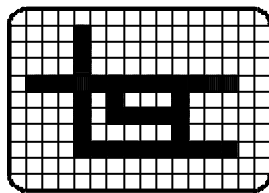


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# **WASHTECH LC102 SERVICE MANUAL**



**TOTAL SYSTEMS CONTROL LTD**

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**Prepared by : Total Systems Control Ltd**

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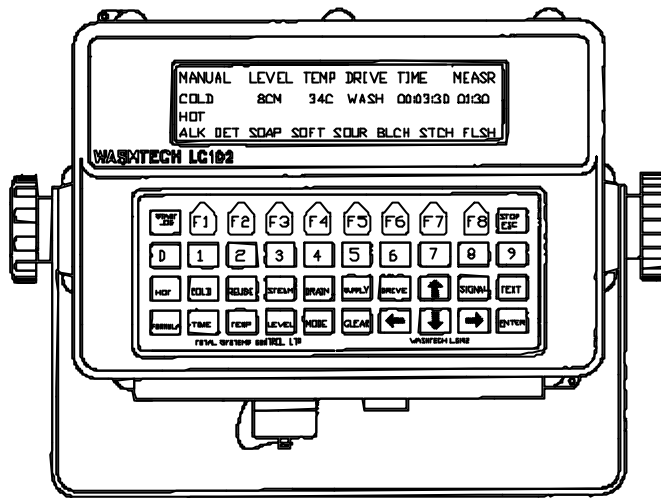
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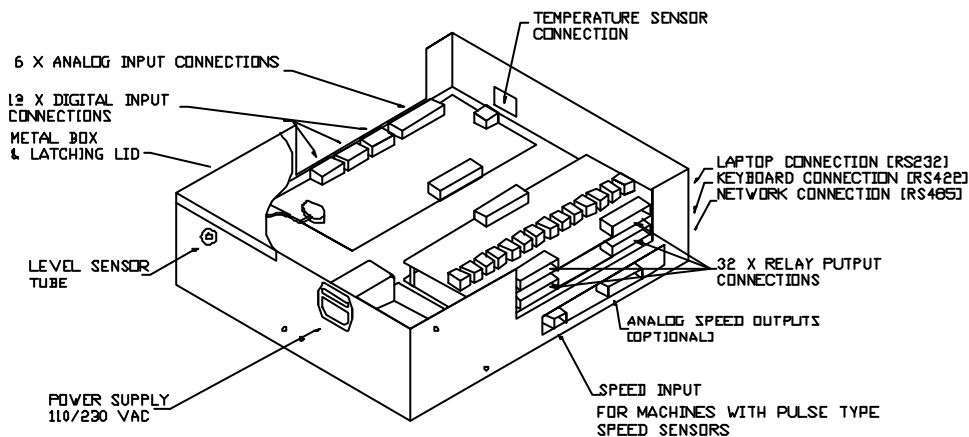
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LC102 General Information

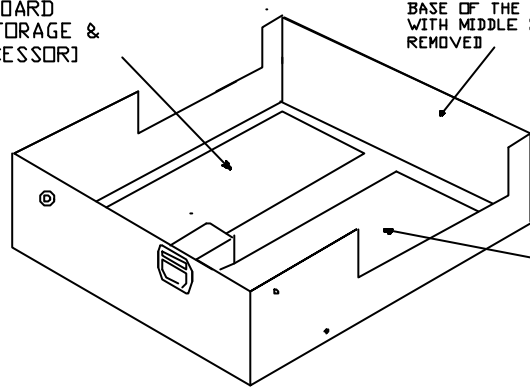
## Washtech LC102 Keyboard



## Washtech LC102 Black Control Box



V25 CPU BOARD  
(MEMORY STORAGE &  
LC102 PROCESSOR)



BASE OF THE LC-102  
WITH MIDDLE SECTION  
REMOVED

COMBO BOARD  
(COMMUNICATIONS &  
POWER DISTRIBUTION)

## Inputs and Outputs

The LC102 controller has the following connections :

- 24 Relay outputs (normally open clean contacts)
- 2 Analogue Outputs
- 12 Digital Inputs
- 8 Analogue Inputs
- Speed Input

### Relay Outputs

The Outputs are arranged in 4 groups with 8 output relays in each group. Each group of 8 relays has a common which can be supplied with any voltage that is required (max 250VAC 5A). When a relay is activated in that group of 8 relays the voltage supplied to the common is switched to the output to supply a contactor or solenoid etc. Each of the 32 relays has an indicator showing you that the relay is on.

### Analogue Outputs

Two outputs are provided to control a variable speed drive.

### Digital Inputs

The 12 digital Inputs are arranged in groups of 4. Each input works on a simple open or closed circuit. Each input sends out 24 Vdc to a particular switch, if the switch is closed the 24 Vdc is taken to ground (common) and the LED indicator for the input is on.

# Analogue Inputs

The LC102 has 8 analogue inputs. Two of them are dedicated to the temperature and level sensors.

## Speed Input

A proximity switch is used to detect to rotation and speed of the washer extractor, this provides great safety and control of the Washer Extractor.

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Preparation

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## Preparation

To do the installation you must have the following parts.

The following items are supplied by Total Systems Control Ltd

- 1 x LC102 black box
- 1 x LC102 keyboard and mounting bracket
- 1 x Temperature probe
- 1 x Keyboard cable
- 3 x 5 way Input plugs
- 4 x 9 way Output plugs
- 1 x 3 way speed sensor input plug
- 1 x Speed sensor proximity switch
- 1 x Cyber Card (memory back up system.)

The following items are needed to complete the installation and should be purchased by the installer.

- A stop switch with a Normally Closed set of contacts
- A start switch with a Normally Open set of contacts
- A 3 position switch with 2 Normally Open sets of contacts
- 2 Inch buttons with Normally Open sets of contacts
- A Beacon Light and Alarm Bell with the same operating voltage as your solenoids for hot cold and steam functions.
- At least 2 x 3 pole relays.
- An appropriate wire numbering system
- Wire ,preferably 0.75mm<sup>2</sup> Red, Black, Blue, White, Green.
- Stainless Steel Panels to cover the holes left in the machine by removing the old control system.

## Removing the old Control System

Remove the old control system to leave only the appropriate equipment to retro fit the LC102 onto the machine.

You must retain the following parts to install the LC102 unit.

- All Contactors, Overloads, motor leads and thermostat wires.
- All Solenoids air or electrically operated.
- Transformers and current overload protection devices i.e. fuses or circuit breakers.
- All limit switches and associated wiring around the machine, i.e., Door open switch, air pressure, vibration switches etc.

## Installation

### Mounting the LC102 Black Box

Find an appropriate space for the black box inside the electrical cabinet. Use the lid of the box as idea of how much space you will need. You must allow a clearance of at least 5cm all the way around the black box to hook up wires and cables.

Mounting the black box is done by bolting the LC102 down in its 4 corners via the mounting tags extended out from the bottom of LC102 box. (See Below)

Also mounting when mounting the black box you must make sure that you can still open and close the cabinet doors securely. Try to position the black box as far away from the contactors and transformers as possible due to electromagnetic fields produced by these components.



### Mounting the LC102 Keyboard

The LC102 keyboard is mounted on the front of the machine. The keyboard bracket is usually mounted on the new stainless steel plate that covers the old control system face. The keyboard unit itself just slots onto the bracket. A 16mm compression gland is needed for the keyboard lead to



pass through the stainless steel plate and another 16mm compression gland is needed for the cable to then enter the electrical cabinet so that water, steam and dust cannot get inside.

## Start, Emergency Stop and Safe Run Switch

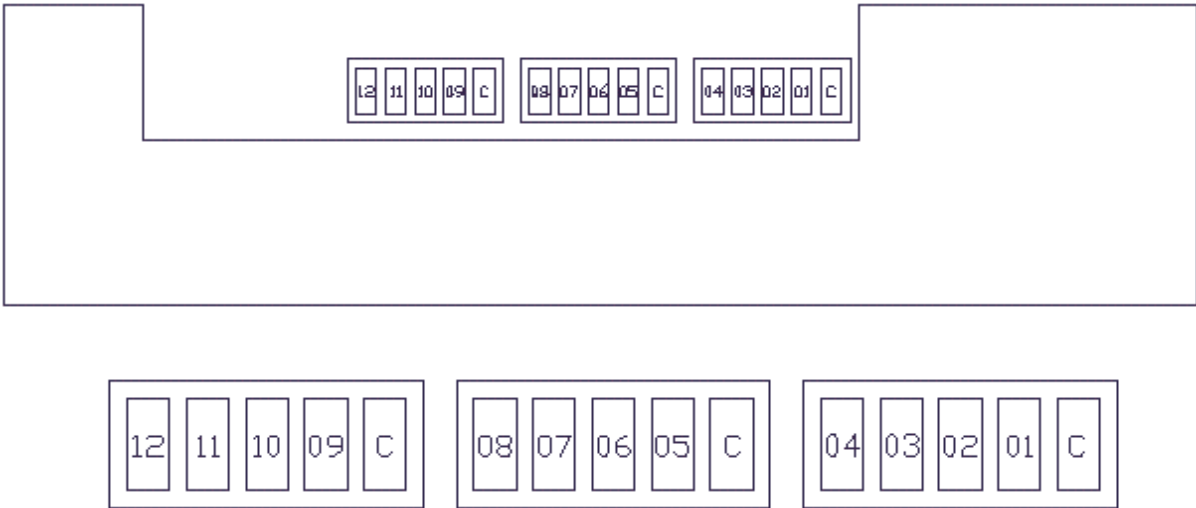
The Start, Emergency Stop and Safe Run switches must be mounted so that the operator can access them very easily. They are generally located on the front of the machine around the LC102 keyboard in the new metal panel that covers the hole the old controller left behind. How you mount them is at your discretion.

## Wiring Up the Machine Inputs

Each input supplies its own 24 Vdc to whatever switch you want to look at. If the switch is closed the 24 Vdc is closed to the common which is the 0 Vdc, the red LED light is on when the input is closed.

The following diagram shows the input assignments for the 3 only 5 way plugs supplied with each Washtech LC102 as viewed from the side of the controller.

Washtech LC102 viewed from the side

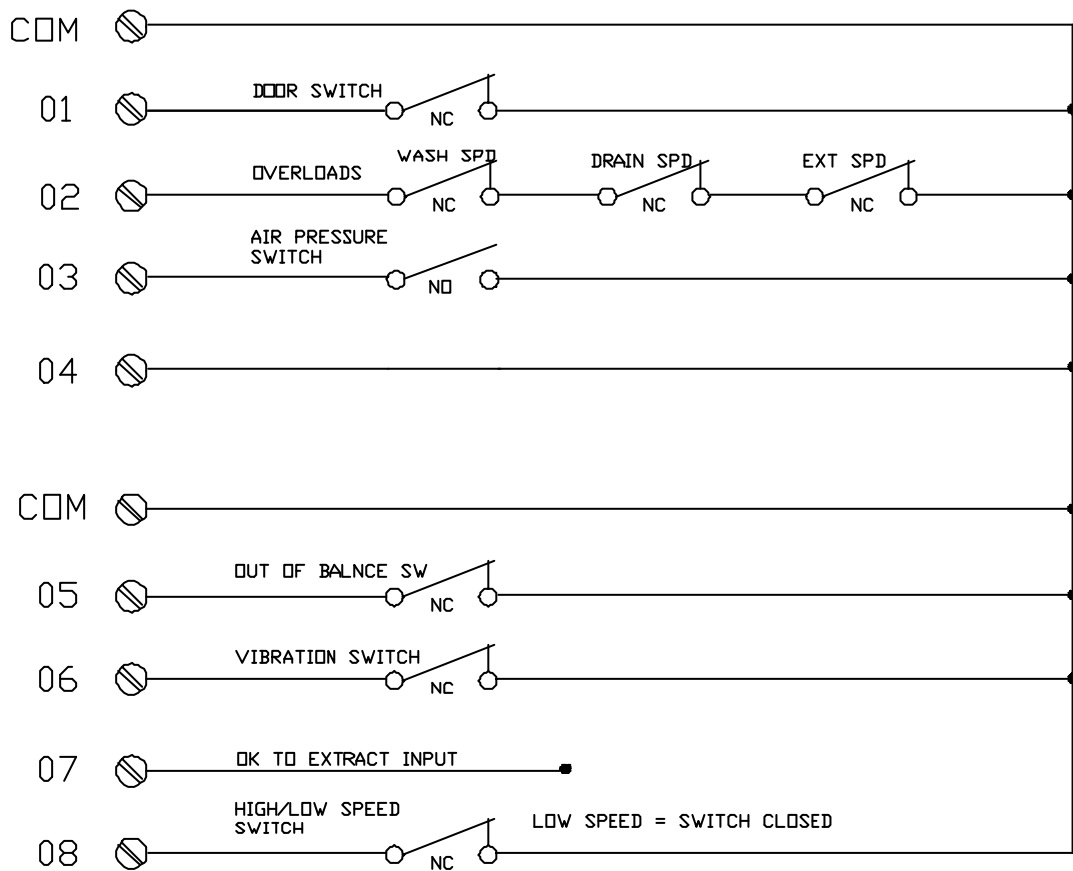


C = Input Common

Inputs 1 through to 12 are dedicated to different inputs depending on the type of machine the LC102 is controlling.

### Typical Washtech LC102 Input Wiring Diagram

An example of how a typical machines inputs are wired to the LC102 is drawn below.



