautions when handling boards or electronic devices.
- Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception, requiring the operator to take whatever steps are necessary to correct the interference.

Lifting

The module is heavy and must be lifted by two people or by using the Genie lifting equipment that is supplied by Meiko (large multi-module systems only).

When using the Genie fork lift you must first attach the two lift-clamp assemblies to either side of the module. Unscrew the securing screw that holds the telescopic section of the lift-clamp closed. Insert the rear locating pins into the holes at the rear edge of the module (the open end of the box section should face the front of the module). Align the front locating pins with the holes at the front of the module and tighten the holding screw.

Locate the forks of the Genie lift into the two box sections in the lift clamps. Raise the module by turning clockwise the handle on the Genie lift. Lower the module by turning the handle anti-clockwise.

Warning – Your attention is drawn to the operating instructions for the Genie lift that are supplied by the lift’s manufacturers.

- Genie fork lift, part number 73-FORK-GENIE.
- Module lifting gear, part number 65-MODULELIFT

Overview

1

The Switch Module is a physical enclosure for up to 4 switch boards — the components used to build the CS-2 data network. Supporting infrastructure within the module consists of cooling fans, power supply, and connections to the processor modules (often via other switch modules) and control the network. The module is fully enclosed and similar in appearance to the Processor Module, and is FCC compliant.

The Switch Module is intended for installation in a CS-2 bay which provides a firm level support, network interconnect, and power distribution panels.

Module Packaging

2

CS-2 modules are shipped in units of 1 to 4. The packaging consists of a wood base, packing foam, antistatic bag, and enclosing triple wall card outer.

Packing Dimensions

All dimensions are approximate.

Packing dimensions (single module):

Height	74 cm (29")
Width	34 cm (13.5")
Length	112 cm (44")

Packing weight (without module):

4 module skid	20 Kg (44lbs)
Module base	4.5 Kg (10lbs)
Filler	1.8 Kg (4lbs)
Outer card cover	4.5 Kg (10lbs)
Packing foam	0.2 Kg (0.4lbs)
Total (1 module)	11 Kg (24.4lbs)
Total (4 modules)	31 Kg (68.4lbs)

Module weight (without switch boards):

Module weight	41.8 Kg (92 lbs)
---------------	------------------

Switch board weights:

MK522 (8 Elites)	2.0 Kg
MK523 (2 Elites)	1.45 Kg (3.19 lbs)
MK529 (4 Elites)	2.0 Kg

Unpacking

Warning – You are reminded of the safety precautions listed in *General Precautions* on page ii.

Modules are shipped in groups of 4 or 1.

For 4 module shipments each module is packaged individually and secured with the others onto a large skid. To unpack a four module skid cut the outer banding and remove one module. Space the remaining three module packs uniformly over the skid.

- To unpack each module first cut the banding and remove the outer card carton by lifting it clear of the module.
- Remove the protective foam from the top and front of the module.
- Remove the antistatic bag by pulling upwards.
- Lift the module from the packing base. Note: the module is heavy and must be lifted by at least two people or by using a Genie lift.
- Check the module for damage and advise the transportation company immediately if any is found.

Retain all packaging and use it when shipping the module.

Installing the Switch Module

3

You must read this chapter thoroughly and completely before using your CS-2 module.

Location

The switch module must be located in a CS-2 Bay. This provides a firm level support for the module and has been designed to maximise the flow of cooling air through the module.

Warning – Overheating can damage this product. Do not block or cover any openings that are built into the module, and do not place the module near any sources of heat.

Modules sit on module trays that are fixed to the bay by telescopic rails. The tray must be extended from the bay before a module may be loaded onto it or removed from it.

Warning – Never extend more than one loaded module tray.

To extend the tray first unscrew the two retaining screws and then pull the tray forward. Lift the module onto the tray ensuring that the feet on the base of the module mate with the holes in the tray. Fix the module into position using the captive screws on the underside of the tray.

Warning – Your attention is drawn to the lifting instructions in *Safety Precautions* on page i.

The module backplane carries a number of Beta Phase connections to the bay. These connectors must be opened using the Meiko Beta Phase Controller before the module tray is pushed into position.

Warning – Failure to open the Beta Flex connectors before pushing the module trays into position will damage your equipment.

With the Beta Phase connectors held open by the Beta Phase Controller push the module tray into position. On each of the telescopic arms is a spring slip that must be pushed-in to allow the arm to slide. Push the tray into position carefully, ensuring that the Beta Phase connectors are correctly situated. Lock the module tray into position using the two captive screws at the front of the tray.

After pushing the module tray into position use the Beta Phase Controller to close the connectors.

