Model Electronic Railway Group

TECHNICAL BULLETIN CBUS-20/13

Issue 2

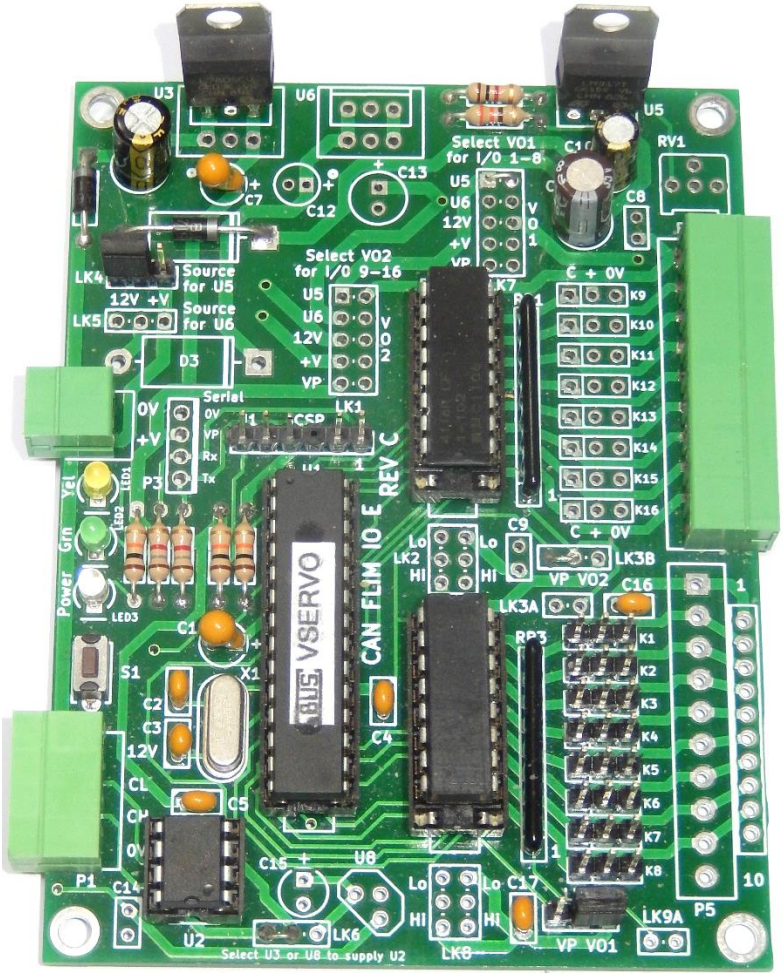
Ian Hart [546]

CANVSERVO – 12V DC CBUS Module with 8 servo outputs and 8 inputs.

June 2021

The CANVSERVO is a 12V DC 2nd generation CBUS Combination Module with 8 outputs for driving servos, plus 8 inputs for feedback or switch inputs. It is available in the MERG Kit Locker as kit 13.

It belongs to a number of layout control modules for use with the CBUS system which is a general purpose layout control bus (LCB) using the industry standard CAN bus. For more information on CBUS, see CBUS-00.



1) Index:

2) Introduction:

The CANVSERVO module is a “combi” module being both a ‘consumer’ and a ‘producer’ of events. The board does not have SLiM mode configuration switches, so the module needs to be set up in FLiM mode by using a configuration tool such as the FliM Configuration Utility FCU.

The kit is a specific configuration of the CAN FLIM IO E (a multipurpose 16 channel CBUS Module) incorporating current limiting and bias resistors for driving 8 servos. The module also offers 8 inputs for feedback or switch inputs.

The CANVSERVO can be enhanced by adding additional components. For example, providing a regulated supply for the I/O or using alternative I/O connectors. More details are available in the CAN FLIM IO E documentation which is available via the information button on the CAN FLIM IO E PCB in the CBUS PCB section of the kit locker.

Use this link to go to the Kitlocker CBUS PCB page: https://www.merg.org.uk/merg_kitlocker/section.php?id=25

The functionality of the module depends on the firmware used.

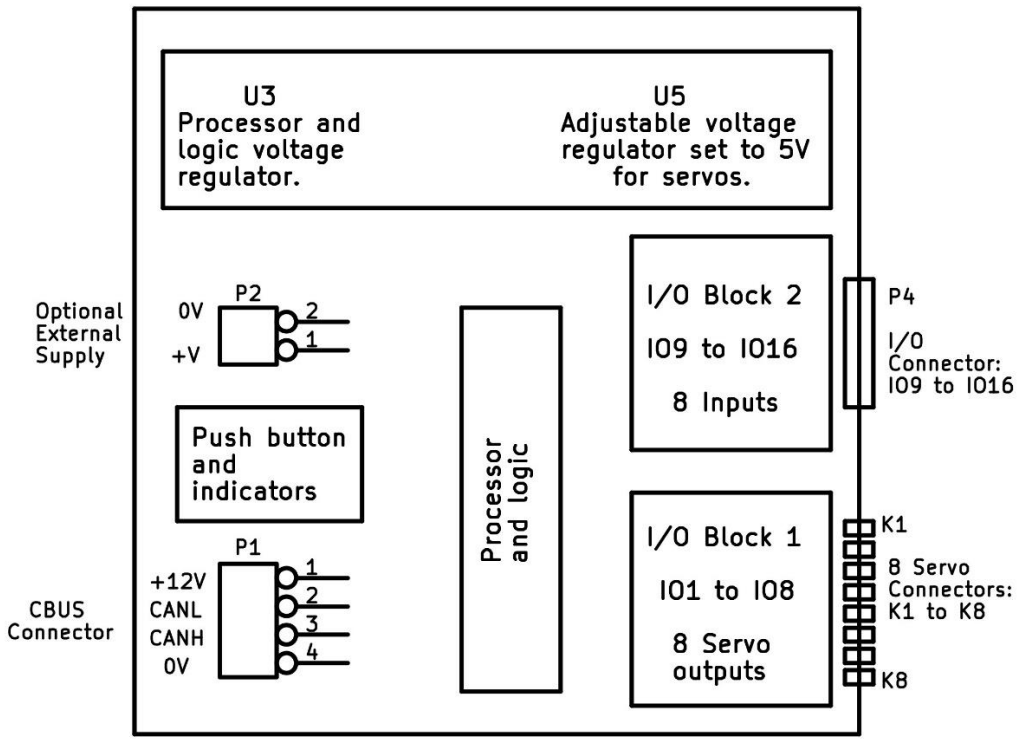
This kit was originally going to be supplied with a preconfigured version of the CANMIO Universal firmware with self-test functionality.
However, with only partial support via the FCU, and changes from Version 2 to Version 3, it has been decided to supply the kit with the CANMIO-SVO firmware. This TB includes instructions to install the CANMIO Universal firmware or a preconfigured version of the CANMIO Universal firmware without the self-test functionality.

The CANMIO-SVO firmware provides functionality similar to a CANSERVO8C with 8 pre-set input events.

The CANMIO Universal firmware provides significantly enhanced functionality, especially the ability to consume its own events. For example, inputs on the module can activate outputs on the module, signal bounce and 3 position semaphore signals are supported.
Using the CANMIO Universal firmware, functionality similar to that of a CANSERVO8C and CANACE8C can be achieved.