### Different machines



**5									
PosnSensor2				12					
**5									
ZeroSpdSw**5	8	8	8		8				
Tilted Down**5				12					12
Tilted Up				8					8

### Special Comments

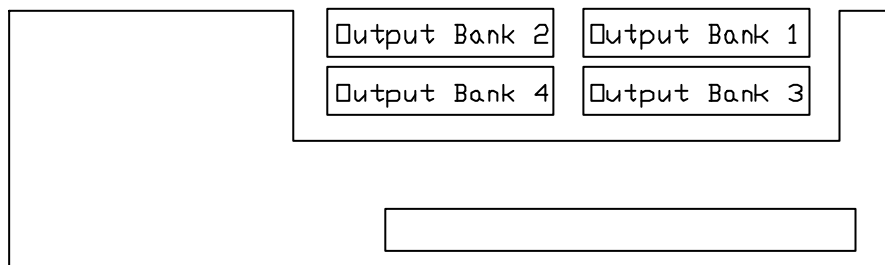
- \*\*1 Closing causes water injection
- \*\*2 Opening causes re-distribution if balance retries are > 0
- \*\*3 Closing causes re-distribution if balance retries are > 0
- \*\*4 These inputs are only used if GENL SETUP1 “Alpha Bus System” is set to YES.
- \*\*5 These inputs are cannot be used if “Alpha Bus System” is set to YES.
- \*\*6 Not Ok To Steam cannot be used if Alpha Bus System is set to YES, or Autojog selected, or machine is a Washex Dye.

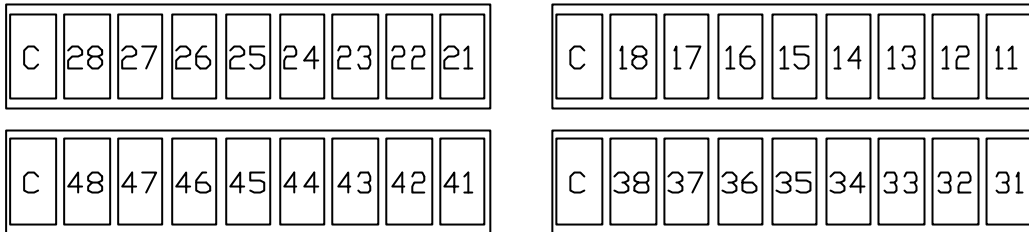
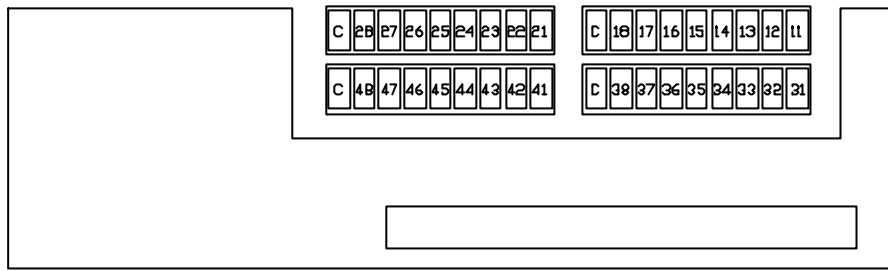
## Wiring up the Machine Outputs

The Outputs are arranged in 4 groups of 8 output relays in each group. Each group of 8 relays has a common which can be supplied with any voltage that is required (max 250VAC). When a relay is activated in that group of 8 relays the voltage supplied to the common is switched to the output to supply a contactor or solenoid etc. Each of the 32 relays has an indicator showing you that the relay is on.

The Outputs are numbered according to their bank number and their position in the bank of 8, i.e., Bank 1 Relay position number 1 is output number 11.

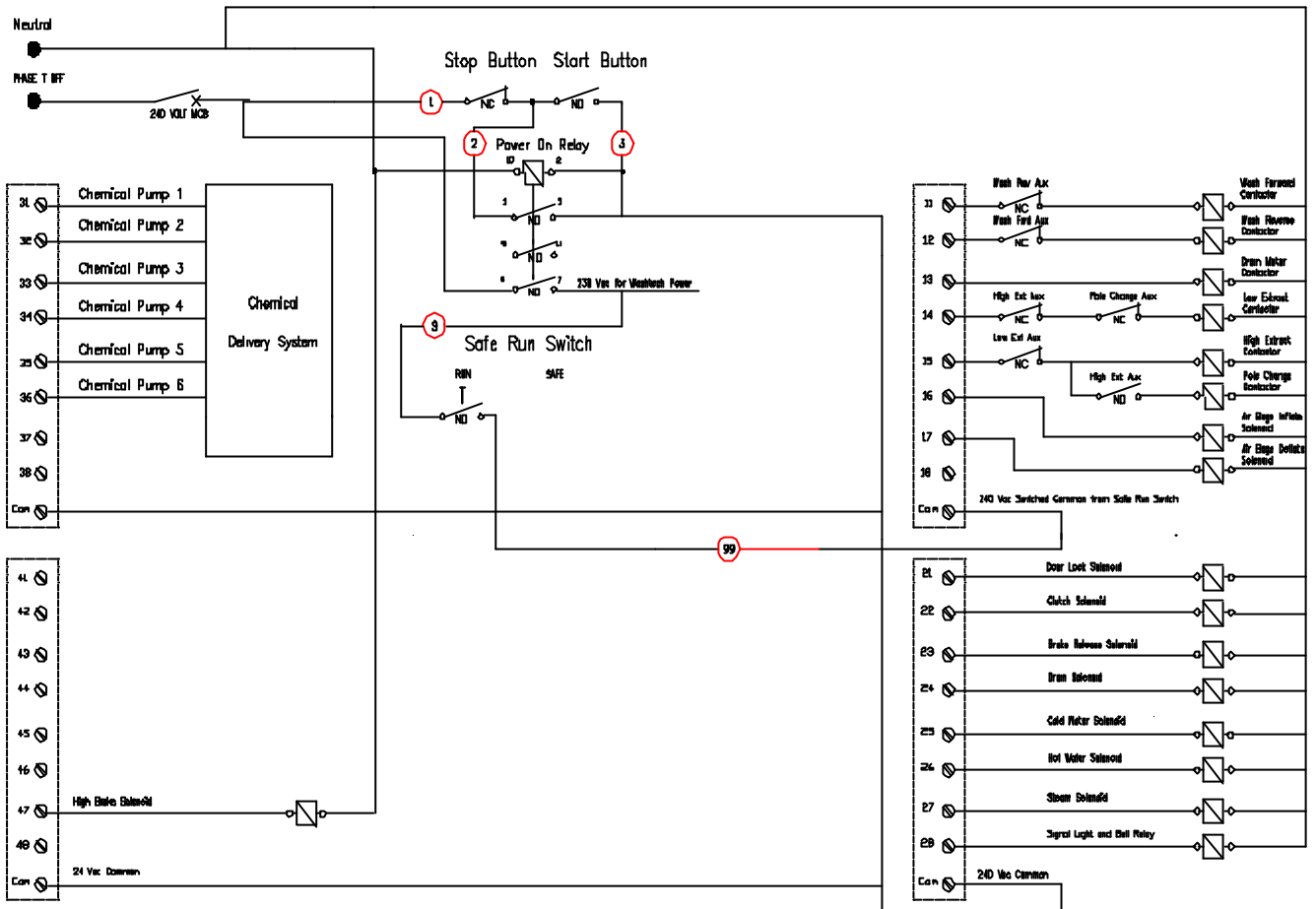
The following diagrams shows how the Outputs are organised and numbered. This number system is used universally on all LC102s so please stick to this convention.





C = Voltage Common for each bank of 8 outputs.

The following diagram shows how a typical Power and Output system is wired up to the LC102.  
The diagram is off of a Washex FLA Washer Extractor .



Obviously not every machine will be wired like this. This diagram is only a general guide. Every machine has subtle differences in the Output wiring, just the same as the Input wiring. On the following page is a list of all machine output assignments mapped into the LC102 memory. Follow the appropriate Output schedule for your machine.

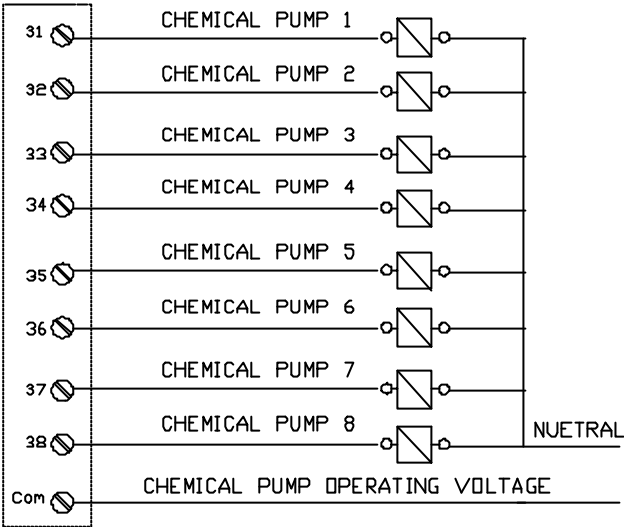
## Safe Run Switch Wiring

The Safe Run Switch is designed to give extra protection against operator error and unfortunate mishaps involving power surges.

You will find the diagram just above this paragraph in the centre of the general outputs diagram. The 2 position switch is labelled SAFE RUN.

The Chemical Pumps are wired directly to the LC102 output relays. The LC102 will turn on the pumps automatically to dose the chemical into the wash. The LC102 User Manual goes into detail on how to set the pump outputs up and how to auto and manual dose the chemicals. The pumps are assigned to Outputs 31 .. 38. Output 31 is Pump 1, Output 32 is Pump 2 ... etc. Check your particular machine type to see which output is assigned to the Auto Flush Output. The Auto Flush output can be configured to flush while the chemical is being pumped or after the chemical is pumped see (Setup 2 General).

The diagram below shows a typical chemical pump setup.



# Washtech LC102 Machine Outputs List

12.8.98 (Version 5.08)

OUTPUTS	Braun	Braun	Braun	Milnor	Milnor tilt	Spen	Spen	Was- cator	Washex	Washex
DESCRIPTION	200 DC	200	600		& Bal	350	750			Dye
Wash CW	11	11	11	11	11	11	11	11	11	11
Wash CCW	12	12	12	12	12	12	12	12	12	12
Drain	13	13	13	13	13	13	13	13	13	13
Extract 1 (low)	14	14	14	14	14	14	14	14	14	14
Extract 2 (hi)	15	15	15	15	15	15	15	15	15	15
Air Bags Up								16	16	16
Air Bags Down								17	17	17
Extract Interlock	18	18	18	18	18	18	18	18	18	18
Door Pin	21	21	21	21	21	21	21	21	21	21
Clutch	22	22	22	* 1 22	* 1 22			22	22	22
Brake Off	23	23	23	23	23	23	23	23	23	23
Waste Drain	24	24	24	24	24	24	24	24	24	24
Cold Water	25	25	25	25	25	25	25	25	25	25
Hot Water	26	26	26	26	26	26	26	26	26	26
Steam Inject	27	27	27	27	27	27	27	27	27	27
Alarm	28	28	28	28	28	28	28	28	28	28
Chemical 1	31	31	31	31	31	31	31	31	31	31
Chemical 2	32	32	32	32	32	32	32	32	32	32
Chemical 3	33	33	33	33	33	33	33	33	33	33
Chemical 4	34	34	34	34	34	34	34	34	34	34
Chemical 5	35	35	35	35	35	35	35	35	35	35
Chemical 6	36	36	36	36	36	36	36	36	36	36
Chemical 7	37	37	37	37	37	37	37	37	37	37
Chemical 8	38	38	38	38	38	38	38	38	38	38

(See schedule on next page for Special Outputs)

## Machine Notes :

**Braun** Machines do not have a drain / balance speed the LC102 uses wash speed as the drain speed because of this.

**Cascadex** Machines have the same output schedule as a Washex machine with 'No Air Bags' configured.

**Spencer** Machines use the word Interspin instead of Drain speed. The output is still the same (13) but on the LC102 screen the comment is Interspin not Drain.

**Milnor** Machines, if the Clutch is not already pneumatically or electrically linked with the air bag system then make it so that it does. This rule does not apply to some Milnors that have their air bags on all the time, only the ones that when the air bags release the machines rise up and use their springs to extract.

Also see Special Comments on Page 14.



## Washtech LC102 Special Machine Outputs

Output	Braun	Braun	Braun	Milnor	Milnor tilt	Spencer	Spencer	Wascator	Washex	Washex
DESCRIPTION	200DC	200	600		& Bal	350	750			Dye
LeftAirBagUp								45	45	
RightAirBagUp								46	46	
Auto Jog Fwd				44	44			44	44	
Auto Jog Rev								48	48	
Balance Pkt 1				46	46	46	46			
Balance Pkt 2				45	47	47	47			
Balance Pkt 3				41	48	48	48			
Cool Dn Drain	43	43	43	43	43	43	43	43	43	43
Cool Dn Inlet	42	42	42	42	42	42	42	42	42	
Door Seal				16	16					41
Door Sucker				17	17					
Dye Speed 2										42
Flush	41	41	41	48	41	41	41	41	41	
High Brake		47		47	51	22	22	47	47	47
Hydraulic Pump					52					
Indirect Steam										48
Pendulum Hold	45	45								
Reclaim 2						* 5 45	* 5 45			
Reuse 1				* 2 44	* 2 44	* 3 44	* 3 44	* 2 44	* 2 44	
Tilt Down					54					46
Tilt Up					53					45
Vent										44

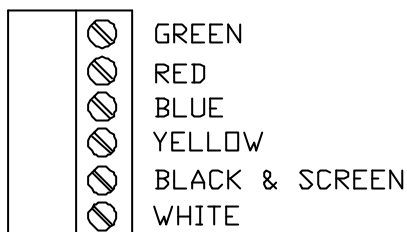
### Special Comments

- \*1 Milnors with Air Bags use the Clutch output (22) to hold down during wash and drain drive.
- \*2 The Reuse is only available if Auto jogging is not selected.
- \*3 Reuse added to Spencers at software version 4.62
- \*4 Previous list spanned Version 4.14 to 4.61.
- \*5 Reclaim 2 added to Spencers at Version 5.08

Note: Please check that Wascator brake outputs are correct.