Using the Meiko Beta Phase Controller

Connect the Beta Phase controller to the 37-way connector located at the rear of the module's power supply unit. Connect the Beta Phase Controller to a mains outlet using the supplied cable. Use the Activate button on the box to open all the Beta Phase connectors used by that module — pressing the same button a second time will close the connectors. Status lights on the box show the condition of each connector; red indicates open, amber indicates power is being applied, green indicates no power. When using the Controller it is safe to hold the Beta Phase connectors open for prolonged periods.

Power Supply

Check that the voltage and frequency of your power supply is suitable for your equipment. The power supply unit is auto-ranging, 110–230 V, 50/60/400 Hz. Maximum current is 15 A.

Power Connections

Power is supplied to the switch module by a 3-way cable that is supplied by Meiko.

The following cable types are available:

- Harvey Hubble to Harvey Hubble.
- Harvey Hubble to UK 13 A outlet.
- Harvey Hubble to US 15 A outlet.

Where several switch modules are used Meiko may also supply a mains distribution board. This connects eight modules to one power supply outlet.

- Power distribution panel, European. Part number 65-DIST-EUR-01
- Power distribution panel, USA. Part number 65-DIST-US-01

Warning – You must only use power cords and distributions panels that are supplied by Meiko. These have the correct power rating for your system.

Warning – You should check that you have been supplied with the correct type of power cord and distribution boards.

Fuses

Three fuses are located at the rear of the switch module. One fuse protects the power supply unit from the incoming mains supply. Two fuses protect the fans.

- Main fuse: standard 250 V, 15 A. Part number 22-F0100-04E150.
- Fan fuse: anti-surge 250 V, 10 A. Part number 22-F0100-04E100.
- Fan fuse: anti-surge 250 V, 5 A. Part number 22-F0100-04E500.

There are 3 fuses located on the module backplane along the bottom edge. These fuses protect the ± 12 V and the +5 V circuits on both the backplane and all boards that draw their power supply from it (including the LED panel and fan trays). Access to these fuses is gained by removing the module side panels. Fuse types are:

- Fuse F1 is 5 A, Meiko part number 22-FU100-03E500.
- Fuse F2 is 1 A, Meiko part number 22-FU100-03E100.
- Fuse F3 is 5 A, Meiko part number 22-FU100-03E500.

Warning – The backplane fuses may only be changed by trained engineers.

Operation

The power supply is operated by the main on/off switch located above the power connector. 0 represents off, 1 represents on.

When first switched on five LEDs are visible through the rear of the power supply unit. Initially three of these should be green, two are red. After a short delay all LEDs should be green.

Warning – A fault is present if any light remains red for more than 10 seconds after first switching on, or changes from green to red during operation. Switch the power supply off, disconnect from the main supply, and contact Meiko for advice.

Removable Panels

Warning – Ensure the power supply is switched off and disconnected from the main supply before removing the module's front or side panels.

The front and side panels may be removed from the module. Removing the front panel gives access to the LED board, and the switch boards. The side panels may be removed but there is no requirement to do so, except to protect them during transit or when lifting the module into a bay.

Warning – Switch boards should only be fitted or removed by trained engineers.

To remove the front panel pull it forward. The front panel is retained by four clips, one in each corner of the panel. When fitting the front panel ensure that the tinted window is aligned with the module's LED display.

The side panels are held in place by 5 key slots on the side of the module. To remove the a side panel slide it forward and pull it off.

External Connections

The switch module includes a number of connectors to the front and rear of the module.

At the Rear of the Power Supply Unit

1×25-way D-type connector:

RS232 connector for module control card diagnostics. This connection is for use by Meiko's trained engineers only.

2×9-way D-type connectors:

X-CAN and G-CAN connectors. The X-CAN is the middle connector — this is used to connect the modules within a cluster (up to 3 bays/24 module systems). The G-CAN is the right-most connector — this is used to interconnect clusters. When using more than one cluster at least two modules in each cluster must be connected to the G-CAN; all unused G-CAN connectors must have terminators fitted. Within a cluster the X-CAN connections are daisy-chained using Meiko supplied cables.

- G-CAN terminators, part number 60-CS2MA009-1T.
- X-CAN interconnect, part number 60-CA0246-1T

1×37-way D-type connector:

Connection for the Meiko Beta Phase Controller; attach the controller box here to operate the Beta Phase connectors on the module backplane.

At the Rear of the Module

Beta Phase Connectors:

Up to 16 Beta Phase Connectors, each carrying four links of the switch network.

At the Front of the Module

Behind the front panel are four polarised 50-way connectors. Two of these are used to connect to the MK525 module LED board. Fit the board to the upper connectors when the module is mounted on the lower shelf of a bay, and the lower connectors when the module is mounted on the upper shelf.

The connectors for the 4 switch boards are also located behind the front panel.

Warning – Switch cards are not user serviceable. They should only be fitted or removed by trained engineers.

