Quin Systems Limited

Programmable Transmission System

Machine Controller Installation Manual

Issue 2

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(MAN532)

Important Notice

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Relevant Directives

The product is designed to be incorporated into a system for the control of machinery, and needs external equipment to enable it to fulfil this function. It must not be relied upon to provide safety-critical features such as guarding or emergency stop functions. It must not be put into service until the machinery into which it has been incorporated has been declared in conformity with the Machinery Directive 89/392/EEC and/or its relevant amendments.

The installation instructions in this manual should be followed in constructing a system which meets requirements.

The product has been tested in typical configurations and meets the EMC Directive 89/336/EEC, when fed from power supplies which meet 89/336/EEC and 92/31/EEC. The product uses only low voltages, and is therefore exempt under 73/23/EEC as amended by 93/68/EEC.

The product as normally supplied has low voltages accessible to touch, and must be mounted within a suitable cabinet to meet any required IP rating to BS EN 60529.

Contents

Figures and Tables

1. Introduction

This document is the Installation Manual for the Machine Controller and the Mini Machine Controller units, part of the Quin Systems digital Programmable Transmission System (PTS) range.

The Machine Controller units are used in SERVOnet based PTS systems. These are distributed systems consisting of a number of servo motor axis controllers and a Machine Controller unit providing overall system control, external communications and user interfaces. The Machine Controller is linked to the axis controller modules via SERVOnet, a high speed network system based on CANbus.

Two models of Machine Controller are available, and this document includes installation details for both. The standard (or large) Machine Controller has 128k bytes of non-volatile memory for storing end user applications, and provides many different communications options including Ethernet and Modbus. The Mini Machine Controller has fewer communications options and a smaller amount of non-volatile memory.

PLEASE READ THIS MANUAL BEFORE INSTALLATION.

It is very important that the guidelines for installation are observed, otherwise damage to the system or to the machine may occur. Quin Systems Limited accept no liability for damage or costs arising from incorrect or inadequate installation of the systems, or from incorrect programming of the system for the required application. Digital control systems are not simple, but can be used successfully to control industrial machinery and provide great improvements in reliability, performance and flexibility.

2. Unpacking and Inspection

Inspect the packaging for external signs of damage, if possible before signing the delivery receipt, as this may indicate that it has been mishandled in transit. When unpacking the system, keep all the packaging materials if possible. If it is necessary to ship the system to another site, or to return it for service, the original packing can be re-used.

Inspect the system carefully when it is unpacked. Check for any loose parts, any circuit boards loose in their card guides, cables not connected, or any bending of the case or chassis.

If any defect or damage is suspected, do not connect power to the system. Notify the carrier immediately, and contact your sales office or the Quin Systems Service Department:

Quin Systems Limited
Service Department
Oaklands Business Centre
Oaklands Park
Wokingham
Berkshire RG41 2FD
England

Telephone	+44 (0)118 977 1077
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Email	sales@quin.co.uk
	support@quin.co.uk

3. System Specifications

This section gives the overall specifications of the system, including mechanical details and environmental requirements.

3.1 Mechanical specification

The dimensions of the Machine Controller are as follows:

Height	296 mm (336mm including mounting brackets)
Width	100 mm (115 mm including screw terminals)
Depth	193 mm
Weight	1.5 kg

The dimensions of the Mini Machine Controller are as follows:

Height	297 mm
Width	42 mm (57 mm including screw terminals)
Depth	175 mm
Weight	1 kg

Sufficient additional clearance must be left in front of the unit for access to the various connectors on the front panel, and to the sides for the screw terminal power connections. The system is designed to be mounted in the normal orientation with the circuit board vertical, to allow cooling air circulation by convection. There should be at least 50mm clearance above and below the unit to allow the air to circulate. If the unit cannot be mounted with the board vertical, then a fan must be fitted to blow air through the unit.

3.2 Environmental specification

Temperature:	storage	0 to 100°C
	operating	0 to 45°C
Relative humidity:	20 to 80% non-condensing	

The system may be operated at higher ambient temperatures, but will require additional cooling such as forced air ventilation in order to do so. The system is normally supplied in a case or chassis with ventilation holes top and bottom, and therefore is not protected against dust, particles, or liquids. If necessary, the unit can be supplied in a suitable sealed cabinet. Please contact your sales office or Quin Systems directly for further details.

3.3 Power supply specification

The power supply requirement for the Machine Controllers is nominally 24V 0.3A d.c., with a switch-on surge of up to 1A. The system accepts a supply voltage in the range 19–36V d.c. The power supply input is protected against reverse voltage connection.

3.4 Relevant directives

The product is designed to be incorporated into a system for the control of machinery, and needs external equipment to enable it to fulfil this function. It must not be relied upon to provide safety-critical features such as guarding or emergency stop functions. It must not be put into service until the machinery into which it has been incorporated has been declared in conformity with the Machinery Directive 89/392/EEC and/or its relevant amendments.