## Keyboard Connection

The keyboard is connected to the Combo card in the LC102. The keyboard cable is 6 core colour coded screened. The connection to the 6 way plug is as follows.



## Temperature Connection

The temperature probe is connected via a 3 way plug onto the A/D board of the LC102. The plug and probe are supplied pre wired. The temperature probe is inserted into the bottom of the machine generally next to the drain. It is 4 inches long and requires a 1/2 inch BSP threaded hole to screw into the machine.

## Level Connection

The level in the Washer Extractor is sensed via a pressure sensor mounted on the A/D board. The LC102 has a bulkhead fitting which requires a 1/8 BSP fitting attached to it and a sealed tube which runs from the fitting to the machine riser tube used for detecting the water level.

## Speed Sensor Connection

The speed sensor is fitted around the back of the machine to pick up the main pulleys spokes. The idea being that by telling the LC102 that a machine has for example a six spoked pulley, the LC102 will see 1 complete revolution when it has seen 6 pulses from the proximity/speed sensor.

The sensing distance of the sensor Total Systems Control Ltd provides is approximately 5mm. Another sensor maybe used if you feel necessary. The requirements of the sensor are, it must operate on 24volts dc, must be able to handle an operating frequency of 150 Hz and be able to return a normally open or normally closed signal. The sensor must be of an NPN or sinking configuration.

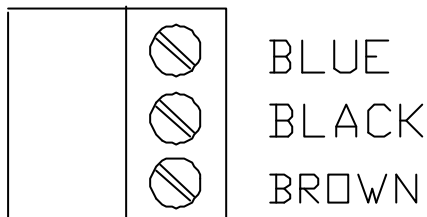
A bracket must be constructed to hold the proximity sensor as steady as possible to pick up the machine spokes. The proximity switch should pick up the spokes as close to the centre of the pulley as possible. The reason for this is that the pulley spoke deviation is less towards the centre. This will give you increased accuracy and less chance of the sensor being damaged.

## Speed Sensor Input Plug Wiring

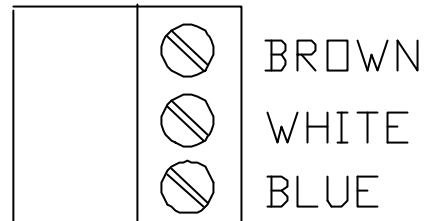
The sensor that Total Systems Control Ltd provides is wired up as follows.

If you have a Telemecanique Proximity sensor : **TE XS4 P12KP370/340** then the wiring schedule for this sensor is below.

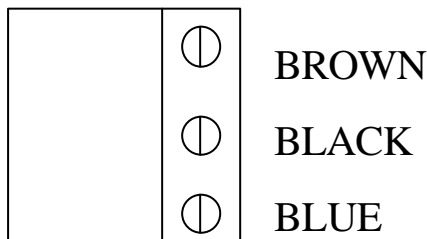
### 3 Wire Sensor



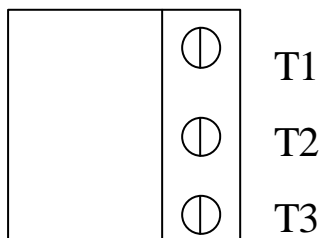
### 4 Wire Sensor



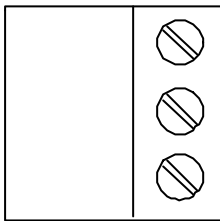
If you have one of the new type 8mm proximity sensor : **ABB 872CDH8NN18E2** then the wiring schedule for this sensor is as follows.



If you have the large proximity sensor which has a 20mm sensing range : **ABB 871L-D20EN40-T3** then the wiring schedule is as follows.



For a sensor that you wish to use, wire your sensor to the correct terminal on the 3 way plug. The diagram below shows what each terminal is used for.



+24 VDC SUPPLY

+24 VDC SIGNAL

0 VDC SUPPLY

## Washtech LC102 Setups

The following section in the installation manual is for the Internal Setup information that needs to be configured once all electrical and external connections have been made to the LC102.

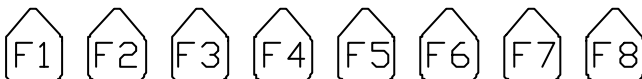
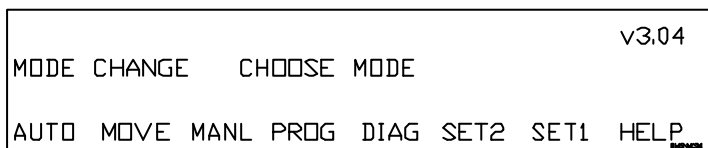
An explanation of each setup variable and timer will be given to make the setup procedure very easy.

Please read the LC102 USER manual first, reading the USER manual will give you an idea of how the LC102 works and certain key strokes you need to know to access certain areas of the LC102 memory.

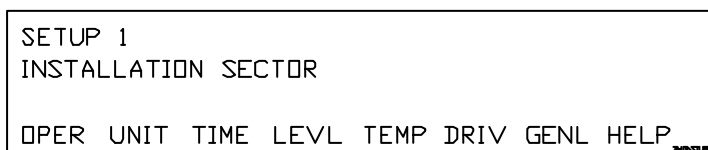
### Power up the LC102 for the first time.

You will have to go into SETUP1 and tell the LC102 what type of machine is going to control. Follow these steps.

Press Stop/Esc and then **MODE** on the keypad. You will now have Mode options shown on the bottom of the screen



Select SETUP 1 (**F7**) and proceed to input the access code (22139). Once the access code is typed in press **ENTER**. You now have another set of options on the screen for SETUP 1.



Press General ( **F7** ), use the - &  $\bar{\quad}$  keys on the key pad to highlight the different fields. The field being highlighted at the time will have two arrows on either side of it. ( >.....< ).

Select **NEW MACHINE TYPE** from the list. Press **ENTER** to change the condition to **YES**, press **Stop/Esc** and then press ( **F1** ) to confirm.

You will then be presented with all the different type of machines. Select your machine from the list with the - &  $\bar{\quad}$  keys and press **ENTER** and then ( **F1** ) to confirm your selection.

Now the LC102 knows what type of machine it needs to control and has mapped all the required Inputs and Outputs into its memory ready for machine operation.

The next step is to give the LC102 an operator code so that you can access all areas of the LC102. (See programming operator access codes in the USER manual to input your personal code).

At this stage the LC102 is at your command. You can access any area of the LC102 controller and set up the LC102 to control the machine the way you want.

## Testing and Configuring the LC102

Testing and Configuring the LC102 are done together. If while you are testing the LC102 you find there is room for fine tuning or that a configuration is not set properly you readjust the associated setting or settings in setup1 or setup2 and then re-test until the machine and LC102 are working together in harmony.

The following pages are dedicated to showing you how to test the machine and tells you all the configurable information and explains what each configuration setting means and does to the LC102, and to the machine you are controlling.

Testing is done in two stages. Manual and Automatic.

### Manual testing.

Change into Manual Mode operation of the LC102. If you are not familiar with the internal structure of the LC102, please read the LC102 User Manual so that you can perform the tests required. Proceed in the order of the following test list. Make sure all tests pass. If they don't they must be remedied before careering on.

- Check each individual input to see that is operating properly. Manually operate the switch to see that the input LED light is coming on or off.
- Close the door and turn the air on to carry on with testing.
- Is the temperature reading correct.
- Is the level reading zero with the machine empty.
- Check the operation of each of the following keys.

SIGNAL (the alarm bell and light should work)

COLD (the cold water valve should operate)

HOT (the hot water valve should operate)

STEAM (you will have to have a level in the machine for this to work, at the same time you can check to see that the level in the machine is rising along with the level on the screen)

DRAIN (select F1 'WASTE' to open the normal waste drain, if the drain is operating the other way around then you can configure the waste drain normally open or normally closed via SETUP 1 GENL.), press ESC to return back to the normal manual screen.

**DRIVES**      Select the wash drive (F1) from the Menu. Once you have made the selection press the ENTER key. The machine should start rotating.

This rotation at the very beginning is the wash forward direction it is also the same direction the machine should extract in. Another way to find out which way is the extract direction or wash forward direction is that when the machine is in extract it should throw the excess water towards the waste drain.

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27th May 1998

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Washtech Setups

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If the machine is rotating in the opposite direction then swap the output wires 11 and 12 around.

Now Run the machine up into extract by selecting DRIVE and then (F5) Extract Cycle. Press the ENTER key and the machine should run up through the different speeds until it reaches it's highest speed.

- **JOGGING (INCHING)**      Once motor direction has been established check the jogging or inching operation. Switch the SAFE RUN INCH switch to INCH and press one of the inch buttons UP or DOWN.
- **CHEMICALS**      If you have Auto chemicals hooked up to the LC102 then you must test their operation from the manual screen. First you must have a level of say 10cm in the machine. To activate a chemical pump all you have to do is press the (F1) to (F8) keys to select a pump 1 to 8. To check the flush water you press the SUPPLY key which will activate the flush water solenoid.

### **Automatic Testing**

Testing in Automatic is simply loading the machine with product and washing it. You will find the need for fine tuning as you see the machine washing the product. Maybe the dwell time needs to be adjusted or a timer needs to be lengthened, level averaging factor increased etc. These things can only be found out when the machine is actually washing something.

Automatic testing is also where you adjust the drive values and it's associated timers so that the speed sensor (if installed) can be used to not only detect speed but to indicate tired motors, bad bearings, slipping belts, slipping clutches etc.

If a drive speed value and associated time does not coincide a fault will appear on the LC102 screen. The fault will tell you which drive it is addressing, what the drive speed is set at, what speed it was doing when it faulted and the associated timer that goes with it. From this information you can correct either the drive speed value or the timer.

## SETUP 1 (CONFIGURATION SETTINGS)

### GENERAL (GENL) (F7)

Select New Machine	This only gives the machine a name that you can type in
Select new Machine Type	When starting from scratch you use this to tell the LC102 what type of machine it will be controlling
Alpha Bus System	Enables the LC102 to be compatible with a Diversey Alpha Bus chemical delivery System.
Beta Bus System	Enables the LC102 to be compatible with a Diversey Alpha Bus chemical delivery System.
Pulsed Input for Speed	Enables the LC102 to read speed input so that the machine is run more efficiently and safely.
Pulses Per Rev	Tells the LC102 how many pulses it should receive in one complete machine revolution
Blank the Memory (NOVRAM)	On the next power up the LC102 will completely wipe the whole memory (BE CAREFUL!!)
Balance Injection	Does the machine have a water balance injection system.
Brake between CW and CCW	Allow braking between wash forward and reverse.
Door locks when relay active	Changes the Door Lock relay to be either normally open or normally closed.
Drain when relay active	Changes the Waste Drain relay to be either normally open or normally closed
One key upward jog	Allows the use of only the ↑ & ↓ arrow keys for jogging the machine around via the keyboard.
No Brake when jogging	Enables or disables the high brake when jogging
Auto Jogging	Used when the existing machine has the old Auto Spot jogging system
Overload normally Open	Sets the overload input to read a fault either when it is normally open or normally closed.
Allow steam during supplies	Allows the steam to be injected while the auto chemicals are being injected.



Hot : Cold flow ratio	This is the ratio of Hot : Cold water injected into the machine. Used only in Washlink reporting.
Department number	When the LC102 is connected to Washlink you can generate reports according to the department number.

**Drives** (Drve) (F6) :

Stop Min Speed-RPM Stop Max Speed-RPM	Sets the Minimum and Maximum speeds allowable by the LC102 for Stop
Wash Min Speed-RPM Wash Max Speed RPM	Sets the Minimum and Maximum speeds allowable by the LC102 for Wash Speed
Drain Min Speed-RPM Drain Max Speed-RPM	Sets the Minimum and Maximum speeds allowable by the LC102 for Drain Speed
EXT1 Min Speed-RPM EXT 1 Max Speed-RPM	Sets the Minimum and Maximum speeds allowable by the LC102 for Extract (low) 1 Speed
EXT 2 Min Speed-RPM EXT 2 Max Speed-RPM	Sets the Minimum and Maximum speeds allowable by the LC102 for Extract (high) 2 Speed
No of Balance Retries	Tells the LC102 how many times to try and rebalance the load after the Out Of Balance switch is triggered
Drain Motor on During Ext 1	Turns the Drain motor on while the Extract 1 motor is on. Not recommend unless you have a very special machine.

The Drive section above and the machine Timers 13 through to 28 work together to monitor the machines drive progress while it is ramping up and ramping down through it's drives speeds.

The Drive section has a minimum and maximum speed for every drive speed available to the machine. The minimum and maximum settings must be within a sensible range so that the LC102 can detect a problem. Use the following guide to setting drive speeds.

Wash Min Speed set to 2 RPM.

Wash Max Speed set to 5-RPM more than normal running Wash speed.

Drain Min Speed set to 5 RPM less than normal running Drain speed.

Drain Max Speed set to 5 RPM more than normal running Drain speed.

Extract 1 Min Speed set to 50 RPM less than normal running Extract 1 speed.

Extract 1 Max Speed set to 30 RPM more than normal running Extract 1 speed.

Extract 2 Min Speed set to 80 RPM less than normal running Extract 2 speed.  
 Extract 2 Max Speed set to 50 RPM more than normal running Extract 2 speed.

When setting the Timers that coincide with the drive speeds do not be too generous with the times. This will defeat the purpose of having these backup safety features. Use the following guide to set timers. For the ramping up timers set them so that there is another 10 seconds left on the timer when it reaches it's normal running speed. Allow the same 10 seconds after the normal speed has been reached for the ramp down timers.