External Indicators

A number of LEDs are visible through the tinted window of the module's front panel.

Four 4×4 matrices of red LEDs are currently unused by Switch boards.

Below each matrix of red LEDs are 3 small circular LEDs. The green and amber lights are driven by the switch board's CAN interface — the green light is the board's heart-beat, the amber light indicates a transmit of data. The red light is not used.

Two LEDs in the top right hand corner of the display are driven by the module controller. The green light is a heart beat signal, the amber light flashes each time the module controller is sending information over the CAN bus.

Module Identification Number

At the rear of the power supply unit are three dials — each represents one nibble from a 12 bit network address, or *netid*. The netid for each module must be unique and modules must be numbered sequentially starting from 0.

Enter each nibble of the address onto the dials using a suitable screwdriver.

Warning – You must ensure that the power is disconnected before setting the module address.

Additional Note for Revision A MK526:

Having identified a module's network address each nibble of the 12 bit address is bit-flipped (e.g. 0111 becomes 1110). The resulting 3 nibbles are then entered onto the dials using a suitable screw driver.

The following table summarises the module id's for systems of up to 32 modules. The dials for module 5, for example, must be set to 00A.

Module	Dials			
0–3	0 0 0	0 0 8	0 0 4	0 0 C
4–7	0 0 2	0 0 A	0 0 6	0 0 E
8–11	0 0 1	0 0 9	0 0 5	0 0 D
12–15	0 0 3	0 0 B	0 0 7	0 0 F
16–19	0 8 0	0 8 8	0 8 4	0 8 C
20–23	0 8 2	0 8 A	0 8 6	0 8 E
24–27	0 8 1	0 8 9	0 8 5	0 8 D
28–31	0 8 3	0 8 B	0 8 7	0 8 F

MK515 Module Control Card

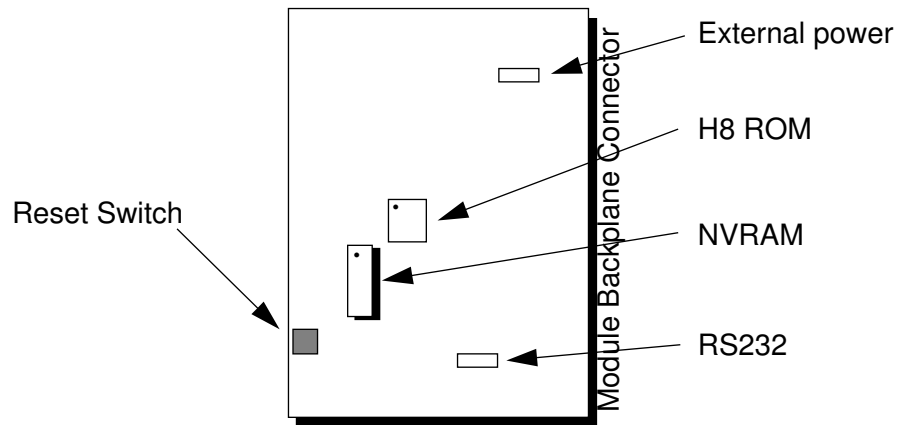
The module control card is fitted into the switch module alongside the switch cards. It monitors the status and configuration of the module, propagating error conditions over the CAN bus (for interception by the System Software) and initiating module shutdown under critical conditions (such as major component failure).

Field Upgradeable Components

The MK515 has the following field upgradeable components:

- H8 ROM.
- Non-volatile RAM (NVRAM).

Figure 3-1 MK515 Components



Meiko may upgrade the H8 ROM from time to time.

The non-volatile RAM (NVRAM) holds system configuration information, such as the number of module switches. The NVRAM contains Lithium batteries which have special handling and disposal requirements — your attention is drawn to the *General Precautions* on page ii.

External Indicators

Two LEDs (one green, one amber) are visible from the rear of the module. The green LED is the module controller's CAN heart beat, the amber light illuminates each time the controller writes to the CAN bus. These indicators are also displayed in the top right hand corner of the module's LED display.

Reset Switch

The reset switch is not accessible when the board is mounted in the module. It is used by Meiko engineers when bench testing the board.

External Connections

Two 3 pin connectors are provided for Meiko engineering use. They are used for bench testing of the board, and allow power and diagnostic RS232 connections to be made.