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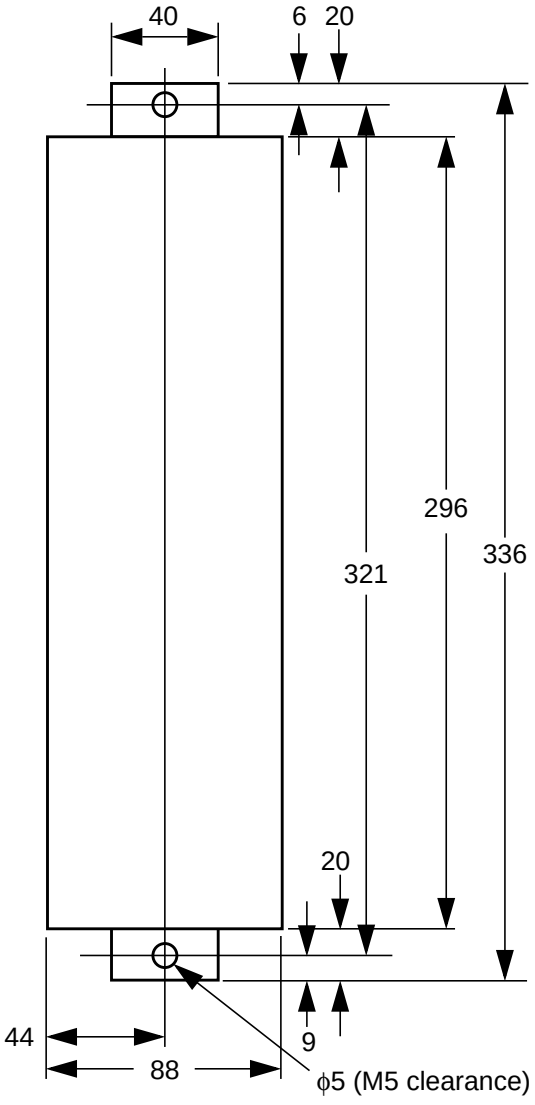
The product as normally supplied has low voltages accessible to touch, and must be mounted within a suitable cabinet to meet any required IP rating to BS EN 60529.

4. Mounting Details

4.1 Machine Controller

The Machine Controller has mounting holes on the rear metal plate, for fixing to the electrical panel inside a cabinet. The unit is fixed with two M5 bolts through holes at the top and bottom of the unit. The fixing centres for these bolts are shown in the diagram below. Note that the bottom fixing hole is slotted and the top fixing hole is keyhole shaped to allow the unit to be slotted over the heads of the mounting bolts.

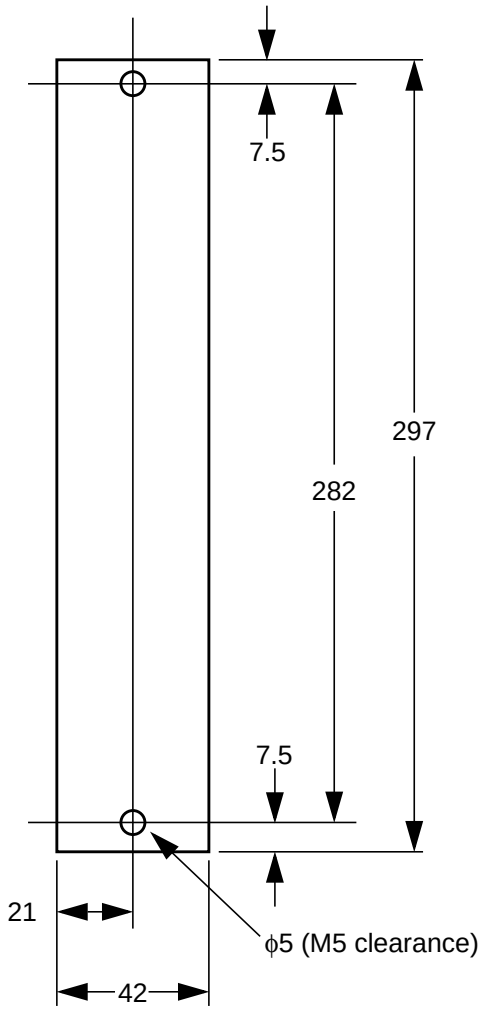


Dimensions in mm

Figure 1. Fixing centres for the Machine Controller.

4.2 Mini Machine Controller

The Mini Machine Controller has mounting holes on the rear metal plate, for fixing to the electrical panel inside a cabinet. The unit is fixed with two M5 bolts through holes at the top and bottom of the unit. The fixing centres for these bolts are shown in the diagram below. Note that the bottom fixing hole is slotted and the top fixing hole is keyhole shaped to allow the unit to be slotted over the heads of the mounting bolts.



Dimensions in mm

Figure 2. Fixing centres for the Mini Machine Controller.

5. Connections

5.1 Machine Controller

The Machine Controller has several connectors. Serial ports and other communications links are conected on the front panel of the unit. The 24V power supply is connected at the back of the unit via a two part screw terminal connector.