The LC102 has excellent diagnostics fault reporting for the drive speed system. If a timer has been tripped for a speed not reached the LC102 will give a very descriptive message on the problem.

An example of the type of error message you'd expect to see is ;

```

----- FAULT -----
CW WASH drive did no accel to 20 RPM
in 5.0 secs (Timer 14):Speed was 18 RPM
-----PRESS STOP-----
  
```

This fault says that when CW Wash drive was engaged (Output number 11) the LC102 did not see the machine get to the Wash Min Speed in the time that it was allowed to. The timer that was tripped was timer 14 the speed when it was tripped was 18 RPM and the speed that it wanted to attain was 20 RPM.

## Temperature (Temp) (F5)

Max Temperature permitted C	The maximum allowable temperature before the LC102 brings up an alarm for excessive temperature
Temperature Averaging Factor	This factor is set to provide a smoothing effect on the temperature reading on the screen.

## Level (LEVL) (F4)

Max Level Permitted	This is the maximum allowable level in the machine before the LC102 will raise an alarm
Over Level Cooldown Trip	When using the cooldown function, the OLCT level is added to the programmed level and cold water is added until it reaches the new level. The LC102 then dumps the water until it reaches the programmed level again and repeats this process until the desired

	temperature is reached.
Max Level for Extract (cm)	If this level is exceeded at anytime during the machines extract cycle the LC102 will stop the machine and bring up and alarm.
Outer Drum Depth (cm)	Outer drum depth of the machine used to calculate water volume and extract G forces.
Inner Drum Diameter (cm)	Internal drum diameter used to calculate extract G forces.
Outer Drum Diameter (cm)	Outer drum diameter used to calculate water volume.
Level Averaging Factor	The water motion inside the machine can be quite violent, this factor smoothes it out so the level on the screen does not reflect the ups and downs of the water motion in the machine.

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Level / Volume Ratio #1 Level / Volume Ratio #2 Level / Volume Ratio #3	These are the Level to Volume ratios of different materials washed in the machine. i.e. Blankets will hold more water than cotton or polycottons. At this time the ratios are not implemented in the LC102 when they are they will only be of use to LC102s connected up to Washlink were wash volumes are reported and logged.
Max door open Level (cm)	The door will be unlocked if the level in the machine is equal to or lower than the Max door open level.

## Timers (TIME) (F3)

Time before event logged	The wash formula has to run for a certain amount of time before it is considered a true event and sent up to Washlink
High Brake to Jog c/o	When jogging through the keyboard this timer enables the jog buttons at the configured time after the high brake has been released.
Mtr off time if coast sw to0	If the coast switch is triggered during extract the extract motor is turned off for this amount of time. (Only used on Spencer Machines)
Mtr on time if coast sw to0	Once the motor has come back on after the Mtr off time, it will run for this amount of time and then check for the coast switch again. (Only used on Spencer Machines)
1 Wash Drive	Duration of wash forward and reverse
2 Wash Stop	Wash Dwell time
3 Gentle Drive	Duration of gentle wash forward and reverse
4 Gentle Stop	Gentle Wash Dwell time
5 Distribution	The distribution time is the time the machine will stay in drain speed

	after the machine has been drained until it steps up to extract.
6 Level 0 to air bag Delay	Used on Washex Floataires, once a level 0 has been reached on an extract cycle the LC102 will count down this time and then engage the Floataires system.
7 Ignore Balance	Used on Braun 200s when looking for the pendulum
8 Extract 1 time	This is the time the Extract 1(low) will stay on before Extract 2(high) is engaged.
9 Clutch On delay	Clutch will be engaged after Wash drive engaged
10 Clutch Off delay	Clutch will be disengaged, wash drive disengaged
11 Airbag Up Delay	Air bags to deflate time after extract has finished.
12 Jog Pulse	If using keyboard jogging then this is the time that the wash contactor will be engaged for when you press the jog button.

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The following timers refer to the speeds inputted into the Drives section of Setup 1, i.e. Timer 13 is “CCW to Stop Ramp dn”, The time inputted into this timer is the maximum allowable time for the machine to go from (CCW) Counter Clockwise Wash speed to STOP (zero) speed. If the machine is still moving after this timer has run out the LC102 will bring up an error message telling you the speed it was doing, the timer number that timed out and the speed it was trying to reach.

13 Counter Clockwise Wash to Stop Ramp dn	The Max time to reach Stop Max Speed-RPM from the machines present Wash speed.
14 Stop to Clockwise Wash Ramp up	The Max time to reach Wash Min Speed-RPM from the machine present Stop speed.
15 Clockwise Wash to Drain ramp up	The Max time to reach Drain Min Speed-RPM from the machine present Wash Speed.
16 Drain to Extract 1 ramp up	The Max time to reach Ext 1 Min Speed-RPM from the machines present Drain speed.
17 Extract 1 to Extract 2 ramp up	The Max time to reach Ext 2 Min Speed-RPM from the machines present Extract 1 speed.
18 Extract 2 to Extract 1 ramp dn	The Max time to reach Ext 1 Max Speed-RPM from the machines present Extract 2 speed.
19 Extract 1 to Drain ramp dn	The Max time to reach Drain Max Speed-RPM from the machines present Extract 1 speed.
20 Drain to Clockwise Wash ramp dn	The Max time to reach Wash Max Speed-RPM from the machines present Drain speed.
21 Clockwise Wash to Stop ramp dn	The Max time to reach Stop Max Speed-RPM from the machines present Wash speed.
22 Stop to Counter Clockwise Wash ramp up	The Max time to reach Wash Min Speed from

	the machines present Stop speed.
23 Clockwise Wash to Drain change/over delay	This is the delay time from de-energising the Wash contactor to energising the Drain contactor.
24 Drain to Extract 1 change/over delay	This is the delay time from de-energising the Drain contactor to energising the Extract 1 contactor.
25 Extract 1 to Extract 2 change/over delay	This is the delay time from de-energising the Extract 1 contactor to energising the Extract 2 contactor

26 Extract 2 to Extract 1 change/over delay	If using regenerative braking ie Washex, Brauns and Wascators. This is the delay time from de-energising the Extract 2 contactor to energising the Extract 1 contactor.
27 Extract 1 to Drain change/over delay	If using regenerative braking ie Washex, Brauns and Wascators. This is the delay time from de-energising the Extract 1 contactor to energising the Drain Contactor.
28 Drain to Clockwise Wash change/over delay	If using regenerarative braking ie Washex, Brauns and Wascators. This is the delay time from de-energising the Drain contactor to energising the Wash contactor.

## Specific Machine Timers

The following timers may vary according to different types of machines. These timers will be listed according to machine type. Follow the timers suited to your machine.

### Braun 200lb with DC Brake

11 Not Used	
17 Not Used	
18 Not Used	

29 Not Used	
25 DC Brake change over delay	Time from De energising of the last contactor to when the DC brake output is engaged
26 DC Brake max time	Maximum time the DC brake is energised to stop excessive heating
30 Not Used	
31 Not Used	
32 Not Used	
33 Not Used	
34 Not Used	

35 Max time for speed switch closed	If you check the Braun input list you will see that it has a High low speed switch. When the machine is run on timers and not from the speed sensor it must see this switch open when ramping up to extract and closed when ramping down to a stop. This time is the time allowed to do so.
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the drain / distribute drive

### Braun 200lb without DC Brake

11 Not Used	
17 Not Used	
18 Not Used	
25 Not Used	
26 Not Used	
30 Not Used	
31 Not Used	
32 Not Used	
33 Not Used	

34 Not Used	
35 Max time for speed switch closed	If you check the Braun input list you will see that it has a High low speed switch. When the machine is run on timers and not from the speed sensor it must see this switch open when ramping up to extract and closed when ramping down to a stop. This time is the time allowed to do so.
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the drain / distribute drive
37 Not Used	
38 Not Used	

### **TSL 600 / Broadbent (Brauns)**

26 DC Brake max time	Maximum time the DC brake is energised to stop excessive heating
30 Not Used	
31 Not Used	
32 Not Used	

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33 Not Used	
34 Not Used	
35 Max time for speed switch closed	If you check the Braun input list you will see that it has a High low speed switch. When the machine is run on timers and not from the speed sensor it must see this switch open when ramping up to extract and closed when ramping down to a stop. This time is the time allowed to do so.
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the drain / distribute drive

### **Milnor (All)**

Timers 29, 30, 31, 32, 34. These are used only on Balancing Milnors.

29 Min Bal Shot Balance speed time	This is the water injection time into a counter balance pocket at while the machine is in Balance speed.
30 Min Bal Shot Extract 1 time	This is the water injection time into a counter balance pocket at while the machine is in Extract 1 speed.

31 Min Bal Shot Extract 2 time	This is the water injection time into a counter balance pocket at while the machine is in Extract 2 speed.
32 Min time between balance shots	This is the time the LC102 will wait until it injects more water into a counter balance pocket.
33 Seal Sucker time	If the Milnor has a seal sucker then this is the time it is engaged for so that it can extract all the air in the door seal.
34 Max Balance Pocket time	This is the maximum total accumulated time that a counter balance pocket has been injected with water. Once the accumulated time exceeds this time an alarm is rung and a message displaying which pocket has timed out and cannot balance.

35 Max time for speed switch closed	If you check the Milnor input list you will see that it has a High low speed switch. When the machine is run on timers and not from the speed sensor it must see this switch open when ramping up to extract and closed when ramping down to a stop. This time is the time allowed to do so.
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the drain / distribute drive
37 Not Used	
38 Not Used	

### Spencer 350 and Spencer 750

29 Min Bal Shot Interspin time	This is the water injection time into a counter balance pocket at while the machine is in Interspin.
30 Min Bal Shot Extract 1 time	This is the water injection time into a counter



	balance pocket at while the machine is in Extract 1 speed.
31 Min Bal Shot Extract 2 time	This is the water injection time into a counter balance pocket at while the machine is in Extract 2 speed.
32 Min time between balance shots	This is the time the LC102 will wait until it injects more water into a counter balance pocket.
33 Coast Switch Clear Before Extract 1or Extract 2	The LC102 has to see the Coast switch input #04 uninterrupted for this amount of time before the LC102 will enable the extract 1 or extract 2 speeds.
34 Max Balance Pocket time	This is the maximum total accumulated time that a counter balance pocket has been injected with water. Once the accumulated time exceeds this time an alarm is rung and a message displaying which pocket has timed out and cannot balance.
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the Interspin drive
37 Not Used	
38 Not Used	

### Washex

29 Autojog Kick Back time	This is the system that used the auto spot function. This is generally discarded once the LC102 is installed.
30 Not Used	
31 Not Used	
32 Not Used	
33 Not Used	
34 Not Used	
35 Not Used	
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the Drain / Balance drive

### Washex Dye

29 Not Used	.
30 Not Used	

31 Not Used	
32 Not Used	
33 Stop to Pin Retract time	Once the machine has stopped this time must elapse before the door pin is retracted.
34 Not Used	
35 Not Used	
36 Min Clockwise Wash before Drain time	This is the minimum time the LC102 will engage the Wash forward drive before it engages the Drain / Balance drive
37 Max Air bag Time	This is the time allowed to either inflate or deflate the air bags to correct height.

## Units (UNIT) (F2)

Select whether you would like the base measurement units.

Temperature	Select	Celsius or Fahrenheit
Level	Select	Centimetres or Inches
Volume	Select	Litres or Gallons

## Operators (OPER) (F1)

Follow the instructions detailed in the LC102 User manual on inputting new operator codes.

## Setup 2 (CONFIGURATION SETTINGS)

### General (GENL) (F7)

Op Code for Formula Start	At the start of each formula run in Automatic you can request that the LC102 ask the operator for their operator identify code so you can keep track of who was loading and unloading the machine at the time. This information can only be used in the Washlink system
Get Weight at Formula Start	At the start of each formula run in Automatic you can request that the LC102 ask the operator for the machine lot weights in each machine pocket. These are then uploaded by the Washlink computer to be later included in reports.
Auto Flush	Selecting yes will enable the auto flushing system. This injects water into the chemical lines after chemicals have been injected into the machine.

Flush During Injection	This will turn the flush water system on while the chemicals are being injected.
Washlink permanent connect	Is the Washlink system permanently connected to the LC102 unit. If this is set to Yes the you will not be able to make formula changes from the LC102 Keyboard.

## Temperature (TEMP) (F6)

Lower Temp Tolerance C	If the programmed temperature is say 80 degrees and the Lower temperature tolerance is 2 degrees, more steam will be injected into the machine when the actual temperature reaches 77 degrees and continue to be injected until it reach's the programmed temperature again
Temp Gradient Sample (sec) % TmSteam on / degree error % TmCold on / degree error % Integral Gain 0=no int Differential Gain 0=no diff	These variables are already pre-set to the optimum values and should not be adjusted unless otherwise instructed. These values are for the cooldown and ramp up process.

## Level (LEVL) (F5)

Lower level Tolerance	If the programmed level is say 30 cm and the Lower Level tolerance is 5 cm, more water will be injected into the machine when the actual level reach's 24 cm and continue to be injected until it reach's the programmed level again
Minimum level for steam cm	The LC102 will not inject steam unless the water level is above the amount set in the parameter
Stain set Cold Min Level cm	The LC102 will only inject cold water upto this level so that the stains are not set in the fabric. Hot water will set the stain if injected straight away.
Minimum level for Supplies cm	The LC102 will not inject chemicals unless the water level is above the amount set in the parameter.

