MARK ROBERTS MOTION CONTROL

UNIVERSAL E-STOP SYSTEM

QUICK START GUIDE

QSG Product Code: MRMC-2091-00
Product Covered: MRMC-2075-00

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Contact information	
Mark Roberts Motion Control Ltd. Unit 3, South East Studios Blindley Heath Surrey RH7 6JP United Kingdom	
Telephone:	+44 (0) 1342 838000
E-mail:	info@mrmoco.com (sales and general enquiries) support@mrmoco.com (customer support)
Web:	www.mrmoco.com www.mrmocorentals.com

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Important safety instructions

To ensure the best from the product, please read this manual carefully. Keep it in the safe place for future reference.

To reduce the risk of electric shock, do not remove the cover from the unit. No user serviceable parts inside. Refer servicing to qualified personnel.

Power and connections

- This unit must be connected to a 24V DC PSU supplied.
- Do not plug in or attempt to operate an obviously damaged unit.

General care

- Do not force switches or external connections.
- Do not attempt to clean the unit with chemical solvents or aerosol cleaners, as this may damage the unit. Use a clean dry cloth.
- Do not use around flammable gas. All electrical equipment can generate sparks that can ignite flammable gas.
- Keep the equipment dry. The system has **not** been made weatherproof. Do not use with wet hands.
- Keep away from pets and children.

Location

Installation of this unit should be away from sources of excessive heat, vibration, and dust.

Intellectual property

This product includes confidential and/or trade secret property. Therefore, you may not copy, modify, adapt, translate, distribute, reverse engineer, or decompile contents thereof.

Overview

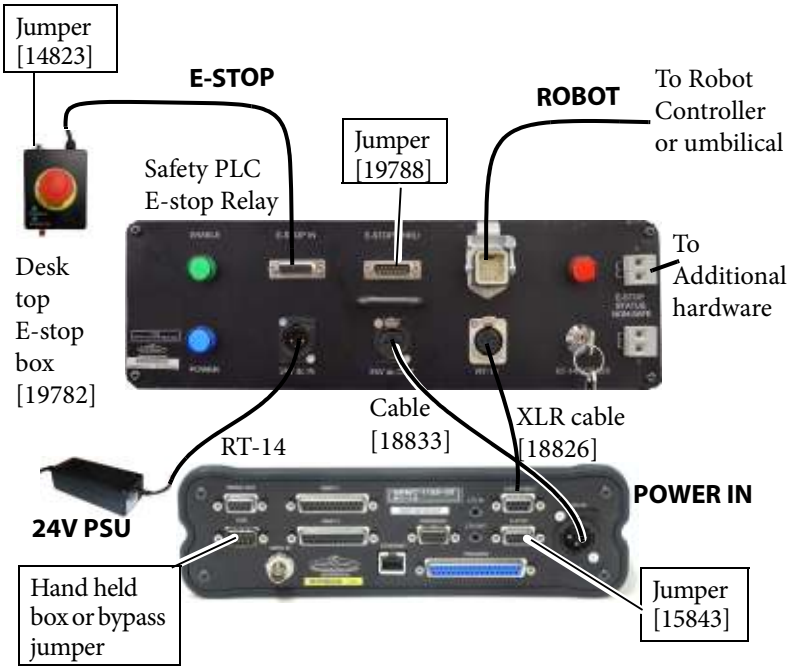
Thank you for using the Universal E-Stop System from Mark Roberts Motion Control (MRMC). The Universal E-Stop System is a safety relay PLC between RT-14 and MRMC Motion Control and Broadcast rigs and is fully integrated with the Flair Motion Control Software.

The Universal E-Stop System has the following main features:

- Can be used as a safety PLC for a single robot. Multiple robots using the Universal E-stop can be easily "daisy-chained" to create a global E-stop system
- An arbitrary number of additional E-stop buttons can be attached and deployed in the customer setup