Operating Conditions

Recommended operating temperature	10–25°C (50–80°F)
Peak operating temperature	32°C (90°F)
Temperature gradient	10°C (18°F) per hour
Storage temperature	-18–60°C (0–140°F)
ANSI media data integrity (max.)	32°C (89.6°F)
Relative humidity	20–80% non-condensing
Storage humidity	10–90% non-condensing
Altitude	3000m (10000 feet)
Operating Shock	1 G

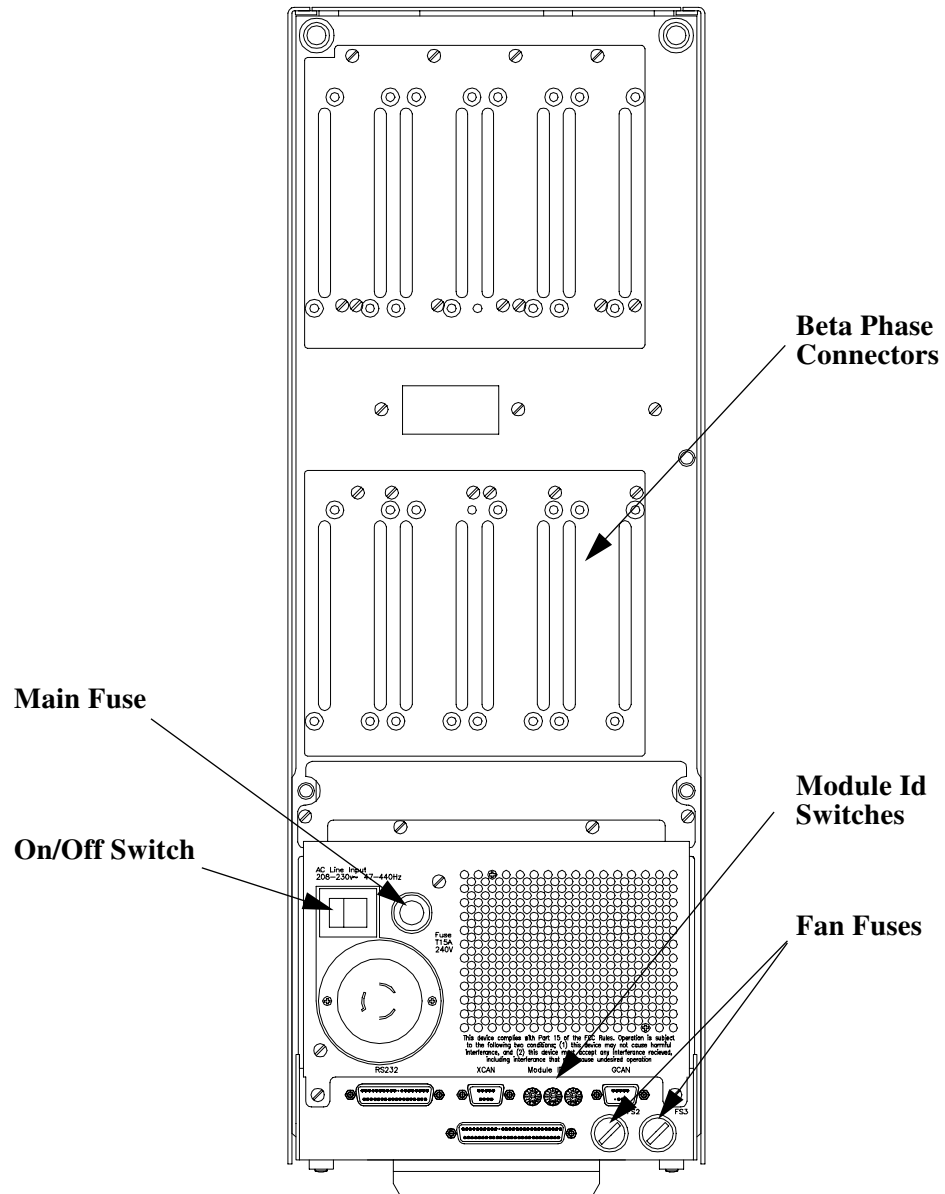
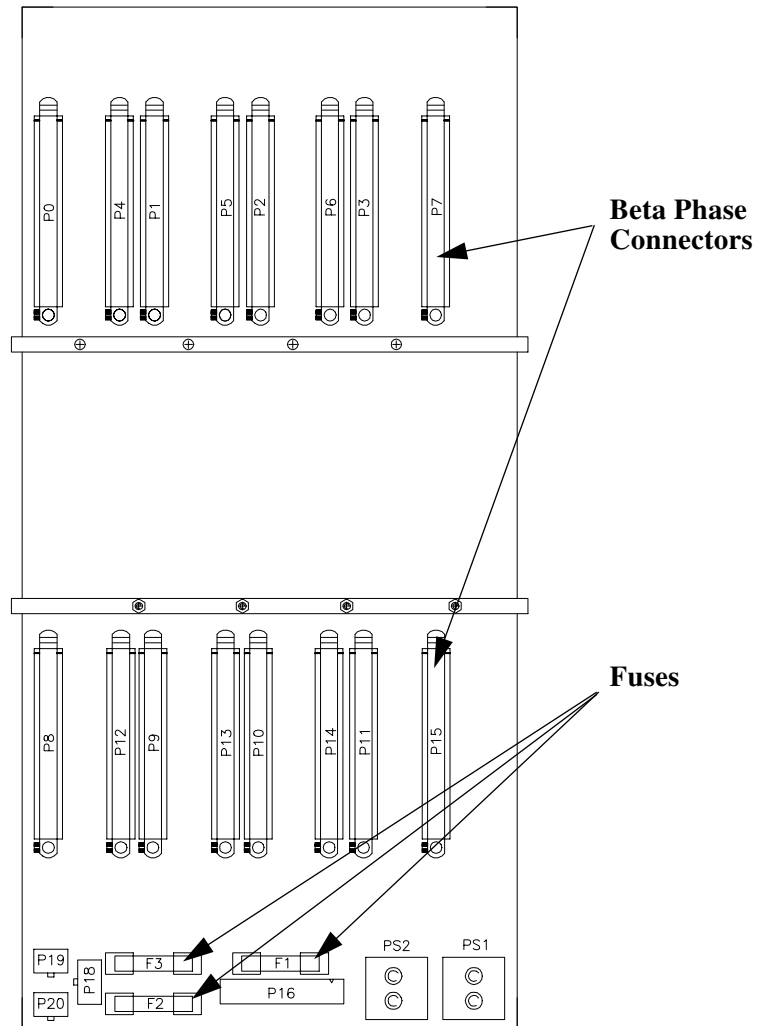
Figure 3-2 The CS-2 Switch Module