## **Time** (TIME) (F4)

Current Time	Enter current time
Current Date	Enter current Date
Short Display time	Time that a piece of extra information is displayed. I.e. when you press the TEMP key when the machine is running you will see target temperature actual temperature etc. After a this amount of time the screen will revert back to normal.
Long Display time	Time that a piece of extra information is displayed. I.e. when you press the TEMP key when the machine is running you will see target temperature actual temperature etc. After a this amount of time the screen will revert back to normal.
Level Attain timeout	The LC102 will only wait for this amount of time to pass to reach the programmed level. If it does not then the LC102 will bring the alarm that the level was not reached in time.
Temperature attain timeout	The LC102 will only wait for this amount of time to pass to reach the programmed temperature. If it does not then the LC102 will bring the alarm that the temperature was not reached in time.

## **Supply** (SUPP) (F3)

This section is where you tell the LC102 what chemicals are available to it. Basically you are making a chemical library.

Detailed information is included in the LC102 USER Manual.

## **Additives** (ADTV) (F2)

This section is where you assign a chemical from the chemical library (Supply) to an output (F1 ... F8).

Detailed information is included in the LC102 USER Manual.

## **Operators** (OPER) (F1)

Detailed information is included in the LC102 USER Manual

## **Specific Machine Information**

The next section gives you the specific installation differences between each of the machines. Each machine is listed and gives an explanation about the variances in each of the machines to look out for when attempting a Washtech LC102 installation.

Machine Types Available

**Braun 200lb with DC brake**

**Braun 200lb no DC brake**

**Cherrytree TSL 600 \ Broadbent**

**Spencer 350**  
**Spencer 750**  
**Washex**  
**Washex Dye**  
**Milnor**  
**Cascadex**  
**Wascator**

Selection of one of the above Machine types will load a standard set of instructions for the operation of that machine type. This will include default timers and drive types. After selecting the machine the installer will check through the items in Setup 1 and ensure that they are suitable for the individual machine.

The following sections detail the differences for each special machine types.

### **Braun 200 with DC brake**

The Braun 200 with Dc brake is an open pocket machine. It has three drive speeds these are as follows :

Wash (Forward & Reverse)  
Drain or Balance  
Extract

This machine type does not have a high extract speed. Do Not program High Extract on the *Washlink* Network System. The machine is equipped with a DC braking system that injects a DC voltage into the Extract motor to bring the machine to a stop after the extract has finished. This should only take about 60 Seconds.

### **Braun 200 no DC brake**

The Braun 200 no Dc brake is an open pocket machine. It has three drive speeds these are as follows.

Wash (Forward & Reverse)  
Drain or Balance  
Extract

This type of machine generally has a pendulum situated on the left hand side behind the machines main front plate. This pendulum is to detect an out of balance situation when it goes into extract. The pendulum has two hold in plungers to keep it steady when it not being sensed. When the Washtech LC102 wants the machine to go into extract it will engage drain/ balance speed, release the pendulum and check it for approximately 7 seconds to see if there is any excessive movement in the machine, if all is clear the pendulum hold plungers are engaged and the machine will safely move into extract.

**Cherrytree TSL600 / Broadbent (Brauns)**

The Cherrytree TSL 600 the Broadbent and Brauns are three different machines that just happen to operate in a similar manner and therefore share the same software setup.

### **Cherrytree TSL 600 and Brauns**

The Cherrytree TSL 600 and Braun Machines are a three pocket washer extractor. It has three drive speeds and they are as listed

Wash (Forward & Reverse)

Low Extract

High Extract

During the normal course of a wash formula the draining of the machine is done in wash speed for all of the steps where a drain is required. You must program a drain step before an extract step for this machine type. It is not necessary to program the waste drain for this to operate as the instruction for the waste drain is built into the extract sequence of events. If the machine is drained in wash speed before an extract it will most likely not balance correctly due to no distribution of load.

### **The Broadbent**

The Broadbent is an open pocket washer extractor. It has three drive speeds and they are as listed

Wash (Forward & Reverse)

Low Extract

High Extract

During the normal course of a wash formula the draining of the machine is done in wash speed and for the extract steps of the cycle the drain is done from a high level (50cm) when the low extract drive is on. It is not necessary to program the waste drain for this to operate as the instruction for the waste drain is built into the extract sequence of events. If the machine is drained in wash speed before an extract it will most likely not balance correctly.

### **Spencer 350**

The Spencer 350 is generally a three pocket washer extractor but there are several examples of the open pocket versions of this machine available. The Spencer 350 has dynamic balancing of the inner drum while the machine is in extract. The Washtech LC102 has complete control of this balancing. The duration of the balance water injection are fully variable as are the pocket full times. The door locking system of the 350 Spencer requires that air be applied to the door pin to release it and allow the door to be opened.

The door seal is mechanical, via a long locking handle.

## **Spencer 750**

The Spencer 750 is a three pocket washer extractor. The Spencer 750 has dynamic balancing of the inner drum while the machine is in extract. The Washtech LC102 has complete control of this balancing. The duration of the balance water injection are fully variable as are the pocket full times. Spencer Machines all have the same type of drive speeds and they are as follows:

Wash (Forward & Reverse) (Wash speed is drain speed)

Balance / Interspin

Low Extract

High Extract

The door pins of the 750 Spencer require air to be applied to the manual switch in the middle of the door before they can be released. This air is supplied by the door lock solenoid. The door seal is controlled by the Washtech LC102 and is operated when required. Spencer's have a centrifugal clutch that will automatically engage and disengage at certain revolutions.

## **Washex**

The Washex machine is available in a wide range of configurations and sizes. The Washtech LC102 is able to control most of the machines that are available from this manufacturer as the original software was developed for this machine and adapted for the other types of washer extractors.

The Washtech LC102 has the facility to provide control of the Auto jogging that is available in the newer Washex Washer extractors using the wash motor running at low speed.

The Washtech LC102 has the full range of drive speeds available for the Washex Washer extractors in either floataires, fixed mounts or open pocket machines.

Be aware when dealing with Floataire machines cushion machines that they use a

combination of valves and switches to operate the floataire system. The common names for these valves are FA, RAM, LAM, RAV, LAV and the two limit switches on either side of the machine sensing the machine height.

To engage the floataire system you first engage RAM, LAM and FA, when the left hand limit switch has been activated i.e. the left hand side of the machine has reached it's correct height disengage LAM, when the right hand limit switch has been activated disengage RAM. This will leave FA going all the time to provide air to the special levelling valves at both ends. To deflate the bags, disengage FA and engage LAV and RAV.



## **Washex Dye**

The Washex Dye Machine Incorporates all LC102 design features for it's complex operation. The Washex Dye Machine is able to be tilted forward so it maybe loaded and airbag facilities for extracting. The Door is pneumatically sealed to the front of the machine. The door locking and sealing of the Washex Dye is fully automated and only requires the operator to press the stop key for sufficient time to allow the door seal to be deflated and the pins to retract but only if the level is lower than the maximum door level. The machine has an external Speed controller for wash speed and the drive speed called Super Penetration which is used to force dye into the fabric.

## **Milnor Machines**

The Washtech LC102 is capable of controlling the complete range of Milnor Washer extractors including those machines that are fitted with a balancing and tilting systems.

Some small Milnors only have one extract speed, so when it comes to programming extract cycles on the LC102 or *Washlink* the final Extract Speed is

Extract 1 (Low Extract).

The door locking and sealing of the Rapid load machines is fully automated and only requires the operator to press the stop key for sufficient time to allow the door seal to be deflated and the pins to retract.

The Washtech LC102 can use either the original speed switch or a pulse input from a proximity switch to detect the speed of the drum while the machine is operating. The Milnor Machines are supplied from the factory with a mixture of solenoid voltages and the installer needs to be aware of this.

## **The Milnor Door**

The operation of the Milnor door system for Rapid Load machines and / or D Pocket machines has retained the original operating principal. To open the door the machine must be powered up. The operator only has to push the Stop button for the duration of the Seal Sucker timer.

When this timer has timed out the Door Pins will retract and the operator can release the stop button and open the doors.

The pins will stay retracted for a short time and will return to their normal position after this. if the door is not opened in this time the operator will have to go through the operation again. It is not possible to open the door while there is water in the machine above the max door open level.

## **Cascadex**

There are two types of Cascadex machines. One is a pocketed machine that operates in the same manner as a fixed mount Washex. The other Cascadex machine that we have controlled is an open pocket machine that operates in the same manner as a Washex Dye machine. The open pocket tilts forward to unload and has a pneumatically driven door. This machine lifts up onto its airbags when extracting. To open the door of this machine you have to press the stop key for a few seconds. If the level in the machine is below the maximum level for door open the seal will deflate. The door pin will now retract and the door can be opened.

When controlling Cascadex machine identify whether it operates like a fixed mount Washex or Washex Dye machine and choose the appropriate software,

### **Wascator**

The Wascator machine is a small machine that generally does not have a braking system. Wascator's also have electrically operated clutches. These machines operate in the same way as a Washex Fixed Mount without the hydraulic braking. They use the low extract motor to slow the machine down from high extract and glide down to stop from there. The door is unlocked after the machine has stopped and the level is below the maximum level for door open.

## **Safety Section**

This section deals with the safety issues in the installation of the Washtech LC102.

This section will talk about :

## **Machine Jogging**

### **Electrical Hazards**

### **Machine interlocks**

### **Unauthorised access**

### **Training**

## **Machine Jogging**

Machine jogging is a very important area for safety. Total Systems Control Ltd have consulted the Occupational Safety and Health (OSH) department of the ministry of Labour in New Zealand to find out the exact standards required for the jogging of a washing machine. The following points must be obeyed for the controller and the machine to conform.

- The Washtech LC102 uses pulsed jogging while the outer machine door is open. The inner drum is moved around in small steps for loading and unloading. The Washtech LC102 pulsed jogging complies completely with OSH requirements.
- If a machine is only able to have continuous jogging then the machine must be modified so that any rotation must not exceed 8 revolutions per minute. Even two handed jogging will not comply if the 8 RPM limit is exceeded.
- If a machine is only able to have continuous jogging and the speed cannot be reduced to lower than 8 RPM then a physical barrier must be erected between the operator and the open machine while the operator is attempting to jog the machine.
- If a machine is only able to have continuous jogging and the speed cannot be reduced to lower than 8 RPM and a physical barrier cannot be constructed then the jogging must be done while the outer machine door is closed.

## **Electrical Hazards**

Electrical hazards must be labelled and clearly identified. All voltages must be identified. Electrical cabinet doors must be closed at all times to reduce the risk of accidental electrocution and to stop other elements like steam, water and dirt damaging electrical equipment.

## Machine Interlocks

Machine interlocks such as door locks, isolation switches and movement sensors must be in fully operational at all times. All staff rely on the locks, switches and sensors to protect them from harm if a mechanical machine fault occurs.

## Unauthorised Access

Steps to stop unauthorised access to vital Washtech LC102 controller timers and setups is crucial. Access codes must not be shared. Personnel given access codes must not share them without the consent of plant management and must make sure they do not allow unauthorised personnel to see them input access codes into the controller.

## Training

Training of Staff is done once final commissioning of the Washtech LC102 is completed. Staff who use the Washtech LC102 will be trained to operate the Washtech LC102 as far as their job requires them to be trained. I.e. the following training schedule shows to what extent each person requires.

- Washroom Operators :** Automatic Operation.
- Washroom Supervisor :** Automatic Operation, Ability to move between steps, Manual mode.
- Production Manager :** Automatic Operation, Ability to move between steps, Manual mode, Programming, Memory back up storage, simple setup configuration.
- Plant Engineer :** Automatic Operation, Ability to move between steps, Manual mode, Programming, Memory back up storage, detailed setup configuration.
- Chemical Serviceman :** Automatic Operation, Ability to move between steps, Manual mode, Programming, Memory back up storage, simple setup configuration

Once initial training has been completed it is the responsibility of plant management to implement further training of new employees so that if essential staff leave the plant that their skills are passed on.

This Fault Section is written to aid you in restoring or correcting a problem you may have with the Washtech LC102.

This fault section is divided into 2 sections:

### **Washtech LC102 Faults 'Reported to Screen' :**

These are screen fault messages which are prompted by the Washtech LC102 when it has detected something wrong with the LC102 or the machine.

### **Washtech LC102 Faults 'Not Reported to Screen' :**

these are faults that are not displayed as a message on the screen and are usually caused by damaged hardware inside the LC102.

Please use this fault section to determine and correct the fault. If for any reason the fault cannot be rectified call

**Total Systems Control Ltd**

**Auckland**

**New Zealand**

**Ph: 09 378 1315      Fax: 09 378 9046**

To enable the best use to be made of the telephone servicing You must be able to tell us several facts about the Washtech LC102 fault first, to help us determine what the problem might be.

Follow this check list and write down the information and have it in front of you when you ring us.

- 1      In your own words describe the fault that has occurred.**
- 2      What part and at what stage of the wash cycle does the fault occur, i.e. Temperature, Drive, Level etc.**
- 3      What is the actual error message displayed on the screen, write down the message on the display exactly if there is one.**
- 4      Is this the first time the fault has occurred; if not how many times and at what point in a wash cycle or time of the day does it happen.**

# Washtech LC102 Faults ‘Reported to Screen’

## “NO AIR PRESSURE”

This fault indicates that the air pressure switch input (03) has registered a low air pressure. Check the pressure switch and all gauges to see if this is correct, resume the program when the air pressure is back to normal.

## “AIR BAGS TIMEOUT”

This fault indicates that either the machine did not inflate or deflate to its correct height in the time allowed (Timer 37). The airbag limit switches which read if the machine is at the correct height or not are inputs (04 Left hand side & 05 Right hand side). These switches must be wired normally closed. When both sides of the machine are safely down on the ground inputs (04 & 05) should be OFF, when the machine is safely suspended on its airbags waiting to go into extract inputs (04 & 05) should be ON.

Also check all airbag valves including exhausts for blockages.