Connecting the cables

Universal E-stop System with a Single Robot

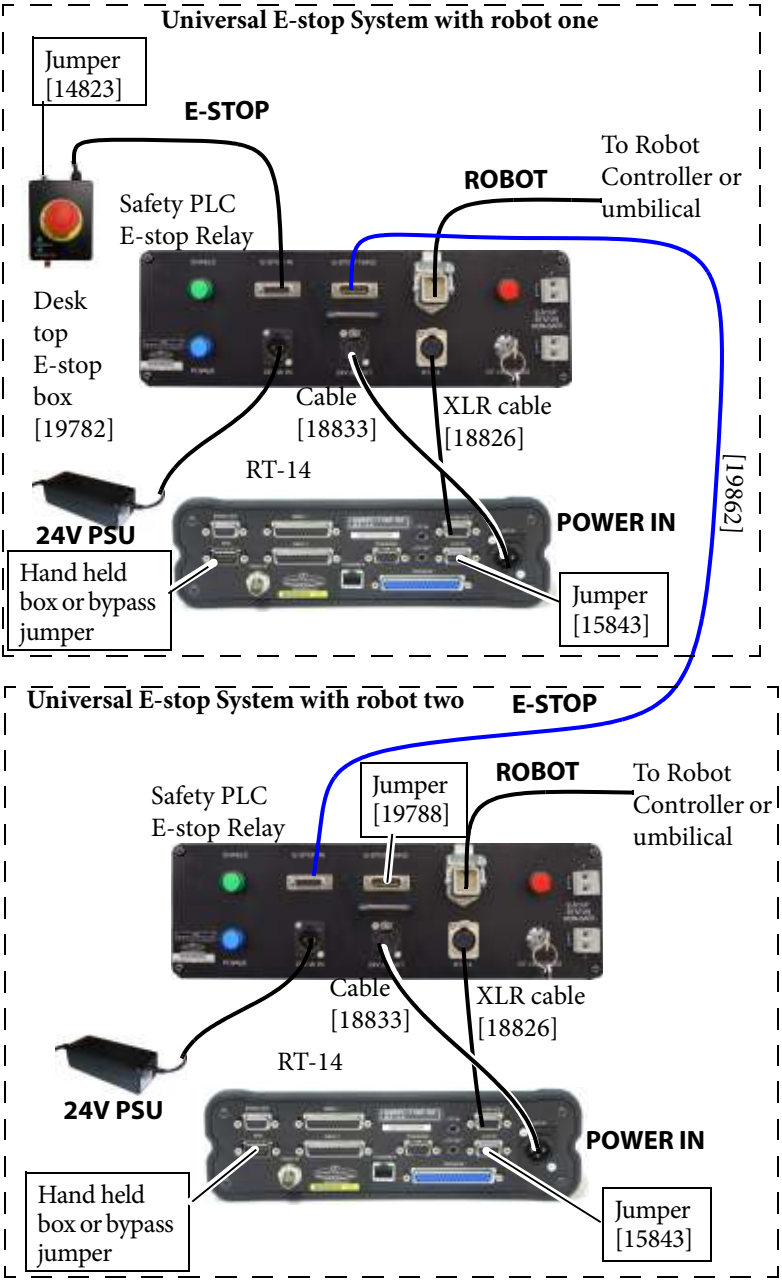


The two **E-stop Status Non-safe** connectors provide Auxiliary relay output and can be connected to additional non-MRMC or custom device. Any hardware that is plugged with these two connectors will be stopped when the E-stop button connected with the Universal E-stop system is pressed but the reverse is not true. In other words, the Universal E-stop System will not accept any feedback from such devices.

