

Motion Application Program



Users Guide



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MAP introduction:

Motion Application Program or MAP is a new way to programme motion control systems. The programme consists of a database manager and a motion control kernel. The database is used to store commands and position data for the motion control command sequence. The end user is presented with a user friendly front end with which to manipulate the database. The database can contain up to 65,000 different commands and due to the structure of MAP, it is a simple matter to change the system to suit another application.

Map is a very flexible language written in 'C'. It is easily adapted to other applications, as each of the user functions is written as a case statement. Adding commands is a quick and easy matter.

The user interface consists of an editor with a user friendly interface that has a down menu system. Upon accessing the commands menu for example, the user is presented with a list of possible commands, the up and down arrow keys are then used to highlight the commands the user wishes to insert into the programme. Once the command is highlighted it may be entered in to the database by pressing the Enter key, then by using the right or left Arrow keys the user simply moves the cursor to the information they wish to edit. The system is programmed to accept data in a strict format which prevents the end user from entering erroneous data. If the end user attempts to enter data incorrectly the system will prompt advising the user of the data limits.

From a users point of view a major benefit of using MAP is that no technical knowledge is required in order to programme the system. Using the MAP database principle any advanced application programme may be written such that the end user has a similar interface.

A system requires calibration information in order to operate to standard measurements. The end user must programme the limits for the system these include system calibration, that the positive and negative limits need to be programmed.

Starting a MAP system for the first time:

When a controller is turned on for the first time the opening menu will be displayed. Before using the controller or doing anything else, the user is required to install the system. This is very simple and involves little that would cause concern to anyone, with a little knowledge about the system they are installing the equipment on. Most of the menus have associated help messages.

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The Welcome menu:

Please see the opening menu below:



Welcome Menu



Language selection

Use this Menu to select the language (Spanish or English)



Technical Menu

All the technical information the controller needs to run the machine is stored here. For more information please review the Installation Manual.



Edit Create Menu

Use this Menu for creating or editing programs. From this menu the user has access to the Memory Menu from where the user can store programs, delete programs delete the whole directory etc. From this menu the user can also execute programs



Operator Menu

Use this Menu for running programs stored in memory. From this menu the user can not modify or create programs or delete programs.

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Language selection:

From the *Welcome menu* select option F7 Languages, a pop up menu box will appear as shown in figure below:



Language Selection

Use the up and down arrow keys to select the required language then press **ENTER**. Press **MENU** to exit without change.

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Edit/Create menu:

When the controller is new it will have no data loaded into the menu. Select the Edit/Create icon from the welcome menu, the controller will present you with the menu shown below:



Edit/Create Menu

The text in the box at the top of the screen is intended to help with data entry as each command has its own header. Where the No. represents the line number of the program, Command is the name of the MAP command and data is entered under the prompt above. Where there is a zero prompt I.E. * no data should or can be entered. The menu has a hint which is displayed just above the lower white box this hint changes to indicate to the operator what information is required. The lower box shows the file information, this includes the file name and the file number. Where the program is new and not linked to a file the system will call the file Noname with the file number 0.

					
Commands	Menu	Delete	Display Reg and Graph	Run	Abort
F3	F4	F5	F6	F7	F8

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Commands

Press the **F3** key to reveal the commands pull down menu, most motion control programmes will begin with either a SPEED or MOVE command. After pressing F1, the controller will display the pull down menu as shown below:

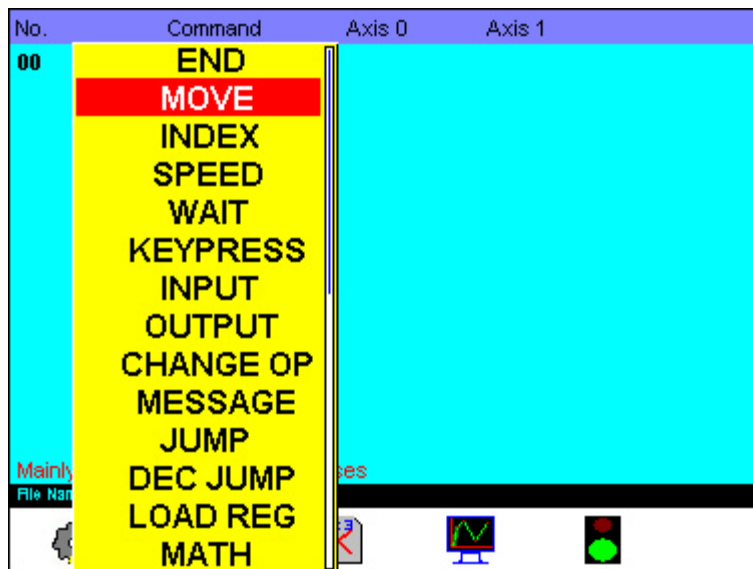


Figure 23 Edit/Create Menu with pull down menu

The desired command is selected by moving the cursor to the instruction required, using the arrow keys. Once the desired command is highlighted pressing the **ENTER** key will cause the command to be entered on the current highlighted line. Any existing commands will be moved down one position. In the example shown above after pressing **ENTER** the command list would read **MOVE** on line 0 and **END** on line 1. If the menu has been selected in error pressing **MENU** will exit the menu without changing the data base. After entering a command the controller will now display the new Command in the data base. Move the cursor to the first data location (I.E. to the right of the command) and enter data using the number keys followed by the Enter or right arrow key. Some command require data to be entered for two axis this will be indicated by a heading above the column. If a value is entered that exceeds the system maximums a message box will be drawn this will prompt the user with the maximum data value, when the user acknowledges the error the system will enter the maximum value in the data base.

If a typing error is made, the left hand **ARROW** key can be used to delete the last character typed.

A description of the standard MAP commands follows:

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NOTE: The examples below assume that all values for axis 2 are '0' for all the examples which means that not movement will be executed in that axis.