Both firmware options follow the FLiM (Full Layout implementation Model) of CBUS and require the FLiM Configuration Utility (FCU) or similar for setting up. A CBUS to PC interface (for example a CANUSB4, CANPiWi or CANETHER) is required to connect to the PC running the FCU programme. The FCU can also be used to download the latest firmware releases to the module. The FCU should be version 1.4.7.49 or later.

A block schematic of the CANVSERVO is shown below:



The top of the module contains two voltage regulators:

1) The 5V fixed voltage regulator U3. The output from U3 is labelled “VP” and supplies the processor and logic.
2) The 5V adjustable regulator U5. The output from U5 is labelled “U5” and supplies the servos.

The processor block uses a PIC18F26K80 PIC microcontroller with a 16MHz crystal and an MCP2562 CAN transceiver to interface to the CBUS.

The push button and indicators are the standard green, yellow (SLiM/FLiM mode) and power indicator with a miniature push button.

There are two independent 8 channel I/O blocks:

Block 1 for I/O 1 to 8 is configured for servo outputs with serial current limiting resistors and resistor pull ups.

Block 2 for I/O 9 to 16 is configured for inputs, with serial current limiting resistors and resistor pull ups to VP (5V).

A more detailed circuit description is in section 4.

The PCB is 100 x 75 mm in size with four M3 mounting holes on 93 x 68 mm centres.

The CANVSERVO parts list is on page 15, the component layout on page 16 and the schematic is on page 17.

3) Power supply to the module:

The CANVSERVO requires a nominal regulated DC supply of 12V. The quiescent current is about 45 mA with all inputs pulled down to 0V and no servos connected.

For efficiency, 12V regulated DC switch mode mains supplies are recommended, such as the MERG Kit 772, to supply the CBUS modules.

4) Circuit description:

See page 17 for the schematic. (The greyed out components are not supplied with the kit.)

4.1) Module internal power supplies:

The processor, CAN interface and LEDs require 5V DC. A 7805 voltage regulator U3 is used to power the processor and CAN Interface IC. The current requirements are low, and the regulator should not need a heatsink in normal use.

The servos normally require 5V DC. A LM317 adjustable regulator U5 is used to supply an independent 5V supply for the servos. The supplied values of R6 and R7 set the LM317 to output 5V. A heatsink should not be needed when using analogue servos and removing the servo control pulses after the servo has moved to its new position.

4.2) Core:

This is the current core used on CBUS modules, with a CAN transceiver MCP2562 connected to a PIC processor (PIC18F26K80) clocked with a 16MHz crystal.

The green and yellow LEDs together with the push button allow the standard selection and indication of SLiM/FLiM status.

The CANVSERVO includes provision both for in-circuit serial programming (ICSP) and debugging via the header J1.

4.3) I/O Block 1 – 8 Servo Outputs:

The CANVSERVO uses this block for the 8 servo outputs. Each of the PIC outputs goes via a series 1k current limiting resistor (RR4) to the 3 pin header. The 3 wire servo leads plug into these headers K1 to K8.

There is also 10k resistor (RR3) connected to each servo control line that can be connected to VP (5V from U3) or to VO1 (5V from U5) or to 0V via LK9.

The Link LK4 allows the servos to be powered via the CBUS 12V on P1 or via connector P2 when using a separate 12V supply to power the servos independently from the CBUS 12V.

4.4) I/O Block 2 – 8 Inputs:

The CANVSERVO uses this block for 8 Inputs providing hardware functionality similar to a CANACE8C.

The inputs are connected to the PIC via a series current limiting resistor of 1k. There is a 10k pull-up resistor between each input and VP (5V).

The basic mode of operation is that putting a “low” (0V) on an input produces an “on” event and removing the low produces an “off” event as the pull-up resistor biases the input “high” (5V).

5) Setting up the module into FliM mode:

This section describes putting the module into FliM mode so that Event configuration can commence.

It also describes two options in sections 5.1 and 5.2 to download and set up the CANMIO Universal firmware for 8 servo outputs and 8 inputs. The first option requires manual configuration to set the IO channels, the second has the IO channels preconfigured. For either option the module is first put into FliM mode using the firmware supplied in the kit, as described below.

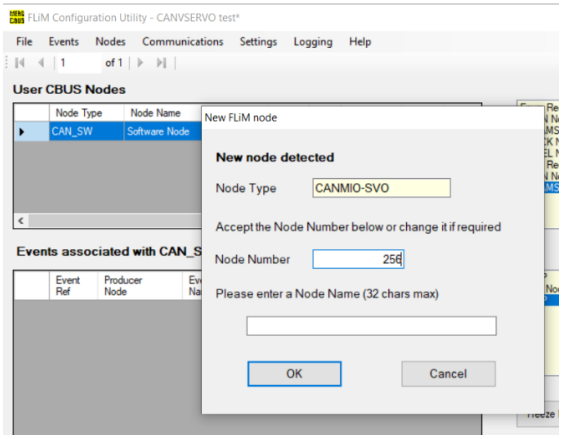
The module is supplied with the CANMIO-SVO firmware, with IO1 to IO8 configured as servo outputs and IO9 to IO16 as inputs.

You can use the LCB Experimenter's Kit (Kit Number: 490) for testing the inputs. The TM1 drives the inputs.

Power up the module and the blue and green LEDs should illuminate.

Connect the CANVSERVO module to your CBUS network and the FliM Configuration Utility. Connecting the CANVSERVO to the CBUS is described in section 7 of this TB.

5.0.1) The next set of instructions on this page put the CANVSERVO into FliM mode using the FCU.

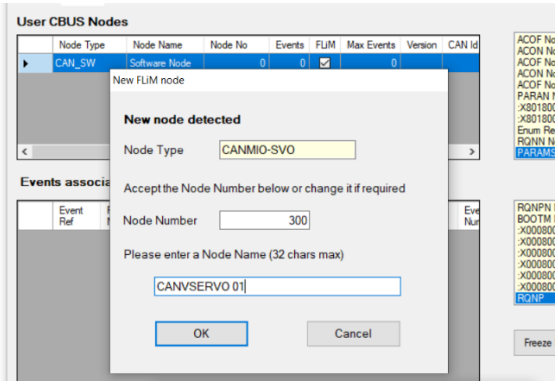


When everything is connected and the FCU is running, press and hold down the push button on CANVSERVO until the green LED goes out.

On release, the yellow LED should be flashing, and a popup will appear on the FCU screen similar to the adjacent screen shot.

The Node Type indicates the CANMIO-SVO firmware.

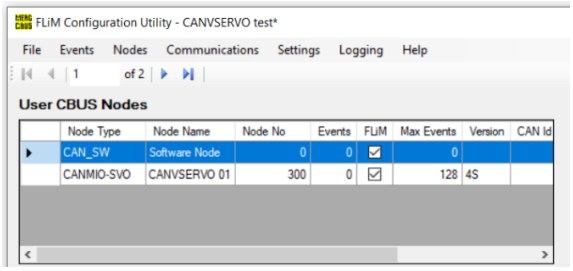
The Node Number is the default offered by the FCU.