Safety Relay PLC LEDs

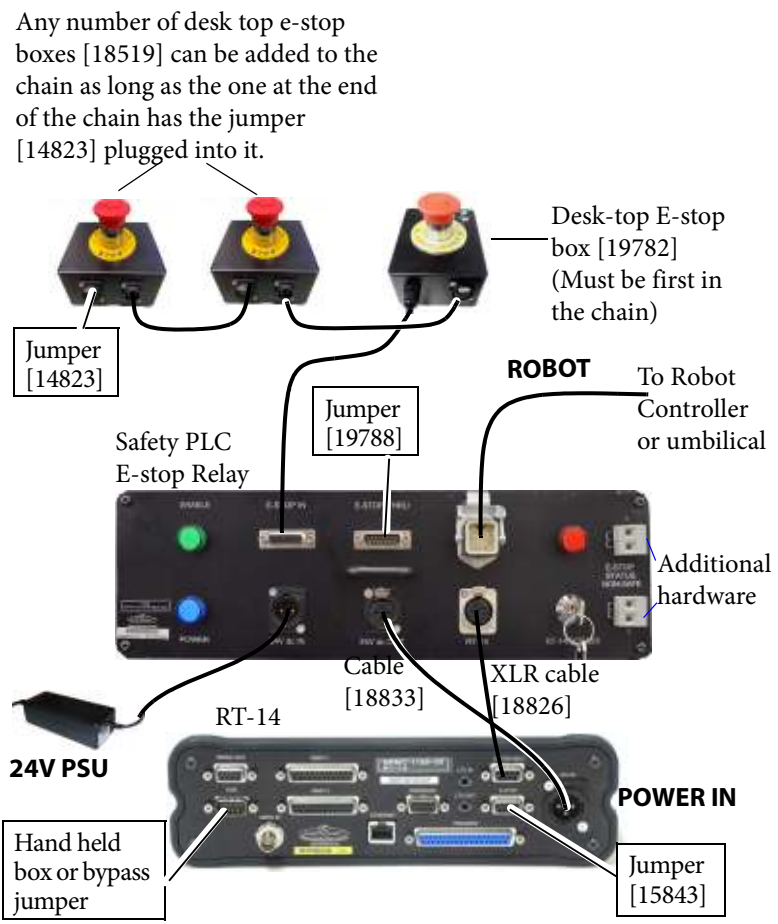
LED/Key	Description
Blue	On indicates that the Safety Relay has power.
Green	On indicates that the E-stop is enabled and the robot can be engaged. Off indicates that the E-stop is pressed and robot is disengaged and cannot be re-engaged.
Red	On indicates that the RT-14 Bypass key is in horizontal position and RT-14 is bypassed. In this condition both the software E-Stop (from Flair) and the HHB E-stop have no effect. For safety reasons, always ensure that this LED is off unless RT-14 is bypassed temporarily on purpose.

Universal E-stop System with Multiple Robots



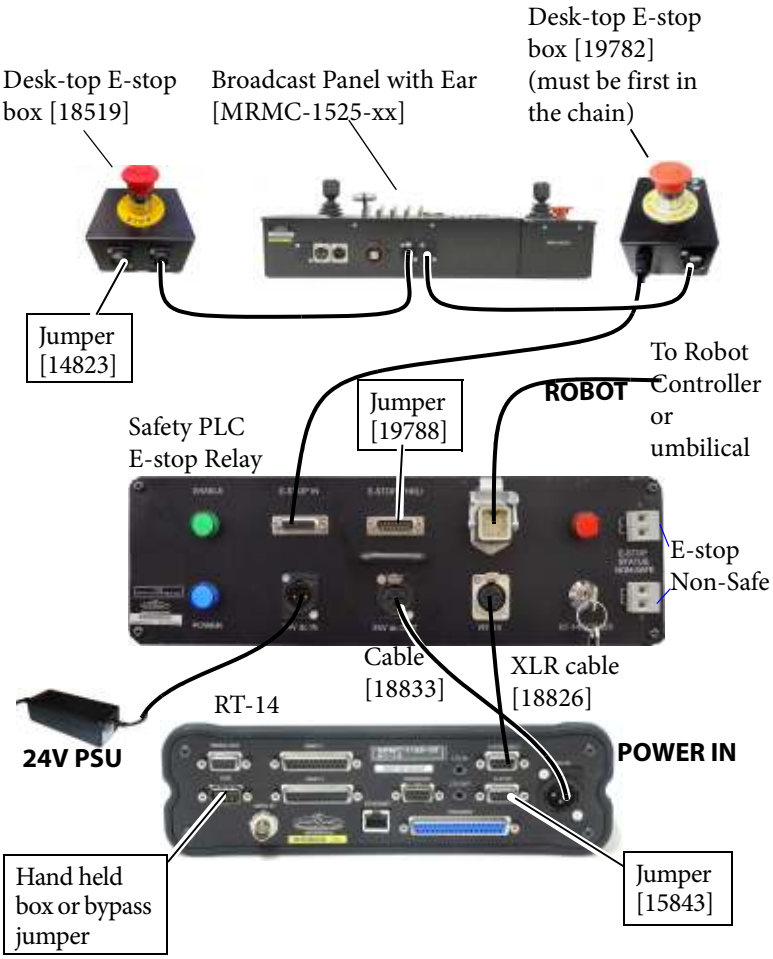
Any number of Universal E-stop Systems can be added to the chain as long as the one at the beginning of the chain has the Desk top E-stop box plugged into **E-Stop In** and the one at the end of the chain has a jumper plugged into **E-stop Thru** connector.

E-stop Button Expansion



Only one main E-stop box [19782] is used per safety relay box, which is plugged to the **E-stop In** connector.