Figure 3-3 The MK520 Switch Module Backplane (not user serviceable)



Installing Switch Boards

4

Warning – The procedures in this chapter must only be undertaken by trained engineers.

Warning – You must disconnect the power supply before installing switch boards into the processor module.

Three types of switch board are available:

- MK522 — 8 interconnected Elite switches.
- MK523 — 2 unconnected Elite switches.
- MK529 — 4 unconnected Elite switches.

Blanking plates must be installed in unused board slots to ensure correct cooling and compliance with RFI regulations.

Installation

The same installation procedure is used to install all three board types.

Insert the board so that it fits into the guide rails at the top and bottom of the module, ensuring that the component side is to the left (viewed facing the module). Gently push the board squarely on the front panel. Before pushing the board fully into position fold back the levers at each end of the front panel so that they are at 90° to the board. Push the board in further until the base of the two levers is touching the card cage; push the board into position by pushing firmly on both levers until they are flat. Secure using the captive screw at each end of the board's front panel.

To remove the board pull both levers out — this will lever the board away from the module's connections. Pull the board clear of the module.

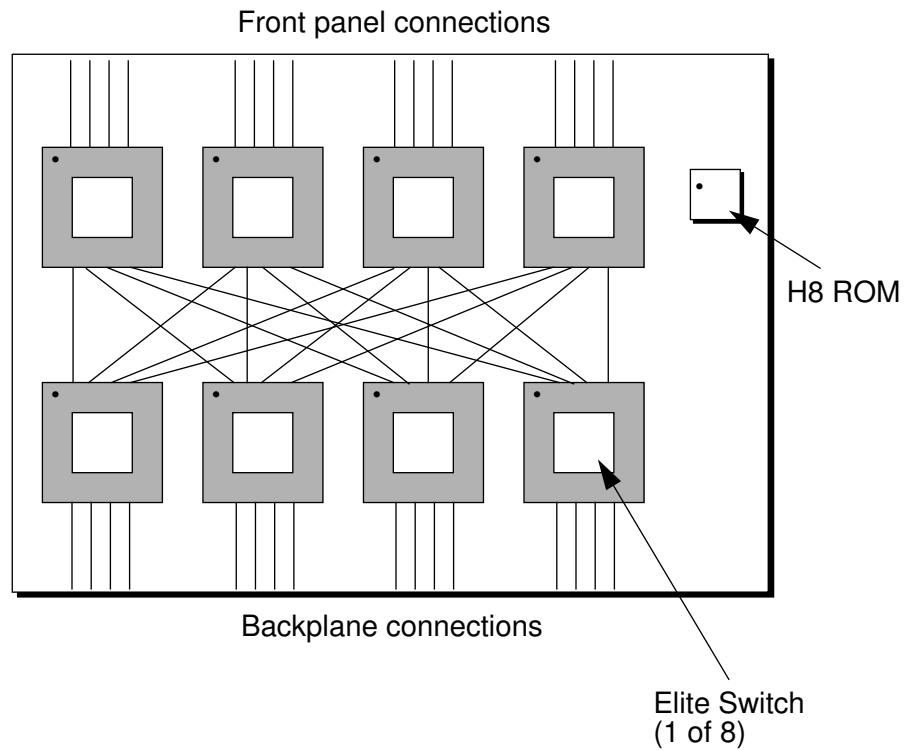
You should take care not to damage the connectors within the module.