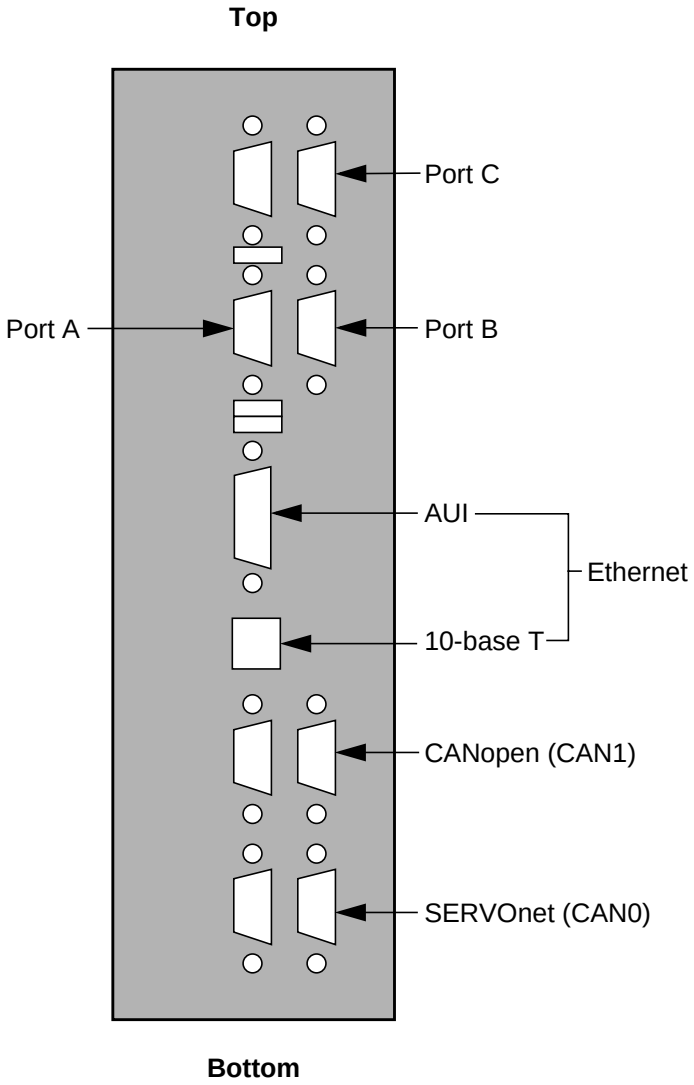


Figure 3. Machine Controller front panel layout

Two 9 way D sockets on the front panel of the host processor board are used for two standard serial ports. Port A is used for the main programming terminal, while port B is used for options such as the Operator's Panel or the Modbus interface. The following table shows the serial port connections on these 9 way D sockets.

Pin no.	Signal	Pin no.	Signal	
			RS-232	RS-485
1	High termination	6	CD	
2	TXD	7	RTS	/TXD
3	RXD	8	CTS	/RXD
4	Low termination	9		
5	0V			

Table 1: Serial port connections

The normal configuration on a Machine Controller is for RS-232 signals on port A, the main terminal port, and RS-485 signals on port B for the Operator's Panel. The serial port configuration is set up with the CF command.

The upper 9 way D plug and socket pair are connected to port C. This is used for a variety of options, according to which interface daughter board is fitted to the CPU360. It supports Bitbus, using the Quin Systems Bitbus interface, or any protocol offered by the Hilscher range of interface modules, such as Profibus.

The Machine Controller also provides an Ethernet interface using either a standard AUI port, or a twisted pair (10baseT) interface. The AUI port uses a standard 15 way D socket, and the twisted pair port uses an 8 way RJ-45 socket. The unit serial number determines the default hardware Ethernet address, and the CF command is used to set the Internet address.

The unit also has two double 9 way D plugs and sockets for two separate CANbus interfaces. The lower pair (CAN0) is used for the SERVOnet interface to the axis controller modules, while the upper pair (CAN1) is used for other options, including SynchroLink and DeviceNet. The plug and socket in each pair are connected pin-to-pin, to allow a simple daisy chain connection between several units using a standard cable assembly.

The connections for the CANbus interfaces on the front panel 9 way connectors are shown below. Note that these comply with the CAN in Automation (CiA) draft standard DS102 Version 2.0, CAN Physical Layer for Industrial Applications, with the optional signals and reserved links used for error detection.

Pin no.	Signal	Pin no.	Signal
1	LINK1	6	CAN_0V
2	CAN_L	7	CAN_H
3	CAN_GND	8	CAN_ERR
4	LINK4	9	CAN_V+ (7–13V)
5	CAN_SHLD (screen)		

Table 2: CANbus connections

Note that the CANbus interfaces require an external power supply for the isolated network transceivers, at nominally +12V d.c. This may be connected via any of the normal D type connectors, or it may be connected via the screw terminal power connector.

The next table shows the connections on the two-part screw terminal block at the back of the unit. This provides connections for the +24V power supply to the unit, and for the CANbus +12V network power, if required.

Back screw terminals Listed from top to bottom	Signal
1.1	+24V supply
1.2	0V supply
1.3	Screen/earth termination
1.4	CAN0_V+ (7–13V)
1.5	CAN0_GND
1.6	CAN1_V+ (7–13V)
1.7	CAN1_GND

Table 3: Back screw terminal connections

Note that the 24V power supply input is not isolated from the internal 5V supply, and the 0V supply connection should normally be earthed.

5.2 Mini Machine Controller

The Mini Machine Controller system has several connectors. Two 9 way D sockets on the front panel are used for serial ports. Port A is used for the main programming terminal, while port B is used for options such as the Operator's Panel or the Modbus interface. Another 9 way D plug and socket on the front panel provide the CANbus interface used for the SERVOnet link. Two-part screw terminals are used for the power connections, with the main +24V power input at the back of the unit on the left hand side, and a separate +5V supply connection for an Operator's Panel at the bottom of the unit. Additional screw terminal connectors are used for digital inputs and outputs at the back of the unit.