## “BRAKE FAULT CALL ENGINEER”

This fault is generally associated with the Washex machines. If the machine has a brake worn limit switch this fault will occur when the brake pads need replacing. The Brake worn limit switch is wired into input (10) when the machine is configured as a Washex.

## “DOOR OPEN”

This fault indicates that input number (01) door switch(s) has been tripped, telling the Washtech that the door(s) are open. Check all doors and door switches.

## “DRAIN BLOCKED”

When the Washtech goes into extract with a full load, the load will start expelling its water. If the water level rises higher than the ( Maximum Level for Extract ) configuration setting in Setup 1 Levels, then this fault message will be displayed and the machine stopped. Check the drain is not actually blocked and is open. If this happens frequently then increase the maximum level for extract by 3 or 4 cm.

## “CANNOT REACH PROGRAMMED LEVEL”

The Washtech LC102 has a timeout facility where it must reach the programmed level by the time set in Setup 2 Time (Level Attain Timeout) if it does not then this fault message will occur.

If the machine is trying to fill to a level, check all water inlet solenoids and the valves for correct operation. If the machine is trying to drain then check to see if the drain is blocked or if water is still coming out of the drain. If everything checks out then maybe the zero level needs recalibrating ( see Washtech Level Calibration in this manual ). Another possibility is the level reading system may have a leak in it so the correct water level is not read.

### **“CANNOT REACH PROGRAMMED TEMPERATURE”**

The Washtech LC102 has a timeout facility where it must reach the programmed temperature by the time set in Setup 2 Time (Temperature Attain Timeout) if it does not then this fault message will occur. Check to see if the steam injection system is operating correctly. Check to see that the temperature on the screen is the same as the temperature inside the machine using another thermometer. This may also be due to steam demand, if the boiler is over stressed and cannot supply enough steam to the whole plant as well as the washer.

### **“CANNOT BALANCE POCKET 1 2 OR 3”**

This fault refers to Spencer or Balancing Milnor machines. The Washtech LC102 has tried to inject water into the offending counter balance pocket for the maximum time allowed without success. The maximum time allowed to try and balance a single pocket is found in Setup 1 timers (Timer 34). Check for badly loaded machine and check to see if balancing system is working correctly. Out of balance Inputs - Pocket 1 = Input (09), Pocket 2 = Input (10), Pocket 3 = Input (11), Water injection Outputs for Pocket 1 = (46), Pocket 2 = (47), Pocket 3 = (48). Check the Balance commutator as well for carbon build up on the brushes.

### **“CHEMICAL DOOR OPEN”**

This fault refers to Washex Dye machine configuration. The chemical door usually has a proximity sensor on it which detects if the door is open or closed. If the door is sensed open the Washtech LC102 will not allow the machine to run. Check the chemical door, make sure it is closed properly. Input (11) reads the chemical door on machines configured to Cascadex or Washex Dye.

### **“CYBER CARD REMOVED OR FAULTY”**

When you are trying to use the Cyber card for memory backup or download this fault will occur if the Cyber card is either not in the Cyber card socket, it is not correctly inserted or there is a problem with the Cyber card you have. Check to see that you have the Cyber card in the socket and that it is inserted correctly.

**“EXCESSIVE VIBRATION”**

Each machine will have an excessive vibration switch which is located in a position to sense the excessive movement of the machine relative to it's mounting position.

This switch is seen as Input (06). Check for correct loading of the machine, faulty shock absorbers or springs., faulty vibration switch or mounting.

**“EXCESS WATER LEVEL”**

The Washtech LC102 has a configuration setting in Setup 1 Levels (Excess water Level) that will stop the machine and bring up this fault whenever this level is reached in normal operation of the machine.

Check that the water outputs (25 & 26), solenoids and valves are operating correctly.

**“DRIVE REPORTS RPM SENSOR FAULT”**

This fault will occur if the Washtech sees that the inner drum of the machines not turning when it should. Reasons for this fault could be :

The Safe Run switch still set to SAFE.

The speed sensor or cable is damaged and not picking up the pulley spokes as it moves around.

The control voltage to the contactors has been disrupted somewhere.

The 24 VDC has been lost to the output relays. See Relay Output Faults.

The contactor coil maybe faulty.

The clutch may not have engaged.

The brake may not have released.

Vee belts are slipping on the pulley.

**SPEED SENSOR PARAMETER FAULTS**

An example of the type of error message you'd expect to see is ;

```
----- FAULT -----
CW WASH drive did no accel to 20 RPM
in 5.0 secs (Timer 14):Speed was 18 RPM
-----PRESS STOP-----
```

This fault says that when CW Wash drive was engaged (Output number 11) on the LC102 did not see the machine get to the Wash Min Speed of 20 RPM in the time that it was allowed to of 5 seconds which is timer 14. The speed when it was tripped was 18 RPM.

To correct this fault you must first ascertain why the fault occurred, whether it was mechanical, electrical or the controller. This fault if it occurs several months after an installation generally



indicates either the sensor has moved out of range of the pulley due to vibration or possibly a wearing part on the machine that needs attention.

The control voltage to the contactors has been disrupted somewhere.

The contactor coil maybe faulty.

The clutch may not have engaged.

The brake may not have released or not be able to slow the machine down fast enough.

Vee belts are slipping on the pulley.

See section in this manual on DRIVES (Setup 1 Configurations).

### **“SPEED SWITCH STAYED CLOSED”**

This fault refers to the zero speed switches found on early models of machines which have not had the new speeds sensors installed. The fault says that the zero speed switch input (08) stayed closed after an allowed time (timer 35) when it should have opened because the machine should have accelerated enough to attempt an extract cycle.

### **“SPEED SWITCH STAYED OPEN”**

This fault refers to the zero speed switches found on early models of machines which have not had the new speeds sensors installed. The fault says that the zero speed switch input (08) stayed open after an allowed time (timer 35) when it should have closed because the machine should have slowed down enough from an extract cycle.

### **“MOTOR OVERLOADED”**

This message indicates that the overload input (02) has tripped while the machine was running. The report will also tell you what overload has tripped whether it was Wash, Drain, Low Extract or High Extract.

Check the appropriate overload, reset the overload trip. This could be due to overloading of the machine, something stopping the motor from turning freely or even a tired motor.

### **“WATCHDOG REPORT POWER FAULT”**

This fault tells you that a special circuit inside the Washtech LC102 called a Watchdog has picked up a power fault. It could be a brownout, blackout or a power spike which has knocked over the main processor board. The Washtech LC102 had to reset itself to counter act it.

No action is necessary at his stage. Keep an eye out to see if this fault occurs frequently. If it does occur frequently then you may have power supply problems to the machine.

## Washtech LC102 Faults ‘Not Reported to Screen’

### LEVEL FAULTS

**The level display reads 0 cm or is slipping but machine is filling.**

- The level pressure system is very sensitive, the pressure sensor on the Input board reads pressure from 0 to 1.5 psi. If there is a small air leak i.e. pin hole or tiny crack in the level tube this fault will occur. Please check all fittings associated with the level system from the pressure sensor down to the machine level fitting.

**Overshooting programmed levels.**

- This can be caused by a slow acting water valve letting in more water after it has been told to close by the LC102.
- This problem can also be caused by lag time. When the LC102 sees the programmed level has been reached it will turn off the water output relays which turn off the water solenoids which decrease the pressure in the air line so that the water valve will shut off. This lag time depending on the water pressure may inject a further 5 to 10 cm of water into the machine. This can be compensated for in the program, decreasing water pressure or using fast double acting water valves and solenoids.

**Machine Overfilling while the level is accurate.**

- Hot or Cold water valves maybe stuck open or unable to turn off.
- Hot or Cold Solenoid valves maybe not be operating correctly.
- LC102 Output relays may not be turning off. Contact Total Systems Control Ltd for replacement relay board.

**Level on Display is different to level in Machine.**

- A small blockage in the level hose could cause this to happen. Clear the level tube by disconnecting it at the LC102 end and blowing back down it into the machine. Please do not blow back into the LC102 pressure sensor, this could cause permanent damage.
- The level will need to be recalibrated using the potentiometers on the Input board. See section in this manual about Level recalibration.

**Level Display keeps flashing 1 or 2 cm of water while trying to drain.**

- A small blockage in the level hose could cause this to happen. Clear the level tube by disconnecting it at the LC102 end and blowing back down it into the machine. Please do not blow back into the LC102 pressure sensor, this could cause permanent damage.
- The level will need to be recalibrated using the potentiometers on the Input board. See section in this manual about Level recalibration.

## TEMPERATURE FAULTS

### Temperature on the display reads 0 or 1 or 99 degrees.

- Temperature probe is not plugged into the Input board properly.
- Temperature probe wires maybe in the wrong terminals, check wiring.
- The Temperature sensor found inside the metal housing has been damaged or shorted to the outside case. You will need to either repair it, obtain another one or make another one (see temperature probe repair instructions in this manual).

## RELAY OUTPUT FAULTS

### A specific relay output does not work.

- Check to see that the relay output light is operating when it should.

Yes : Then check that the voltage is being switched to the terminal that is associated with that output. Check also the (solenoid, contactor, relay etc.) connected to that output.

No : Contact Total Systems Control Ltd. You most probably have a faulty relay board.

### All Relays are not operating, but the input lights are on.

- Is the R Pwr (Relay Power) light on. This is found next to the speed sensor on the combo board.

Yes : Check all ribbon cable connections, otherwise you most probably have a faulty relay board. Please contact Total Systems Control Ltd for a replacement board.

No : Check the earth connections on the combo board, other wise you may have a faulty Combo board. Please contact Total Systems Control Ltd for a replacement board.

### All Relays are not operating, No Inputs are on but the screen seems normal.

- The 24 VDC fuse has blown. The 24 VDC fuse is a resistor called R1, this is found on the Combo board. R1 should have a value of 10 ohms. Replace R1 with another 10 ohm flame proof resistor.

## **INPUT FAULTS**

### **A specific Input is not operating correctly.**

- Short out that input directly to the input common to see if the input light comes on.

Yes : Check the associated input switch (door switch, vibration switch etc.) for correct operation.

No : Try using a different input common otherwise you may have a faulty Input board. Please Contact Total Systems Control Ltd for a replacement board.

### **All Inputs seem dead, no lights are on, keyboard screen looks normal.**

- Check the 24 VDC lead that comes up from the Combo board to see that it has 24 VDC on the end of the plug.

Yes : Make sure the plug is in the correct way, otherwise you may have a faulty Input card. Please Contact Total Systems Control Ltd for a replacement board.

No : The 24 VDC fuse has blown. The 24 VDC fuse is a resistor called R1, this is found on the Combo board. R1 should have a value of 10 ohms. Replace R1 with another 10 ohm flame proof resistor.

## **KEYBOARD FAULTS**

### **Keyboard looks dead, no back light or characters on the screen.**

- First check to see if the LC102 black box is operating i.e. if you see lights and indicators on inside.

Yes : The keyboard fuse has blown. There is a keyboard fuse located on the Combo board (see technical diagrams for details and location) that protects the keyboard. Replace this fuse with 650mA - 1 Amp fuse.

No : Check all control circuit breakers, fuses and switches to see that they are on. Check also the LC102 fuse which is located inside the LC102 Line filter.

### **Keyboard Keys are not responding when you press them.**

- To test this you need to perform a keyboard response test. To do this you must turn off the LC102 then when you turn it back on again you must press the START and F1 keys together while the keyboard is running it's little test routine before the LC102 initialises. You will see a grid on the screen, when you press a key it is reflected onto the screen to show that it has been read. Press all keys to see if they all respond correctly.

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Trouble Shooting Section

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## **V25 CPU FAULTS**

### **The Keyboard Screen keeps scrolling characters and not initialising.**

- This problem indicates the LC102 has been upset by either a power spike, brown out, electrical noise or even vibration causing movement of components. The first course of action would be to pull the LC102 apart, back to the bottom two boards (V25 & Combo) and recheck all ribbon cable connections as well as checking all micro chips are all sitting tightly in there respective sockets. Power the LC102 back up again. If the LC102 doesn't work then contact Total Systems Control Ltd technical support.

### **There is a black flashing cursor in the top left hand corner. The LC102 seems to be frozen.**

- This problem is related to the internal NOVRAM (this is the chip where all formulas, timers and machine configurations live). This fault suggests that it has been corrupted due powers spikes, brown outs, electrical noise and vibration. To remedy this you need to clear the NOVRAM and then reload the Cyber card back into it.

#### **Clearing the NOVRAM and reset using Cyber card :**

Turn the LC102 off.

Find the 8 way Dip switch on the V25 board.

Find dip switch #6 and flick it to ON.

Turn back on the LC102.

The screen should now say "Invalid Machine Type".

Turn off LC102.

Return dip switch #6 back to OFF.

Turn on LC102, go into Setup 1 General, select "New Machine type" select your machine.

Go into Setup 1 Operators, configure yourself as an operator and give yourself access to all parts of the LC102.

Go into Diagnostics and load in the Cyber card information for that machine.

### **The Keyboard screen Displays “Invalid Machine Type”.**

- This problem is related to the internal NOVRAM (this is the chip where all formulas, timers and machine configurations live). This fault suggests that it has been corrupted due powers spikes, brown outs, electrical noise and vibration. To remedy this you need to clear the NOVRAM and then reload the Cyber card back into it.

#### **Clearing the NOVRAM and reset using Cyber card :**

Turn the LC102 off.

Find the 8 way Dip switch on the V25 board.

Find dip switch #6 and flick it to ON.

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**Trouble Shooting Section**

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Turn back on the LC102.

The screen should now say “Invalid Machine Type”.

Turn off LC102.

Return dip switch #6 back to OFF.

Turn on LC102, go into Setup 1 General, select “New Machine type” select your machine.