You should also take care not to damage the RFI (copper) seals along the edge of the board's front panel.

MK522 — 8 Elite Switch Card

The MK522 has the following field serviceable components:

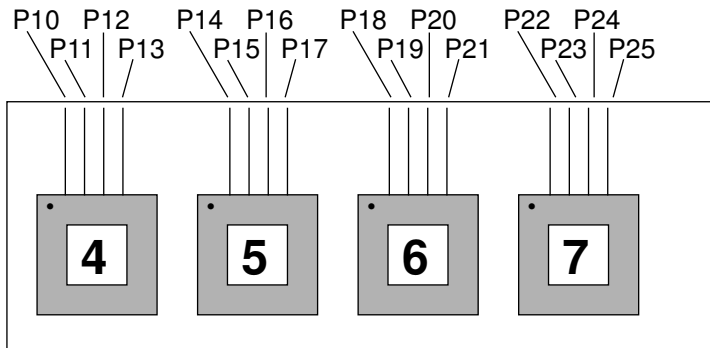
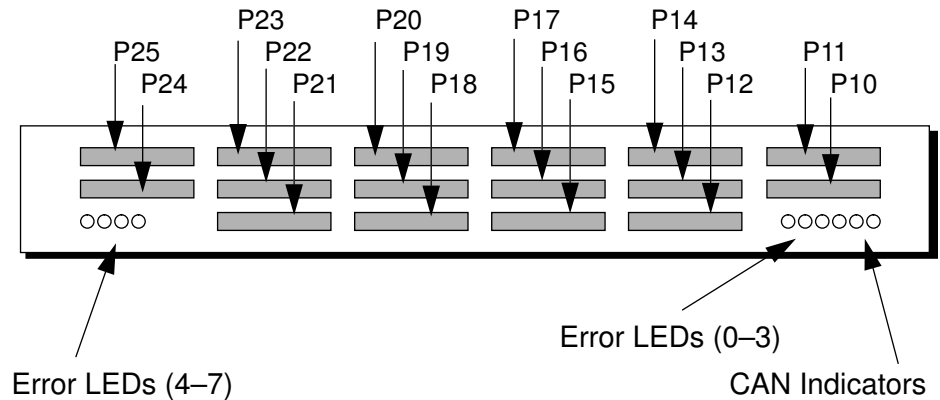
- 8 Meiko Elite network switches.
- H8 ROM.

Figure 4-1 MK522 Components

Both the Elite switches and the H8 ROM are held in sockets and can be removed using the appropriate tool. Take care not to damage the component or its neighbours when installing or removing these devices.

External Connections

Sockets are provided on the board's front panel for external link connections. Sixteen 50-way connectors are used, one connector for each link. The connectors are numbered P10 to P25, as shown in Figure 4-2 and Figure 4-3.

Figure 4-2 External Link Numbering on the MK522**Figure 4-3 The MK522 Front Panel**

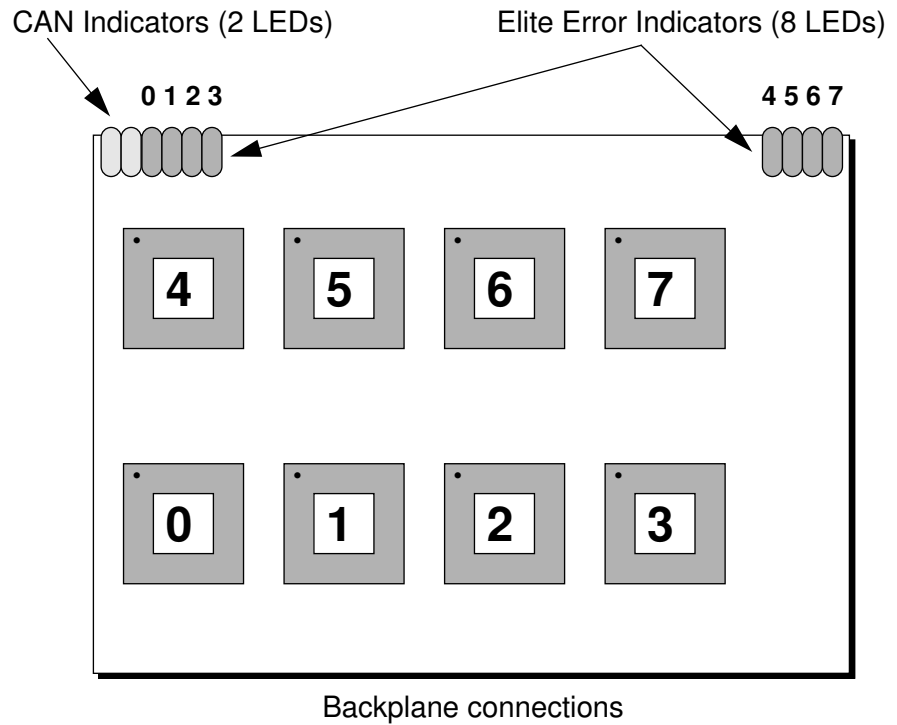
External Indicators

10 LEDs are included on the front panel. At the one end of the front panel there are 6 LEDs — 4 red, 1 green, and 1 amber. At the other end are a second group of 4 red LEDs.