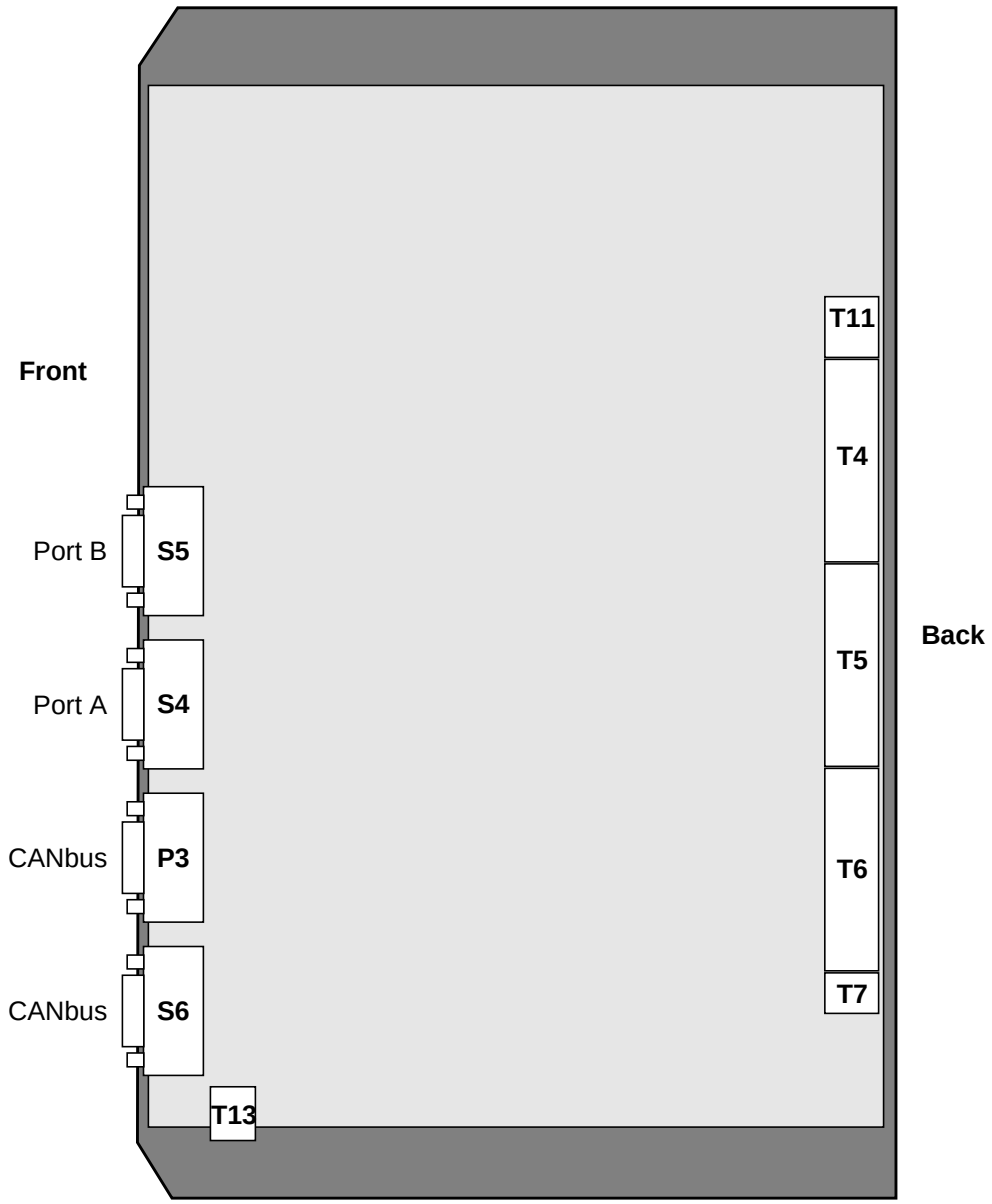


Figure 4. Mini Machine Controller layout

The following table shows the connections on the front panel 9 way D sockets S4 and S5 for serial ports A and B.

Pin no.	Signal	Pin no.	Signal	
			RS-232	RS-485
1	High termination	6		
2	TXD	7	RTS	/TXD
3	RXD	8	CTS	/RXD
4	Low termination	9		
5	0V			

Table 4: Serial port connections : ports A and B

The connections for the CANbus interface on the front panel 9 way D connectors P3 and S6 are shown below. Note that this complies with the CAN in Automation (CiA) draft standard DS102 Version 2.0, CAN Physical Layer for Industrial Applications, with the optional signals and reserved links used for error detection. P3 and S6 are directly linked pin to pin, to allow easy daisy chain connections with standard cables.

Pin no.	Signal	Pin no.	Signal
1	LINK1	6	CAN_0V
2	CAN_L	7	CAN_H
3	CAN_GND	8	CAN_ERR
4	LINK4	9	CAN_V+ (7–13V)
5	CAN_SHLD (screen)		

Table 5: CANbus connections

Note that the CANbus interface requires an external power supply for the isolated network transceiver, at nominally +12V d.c. This may be connected via either of the two D type connectors.