Go into Setup 1 Operators, configure yourself as an operator and give yourself access to all parts of the LC102.

Go into Diagnostics and load in the Cyber card information for that machine.

## LC102 Technical Diagrams.

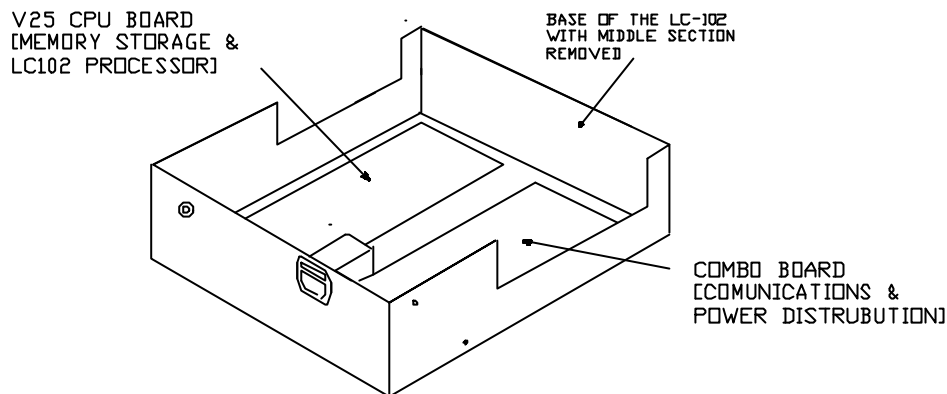
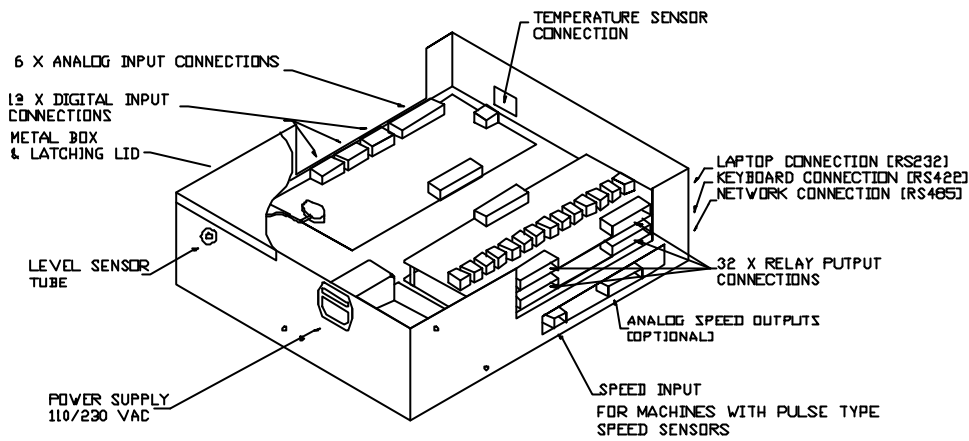
This section of the manual explains how the LC102 is made up of its different parts and what each of the parts represent and do in the LC102.

The diagrams and drawings show general layout of the LC102 circuit boards showing important connection points on each board. Also covered are Transformer voltages, Level calibration, Board addresses and how an LC102 to a particular *WASHLINK* Network address.

The LC102 can also be extract interlocked and steam interlocked. Details on how this is done is also in the section.

If at anytime you are unsure on how to reconnect internal leads in the LC102 please refer to this section.

The diagram below shows the general layout and orientation of the boards in the LC102

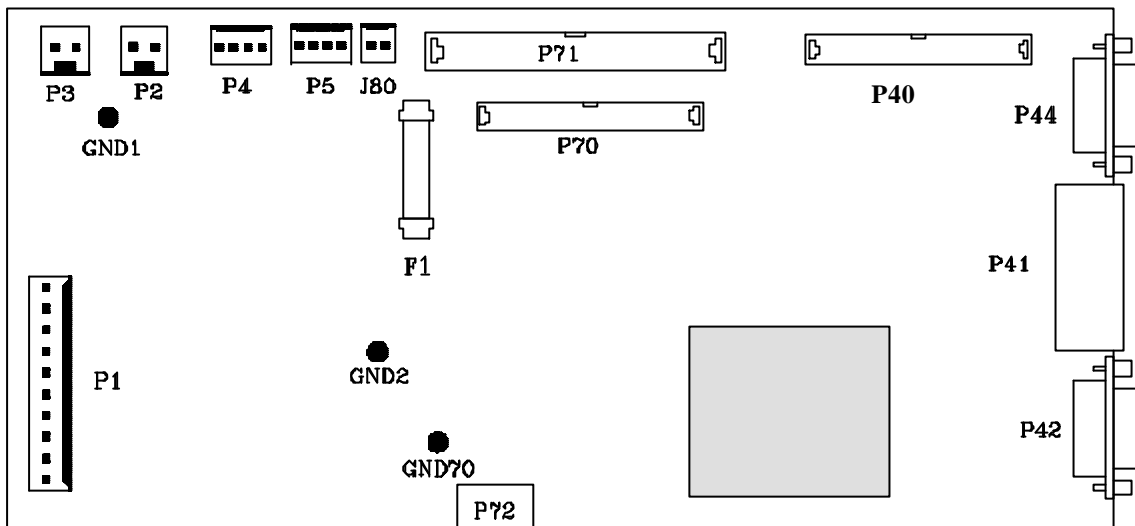


## Combo Board Connections.

- P1 Transformer plug.
- P2 24 Volts DC supply to the Analogue Digital board.
- P3 24 Volts DC supply.
- P4 Battery Out plug, this goes to the external battery plug on V25 board.  
It keeps the v25 clock alive when the power is off.
- P5 Battery In plug, this comes from the battery pack underneath the line filter.
- P40 26 Way Washtech Bus. This goes to the serial bus connection the V25 Board.
- P41 Keyboard connection plug.
- P42 RS232 laptop connection plug.
- P44 RS485 network connection plug.
- P70 26 Way Ribbon cable connection. This ribbon cable is connected to the input and output boards.



- P71 50 Way Ribbon cable connection. This the parallel I/O bus which goes to the V25 board.
- P72 Speed sensor connection.
- J80 Watchdog timer plug. Goes to the Halt Reset plug on the V25 board.
- F1 1 amp fuse for the 10 Volts DC Keyboard power.
- GND1 Chassis earth connection from the main earth point.
- GND2 Chassis earth connection from the main earth point.
- GND70 Chassis earth connection from the main earth point.

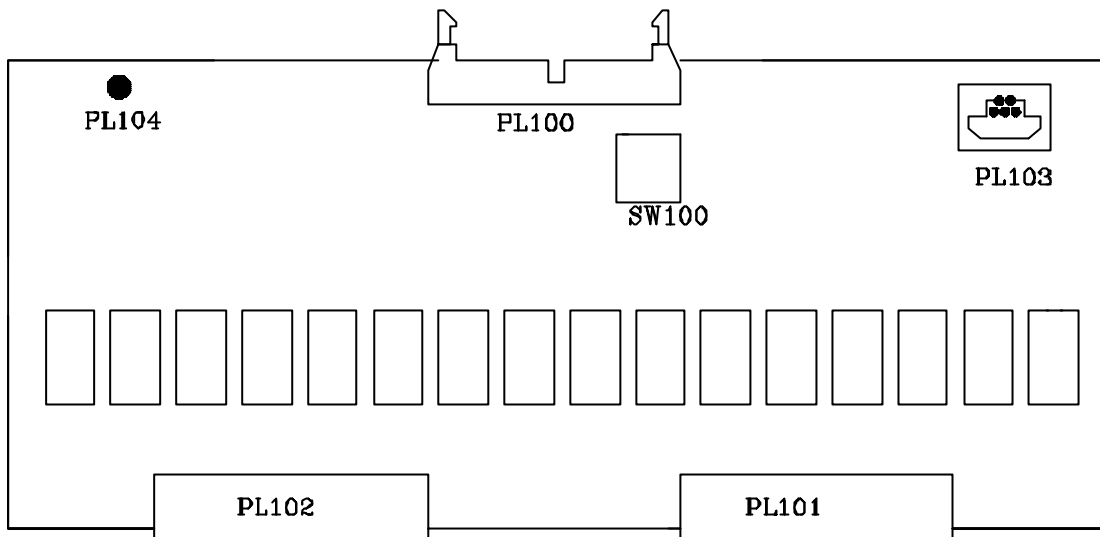


**Please Note :** On earlier versions of the Combo board there is a small add on board which incorporates a Watchdog Timer. This board would be found in the position of the shaded area on the above diagram of the Combo board layout. Later versions of the Combo board have the Watchdog Timer already built in and did not need this add on board fitted. J80 would be found on the add on board instead of where you see it located above.

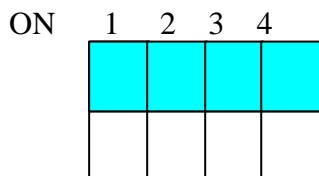
## Relay Board Connections.

The function of the relay board is to provide an individually controlled output to energise such things as contactors, solenoids, relays and pumps. There are 2 relay boards in the LC102. The top one has a Cyber socket on it which allows you to save and load the entire memory for backup purposes.

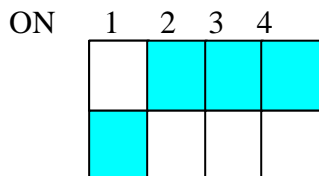
- PL100 26 Way ribbon cable connection. Comes from the 26 Way ribbon cable connection P70 on the combo board.
- PL101 Output Plug which goes to solenoids, contactors and relays.
- PL102 Output Plug which goes to solenoids, contactors and relays.
- PL103 Cyber card connection socket.
- PL104 Chassis earth connection from the main earth point next to the line filter.
- SW100 Board address dip switch.



### Top Relay Board Address Settings



### Bottom Relay Board Address Setting

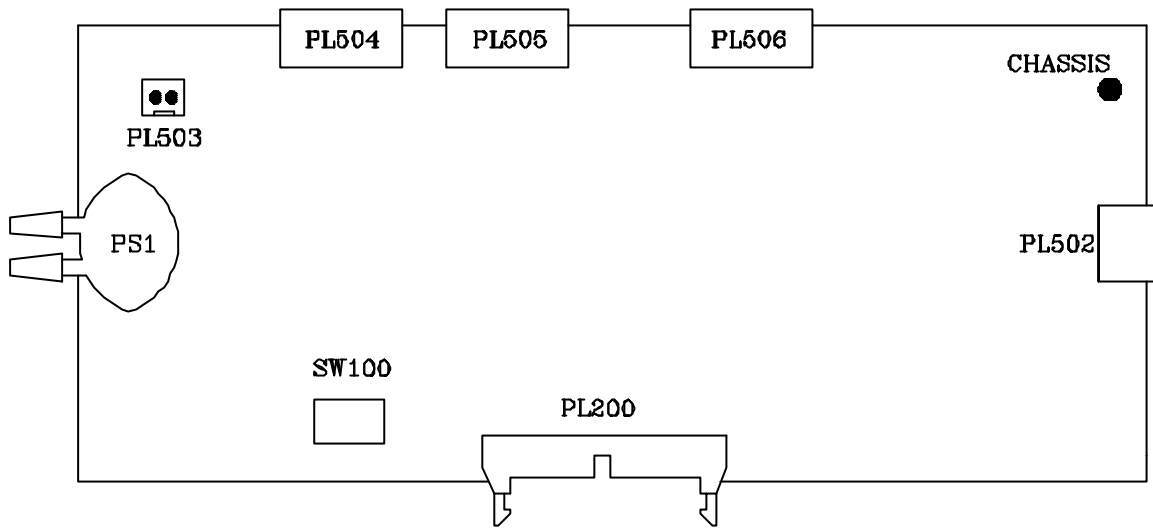


## Analogue Digital (A/D) Board.

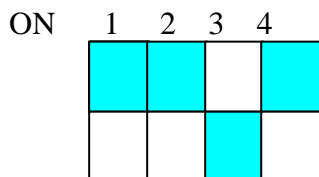
The function of the A/D board is to see the digital inputs from the machine and to read the Machine water level and temperature.

- PS1            Pressure Sensor. Reads the level in the machine.
- PL502        Temperature sensor connection plug.
- PL503        24 Volts DC supply that comes from P2 on the Combo board to run the digital inputs.
- PL504        Digital Inputs connection plug. Provides inputs 01, 02, 03, 04.
- PL505        Digital Inputs connection plug. Provides inputs 05, 06, 07, 08.
- PL506        Digital Inputs connection plug. Provides inputs 09, 10, 11, 12.

- CHASSIS      Chassis earth connection from the main earth point next to the line filter.
- SW100        Board address dip switch.
- PL200        26 Way Ribbon cable connection which comes from P70 on the Combo card.