The green and amber LEDs are the CAN bus indicators. The green LED is the heart beat from the board's CAN controller; this flashes at a slow steady rate (once per second) when the board is operating normally. The amber light illuminates each time the CAN controller transmits on the CAN bus.

The red LEDs are error lights, one for each of the 8 Elite switches. Figure 4-4 shows the numbering of the switches and their error lights:

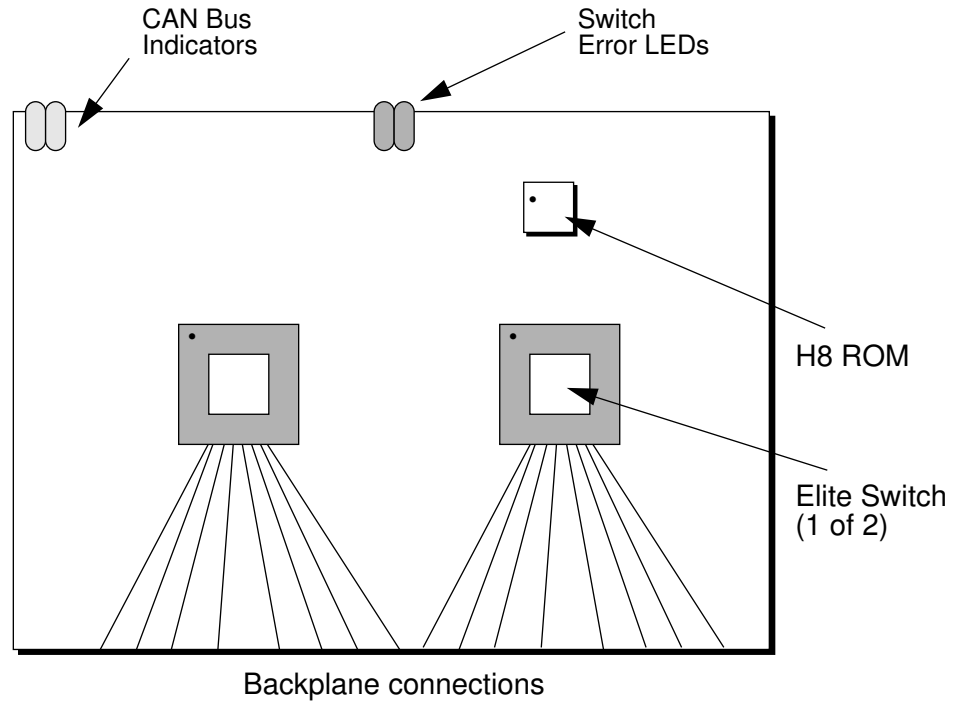
Figure 4-4 Switch and Error Light Numbering



MK523 — 2 Elite Switch Card

The MK523 has the following field serviceable components:

- 2 Meiko Elite network switches.
- H8 ROM.

Figure 4-5 MK523 Components

Both the Elite switches and the H8 ROM are held in sockets and can be removed using the appropriate tool. Take care not to damage the component or its neighbours when installing or removing these devices.

External Indicators

4 LEDs are included on the front panel. At one end of the front panel there are 2 LEDs — 1 green, and 1 amber. In the middle are 2 red LEDs.

The green and amber LEDs are the CAN bus indicators. The green LED is the heart beat from the board's CAN controller; this flashes at a slow steady rate (once per second) when the board is operating normally. The amber light illuminates each time the CAN controller transmits on the CAN bus.