The next tables show the connections on the two-part screw terminal blocks at the back and at the bottom of the unit. The back screw terminals provide connections for the 24V power supply to the unit and the digital inputs and outputs.

Back screw terminals Listed from top to bottom	Signal
11.1	+24V supply
11.2	0V supply
11.3	Screen/earth termination
4.1	0V i/o
4.2	Input 1:1
4.3	Input 1:2
4.4	Input 1:3
4.5	Input 1:4
4.6	Input 1:5
4.7	Input 1:6
4.8	Input 1:7
4.9	Input 1:8
4.10	+24V i/o
5.1	0V i/o
5.2	Input 2:1
5.3	Input 2:2
5.4	Input 2:3
5.5	Input 2:4
5.6	Input 2:5
5.7	Input 2:6
5.8	Input 2:7
5.9	Input 2:8
5.10	+24V i/o
6.1	0V i/o
6.2	Output 1:1
6.3	Output 1:2
6.4	Output 1:3
6.5	Output 1:4
6.6	Output 1:5
6.7	Output 1:6
6.8	Output 1:7
6.9	Output 1:8
6.10	+24V i/o
7.1	+24V i/o
7.2	0V i/o

Table 6: Back screw terminal connections

Note that the 24V power supply input is not isolated from the internal 5V supply, and the 0V supply connection should normally be earthed. The 24V i/o supply is required for correct operation of the digital inputs and outputs.

The bottom screw terminals provide power connections for an Operator's Panel connected to serial port B.

Bottom screw terminals Listed from front to back	Signal
13.1	0V Operator's Panel supply
13.2	+5V Operator's Panel supply

Table 7: Bottom screw terminal connections

The supply connection for the Operator's Panel on terminal block T13 is brought out on pin 9 (+5V) and pin 6 (0V) of the 9 way D socket for serial port B. This allows a single cable to be used to connect to the Operator's Panel instead of a split cable with wire tails to a separate external supply connection.

6. Board Configurations

6.1 General

This section gives details of the configuration options on the CPU360 board used in the Machine Controller, and the SRV-2 board used in the Mini Machine Controller. They are described here for completeness, although the settings are not normally changed. The boards are set up as described below when shipped.

6.2 CPU360 Machine Controller

The CPU360 board is used in the standard Machine Controller unit.

J1: Eprom/flash pin 31.
J1 selects the signal connected to pin 31 of the eprom or flash rom devices in sockets IC3-6. For 27C020 or similar eproms (256k×8), link pins 1 and 2 only. For 27C040 eproms (512k×8) or larger, link pins 1–2 and 3–4. For all flash roms, no links should be fitted to J1.

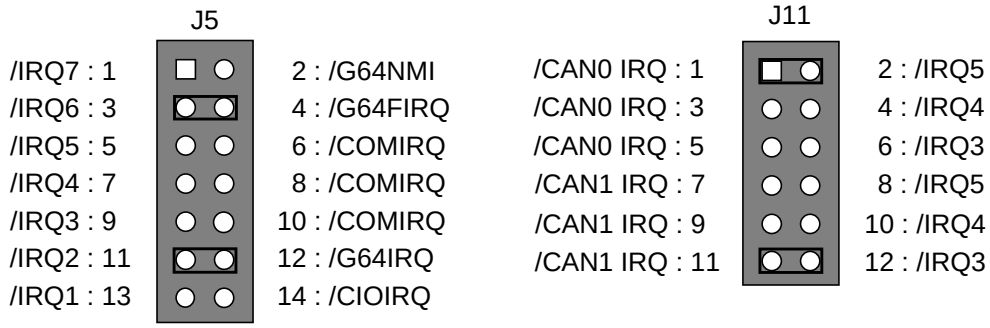
J2: Eprom/flash pin 1.
J2 selects the signal connected to pin 1 of the eprom or flash rom devices in sockets IC3-6. For most eproms and flash devices, no link should be fitted to J2. For 27C080 eproms (1M×8), link pins 1 and 2. For 29F040 flash roms, link pins 2 and 3.

J3: Dram burst addressing.
Jumper J3 allows the dram memory to be configured for burst cycles when used with the optional 68040 processor. For normal operation with the 68360 processor, link pins 1–3 and 2–4. To allow burst cycle operation with the optional 68040 processor, link pins 3–5 and 4–6.

J4: Serial eeprom write protect.
To write protect the serial eeprom device IC16, fit a link to jumper J4.

J5/11: Interrupt configuration.

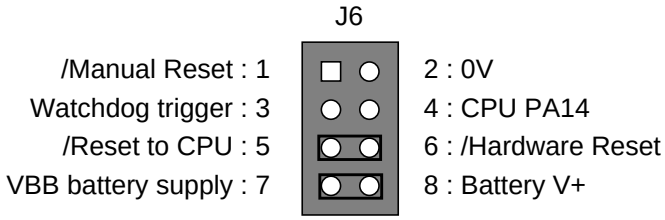
Jumper J5 is used to connect various interrupt sources to the seven processor interrupt inputs. The interrupts from the CANbus interfaces are configured with jumper J11.