You can use the default Node number or overwrite it. The example uses 300.

You then enter a Node Name. The example used CANVSERVO 01. It can be editted later using the FCU.

Click on “OK” to make the changes.



The green LED remains extingushed and the yellow LED will stop flashing and remain illuminated on the CANVSERVO.

The new Node is now shown in the “User CBUS Nodes” window.

The CANVSERVO is now set in FliM mode ready for configuration using the FCU.

If you want to continue using the supplied CANMIO-SVO firmware go to section 5.1.

If you want use the CANMIO Universal firmware there are two options:

1) Install the CANMIO Universal firmware (which defaults to all inputs) and configure it for the CANVSERVO hardware as described in section 5.2.

2) Install a preconfigured version of the CANMIO Universal firmware for the CANVSERVO hardware as described in section 5.3.

5.1) CANMIO-SVO firmware:

The CANMIO-SVO Node is now in the FCU ready for configuration.

The CANMIO-SVO firmware is fully supported by the FCU and information on configuring the CANMIO-SVO firmware is in the FCU CBUS Modules Guide - section 2.7.

The Module Guide is available via the MERG Software Wiki in the CBUS Software section:
See the CBUS FliM Configuration Utility (FCU).

Use this link to access the FCU Home Page:
https://www.merg.org.uk/merg_wiki/doku.php?id=cbus_flim:cbus_flim

For information on downloading the CANMIO-SVO firmware see section 6.1.

End of section 5.1

5.2) CANMIO Universal firmware:

This section details how to install the firmware and use the Node Variables (NVs) to set up the 16 IO channels, to provide the basic 8 servo outputs and eight inputs. There are numerous options in setting up the channels, which are beyond this TB. See section 6 for pointers to further information.

5.2.1) The first step is to install the CANMIO Universal firmware. You need a copy of the current CANMIO Universal Hex file on your computer (see section 6.2). Ensure you get the version for the18F26K80 and 16MHz frequency.

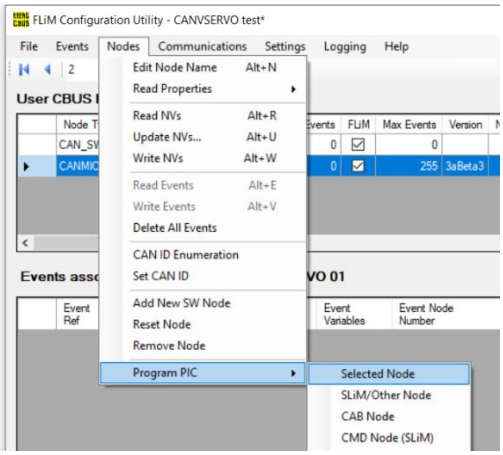
The firmware is supplied in a Zip file. Un-zip the file to extract the hex file which will be used to program the PIC.

This step assumes you have the CANVSERVO configured in FliM Mode as described at the start of section 5.

Highlight the new CANVSERVO Node.

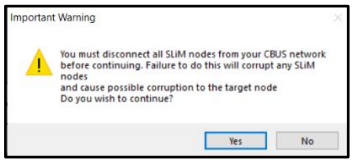
From the Node drop down menu select “Program PIC”.

In the next drop down, menu select “Selected Node”.



A warning notice appears.

Follow the advice, and then click on “Yes”.

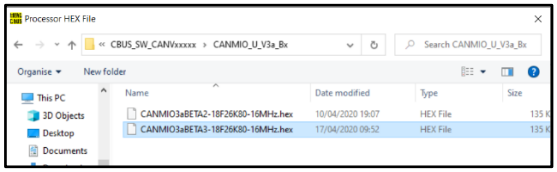


A pop up window appears.

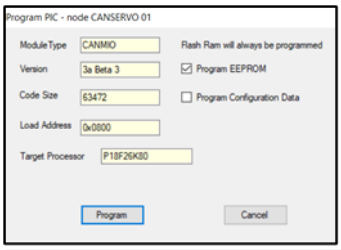
Locate the Hex File for the version of the CANMIO Universal firmware you have installed on your computer.

Ensure that you use the version for the 18F26K80 and 16MHz frequency. In the example, the CANMIO Universal Version 3a Beta 3 is being downloaded.

Select “Open” to select the Hex file.

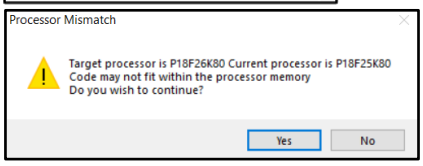


If a Program Pic pop up window appears, you are overwriting the same firmware type.
Tick the “Program EEPROM” box.
Select “Program” to start the programming sequence.
The next two warning messages may not appear, and programming may commence immediately.



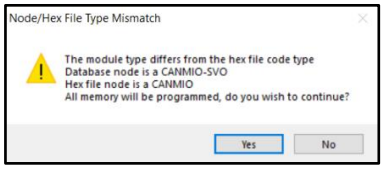
A warning message appears. It is slightly ambiguous as the current processor in the kit is actually a 26K80. The 25K80 message is based on the assumption that the CANMIO-SVO uses a 25K80.

Select “Yes” to continue.



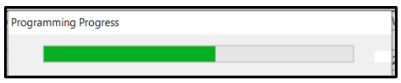
A second warning message appears. This is correct as we are loading the CANMIO Universal over the CANMIO-SVO firmware.

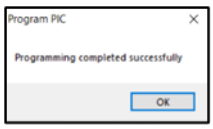
Select “Yes” to continue.



A progress bar appears and eventually the “Programming completed successfully” message appears.

Select “OK” to complete the programming.





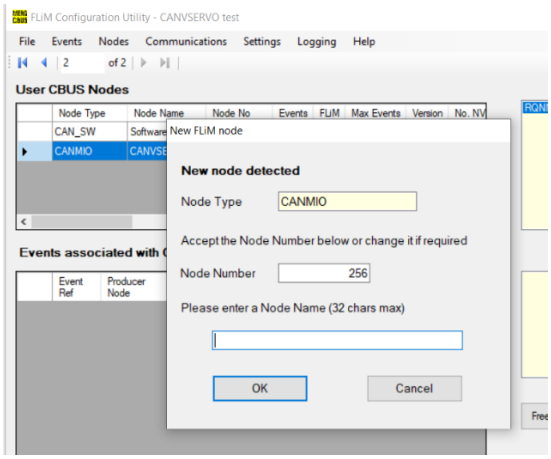
The CANVSERVO Node has been removed from the FCU.

If the CANVSERVO’s green LED remains extinguished, take the power off the CANVSERVO, and repower. The green LED should illuminate (after a short delay), indicating that CANVSERVO is now running the CANMIO Universal firmware.

5.2.2) This set of instructions puts the CANVSERVO into FliM mode so that the IO channels can be set up.