The set of commands are organised by type. There are for types:

Motion Control
Input / Output
Program Flow
Maths & Data

Motion Control Commands

MOVE:

The move command as it might suggest causes the controller to move one or more axis. **All moves are automatically interpolated moves.** Since an axis will only move when the system encounters a **MOVE** command and there is a difference in the old/new positions. Therefore it is simple to move only one axis if required by changing the position data for only one axis between two or more MOVE commands. The Move command works by taking the position at which the axis currently are, and moving all the axis together in an interpolated move, therefore if an axis has its current and new positions programmed the same, then the axis will not move, only axis which have a new and different destination will move. The movement will take place in the following sequence:

1. The controller will calculate the distance of each axis relative to its current position.
2. The controller will then work out which is the master axis (the master axis is the one which is moving the greatest distance), where more than 1 axis are Masters because all are moving the same amount, the controller will use the lowest number as the master.
3. The controller will then ensure that none of the axis will be running at greater than its maximum speed, the speed therefore, is the maximum speed of the slowest axis. The move Command may include positive or negative moves if the axis has been programmed to accept negative moves in the calibration menu.
- 4.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200. Please remember that MOVE command is a Linear interpolation command.
01	MOVE	150.00	300.00	0.00	Move axis '0' to 150 mm and axis '2' to 300. Please remember that MOVE command is a Linear interpolation command.
02	END				End of program. The program will run as a loop

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Note: in the example above we assume that the axis are set as 'Absolute' in the technical menu.

INDEX:

This command is similar to the MOVE command explained above but it indicates a relative position so if the command is INDEX 5, the axis will advance 5 mm from the current position.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	END				End of program. The program will run as a loop

DO_MOVE.....WHILE

This command is a conditional Move command, It will move the distance set by the user unless the condition is not true. Note that this command requires the user to "close" the command by entering a **WHILE** command.

No	Command	Data1	Data2	Data3	Explanation
00	DO_MOVE	100.00	0.00		The axis 0 (Data1) will start to move to 100.00 and axis 1 (Data2) will remain in 0.
01	LOAD	R05	IP.b	2	Loads the Register 5 (R05) with the logic value of the input 2 (Data2).
02	WHILE	R05	==	0	This is the end of the DO_MOVE-WHILE command. the Loop will repeat as long as the condition stated here is met or the DO_MOVE distance has not reach its maximum set (100.00 in this example). In this example, if the register R05 is loaded with '0' the execution of the program will jump to the DO_MOVE command and execute all the lines in between, in this case only the LOAD command. The == parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 6 options.
03	MOVE	0.00	0.00		Moves axis 0 and axis1 (Data1 and Data2) to zero
04	END				End of program. The program will run as a loop

HOME

The HOME Command allows the user to calibrate with '0' reference (home sensor) at any time. It is good to clarify that a MAP program does not require a home command because it automatically makes the Home routine at the beginning of the program. So this HOME command is only for executing extra home routines.

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G_code

This command allows to execute a G-code program created externally. This is an excellent command for CNC machines of up to 3 axis. The user generates the G-code, it could be via a CAD/CAM software or manually and then by using the USB port the user loads the file into the controller and execute it.

No	Command	Data1	Data2	Data3	Explanation
00	G_CODE	horse.tap			The program will execute the g-code program call 'horse.tap'. and after finish executing the g-code the program will continue with the next MAP instruction. For selecting the g-code file 'horse.tap' the user has to position the cursor on the Data1 parameter and press ENTER, a pop up window appears where the user can select what g-code file to upload. By using the F keys the user can select the drive to upload the file, normally from the USB stick.
01	DO_MOVE	100.00	0.00		The axis 0 (Data1) will start to move to 100.00 and axis 1 (Data2) will remain in 0.
02	LOAD	R05 <input type="text" value="IP.b"/>	2		Loads the Register 5 (R05) with the logic value of the input 2 (Data2).
03	WHILE	R05 <input type="text" value="=="/>	0		This is the end of the DO_MOVE-WHILE command. the Loop will repeat as long as the condition stated here is met or the DO_MOVE distance has not reach its maximum set (100.00 in this example). In this example, if the register R05 is loaded with '0' the execution of the program will jump to the DO_MOVE command and execute all the lines in between, in this case only the LOAD command. The <input type="text" value="=="/> parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 6 options.
04	MOVE	0.00	0.00		Moves axis 0 and axis1 (Data1 and Data2) to zero
05	END				End of program. The program will run as a loop

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ARC

This command allows the user to execute arcs or complete circles between X and Y axis. The user has to specify the center point (X,Y) and the angle of the circle, a positive angle will be a counter clockwise arc and a negative angle will be a clockwise arc. The current position will be the starting point of the circle.

No	Command	Data1	Data2	Data3	Explanation
00	MOVE	110.00	100.00		Turn ON the LED's.
01	ARC	0.00	-5.00	90.00	The ARC will start at position X= 110.0, Y=100,00. The center point is always specified relative to the current position with Data1 and Data2 parameters. Therefore the center point is located in X: $110.00 + (0.00) = 110.00 = X_c$ and for Y: $100.00 + (-5.00) = 95.00 = Y_c$ The arc will have an angle of 90 degrees (Data3)
02	:				
03	:				
04	:				
05	:				
06	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

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REVOLVE

This command allows to revolve an axis continuously at a desired speed. In order to do that the axis has to be set as a relative axis in the installation menu. The command has 3 settings, the first one is the number of axis, the second one is to select if the axis will be affected in a move command in another part of the program or not and finally the speed set to revolve. In order to have access to the 2nd parameter the user has to position the cursor on the 1st or 3rd parameter and press 'ENTER', this will give the user 2 options: "Relinked on Move" and "Solo Axis". By selecting "Solo Axis" the axis will remain revolving when a MOVE command appears in a different part of the program.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05
03	REVOLVE	1 Solo	85.00		The axis number 1 (data1 column) will revolve continuously at 85.00%. Please note that the user can select between SOLO or RELINK ON MOVE [...] by pressing the ENTER key when the cursor is on one of the data columns of the REVOLVE command.
04	REVOLVE	0 [...]	R04		The axis number 0 will revolve continuously at the speed set in R04. In order to set the register R04 the user has position the cursor on the data 2 column and press the '+' key, then a yellow window appears asking for the register number
05	END				End of program.

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STOP AXIS

This command allows the user Stop revolving an axis. This command just has 1 parameter which is the axis to be stopped.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05
03	REVOLVE	1 Solo	85.00		The axis number 1 (data1 column) will revolve continuously at 85.00%. Please note that the user can select between SOLO or RELINK ON MOVE [...] by pressing the ENTER key when the cursor is on one of the data columns of the REVOLVE command.
04	STOP AXIS	0			This command will stop the axis 0 (Data1)
05	END				End of program. The program will run as a loop

SPEED:

Please see *Maximum speed menu* section above for a detailed description of the speed setting. This command allows the user to adjust the speed as a percentage of the maximum speed of each axis set in the *Speed Settings Menu*. The speed is set in percentage of maximum speed where 100 is maximum and 0.01 is the minimum.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
03	END				End of program. The program will run as a loop

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ZERO Pos.: (OFFSET)

Offset zero position, this command is used to off set an axis the position of the axis. The user has to select the axis and the value to off setting that axis. The offset value can also be stored in a register and use that register in the offsetting value. In order to select a register the user has to position the cursor on the offset column and press the '+' key, then write the number of the register from 0 to 31 (there are 32 registers available).