The normal configuration is with the G64 bus /FIRQ interrupt connected to level 6 and the G64 bus /IRQ signal connected to irq level 2. For the two CANbus controller interrupts, CAN0 IRQ is connected to irq level 5 and CAN1 IRQ to irq level 3. The standard firmware supplied with the Machine Controller system uses these interrupt levels.

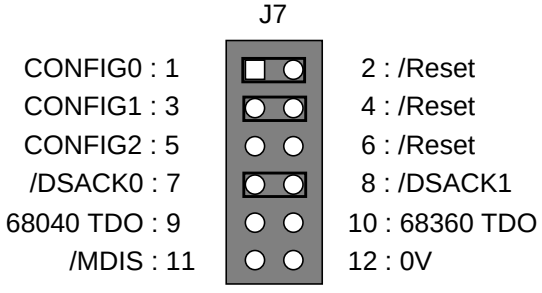
J6 : Reset and watchdog.

Jumper J6 sets up options for the hardware watchdog and reset device. Link pins 1 and 2 to give a manual reset signal to the processor. Link pins 3 and 4 to enable the external hardware watchdog. Link pins 5 and 6 to enable the external hardware reset to the processor. Pins 7 and 8 connect the rechargeable battery to the VBB supply rail for the battery backed memory and real time calendar/clock devices. The normal configuration is with links fitted to pins 5–6 and 7–8.



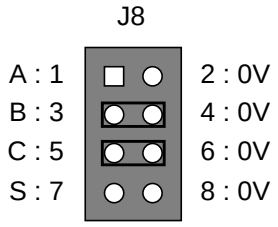
J7 : Processor configuration.

Jumper J7 is used to set the processor configuration. For normal use with the 68360 cpu, link J7 pins 1–2, 3–4 and 7–8. For use with the optional 68040 cpu, link J7 pins 5–6 only. To disable the MMU on a full 68040 cpu, link J7 pins 11 and 12. This has no effect on the 68360 cpu, or on other variants of the 68040 such as the 68EC040 or 68LC040.



J8: CIO clock frequency.

Jumper J8 sets the Z8536 CIO peripheral clock frequency as a power of 2 division of the main processor clock. The normal configuration is for a CIO clock of 6 MHz from a main processor clock of 24 MHz.

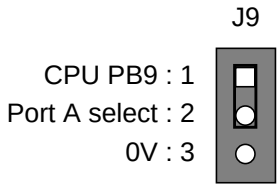


A link fitted connects the clock select line to 0V. The table below shows the clock division ratios for all link settings, and the peripheral clock speeds for a 24 MHz main processor clock.

A	B	C	Divisor	24 MHz
in	in	in	2	12 MHz
out	in	in	4	**6 MHz** (default)
in	out	in	8	3 MHz
out	out	in	16	1.5 MHz
in	in	out	32	750 kHz
out	in	out	64	375 kHz
in	out	out	128	187.5 kHz
out	out	out	256	93.75 kHz

J9: Serial port A override

The serial ports on the CPU360 module are configured by the software for RS-232 or RS-485 as required, to reduce the number of jumpers that need to be configured by the customer for different applications. Jumper J9 allows the software configuration for port A to be overridden for testing. For normal operation under software control, link J9 pins 1 and 2. To force RS-232 operation, link pins 2 and 3. To force RS-485 operation, remove the link.