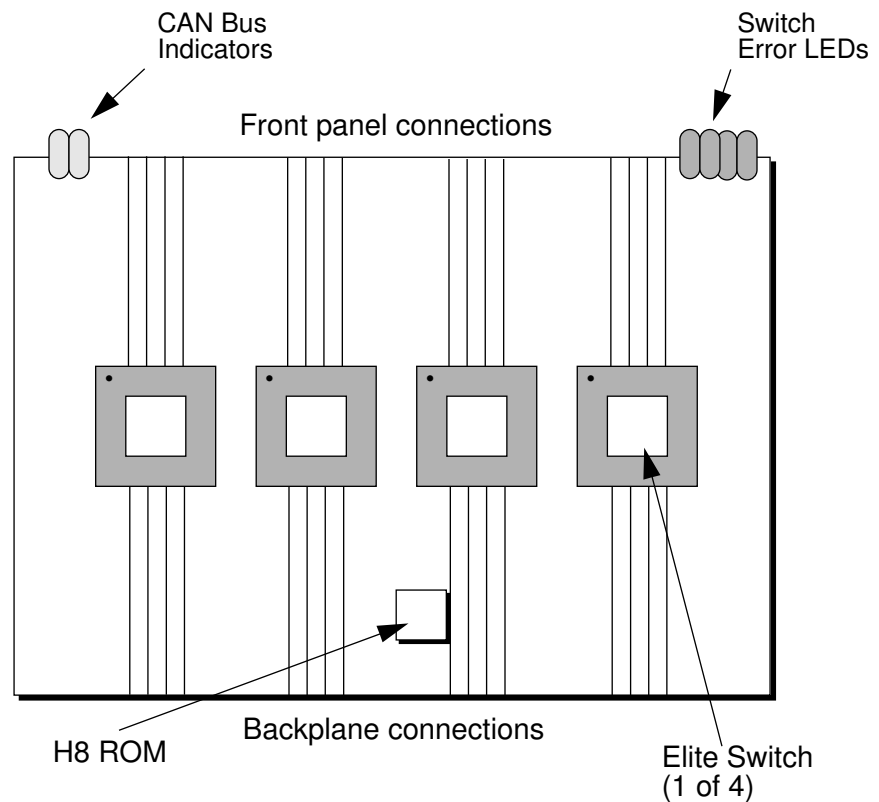
The red LEDs are error lights, one for each of the Elite switches.

MK529 — 4 Elite Switch Card

The MK529 has the following field serviceable components:

- 4 Meiko Elite network switches.
- H8 ROM.

Figure 4-6 MK529 Components



The Elite switches and the H8 ROM are held in sockets and can be removed using the appropriate tool. Take care not to damage the component or its neighbours when installing or removing these devices.

External Connections

Sockets are provided on the board's front panel for external link connections. Sixteen 50-way connectors are used, one connector for each link. The connectors are numbered P10 to P23.

Figure 4-7 External Link Numbering on the MK529

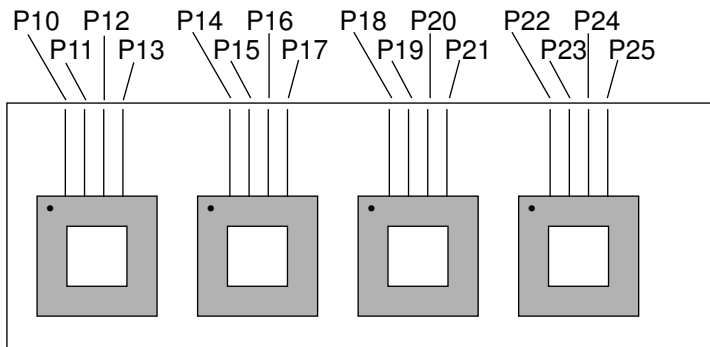
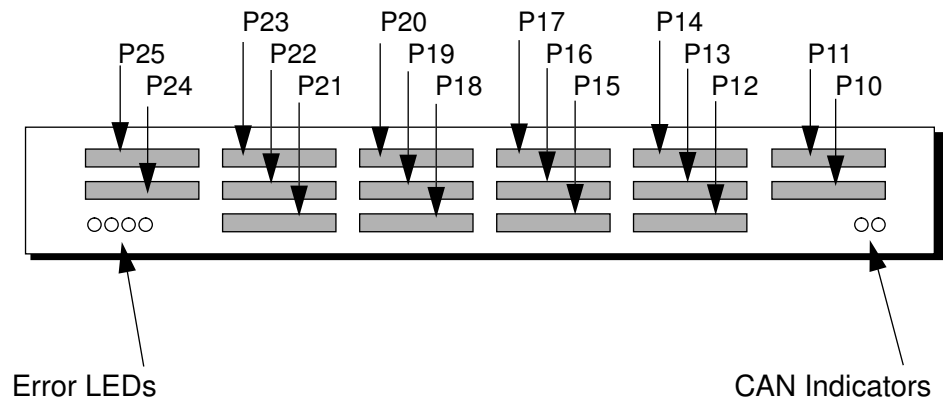


Figure 4-8 The MK529 Front Panel



External Indicators

Six LEDs are included on the board's front panel. At one end there are 2 LEDs, 1 amber and 1 green. At the other end are 4 red LEDs.

The green and amber LEDs are the CAN bus indicators. The green LED is the heart beat from the board's CAN controller; this flashes at a slow steady rate (once per second) when the board is operating normally. The amber light illuminates each time the CAN controller transmits on the CAN bus.

The red LEDs are error lights, one for each of the 4 Elite switches.