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10. The VorR (Value or Register) parameter is accessed by placing the cursor on top of the data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 9 options. In this example we choose "Value or Register" (VorR) which indicates that the data2 has to be a value or a register. Please note that the data2 is attached to the option selected.
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05. The * parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 10 options.
03	ZERO Pos.	1 Val	5.00		The axis 1 (data1) will be offset 5 mm and the axis will remain offset 5 mm until a new value is used. The Val parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 2 options. If the Man (Manual) option is selected the program will run normally but at this command the user will be required to offset manually the axis specified in data1 (e.g.: axis 1)
04	MOVE	50.00	70.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
05	END				End of program. The program will run as a loop

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TORQUE LIM: (TORQUE)

This command allows the user to limit the output torque for the selected axis (i.e.. current). The command has 2 parameters which are the Axis (from 0 to 2) and "power %" which the maximum limit in percentage. "Power %" sets the limit for torque.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05
03	REVOLVE	1 Solo	85.00		The axis number 1 (data1 column) will revolve continuously at 85.00%. Please note that the user can select between SOLO or RELINK ON MOVE [...] by pressing the ENTER key when the cursor is on one of the data columns of the REVOLVE command.
04	TORQUE LIM	1	50.00		This command will limit the torque of axis 1 (data1) to 50% of the maximum
05	END				End of program. The program will run as a loop

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Input / Output Commands

OUTPUT:

The OUTPUT command gives the user direct access to the PLC facilities of the controller. The controllers outputs can be individually operated via the output command. Data may be entered in numeric form where a decimal number represents the driver pattern. To turn the drivers off, enter 0 and to a driver or drivers on enter a number greater than zero. For example to turn on driver 0 enter number 1. The PMC3 family has a total of 16 outputs distributed as 8 TTL outputs and 8 drivers outputs (active low) the maximum possible number that can be entered is 65535. If all this seems a bit daunting there is a wizard facility to assist the operator, to access the wizard move the cursor to the second column and press **ENTER** the wizard message box will appear as shown below, then you can turn ON or OFF each output manually .

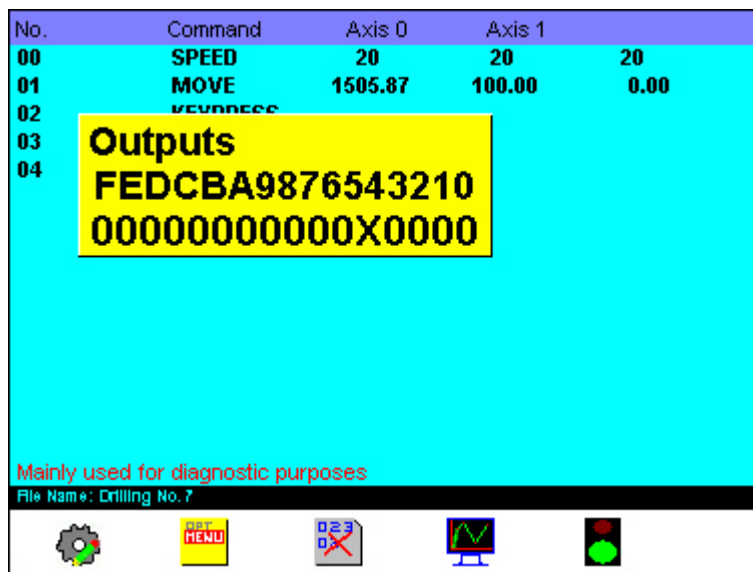


Figure 24 Edit/Create Menu with output Wizard

To turn the drivers off enter 0 and to turn a driver or drivers on enter a number 1 for each driver that is required to be ON. When complete press **ENTER** to indicate that the data is correct or Menu to leave the existing data unchanged.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	OUTPUT	4	1		The program turns ON output '2' (4 is the representation of a binary number in the decimal system, in this case the output 2 is the only output with a '1')
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'

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04	END				End of program. The program will run as a loop
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EXPORT

This command is used to send data from the controller to a computer or to another controller. A program from TRM has to be installed into the PC first. The controller has to be connected to the computer via a serial lead using the RS232 connector.

Before using this command, the user has to set up the speed of communications (Baud Rate) in Technical Menu ---> Set Up Menu ---> Serial Comms Menu

Example

No	Command	Data1	Data2	Data3	Explanation
0	LOAD REG	R31 Apos	1		Register 31 is being load with the Actual position (Apos) of the axis 1 (data2). In order to get access to the Apos data, the user has to place the cursor on data1 or data2 of this command and press ENTER and then select the option Actual Position.
1	EXPORT	R31	R31		Exports to the computer the data stored in registers from R31 (data1) to R31 (data2). For this example the only register exported is R31.
2	INDEX	100.00	200.00	0.00	Index is a relative move and will index 100.00 to the current position of axis 0 and 200.00 to the current position of axis 1
6	END				End of program. The program will start again unless the user has setup a loop quantity.

CHANGE OP:

Set a single output. The user has to select the output number and the desired value '0' in active '1' active.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	CHANGE OP	7	1		The program turns ON output '7' (The second column shows '1' which means turn ON the output, In order to turn it OFF the user has to write '0')
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	END				End of program. The program will run as a loop

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LED

This command gives access to the LED placed in the front of the controller. A binary value can be written in the parameter (being 255 the maximum) or a register that contains the desired value. Please note that the LED labelled RDY is in use for the controller so you can not fully control that LED.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LED	255			Turn ON the LED's.
01	WAIT	0.20			Waits 0.2 seconds
02	LED	0			Turn OFF the LED's
03	WAIT	0.20			Waits 0.2 seconds
04	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

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POWER RAMP: (RAMP)

This command must be used with a MOVE command following. It allows to set up an output power ramp (i.e.. volts) for the 4th analogue output (non of the output used for motion control).

It allows to set up the initial value of the ramp, the final value and the distance The command has 4 parameters:

- Init %: Power ramp Initial value in percentage
- Axis: in order to access this parameter the user has to move the cursor to one of the other parameters and press ENTER. This parameter refers to the axis to which the power ramp is attached.
- Final %: Power ramp final value in percentage
- Distance: refers to the distance that the axis specified above has to travel to ramp the 4th analogue output from initial value to final value and then from final value to initial value.