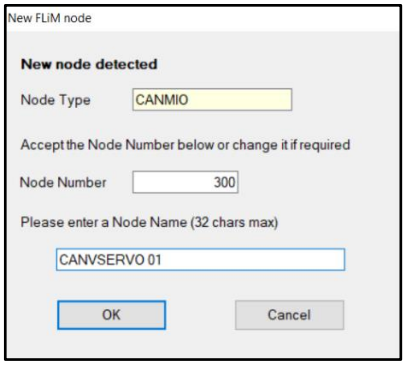
Press the push button on CANVSERVO until the green LED goes out.

On release, the yellow LED should be flashing, and a popup will appear on the FCU screen similar to the adjacent screen shot.



The Node Type indicates the CANMIO firmware. The Node Number is the default offered by the FCU.

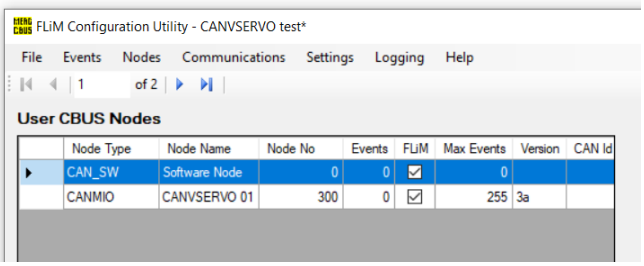
You can use the default Node number or overwrite it. The example uses 300.



You then enter a Node Name. The example uses CANVSERVO 01. It can be editted later using the FCU.

Click on “OK” to make the changes.

The green LED remains extingushed and the yellow LED will stop flashing and remain illuminated on the CANVSERVO.



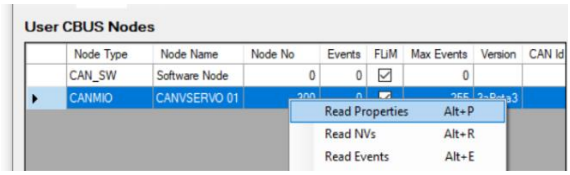
The new Node is now shown in the “User CBUS Nodes” window.

The CANVSERVO is now set in FliM mode ready for configuration.

……

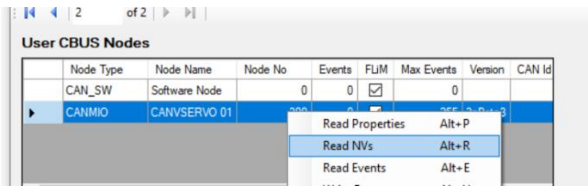
5.2.3) This next set of instructions sets up the Node Variables NVs of the CANMIO Universal firmware to configure it from its default 16 inputs to the CANVSERVO 8 inputs and 8 servo outputs.

Highlight the CANVSERVO 01 Node and right click to access the drop down menu and select “Read Properties”.



Click on “Close” to remove the properties information window.

Again, highlight the CANVSERVO 01 Node, and right click to access the drop down menu and select
“Read NVs”.



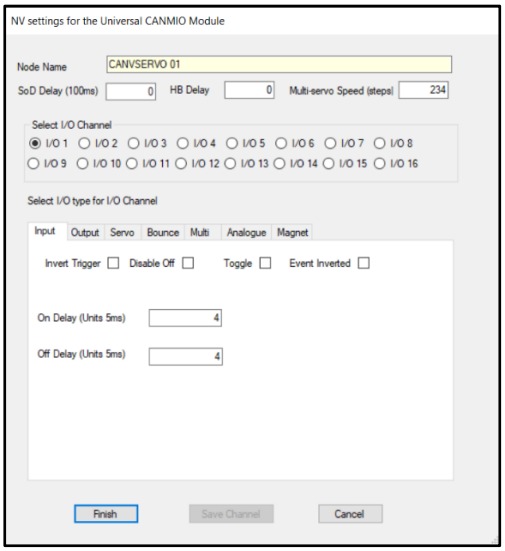
The NVs will be read from the CANVSERVO.

Double click on the highlighted CANVSERVO Node.

The NV settings menu pops up.

Each of the 16 I/O channels can be selected and the I/O type set for each I/O channel.

The default type is Input as shown. All 16 channels are set as inputs, which is the default for the CANMIO Universal firmware.



For the CANVSERVO we need to set the following:

I/O1 to I/O8 to the Servo type.

Inputs I/O9 to I/O12 are modified, as the default settings have the internal pull ups on the PIC enabled. The CANVSERVO has external pull ups and serial current limiting resistors, so the PIC internal pull ups need to be disabled.

I/O13 to I/O16 do not need to be changed unless you want to change the Input defaults.

The first task is to change I/O1 to I/O8 to the servo type.

Select each channel in turn and do the following:

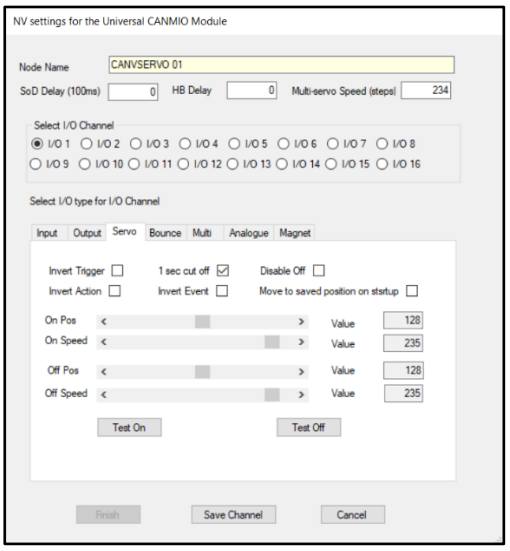
Select the Output Tab and the options are shown. In the example on the right the “1 sec cut off” action is pre-selected (this turns off the servo control pulses 1 sec after the servo reaches its end point).

Do not worry if you are not sure of the servo settings you want to use at this time. You can change them at any time. The purpose is to change the channel type to a servo output.

Select the “Save Channel” at the bottom of the menu.

Repeat for I/O2 to I/O8.

When you have selected “Save Channel” for I/O8, select “Finish” which will load the NVs into the CANVSERVO.



The final task is to disable the PIC internal pull ups on I/O channels 9 to 12.

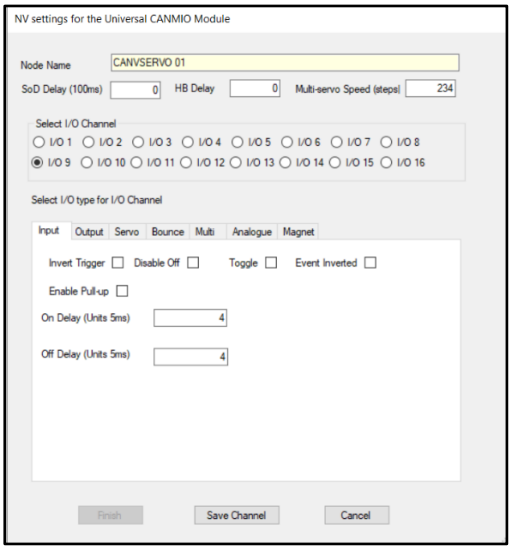
Double click the CANVSERVO Node to open the NV settings menu and select I/O channel 9.

Click on “Enable Pull-up” to disable the internal pull up. The tick should disappear as shown on the right.

Select the “Save Channel” at the bottom of the menu.

Repeat for I/O10 to I/O12.