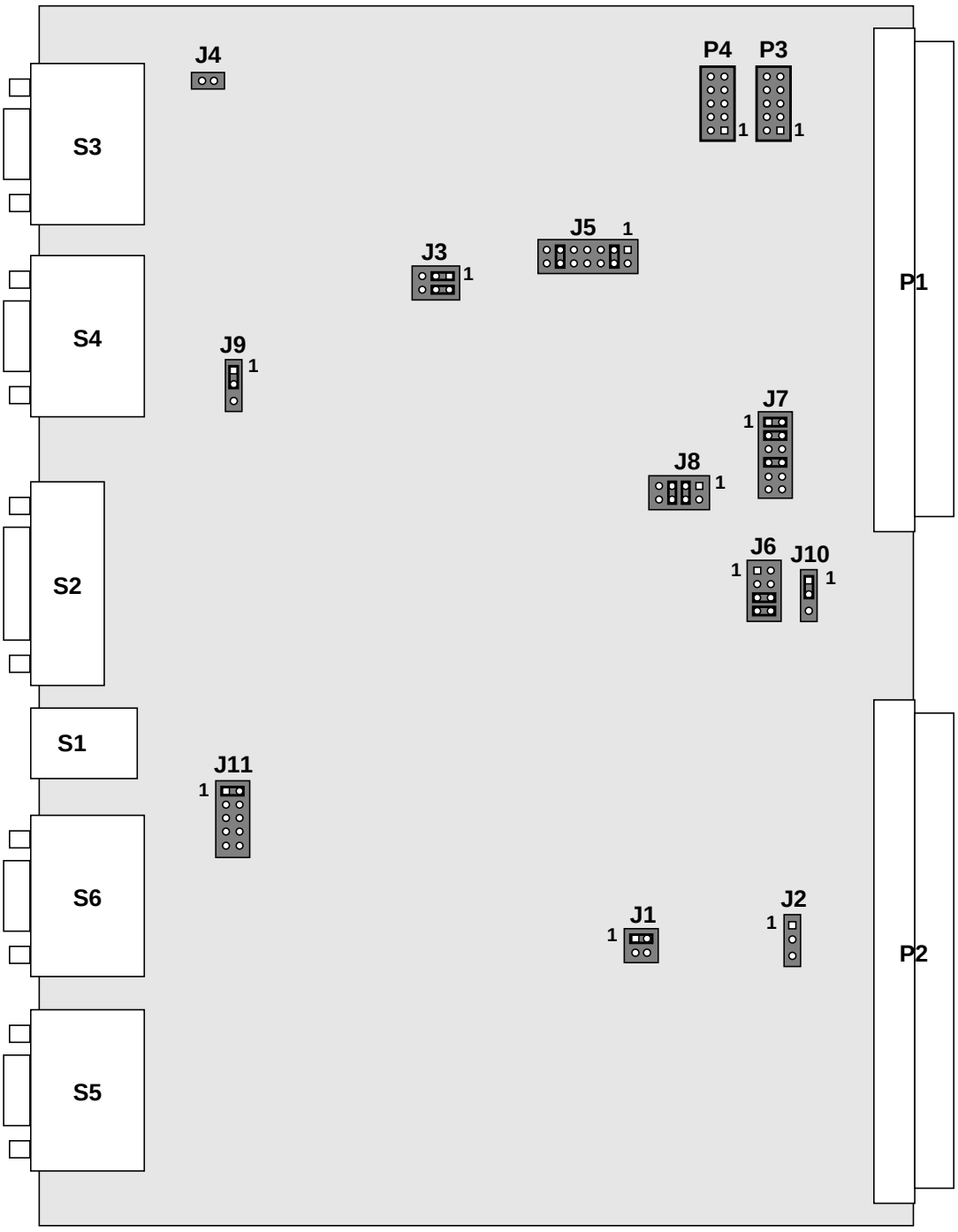


J10: Static ram size

The CPU360 module can support a 128k×8 or a 512k×8 static ram device. Jumper J10 sets the appropriate address line configuration. For normal operation with a 128k×8 device (e.g. HM628128), link J10 pins 1 and 2. For use with a 512k×8 device (e.g. HM628512), link pins 2 and 3. Note that the larger static ram is only available if specified when the CPU360 is ordered, as the device is in a surface mount package and is soldered directly to the circuit board.

CPU360 board - component side

Top



Bottom

Figure 5. CPU360 jumper locations

6.3 SRV-2 Mini Machine Controller

The SRV-2 board is used in the Mini Machine Controller unit.

J1: Processor options

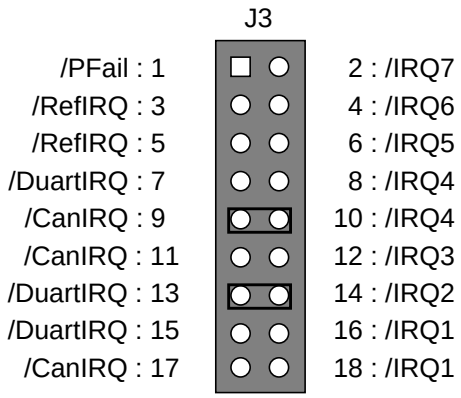
Jumper J1 is provided for use with some processor test facilities. No links should be fitted to J1 in normal operation.

J2: Reset and watchdog enable

Jumper J2 provides a manual reset input, used during development, and enables the hardware watchdog. Shorting J2 pins 1 and 2 resets the processor. If a link is fitted between J2 pins 3 and 4 then the hardware watchdog is enabled. If no link is fitted then the hardware watchdog is disabled. Currently the hardware watchdog is not used and no links are fitted to J2.

J3: Interrupt configuration

Jumper J3 is used to connect the various external interrupt sources to the seven local processor interrupt inputs.



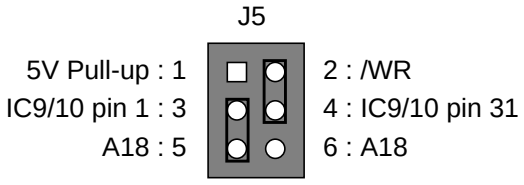
The normal configuration is with the duart interrupt connected to /IRQ2, and the CAN controller interrupt connected to /IRQ4. The standard Mini Machine Controller firmware uses these interrupt levels.

J4: SSI encoder clock signals

Jumper J4 is not used on the Mini Machine Controller.

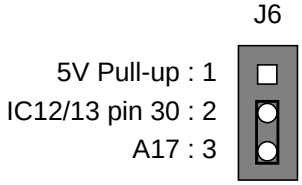
J5: EPROM device select

Jumper J5 selects the signals connected to pins 1 and 31 of the eprom or flash memory devices IC9 and IC10. For 27C020 or similar eproms (256k×8) and 29F020 or similar flash roms, link pins 1–3 and 2–4. For 27C040 eprom devices (512k×8) link pins 1–3 and 4–6. For 29F040 flash roms link pins 3–5 and 2–4.