Example

No	Command	Data1	Data2	Data3	Explanation
00	POWER_RAMP	0.00 AX1	85.00	15.00	The initial value of the power ramp is 0% (Data1) i.e. 0V. The axis attached to the ramp is AX1. The final value of the power ramp is 85%. The distance that the axis 1 (AX1) will have to move for the power ramp to go from the initial value to the final value is 15.00 mm. The AX1 parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 3 options: AX0, AX1, AX2.
01	MOVE	200.00	400.00		This is a normal MOVE command but the power ramp above it will act coordinated to the movement of the axis 1 (AX1). In this example the AX1 will move 400.00 mm. The first 15 mm of movement of the AX1 will see the ramp of the analogue output 4 from 0% to 85% (0 volts to 8.5 volts). the 85% power will remain until the last 15 mm of movement when the analogue output will ramp down from 85% to 0%. (8.5 Volts to 0 volts)
02	MOVE	0.000	0.00		Move both axis to 0.00
03	WAIT	1.00			the program waits 1.00 seconds
04	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

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PRINT REGISTER

Print Register prints on screen the value of a selected register. The register will be printed on the bottom left hand side of the screen.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R25 VorR	547		Turn ON the LED's. The VorR parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 10 options.
01	PRINT REG	R25	5	1	Print on screen the value of the register 25 (i.e.. 547) with 5 digits (data2) before the decimal point, and 1 decimal place, i.e.: 00053,7
04	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

INPUT:

This command is intended to pause the program while a designated input is high or low (state). While waiting, the command will display a message box to advise the operator. Operation of the program continues after the designated input goes low or high depending on the parameter STATE selected. The minimum low time is 1 ms. The command can be terminated at any time by pressing **MENU** while the command message box is being displayed. Any of the controllers inputs can be used from 0 through to 15. Currently there is no test for conflicts with the home switch inputs. Care should be used to ensure that the correct input number is selected.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	INPUT	15	1		The program waits until the controller reads a '1' on the digital input 15 before executing line 3.
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	END				End of program. The program will run as a loop

IMPORT

This command is used to received data into the controller from a computer (a program form TRM has to be installed into the PC first.) or from another controller. The data received is stored into the registers for future use. The controller has to be connected to the computer via a serial lead using the RS232 connector.

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Before using this command, the user has to set up the speed of communications (Baud Rate) in Technical Menu ---> Set Up Menu ---> Serial Comms Menu

Example

No	Command	Data1	Data2	Data3	Explanation
0	LOAD REG	R31 VorR	5		Register 31 (R31) is loaded with the value 5 (data2). In this program Register 31 is only in use as a flag and when send the data from the controller be sure to load '0'. The VorR parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 9 options.
1	IMPORT	R00 LDR	R31		please remember to use the register 31 as a flag only for this example. Load it with '0' for this example. Here the controller will import the information from R00 (data1) to R31 (data2). The LDR parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 4 options. An explanation of each options below this table
2	IF	R31 ==	0	1	it is comparing the flag register 31 is equal to '0' and will jump to line No 1 if it is NOT '0'. In other words it is waiting for data from computer. The == parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 6 options.
3	MOVE	R00	R03	R06	Lines 3 to 5 are movements you want to do. You can make as many lines as you want, we just used 3 for this example.
4	MOVE	R01	R04	R07	Please remember that the register 31 is used as a flag so do not use it for importing data. Always load R31 with 0 for this example
5	MOVE	R02	R05	R08	
6	END				End of program. The program will start again waiting to receive data from the computer unless it already received the data while moving

Options for importing data:

- **Load Data & Clear Stat (LDR):** when the data is sent out to the controller, it is stored in the buffer even if the controller is executing another command. When the data is stored in the buffer the status flag (Stat) is set to '1' which means there are a data ready to be loaded. By selecting this option the controller will load the data ready in the buffer and after will clear the status flag (Stat). If there is not data ready (stat flag is cleared) the program will continue to the next instruction command without loading any data.

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- **Load if data present (LDP):** exactly the same that the option above but will not clear the Status flag (Stat).
- **Wait, Load & clear stat (WLC):** When the import command is executed it will check for the status flag, if it is set, it will load the data straight away. If it is cleared it will wait until receiving the data and then load the data after which it will clear the status flag and continue to the next command.
- **Wait for data & Load (WLD):** It is as the option above but after loading the data it will not clear the status flag (Stat)

Please note that the controller will always be open to receive data into the buffer regardless of the value of the status flag (stat).

QUESTION

This command is used for printing a message on screen (the question) and wait for the user to enter the answer by pressing the number keys and store them into a register for future use in the program.

This command has 3 parameters:

- **Reg No.:** Register number. The user has to select 1 of the registers available to store the numerical answer.
- **Msg No.:** Message Number. The user select which message (the question) to print on screen.
- **Digits:** this is the number of digits of the answer, just until the operator has pressed the number of digits set up here the program will continue.

Example

No	Command	Data1	Data2	Data3	Explanation
00	QUESTION	R00	22	3.00	The message number 22 (data2) will be displayed on screen, this message will ask the user a numeric answer, in this example 3 digits (data3). The 3 keys keyed by the user will be stored in the register 0 (R00, data1). The user can write the question he wants by editing the USER MESSAGES (in this case the message 22) which are found in the Technical Menu--> Setup Menu--> User Messages.
01	PRINT_REG	R00	0	0	will print on screen the data stored in the register 0 (R00) without any decimal points.
02	KEY PRESS				The program will wait in this line until the operator press any key, (with the exemption of MENU key or F8 (STOP) key)
04	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

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MESSAGE:

Message is used to display messages in the message centre on the operator screen. The messages can be up to 32 characters long and there are 32 messages to choose from. A message once displayed persists until the next message is displayed. Message 32+ is no message and can be used to clear the message centre in the operator menu. When executing the program, the text will show up on screen after the Message command is executed.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	MESSAGE	User Message No 2			The message is displayed on screen. The user can edit the messages in the Technical Menu in the option "User Messages". When writing the message in the technical menu, the user needs to press the SYM (symbol) key for selecting the letter keys, and by pressing SYM and the ENTER key the user can leave a space between words
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
	END				End of program. The program will run as a loop

Note: Valid number for message are 0-31. For clearing the message use 32!