When you have selected “Save Channel” for I/O12, select “Finish” which will load the NVs into the CANVSERVO.



This completes the basic set up of the CANMIO Universal firmware on the CANVSERVO.

For more information on using the CANMIO Universal firmware, see section 6.2.

End of section 5.2

5.3) CANMIO Universal preconfigured firmware:

This section details how to install the preconfigured firmware, which is in FLIM mode and set up to provide the basic 8 servo outputs and eight inputs.

5.3.1) The first step is to install the preconfigured firmware. You need a copy of the current CANVSERVO preconfigured firmware on your computer (see section 6.3).

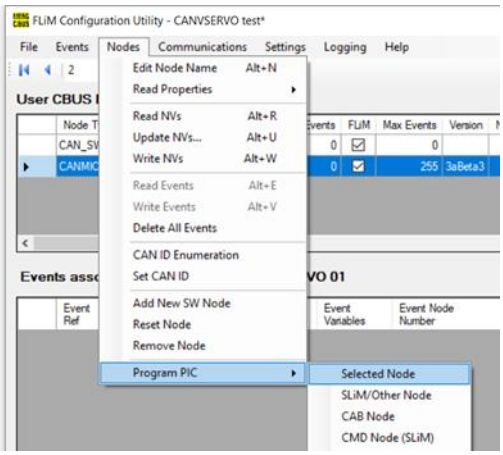
The firmware is supplied in a Zip file. Un-zip the file to extract the hex file which will be used to program the PIC.

This step assumes you have the CANVSERVO configured in FliM Mode as described in start of section 5.

Highlight the new CANVSERVO Node.

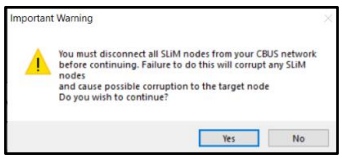
From the Node drop down menu select “Program PIC”.

In the next drop down menu select “Selected Node”.



A warning notice appears.

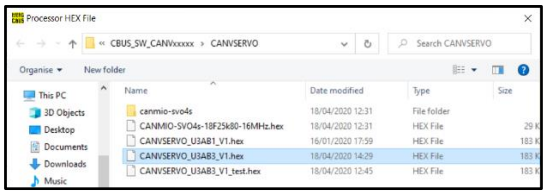
Follow the advice, and then click on “Yes”.



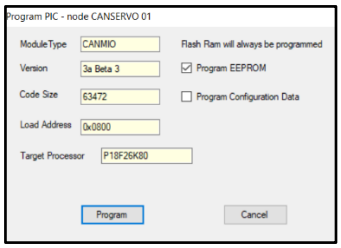
A pop up window appears.

Locate the Hex File for the version of the CANVSERVO preconfigured firmware you have installed on your computer. In the example, the CANVSERVO U3AB3 _V1 is being downloaded.

Select “Open” to select the Hex file.

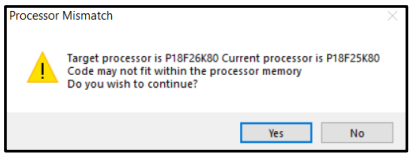


If a Program Pic pop up window appears, you are overwriting the same firmware type.
Tick the “Program EEPROM” box.
Select “Program” to start the programming sequence.
The next two warning messages may not appear, and programming may commence immediately.



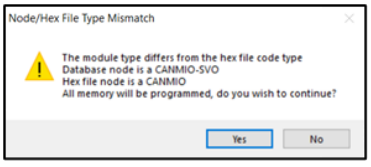
A warning message appears. It is slightly ambiguous as the current processor supplied in the kit is actually a 26K80. The 25K80 message is based on the assumption that the CANMIO-SVO uses a 25K80.

Select “Yes” to continue.



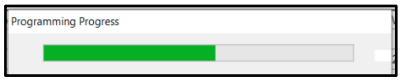
A second warning message appears. This is correct as we are loading the CANMIO Universal over the CANMIO-SVO firmware.

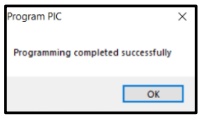
Select “Yes” to continue.



A progress bar appears and eventually the “Programming completed successfully” message appears.

Select “OK” to complete the programming.





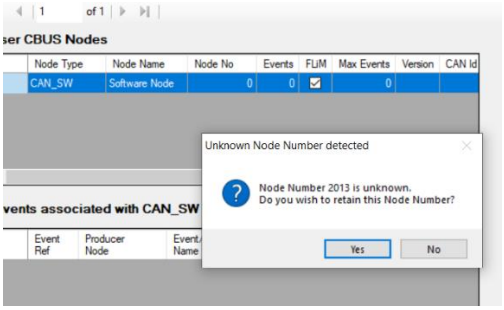
The CANVSERVO Node has been removed from the FCU.

If the CANVSERVO’s yellow LED remains extinguished, take the power off the CANVSERVO, and repower. The yellow LED should illuminate (after a short delay), indicating that CANVSERVO is now in FliM mode running the preconfigured CANMIO Universal firmware.

5.3.2) This set of instructions puts the CANVSERVO as a Node in the FCU.

Press the push button on CANVSERVO for about a second.

On release, the yellow LED should be flashing, and a popup will appear on the FCU screen similar to the adjacent screen shot.



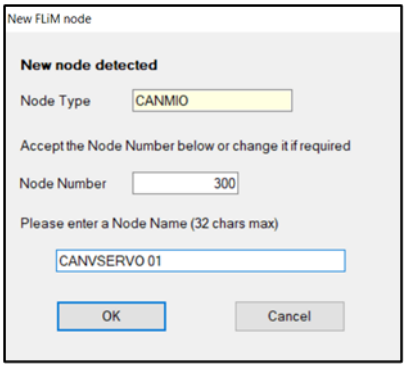
The Node Number is 2013 which is the default for the CANVSERVO preconfigured firmware.
As you will probably want to change the Node Number, select “No”.

A new pop up appears.

You enter the Node Number. The example uses 300.

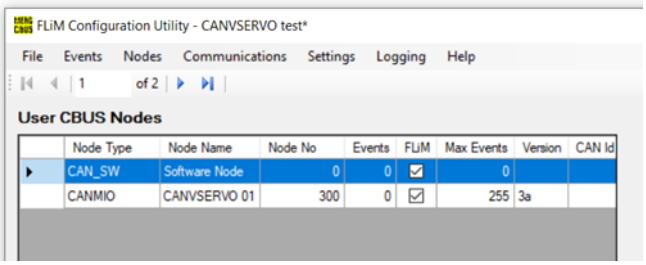
You then enter a Node Name. The example uses CANVSERVO 01. It can be editted later using the FCU.

Click on “OK” to make the changes.



The yellow LED will stop flashing and remain illuminated on the CANVSERVO.

The new Node is now shown in the “User CBUS Nodes” window.