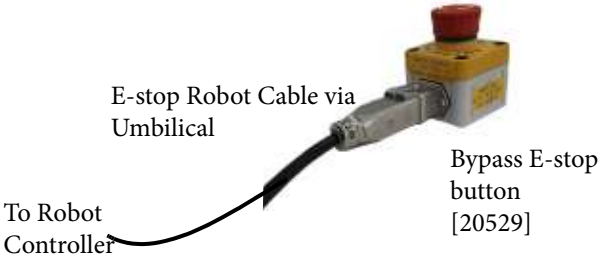
When using multiple desk top E-stop boxes, E-stop Extension Cable [18466] is used to 'chain' the E-stop boxes.



You can even use Broadcast Panel with Ear [MRMC-1525-xx] for robot operation and emergency stops as well. Again any number of Broadcast Panel with Ear and desk top E-stop boxes [18519]'s can be added to the chain in any order as long as the unit at the end of the chain has jumper [14823] plugged into it.

Universal E-stop Bypass Operation

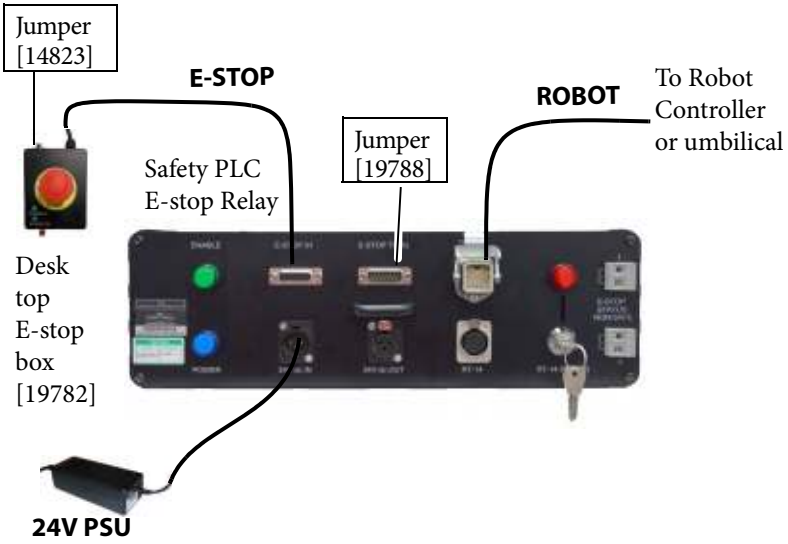
You can bypass the Universal E-stop system temporarily for troubleshooting a fault in the system or to move the arm when Flair PC is not connected for example to move the arm in transport position. To do so, connect the Bypass E-stop button via E-stop Robot Cable in the umbilical to the Robot Controller.



Bypassing the Universal E-stop System is for temporary use only. Robot will enable as soon as E-stop button is reset. This will also bypass the software E-stop and any other hardware E-stops and the robot will have no controlled E-stop action.

RT-14 Bypass Operation

By setting the key in the horizontal position, you can bypass the RT-14. In this mode the E-stop can be enabled even if the RT-14 is not connected or not loaded, or Flair is not running, or the HHB is unplugged. The red LED indicates that this mode is active.



Bypassing RT-14 will make the safety circuit IGNORE the software E-stop and the HHB E-stop that is plugged into RT-14. This should be used only temporarily and the key put back in vertical position soon after.

Universal Estop LED Description

Below is an image of the PLC hardware inside the Universal Estop box.

It consists of 4 slices that are squeezed together and mounted on a DIN rail.

The first slice is the main CPU1 that runs the program, the actual program is stored in the plugin module where the power is supplied (top left of the image).

Second slice (UE410-4R0) is one of the safety relays (Override and Immediate Estop contacts)

Third slice is the XTIO module, this is where all the I/O switching happens

The fourth slice (UE410-4R0) is the second safety relay (Delayed Estop contacts and Logic Stop signal)

The following is a list of what each LED is used for:

CPU Module (CPU1)

MS Module Status (normally green when running)

CV Configuration Status (solid yellow is a verified configuration)

EFI1Not Used

EFI2Not Used

First Relay (UE410-4R0), (Override and Immediate Estop switch closure)

PWRPower Indicator (normally green)

K1/2Feedback Override controlled from XTIO Q3

K3/4Immediate Estop contacts controlled from XTIO Q4

I/O switching module (XTIO)

I1 Estop Button, RT-14 and Feedback Input Channel A (green when ok)

I2 Estop Button, RT-14 and Feedback Input Channel B (green when ok)

I3 Reset Button and Contactor Monitor (green when both states are met)

I4 > I8No Used

MS Module Status (normally green when running)

Q1 Connected to Second Relay K1/2 for Delayed Estop contacts

Q2 Connected to Second Relay K3/4 for Logic Stop

Q3 Connected to First Relay K1/2 for Feedback Override

Q4 Connected to First Relay K3/4 for Immediate Estop contacts

> Note
>
> Q4 is also connected to a standard relay for the Aux output terminals.