KEYPRESS

The "Keypress" command is used to cause the controller to stop execution of the programme and wait for the user to press a button on the controller's Keypad. When the controller is waiting for a key press, a message box will be displayed to assist the operator. The command can be terminated at any time by pressing **MENU** while the command message box is being displayed.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	KEYPRESS				The program waits until the user press any key before executing line 3
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'

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04	END				End of program. The program will run as a loop
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READ FILE: (READ)

This command reads a file created by the **WRITE FILE** command. The file has the name "outputXX.mdf" where XX is the number of the file. The user has to specify the number of the file and the start and end of the array of registers to read.

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	WRITE FILE	output00.mdf	0	15	The 16 registers from register 0 (Data2) to 15 (Data3) will be saved in the file called "output00.mdf" (Data1). This file can be retrieved later on for using the registers.
03	READ FILE	output12.mdf	5	15	The 11 registers from register 5 (Data2) to 15 (Data3) will be loaded with the values of those registers stored in the file called "output12.mdf" (Data1).
04	END				End of program. The program will run as a loop

WRITE FILE: (WRITE)

This command store the registers and its contents in a file for future use. The user has to specify the start and end of the array of registers to be stored in the file. The file has the name "outputXX.mdf" where XX is the number of the file.

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	WRITE FILE	output00.mdf	0	15	The 16 registers from register 0 (Data2) to 15 (Data3) will be saved in the file called "output00.mdf" (Data1). This file can be retrieved later on for using the registers.
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	END				End of program. The program will run as a loop

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ANALOG OP: (ANALOGUE OUT)

This command allows to use one of the analogue outputs when it is in not in use for motion control (PMC3 has 4 analogue outputs, 3 of them can be used for motion control). this command has 2 parameters: "Channel" which is the number of the axis not in use and "Op (+/-)%" which is the analogue output voltage in percentage being 100% equal to +/-10 V and 0% equal to 0 volts.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05
03	REVOLVE	1 Solo	85.00		The axis number 1 (data1 column) will revolve continuously at 85.00%. Please note that the user can select between SOLO or RELINK ON MOVE [...] by pressing the ENTER key when the cursor is on one of the data columns of the REVOLVE command.
04	ANALOG OP	3	-35.00		The analogue output 3 will output -35.00% of 10 volts (e.g. -3.5V).
05	END				End of program. The program will run as a loop

ADC:

This command is used to store the digital value of the analogue input in a register(s).

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05
03	REVOLVE	1 Solo	85.00		The axis number 1 (data1 column) will revolve continuously at 85.00%. Please note that the user can select between SOLO or RELINK ON MOVE [...] by pressing the ENTER key when the cursor is on one of the data columns of the REVOLVE command.
04	ADC	2	R00	R02	The digital value of the analogue input 2 (Data1) will be stored in R00, R01 and R02
05	END				End of program. The program will run as a loop

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AVG

This command is for average the value of the specified registers and the result will be store another specified register.

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10.00		The Register 5 (R05) is being loaded with the value 10
01	LOAD REG	R06 VorR	20.00		The Register 6 (R06) is being loaded with the value 20
02	LOAD REG	R07 VorR	30		The Register 7 (R07) is being loaded with the value 30
03	AVG	R05	R07	R00	This command is averaging the values of the registers R05, R06 and R07 (specified in start register (Data1) and end register (Data2)) and storing the result in R00 (Data3)
04	END				End of program. The program will run as a loop

Program Flow Commands

JUMP:

Jump is similar to an 'IF' statement in basic, [Pascal or 'C'](#) programming languages. in that if an input bit is active and the bit number is within range, the processor will jump to the line listed in the data parameter 2. For example in an application input 3 is connected to a hopper sensor such that when the hopper is below a minimum level the signal becomes inactive (high). When the signal is inactive a message is displayed and the process paused. The following code illustrates this:

Example

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	JUMP	3	4		If port bit 3 is active (low) jump to line 16
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	MOVE	50.00	70.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
	END				End of program. The program will run as a loop

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DEC JUMP:

Decrement Jump is similar to the jump instruction explained above but this time the program will decrement a variable loaded with any number, when the variable is not zero the program will jump to the instruction line indicated, when it is zero will follow with the next line in the program.

Example

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	DEC JUMP	R05	1		The program will decrement in 1 the value loaded in the Register 5 (R05) and will compare the result with 0, if it is different to 0 the execution of the program will jump to line number 1. When the comparison is equal to 0 the program will continue with line number 3.
03	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
04	MOVE	50.00	70.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
05	END				End of program. The program will run as a loop

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IF

This command allows to compare a selected register to another register or value and jump to a different line in the program if the comparison is true. This command has 4 parameters:

- Reg No.: Register number. the user has to select the register that is going to compare against a value or a different register.
- The second parameter if the comparison. In order to access them move the cursor to one of the other parameters and press ENTER, there are 6 parameters to choose from.
- Compare: the user can compare the register selected before against a value or a different register. In order to compare it against a value just write the value using the keypad or select a register by pressing the '+' key and write the number of the register required.
- Line No.: This is the line the program will jump if the condition is met.

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	TIMER	R31 R-1	8	1000	The register 31 (data1) will be used as a down counter timer (R-1). the timer will use the channel number 8 (data2) and the starting value will be 1000 (data3) multiplied by 10mS (e.g.. 10S)
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	IF	R31 ==	0	4	Here we are verifying if the timer used in line 2 (R31) has reached 0 (data2) or not. If not, the program will jump to line 4 which is the same line so the program will remain in this line until the timer has reached 0. Once the timer has reach 0, the program will continue to line 5. The parameter == is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 6 options. Please note that the timer by itself does not stop the program! if the user only wants to stop the program for a little while then the WAIT command is available.
05	ANALOGUE OP	3	-35.00		The analogue output 3 will output -35.00% of 10 volts (e.g. -3.5V).
06	END				End of program. The program will run as a loop

The **IF** command has 6 comparison options, this options are visible by positioning the cursor on the Data1 or Data2 column on this command and pressing the ENTER key. A pop up yellow window will appear on screen with the following options:

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1	Equal	==
2	Not Equal	!=
3	Greater than	>
4	Greater or equal	>=
5	Less than	<
6	Less or equal	<=

The user has to select one of the options, by default the **==** (Equal) will be displayed. when selecting the **IF** command.

DO

This command has to be used together with the WHILE command explained below. The program will execute the lines located between DO and WHILE as long as the condition set in the while command is met.

Please see the example with the next WHILE command.