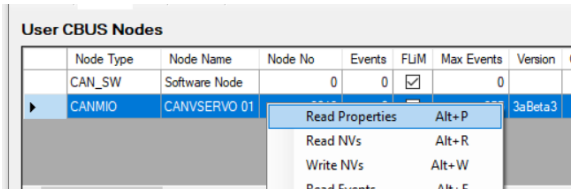


……

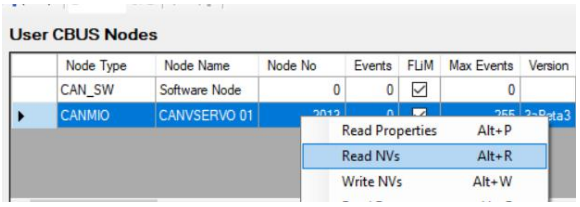
5.3.3) This set of instructions reads the Node Variables (NVs) of the preconfigured CANMIO Universal Firmware into the FCU.

Highlight the CANVSERVO 01 Node and right click to access the drop down menu and select “Read Properties”.

Click on “Close” to remove the properties information window.



Again, highlight the CANVSERVO 01 Node, and right click to access the drop down menu and select
“Read NVs”.



This completes set up of the CANMIO Universal preconfigured firmware on the CANVSERVO.

For more information on using the CANMIO Universal firmware, see section 6.3.

End of section 5.3

6) CANVSERVO firmware options:

The CANVSERVO Kit 13 is supplied with a PIC18F26K80 processor running at 16MHz and the PIC is labelled "CBUS VSERVO".

The kit is supplied with the CANMIO-SVO firmware.

Section 6.1 describes locating and downloading the latest release of the CANMIO-SVO firmware.

Section 6.2 describes locating and downloading the latest release of the CANMIO Universal firmware, and where to find information on using the firmware.

Section 6.3 describes locating and downloading the latest release of the preconfigured version of CANMIO Universal firmware for the CANVSERVO, and where to find information on using the firmware. This preconfigured version sets the module in FliM mode with CANMIO Universal firmware set for the CANVSERVO with 8 servo outputs and 8 inputs.

6.1) CANMIO-SVO firmware:

The Latest version of the CANMIO-SVO firmware is available to download from the MERG Software Wiki.

It is in the "CBUS modules and firmware downloads" area, see the "CANMIO" entry. The firmware is in the CANMIO-SVO section. Use the link: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus:canmio#canmio-svo

The firmware is in the zip file "CANMIO-SVO version xx for the 18F25K80 and 16MHz resonator". Where xx is the version number.

After extracting the files from the zip file, use the firmware: "CANMIO-SVOxx_18F25k80_16Mhz.hex". The firmware runs on the 18F26K80 and 16MHz crystal supplied in the kit.

6.2) CANMIO Universal firmware:

The latest version of the CANMIO Universal firmware is available from the MERG Software Wiki.

It is in the "CBUS modules and firmware downloads" area, see the "CANMIO Universal firmware" entry.
Use the link: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus:canmio_fw

See the section "Latest Hex Files" for the current version. Select the zip file for the PIC18F26K80 to download.

The extracted file is "CANMIOxx-18F26K80-16MHz.hex", where xx is the version information.

See the "Documentation" section for various guides on using the CANMIO Universal Firmware.

As of March 2020, the FCU supports Node Variable setting and has partial support for Event Variable setting using the generic Event Setting screen.
For more information on using the CANMIO Universal firmware with the FCU, download the FliM Utility user guides from the MERG Software Wiki: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus_flim:cbus_flim

> See the release notes for version 1.4.7.48 for the initial information on the FCU support for the CANMIO Universal firmware.

6.3) CANMIO Universal preconfigured firmware:

The preconfigured version of the CANMIO Universal is configured in FLiM mode with a Node Number (NN) of 2013 and CANID of 13.

Channels IO1 to IO8 are set to servo outputs with the default 1sec cut off, on position 108, off position 148 and on/off speed 236. This provides a small movement of the servo, which is useful to determine they are working.

Channels IO9 to IO16 are configured as inputs, using the CANMIO Universal firmware default settings for input, but with the internal pull ups on IO9 to IO12 disabled because the CANVSERVO has external pull-ups.

The preconfigured version of the CANMIO Universal for the CANVSERVO is downloadable from the MERG Software Wiki in the “CBUS modules and firmware downloads” section.
The preconfigured firmware for the CANVSERVO is in the “CANVxxxxx” link.
Use the link: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus:canvxxxxx#canvservo

Download the zip file, the extracted file is “CANVSERVO_x_y.hex”, where _x_y is the version information.

For more information on using the CANMIO Universal firmware, see the “Documentation” section of the CANMIO Universal Wiki. Use the link: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus:canmio_fw

As of April 2020, the FCU supports Node Variable setting and has partial support for Event Variable setting using the generic Event Setting screen.
For more information on using the CANMIO Universal firmware with the FCU, download the FliM Utility user guides from the MERG Software Wiki: https://www.merg.org.uk/merg_wiki/doku.php?id=cbus_flim:cbus_flim

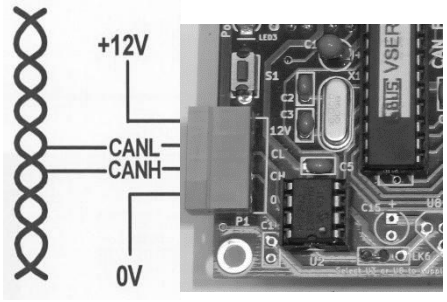
> See the release notes for version 1.4.7.48 for the initial information on the FCU support for the CANMIO Universal firmware.

7) Connecting the module to the CBUS network:

The CANH and CANL wires go to all modules. They are polarity sensitive so CANH must go to CANH and CANL to CANL. These wires should ideally be a twisted pair although screening is not necessary. The 0V needs to be connected to all modules.

The CBUS wiring should be kept separated from any DCC supply wiring to prevent possible interference.

Connections to the CANVSERVO module are shown opposite.



It is best practice to wire the bus sequentially round the various modules with a termination of 120 ohms at each end.

The ‘termination’ resistors serve two purposes: Primarily as a load for the CANH and CANL to ensure the bus returns to a recessive state from a dominant state. The secondary function is for impedance matching the ends of the CAN bus twisted pair cable, although this is less important for the bus speed and the bus lengths we typically use.

Stub connections to the bus are permitted and are typically used by the plugin CANCABs.
The “CAN In Automation” Web site gives guidance that stub connections can be up to 110m in total length with a single stub no longer than 22m.

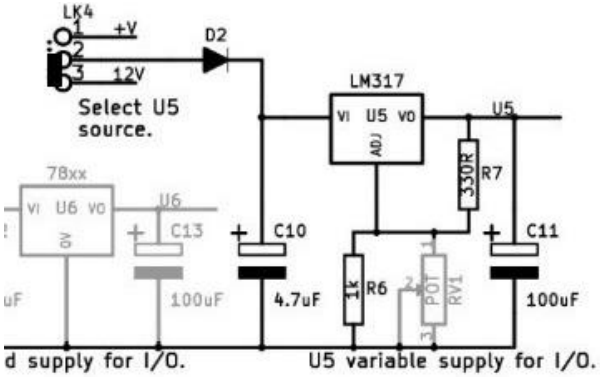
For additional detail regarding the cabling of your CBUS network see Technical Bulletin CBUS-10 ‘Planning for CBUS on Your Layout’.

……..