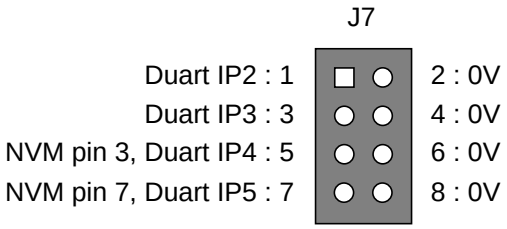
J6: RAM device select

Jumper J6 selects the signal connected to pin 30 of the SRAM memory devices IC12 and IC13. It allows pin 30 to be connected to either a high pull-up or address line A17 as required. For 128k×8 devices fit a link between pins 1 and 2. For 256k×8 or larger devices fit a link between pins 2 and 3.



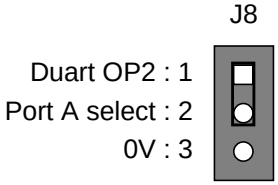
J7: Spare duart inputs

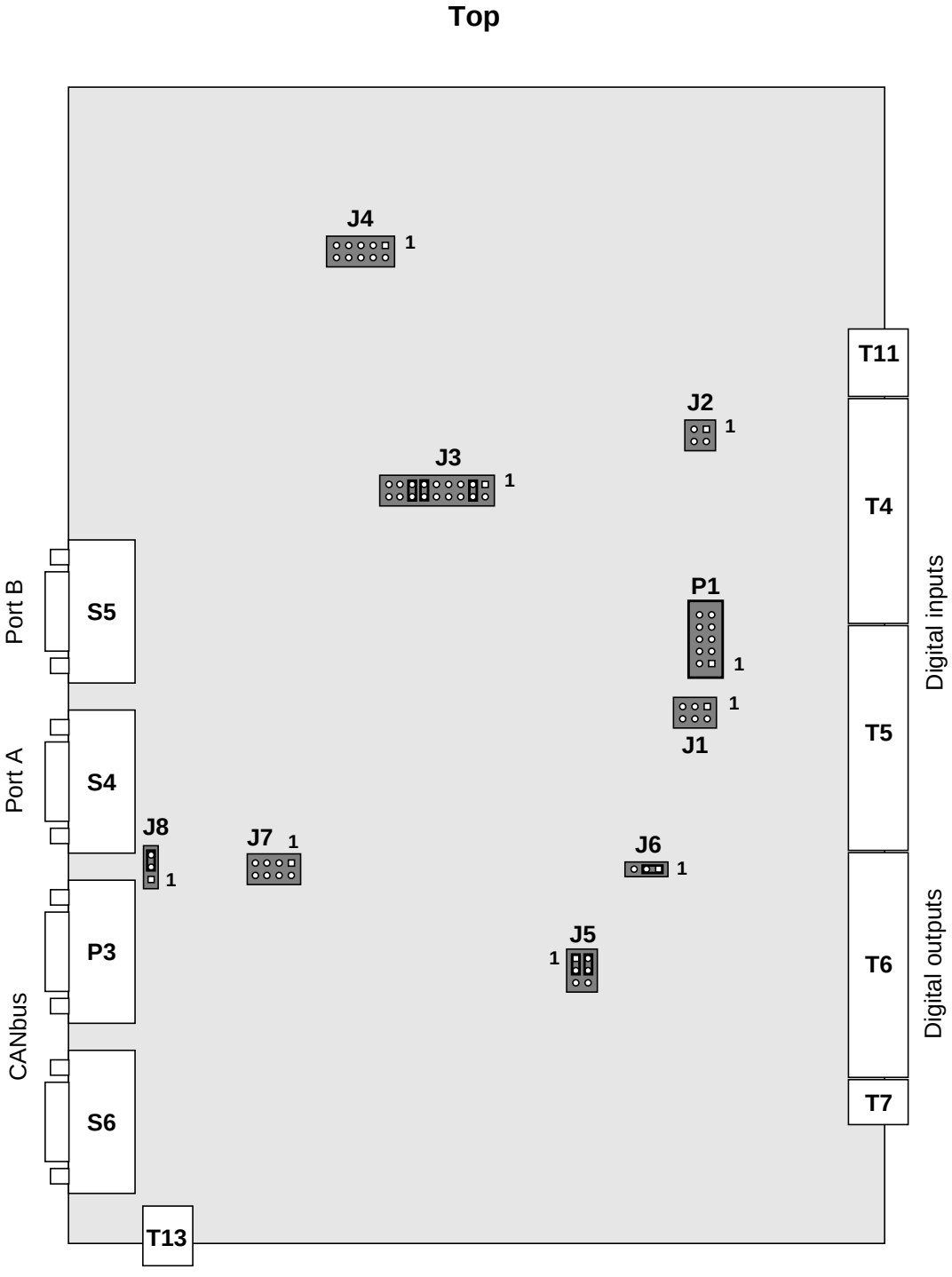
Jumper J7 allows the unused inputs on the duart serial port device to be tied high or low. The duart input pins are connected to a pull-up resistor network, and the jumper pad allows them to be connected to 0V. Two of these lines are also connected to pins 3 and 7 of the serial eeprom devices IC6 and IC7, for configuration of device-dependent options.



J8: Serial port A override

The serial ports on the SRV-2 module are configured by the software for RS-232 or RS-485 as required, to reduce the number of jumpers that need to be configured by the customer for different applications. Jumper J8 allows the software configuration for port A to be overridden for testing. For normal operation under software control, link J8 pins 1 and 2. To force RS-232 operation, link pins 2 and 3.





SRV-2 module - component side

Figure 6. SRV-2 jumper locations

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