WHILE

The WHILE command is used to make comparisons between values stored in registers or a value of a register and a value. WHILE can be used in conjunction with the DO command or on its own. If used on its own, the execution of the program will remain in the line of the comparison as long as the comparison is true. The command has 3 parameters:

- Reg No.: Register number: the user has to select the register he wants to compare.
- The second parameter is the comparison. In order to select a comparison, move the cursor to one of the parameters and press ENTER, there are 6 options to choose from.
- Compare: the user can compare the register selected against a value or a different register. In order to compare it with a value just write the value using the keypad or select a register by pressing the '+' key and write the number of the desired register.

Example on next page:

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No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	DO				The DO while loop starts here. all commands between this loop will execute at least the first time. If the condition in the WHILE command is true, the loop will repeat again.
02	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
03	LOAD REG	R05 IP.b	3		Loading the value of the input 3 (data2) into the register R05. The IP.b parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 10 options.
04	WHILE	R05 !=	0		This is the end of the DO-WHILE command. the Loop will repeat as long as the condition stated here is met. In this example, if the value stored in register R05 is not 0 the execution of the program will jump to the DO command and execute all the lines in between. The != parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 6 options.
05	OUTPUT	5			Turn ON the Outputs 0 and 2 for its representation in binary. The user can use a wizard by pressing the ENTER key when the cursor is in the parameter (5 in this example)
06	WAIT	10.00			The program will wait 10 seconds in this line.
07	OUTPUT	0			Turn OFF all the OUTPUTS
08	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

The **WHILE** command has 6 comparison options, this options are visible by positioning the cursor on the Data1 or Data2 column on this command and pressing the ENTER key. A pop up yellow window will appear on screen with the following options:

1	Equal	==
2	Not Equal	!=
3	Greater than	>
4	Greater or equal	>=
5	Less than	<
6	Less or equal	<=

The user has to select one of the options, by default the **==** (Equal) will be displayed. when selecting the While command.

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END:

The End command is used to tell the system that the end of the programme has been reached. You may use the End Command to break up a programme which you are trying to debug. This can be done by inserting the End Command at the appropriate points in the programme.

BEGIN – END FUNCTION

This command is for creating a subprogram that can be called at any time. This can be used when the same routine is executed in different parts of the program, and then saves the user to write the same code in different parts of the program. These subprograms will be located just before the END of the program. At the end of the subprogram is require to use a END FUNCTION command which will indicate to what line the program will return after executing the subprogram. It is possible to have 99 subprograms in every MAP program.

No	Command	Data1	Data2	Data3	Explanation
00	LED	255			Turn ON the LED's.
01	CALL	0			Calls the subprogram number '0'. After the execution of the subprogram MAP will execute the next line. Subprograms are located at the end of the MAP program.
02	LED	0			Turn OFF the LED's
03	CALL	0			Calls the subprogram number '0'. this is the second time the subprogram '0' is called in this program. After the execution of the subprogram MAP will execute the next line. Subprograms are located at the end of the MAP program.
04	WAIT	0.20			Waits 0.2 seconds
05	BEGIN	0			Begins the subprogram '0'. All lines below a BEGIN belong to subprograms, therefor will only be executed when a CALL command calls the subprogram.
06	MOVE	100.00	100.00	100.00	All 3 axis are moving to position 100.00
07	WAIT	0.20			Waits 0.2 seconds
08	MOVE	100.00	100.00	100.00	All 3 axis are moving to position 0.00
09	END	Function			End of subprogram '0'. After this instruction the program will return to the next line after the subprogram was called. In order to use this command select the END command and then move the cursor to the Data1 parameter press ENTER and select the "END return" option.
10	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

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CALL

This command calls the subprogram, you can call subprograms as many times as you want. After the subprogram is executed, the program will return to the following line after the CALL command. This command has to be used together with the BEGIN command and the END FUNCTION command. The user can create up to 99 subprograms and call the as many times as he wants. **It is not allowed to jump in or out of the sub program.**

No	Command	Data1	Data2	Data3	Explanation
00	LED	255			Turn ON the LED's.
01	CALL	0			Calls the subprogram number '0'. After the execution of the subprogram the MAP will execute the next line. Subprograms are located at the end of the MAP program.
02	LED	0			Turn OFF the LED's
03	CALL	0			Calls the subprogram number '0'. this is the second time the subprogram '0' is called in this program. After the execution of the subprogram the MAP will execute the next line. Subprograms are located at the end of the MAP program.
04	WAIT	0.20			Waits 0.2 seconds
05	BEGIN	0			Begins the subprogram '0'. All lines below a BEGIN belong to subprograms, therefor will only be executed when a CALL command calls the subprogram.
06	MOVE	100.00	100.00	100.00	All 3 axis are moving to position 100.00
07	WAIT	0.20			Waits 0.2 seconds
08	MOVE	100.00	100.00	100.00	All 3 axis are moving to position 0.00
09	END	Function			End of subprogram '0'. After this instruction the program will return to the next line after the subprogram was called. In order to use this command select the END command and then move the cursor to the Data1 parameter press ENTER and select the "END return" option.
10	END				End of program. The program will run as a loop unless the user has selected the loop quantity option by pressing the F4 key.

BRANCH (COMPARE_SNE)

COMPARE Skip Not Equal this command differs from the IF command because it does not jump to a fix line it only *skip* a number of lines.

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Maths & Data Commands

LOAD Reg:

Load register is used for loading a value into one of the 32 registers with a value that can be from a key press, inputs, ADC reading, a pulse count and more. The user has to specify what register to load from 0 to 31 what value (parameter) to load or 'copy' into the register. The full list of parameters that can be load in the registers are found by moving the cursor to one of the 2 parameters of this command and pressing ENTER. The list follows below:

1	Value or Register VorR	By using this option it is possible to load into the register a value specified by the user or the value stored in a different register. For selecting the register to load the user has to move the cursor into the Data2, press the '+' key and select the register.
2	Actual position Apos	The user select a register and load it with the actual position of any of the axes (the user has to specified which axis). Please note the value loaded will not have decimal places, so if the position is 5.69 mm, the value loaded into the register will be 569 .
3	Encoder Register EnCr	The user can select any of the 3 encoder register and load its value into a selected register.
4	Following Error Ferr	The following error is loaded into the register selected by the user.
5	Torque Output Torq	The torque output value is loaded into the register.
6	Get Input Port Port	The decimal value of the 16 digital inputs is loaded into a selected register.
7	Input Port Bit IP.b	The user select what input (bit) to load into the register. As it is only one bit the value loaded will always be 1 or 0.
8	Get keypad Input Key	Load the value of the key pressed into a selected register.
9	Get the pulse count PCnt	MAP allows to set an input as a pulse counter from the menu "Assignable Inputs" which is found in the "Technical Menu". Then by selecting "Get pulse count" the value of the counter will be loaded into the selected register. The counter will detect the pulses (counting them) even when executing a different command, however the user has to use this command for loading the counter into a register before any operation involving the number of pulses counted otherwise the register will not be updated.
10	Get Jog Encoder Position Jpos	This command allows to load the position of the Jog encoder into s selected register
11	Tool Offset Z Position Toff	This command allows to load the Z offset position of a tool into the selected register. The Z offset positions must have already been set the Set up menu "Tool Offset Positions"