Second Relay (UE410-4R0), (Delayed Estop switch closure and Logic Stop signal)

PWRPower Indicator (normally green)

K1/2Delayed Estop contacts (delay on opening) controlled from XTIO Q1

K3/4Logic Stop switch closure controlled from XTIO Q2.

> Note
>
> The Delay is so an axis can be brought to a controlled stop, via 'Logic Stop', before the Estop contacts open (eg Robot depending, these could switch a Mains Contactor or STO lines on a track drive).

Below is a table of all LED states for the CPU1 Module.

MS LED	Meaning	Notes
○	Supply voltage out of range	Switch on the voltage supply of the Flexi Soft system and check at the A1 and A2 terminals of the main module.
☼ Red/ green (1 Hz)	Self-test in progress or system initializing.	Please wait ...
☼ Green (1 Hz)	System in Stop	The application can be started from within the configuration software.
☼ Green (2 Hz)	Identify (e.g., for Flexi Link)	–
● Green	System in Run	–
☼ Red (1 Hz)	Invalid configuration	Check module type and module version of main module and expansion modules on which the MS LED ☼ is flashing red/green. Modify the configuration if necessary. Use the configuration software diagnostic function.
☼ Red (2 Hz)	Serious error in the system, presumably in this module. The application was stopped. All outputs are switched off.	Switch the power supply off and then on again. If the problem still has not been remedied after multiple repetitions, replace this module. Use the configuration software diagnostic function.
● Red	Serious error in the system, presumably in a different module. The application was stopped. All outputs are switched off.	Switch the power supply off and then on again. If the problem still has not been remedied after multiple repetitions, replace the module showing ☼ red (2 Hz). If applicable, also use the diagnostic function in the configuration software to isolate the affected module.

CV LED	Meaning	Note
○	Configuration in progress.	–
☼ Yellow (2 Hz)	Saving configuration data in the system plug (non-volatile memory)	Do not disconnect from power supply until save process has been completed.
☼ Yellow (1 Hz)	Unverified configuration	Verify the configuration with the configuration software.
● Yellow	Verified configuration	–

Below is a table of all LED states for the XTIO Module.

MS LED	Meaning	Notes
○	Supply voltage out of range	Switch on the voltage supply of the Flexi Soft system and check at the A1 and A2 terminals of the main module.
☀ Red/ green (1 Hz)	With firmware V1.xx.0: invalid configuration	
	With firmware ≥ V2.00.0: remediable external error	Check cabling of the flashing inputs and outputs. If all output LEDs are flashing, check the supply voltage of terminals A1 and A2 on this module.
☀ Green (1 Hz)	System in Stop	The application can be started from within the configuration software.
● Green	System in Run	
☀ Red (1 Hz)	With firmware V1.xx.0: remediable external error	Check cabling of the flashing inputs and outputs. If all output LEDs are flashing, check the supply voltage of terminals A1 and A2 on this module.
	With firmware ≥ V2.00.0: invalid configuration	
☀ Red (2 Hz)	Serious error in the system, presumably in this module. The application was stopped. All outputs are switched off.	Switch the power supply off and then on again. If the problem still has not been remedied after multiple repetitions, replace this module. Use the configuration software diagnostic function.
● Red	Serious error in the system, presumably in a different module. The application was stopped. All outputs are switched off.	Switch the power supply off and then on again. If the problem still has not been remedied after multiple repetitions, replace the module showing ☀ red (2 Hz). If applicable, also use the diagnostic function in the configuration software to isolate the affected module.

Input LEDs (I1 ... I8) Output LEDs (Q1 ... Q4)	Meaning
○	Input/output is deactivated.
● Green	Input/output is active.
☀ Green (1 Hz) synchronized with the red MS LED	Input/output is deactivated and there is a remediable error.
☀ Green (1 Hz) alternating with the red MS LED	Input/output is active and there is a remediable error.

Notes

Mark Roberts Motion Control Ltd.
Unit 3, South East Studios, Blindley Heath, Surrey RH7 6JP
United Kingdom
Telephone: +44 (0) 1342 838000
info@mrmoco.com
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