8) Connecting the servos and inputs to the module:

8.1) I/O Block 1 (Servo outputs):

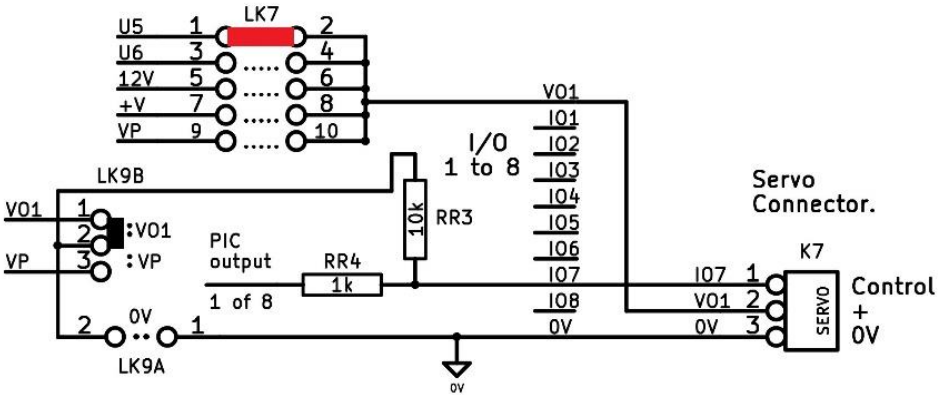
The schematic below shows the two supply options to U5 the adjustable regulator supplying 5V to the servos:



As built, LK4 has the jumper link in the “12V” position so the servos are effectively powered from the CBUS connector 12V supply.

To power the servos from a separate 12V DC supply, use the two way connector P2. Connect 0V to P2/1 “0V” and connect 12V to P/2 “+V”. Finally change the LK4 jumper link to the “+V” position to feed the separate 12V to regulator U5.

The schematic below shows the links options for powering the servo and biasing the servo control line.



As built, link LK7 is hard wired in the U5 position (5V from the adjustable regulator) to supply power to the servos via VO1.

The link LK9 is used to bias the control line, via RR3, to the servo to reduce/eliminate twitching. LK9B is normally used to bias the control line to VO1 (5V servo supply).

There are two options for supplying 5V to RR3: The first is from VO1 which is the 5V servo supply from the adjustable regulator U5. The second is from VP, the 5V regulator U3 that supplies the processor. This can be used if using a separate 12V supply to the servos so the bias supply is removed when the CBUS supply is off, even if the servo supply remains on. This removes any risk of back feeding the PIC I/O pins via the resistor arrays when the PIC is not powered.

If you have followed the build instructions, the link LK9B will have the jumper link in the VO1 position, biasing the pull-up to 5V from U5, which works for the majority of servos.

If the servo still twitches remove LK9 shorting link and try biasing the control line at 0V by fitting link LK9A only (not supplied with Kit 13).

The adjacent diagram shows the 3 wire servo connections:

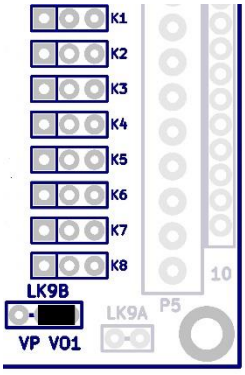
The servos connect via the eight 3 way headers:
IO1 to K1 up to IO8 to K8.

The left hand pin connects to the servo control line.

The centre pin is the positive VO1 (5V) supply to the servo.

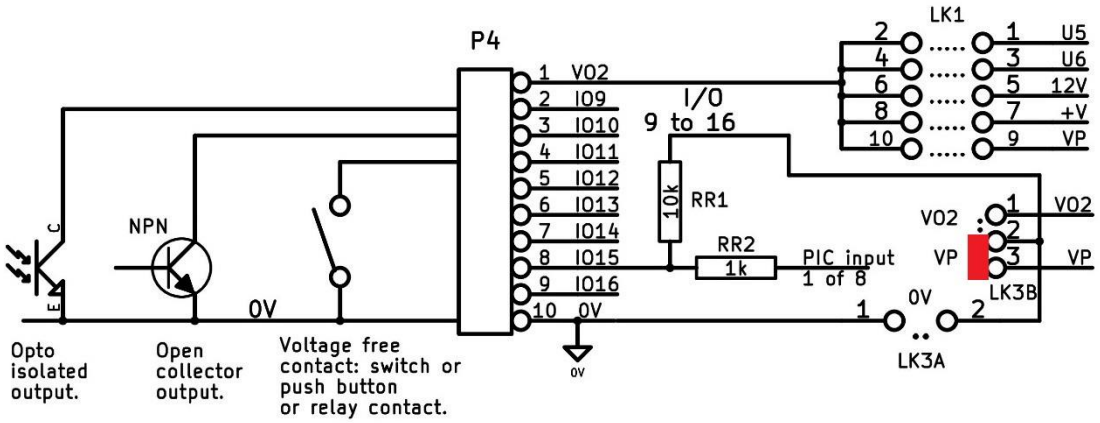
The right hand pin is the 0V supply to the servo.

Carefully check the servo wiring colours and documentation to ensure the servo is plugged in the correct way round.



8.2) I/O Block 2 (Inputs):

The schematic below shows typical input connections with I/O Block 2 configured for inputs:



The module is configured with LK3B linked in the “VP” position to connect to the PIC microcontroller supply, so the inputs are pulled up via the resistor RR1. To activate an input, it is taken down to 0V. So, the CANVSERVO expects “active low” inputs, which is the standard configuration for MERG ToTIs, detectors, etc..

The low input needs to be less than 0.8V to be detected by the PIC, so avoid using feedback modules with Darlington outputs as these may not go below 0.7V which gives little margin for reliable operation.

LK1 (not supplied in the kit) can be used to provide a supply (VO2) on P4 pin 1 which can be used to power the feedback modules.
As built, the CANVSERVO can provide 12V from the CBUS 12V, 12V from +V (via P2), 5V (via VP) from the processor 5V supply U3 or 5V (via U5) from the 5V supply to the servos.
If using VP (5V) to supply more than 40/50mA to the feedback modules, consider adding a heatsink to U3 or add a separate regulator 5V regulator U6.

More information on fitting onboard regulators is available in the CAN FLIM IO E documentation in Section 4.1. The documentation is available via the information button on the CAN FLIM IO E PCB in the CBUS PCB section of the kit locker.