An example follows below:

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Example:

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10. The VorR (Value or Register) parameter is accessed by placing the cursor on top of the data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 10 options. In this example we choose "Value or Register" (VorR) which indicates that the data2 has to be a value or a register. Please note that the meaning of data2 depends of the option selected.
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	DEC JUMP	R05	1		The program will decrement in 1 the value loaded in the Register 5 (R05) and will compare the result with 0, if it is different to 0 the execution of the program will jump to line number 1. When the comparison is equal to 0 the program will continue with line number 3.
03	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
04	MOVE	50.00	70.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
05	END				End of program. The program will run as a loop

MATH

This command is to make mathematical operation between the data stored into the specified registers.

The user can select the Mathematical operation by positioning the cursor on the MATH command line and in the column of one of the registers and press ENTER. A pop down window will be displayed with all the mathematical and logical functions available.

Mathematical operations available:

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1	Add	+
2	Subtract	-
3	Divide	/
4	Multiply	*
5	Shift right	>>
6	Shift left	<<
7	Logical OR	:
8	Logical AND	&
9	Logical XOR	^
10	Logical Not	!

Example

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10. The VorR (Value or Register) parameter is accessed by placing the cursor on top of the data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 9 options. In this example we choose "Value or Register" (VorR) which indicates that the data2 has to be a value or a register. Please note that the data2 is attached to the option selected.
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	MATH	R05 *	2		The value stored in the Register 5 (R05) will be multiplied for 2 and the result will be stored again in R05. The * parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 10 options.
03	MATH	R05 /	R07		The value stored in the Register 5 (R05) will be multiplied with the value stored in Register 7 (R07) and the result will be stored again in R05. In order to select the R07 register the user has to position the cursor in the point and press the '+' key
04	MOVE	50.00	70.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
05	END				End of program. The program will run as a loop

WAIT:

The wait Command is included to allow the controller to wait for a specific period of time. The minimum time is 10 ms. The time delay is entered in seconds. The command will allow time entry to 0.01 seconds by using the decimal point '.' When the Wait Command is executed, a message will be displayed to the operator informing them that the

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controller is timing. After the given amount of time the controller will commence execution of the next instruction. The command can be terminated at any time by pressing **MENU** while the command message box is being displayed.

Example:

No	Command	Data1	Data2	Data3	Explanation
00	SPEED	80.00	100.00	0.00	Sets the speed of axis '0' to 80% and axis '1' to 100% of the maximum speed.
01	MOVE	100.00	200.00	0.00	Move axis '0' to 100 mm and axis '1' to 200
02	WAIT	10.00			The program waits 10 seconds before executing line 3
03	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	END				End of program. The program will run as a loop

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TIMER

This command gives access to the timers, there are 8 timers available. The command has 4 parameters:

- Reg No: Register number. The user has to set 1 of the registers available as a counter. the user can then manipulate the counter as required by access to the register.
- R-1 or R+1: the user has to choose if the counter is down counter or up counter. In order to select this parameter the user has to move the cursor to the 1 of the other parameters and by pressing ENTER the 2 options will be evident. Select the option desired.
- Channel: select 1 of the 8 timers available (from 1 to 8)
- Initial value

Please see an example of the TIMER command together with next HALT TIMER command.

HALT TIMER

Stop the Timer, This parameter has just 1 parameter and that is the register assigned to the timer.

No	Command	Data1	Data2	Data3	Explanation
00	LOAD REG	R05 VorR	10		The Register 5 (R05) is being loaded with the value 10
01	INDEX	75.00	10.00	0.00	Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
02	TIMER	R31 R-1	8	1000	The register 31 (R31) (data1) will be used as a down counter timer (R-1). The timer will use the channel number 8 (data2) and the starting value will be 1000 (data3) multiplied by 10mS (e.g.. 10S). The R-1 parameter is accessed by placing the cursor on data1 or data2 of this command and pressing ENTER. A pop up yellow window appears with 2 options. R-1 and R+1
03	INPUT	5	0		Index advance 75 mm from the current position for axis '0' and 10 mm for axis '1'
04	HALT TIMER	R31			Stops the timer running on R31
05	IF	R31 !=	0	2	Here we are verifying if the value of the timer used in line 2 (R31) is different (!=) to 0 (data2) or not. If not, the program will jump to line 2 (data3). Once a timer has reach 0 it will stop running! Please note that the timer by itself does not stop the program! if the user only wants to stop the program for a little while then the WAIT command is available.
05	ANALOGUE OP	3	-35.00		The analogue output 3 will output -35.00% of 10 volts (e.g. -3.5V).
07	END				End of program. The program will run as a loop

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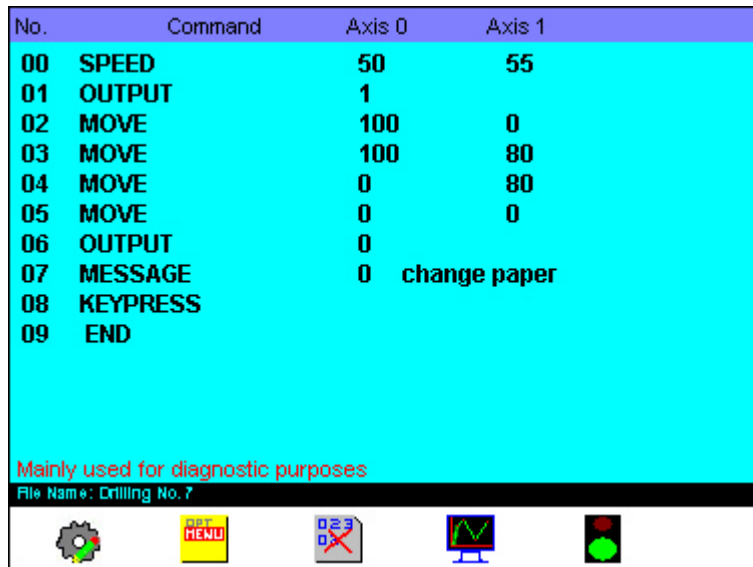
REG_TYPE

This command Register Type is to set the register. There are 5 options to choose the register type. They are as follow:

1	SLONG	Signed long is an integer number that can be positive or negative
2	ULONG	Unsigned long is an interger number without sign
3	FLOAT	Float is a register that can store decimal places
4	*PTR*	Pointer is reserve for future use
5	UBYTE	Unsigned Byte is a type of register that can only store maximum of a byte. This means that the maximum number it can store is 255. If you try to store a bigger number the controller will 'AND' the byte with 255 and will store the result.


Program Example:

Below is an drawing of how would it look a program on screen. The application is a 2 axis demonstration plotter (Axis 0, Axis 1). The program is a sequence in this case with 10 commands, from Line 0 to line 9. The commands will execute one after the other in an endless loop unless the user has set a loop quantity.



No.	Command	Axis 0	Axis 1
00	SPEED	50	55
01	OUTPUT	1	
02	MOVE	100	0
03	MOVE	100	80
04	MOVE	0	80
05	MOVE	0	0
06	OUTPUT	0	
07	MESSAGE	0	change paper
08	KEYPRESS		
09	END		

Mainly used for diagnostic purposes
File Name: Drilling No. 7



Map program example

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Menu

By pressing F4 key under the menu icon a pull down menu appears showing 4 options as shown in the next drawing:



Pull down menu appears when selecting the menu icon

Loop quantity

The controller has a loop counter, which stops the controller when the counter reaches zero. If the counter is set to zero then the machine will operate until the operator stops the controller by pressing a key on the Keypad. The operator should programme the loop counter with the number of repetitions they wish the system to complete. Once the loop counter reaches '0' the program will stop and the counter will be set to zero again.

Load MAP file :

The user can select what MAP file to open. It is possible to open files from a USB stick plugged into the controller, the Flash memory and the RAM memory.

Save/Delete MAP file

The user can store in Memory as many files as he wants as long as the memory is not full. the available internal memory is 16 Mb of flash memory plus 2 Mb of RAM memory. This will allow to save many files in memory if required. The user can also save programs into a USB stick for back up. When the pop up window appears the user first has to select where to save the file by using the following F keys: F4= USB stick, F5= Flash Memory, F5= RAM Memory and then write the name.

The user can also delete files, when the pop up window appears move the cursor to the file you want to delete and then select the F6 key for deleting the file.

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Units Menu

By selecting Units menu a new pull down menu appears from which the user can select metric or imperial units.

Clear Registers

The user have 30 registers available in a program in which he can store data, do mathematical operations, logic operations etc. By selecting this option the data stored into the registers will be deleted.

Start New Program

This option is used when the user want to create a new program. By selecting this option the user will be prevented that any unshaved data in the current program will be lost, as shown in the screen bellow.



Deleting a command

To delete a line move the cursor over the command that requires deleting. Pressing **F5** a message box will appear with the caption "Delete current line ENTER = Yes". As stated press **ENTER** to delete the line and any other key to cancel the delete command. After deleting the current line, all the lines following will be moved up one position.



Display Registers and Graph

Pressing the F6 key a pop up menu will be drawn as follow

No.	Command	Axis 0	Axis 1	
00	SPEED	20	20	20
01	MOVE	1505.87	100.00	0.00
02	KEYPRESS			
03	Display Variables			
04	Display graph with graticules			
	Display Graph without Graticules			
	Dry run Graph			
	Display Origins			

Mainly used for diagnostic purposes
File Name: Drilling No. 7

Pressing F6 on the Edit/Create menu

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The user can scroll down between the options using the UP and Down keys and press ENTER to select an option. *Display Variables* will show on screen the current value stored on each variable. *Display graph* will show an X Y graph with the movements of both axis. *dry run graph* will show step by step the movements of the axis.



Running the program

Once the database has been updated with the user's programme the controller is ready for use. Use the **F7** key to start the motion control program running. To stop the machine press the **MENU** key. When the controller is running the programme, it will display the number of positions that it has visited and the loop count. At the bottom of the screen the position of all axis will be displayed in the units the user has programmed.



Abort

This icon is evident just when the program is running. By pressing F8 the program will abort the execution of the program.

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Operator's menu:

The Operator's menu is designed to execute a program already created, however it is not possible to modify a program form here.

There are very few facilities in this menu. These are the ability to select a file and enter the number of loops or products that are to be made. And of course the operator can start and stop the process.

No.	Command	Axis 0	Axis 1
00	SPEED	50	55
01	OUTPUT	1	
02	MOVE	100	0
03	MOVE	100	80
04	MOVE	0	80
05	MOVE	0	0
06	OUTPUT	0	
07	MESSAGE	0	change paper
08	KEYPRESS		
09	END		

Mainly used for diagnostic purposes
File Name: Drilling No. 7

Operator's menu

Figure 20 above show the operators menu in operation a user message is displayed "change paper" the message box has a section that shows the current line number in progress, and the axis positions. The counter is also displayed.



Open File:

The operator menu can not be used without at least one product in existence. To open the product that is required for production press the key below the icon open that is **F3** on the controller's keypad. The controller will draw the retrieve file menu as shown in Figure 25 in the next section. Use the up and down arrow keys to select the required file, this will be highlighted in white. Press ENTER to load the selected file or MENU to return to the operator menu. After a file has been selected it's name will appear in the file name box.

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Loop:

If the cycles quantity required is greater than 0 (zero) the system will continue to operate until the counter is counted down to zero. If the counter is zero when the process is started it is the same as "Don't count" and therefore the process will continue without limit. To enter a value in the counter press the key below the icon that is **F4**, the controller will display a message box containing the words "Enter loop quantity -> _____" at the prompt enter the quantity required then press enter. After the command the controller will display the new target count. This is a temporary setting and the counter will be set to '0' automatically after the loop is finish.



Display Registers and Graph

Refer to the Edit/Create menu for more information about this function.



Run:

Once the system has a valid file loaded the process can be started. The program can be loaded either by the edit create menu or the memory but an error message will be display if the operator tries to run an empty data base. To start the process simply press the key below the icon, that is **F5**. The first time the system is running all axis that have valid home switch settings will start by moving towards the home position. After homing the system will commence the program



Abort:

This Icon is just evident when the program is running. By pressing the F8 key Abort will abort the execution without any further notice.