Use this link to go to the Kitlocker CBUS PCB page:
https://www.merg.org.uk/merg_kitlocker/section.php?id=25

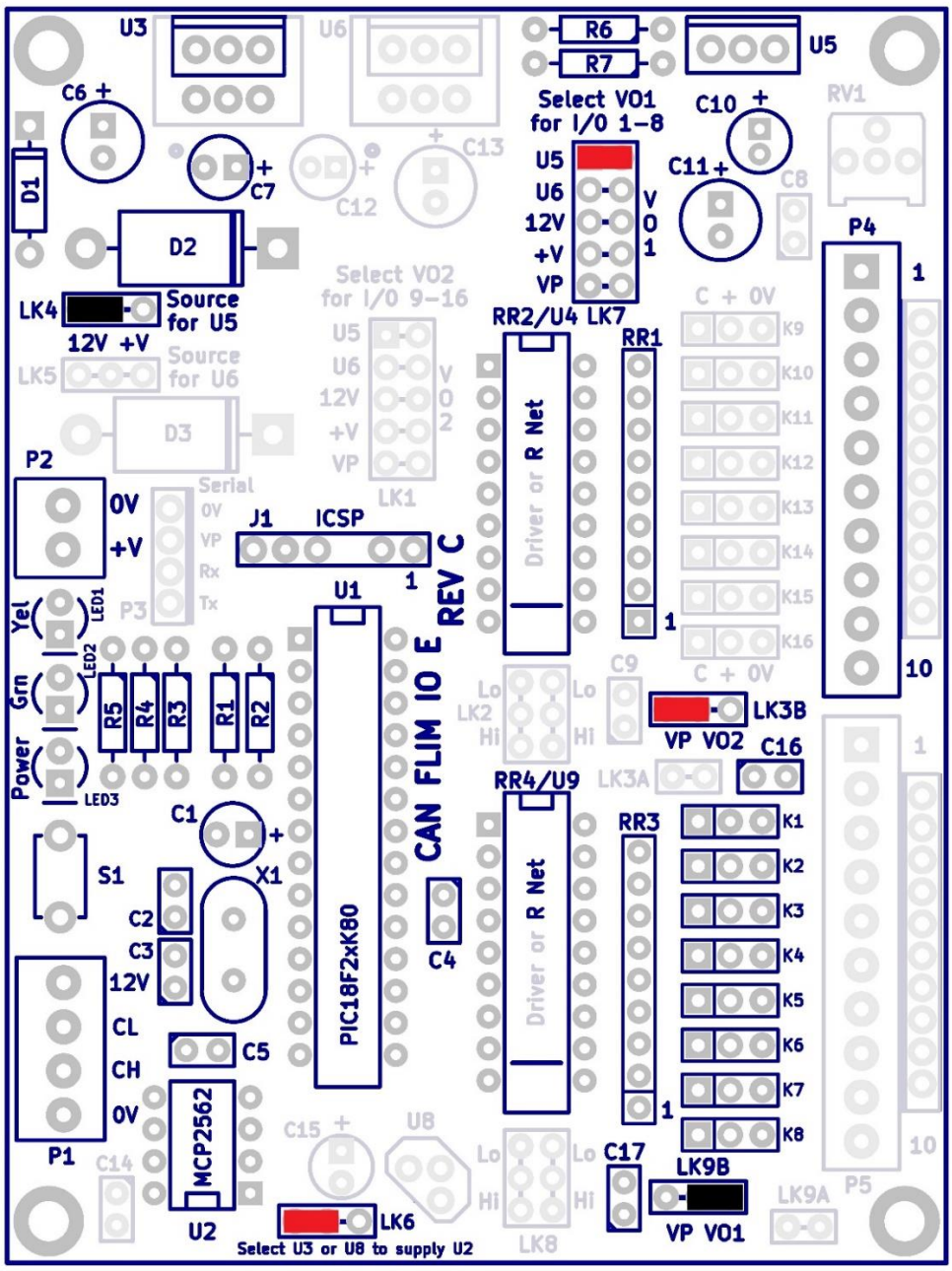
9) Parts list:

Note that many of the components are now supplied in multiples.

If any components are found to be discontinued consult the MERG Preferred Component List for alternatives.

Circuit ID	Component	Supplier (Rapid unless otherwise stated)
(U1), (U2), (RR2/U4), (RR4/U9)	28 pin, 8 pin, 18 pin and 18 pin dual in line sockets	
R1, R2, R5	10k 1/4W 5% carbon film resistor	62-0394
R3, R4	1k8 1/4W 5% carbon film resistor	62-0376
R6	1k 1/4W 5% carbon film resistor	62-0370
R7	330R 1/4W 5% carbon film resistor	62-0358
RR1, RR3	10k 8 common resistor SIL network 9 pin	63-0230
RR2, RR4	1k 8 resistor DIL array	63-0645
C1	10µF 10V tantalum capacitor 2.5mm pitch	11-1004
C2, C3	22pF NPO ceramic capacitor 2.54mm pitch	11-3427
C4, C5, C16, C17	100nF Y5V ceramic capacitor 2.54mm pitch	11-3455
C6, C11	100uF 25V electrolytic capacitor 2.5mm pitch	11-3509
C7	4.7uF 10V tantalum capacitor 2.5mm pitch	11-1018
C10	4.7uF 63V electrolytic capacitor 2mm pitch	11-3502
J1	ICSP MERG programming header	Part of 22-0545
K1, K2, K3, K4, K5, K6, K7, K8, LK4, LK9B	3 way header	Part of 22-0545
(LK4), (K9B)	2 way jumper link	22-0692
P1	4 way 3.5mm side entry PCB socket	21-3029
(P1)	4 way 3.5mm free plug	21-3036
P2	2 way 3.5mm side entry PCB socket	21-3027
(P2)	2 way 3.5mm free plug	21-3034
P4	10 way 3.5mm pitch side entry PCB socket - IMO	Farnell 2575221
(P4)	10 way 3.5mm pitch free plug - IMO	Farnell 2575213
S1	4.3mm miniature rectangular pushbutton	78-1120
X1	16MHz HC-49U crystal, 18pF load capacitance	Farnell 2508458
D1, D2	1amp diode IN5819	50-0305
LED1 Yel	3mm yellow low current	56-0410
LED2 Grn	3mm green low current	56-0405
LED3 power	3mm blue (clear body)	55-1476
U1	PIC18F26K80-I/SP PIC microcontroller	Farnell 1823165
U2	MCP2562-I/P or MCP2562-E/P CAN transceiver	Farnell 2362838
U3	7805 regulator 5V 1A TO-220 case	47-3290
U5	LM317 adjustable regulator 1A TO-220 case	47-3321
PCB	CAN FLIM IO E Rev C	Kitlocker 911

10) PCB component layout (The greyed out components are not supplied with the kit)**:**



The three wire links, shown in red, are required for operation and fitted as part of the CANVSERVO kit build.

LK3B is fitted in the “VP” position. This provides the 5V (VP) supply to the resistor array that pulls up the 8 inputs to 5V.

LK6 is fitted in the “U3” position to set the source of the 5V supply to the CAN Transceiver U2.

LK7 in the “U5” position to supply the servos from the onboard regulator U5.

The two jumper links, shown in black, are required for operation and fitted as part of the CANVSERVO kit build.

LK9B is fitted in the “VO1” position. This provides the 5V to the resistor array that pulls up the 8 servo control lines to 5V.

LK4 is fitted in the “12V” position to set the source to the 5V regulator for the servos to the CBUS 12V on P1.

Acknowledgements and Copyright.

Module Design, PCB Layout and Kit documentation – Ian Hart M546.
CANMIO-SVO Firmware – Pete Brownlow M1741 *CANMIO Universal Firmware - Ian Hogg M5144.*
Technical Bulletin – Ian Hart. Reviewed by Martin Perry M1481.

11) Circuit schematic (The greyed out components are not supplied with the kit)**:**