Analogue Digital Board Address Setting (A/D)

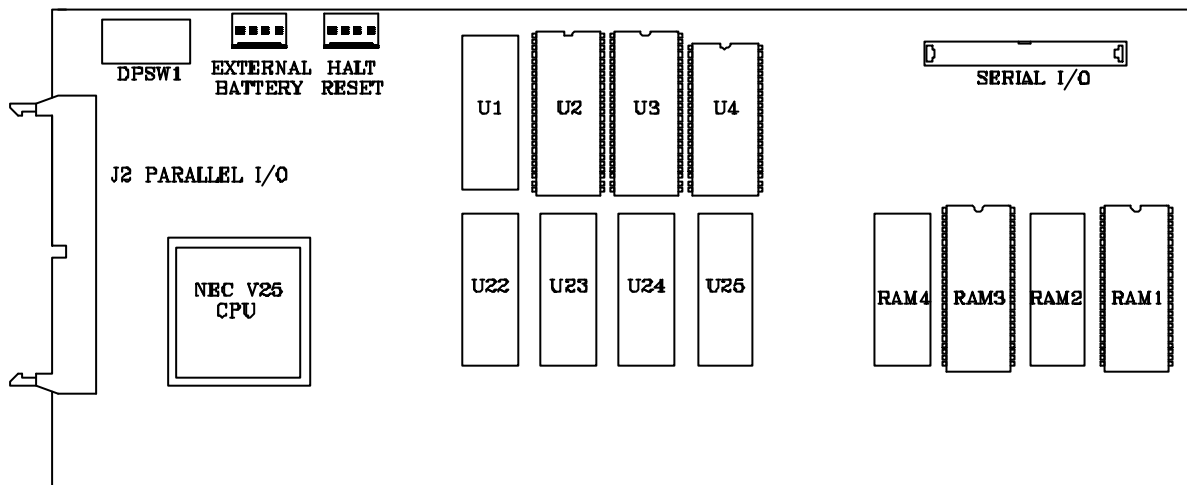


## V25 Board Connections.

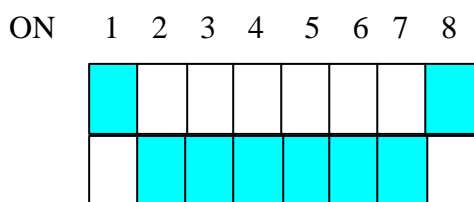
The V25 board is the main CPU board which organises, sends and receives instructions given to it via the wash programs set in memory or manual instructions given to it via the keyboard. The V25 board hold the all the memory and software chips the LC102 requires to operate. The *Washlink* network address is also set on the V25 board. How to set the address is detail below.

- J2              Parallel I/O. 50 Way Ribbon cable connection which connects to P71 on the Combo board.
- DPSW1        LC102 Network setting dip switch.

- External Battery      Battery power supply from the Combo board plug P4.
- Halt Reset          CPU reset plug which comes from J80 on the Combo board.
- Serial I/O          Serial Washtech bus which connects to P72 on the Combo Board.
- U1                  Not used
- U2                  Houses the U2 LC102 software chip.
- U3                  Houses the U3 LC102 software chip.
- U4                  Houses the V25 BIOS chip. This is not be removed or touched.
- U22                Not Used
- U23                Not Used
- U24                Not Used
- U25                Not Used
- RAM4              Not Used
- RAM3              Houses the Non Volatile Memory battery backed RAM.
- RAM2              Not Used
- RAM1              Houses the Temporary Memory.

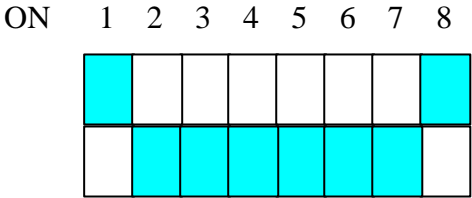


The V25 board has an eight way dip switch (DPSW1) which is pre-set to the following address before leaving the Total Systems Control Ltd workshop.

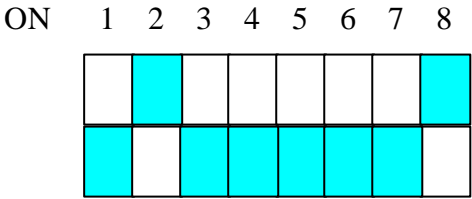


The dip switches are changed when the LC102 is connected to the *Washlink* network. Each LC102 is given it's own *Washlink* address by turning on or off the switches on the V25 board. The addresses are coded in binary. Use the following guide for LC102 address selection.

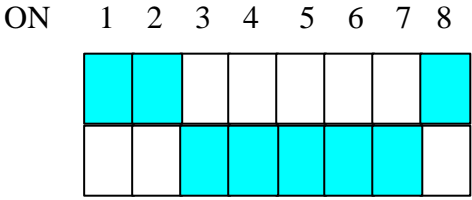
Address 1



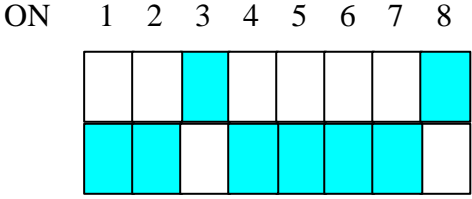
Address 2



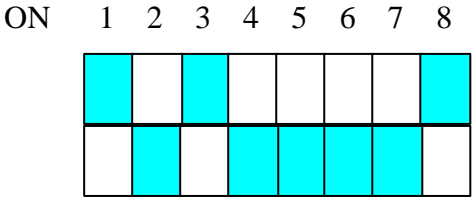
Address 3



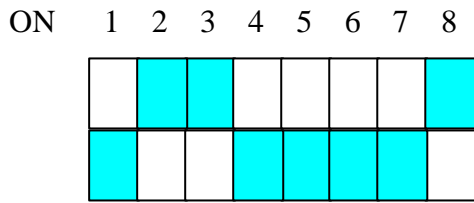
Address 4



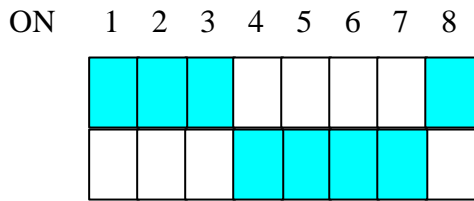
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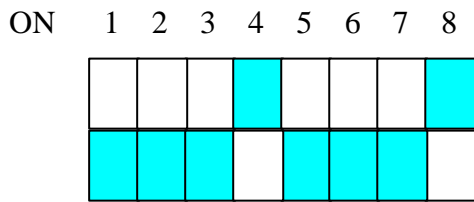
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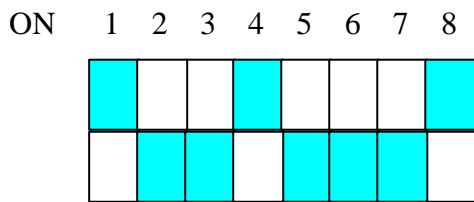
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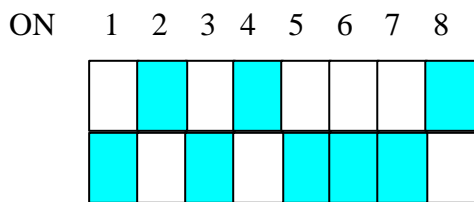
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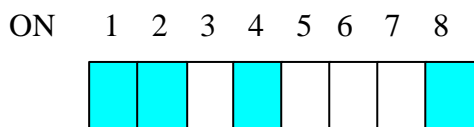
Address 9



Address 10



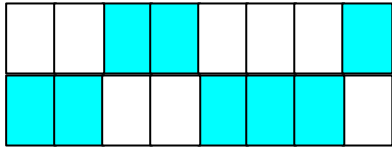
Address 11





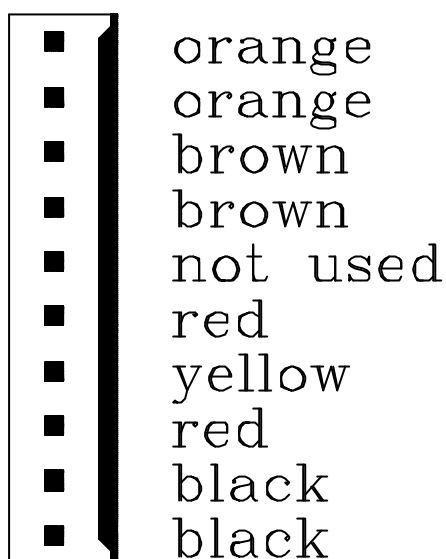
Address 12

ON    1   2   3   4   5   6   7   8



# Washtech Transformer Voltages

The diagram below shows the colour coding of the wires in the transformer plug.



The following list describes what voltage should be seen between the certain points on the plug.

Orange to Orange                      24 Volts AC

Brown to Brown                        10 Volts AC

Red to Red                                30 Volts AC

Red to Yellow                            15 Volts AC

Black to Black                          8.5 Volts AC

## Washtech Circuit Board Earthing

Every circuit board in the black box excluding the V25 board has one or more chassis earth connections. All circuit board earths converge at one point which is just next to the line filter. Check each board for their relevant earth connections on the previous Pages in the section.

The Combo board has 3 earth connection on points GND1, GND2, GND70. The Relay board has 1 earth connection on point PL104. The Analogue Digital board has 1 earth connection which is on point CHASSIS.



# Extract Interlocking

The extract interlocking facility is designed to stop machines going into extract at the same time. If machines go into extract at the same time the current drawn on the mains becomes very heavy.

Parts you will require to do the extract interlocking are as follows. :

- Multicore cable. If you have 5 machines to interlock you must use at least 5 core cable etc.
- Relays and Relay bases. You can use multi pole relays. You must have at least one set of normally open contacts for every machine you want to interlock. i.e. if you have to interlock 5 machines then you require say 2 x 3 pole relays for every machine  
You must also match the relay voltage to what ever is the contactor voltage.
- Appropriate glands, fittings and din rail.

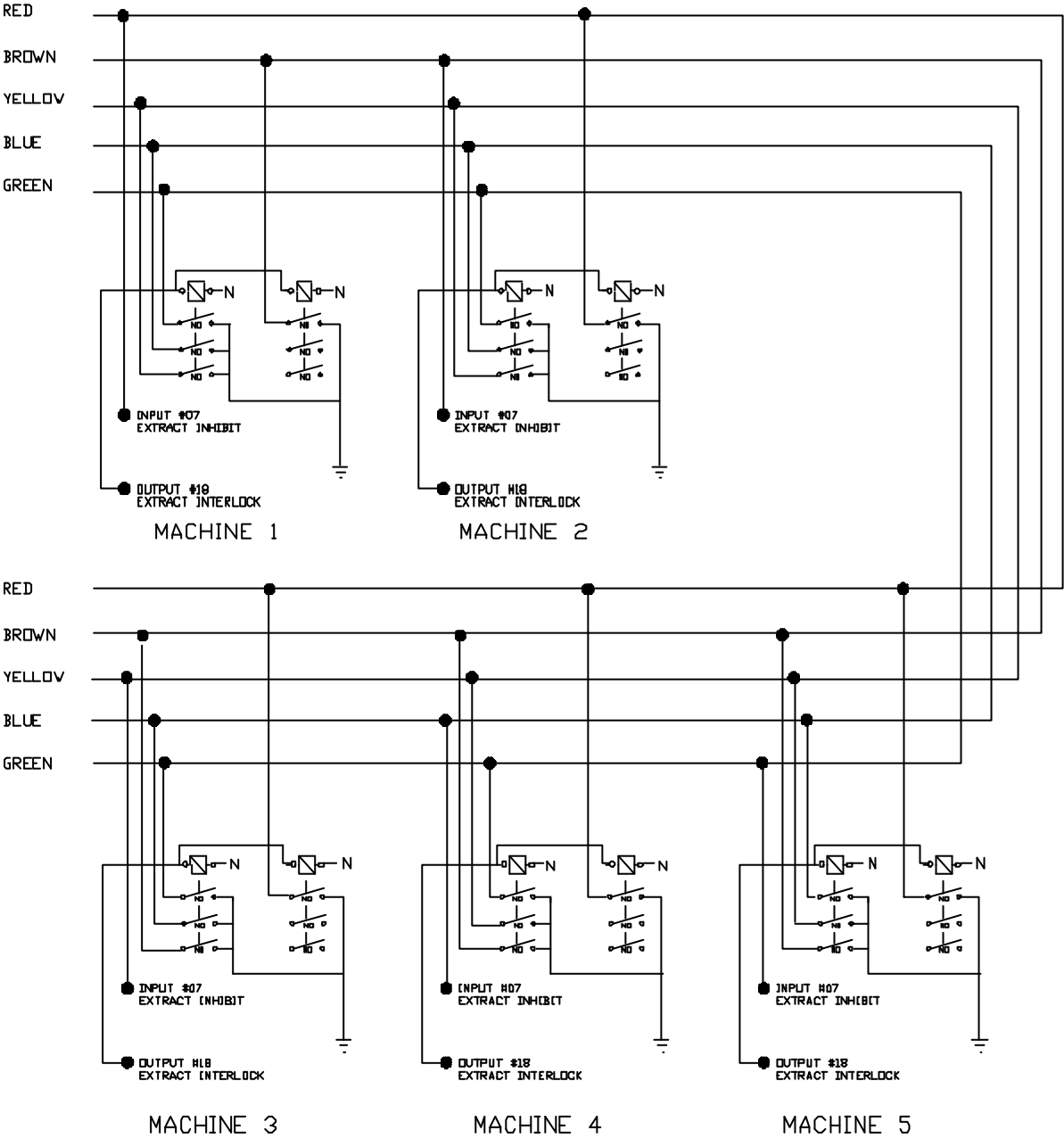
The interlocking only requires one output and one input from the LC102. They are already assigned to extract interlocking.

The output that is used is output number #18. This output when it is on, energises the relays which tell the other machines that this machine has gone into it's high current drawing stage of it's extract cycle.

The input used is input number #07. This tells the LC102 that another machine has gone into it's high current drawing stage of it's extract cycle and not to go into extract until the other machine has finished.

On the next page is a typical extract interlocking diagram for a set of machines.

# Extract Interlocking Diagram of 5 Machines



# Steam Interlocking

The steam interlocking facility is designed to stop machines calling for steam at the same time. Steam interlocking is generally only used when the steam generator does not have the capacity to generate enough steam to supply 2 or more machines at once.

**NOTE :** STEAM INTERLOCKING CANNOT BE USED IF YOUR MACHINES ARE RUNNING WITH DIVERSEY CHEMICALS ALPHABUS SYSTEM, USING THE AUTOJOG FACILITY OR ANY OF YOUR MACHINES IS A WASHEX DYE MACHINE.

Parts you will require to do the steam interlocking are as follows. :

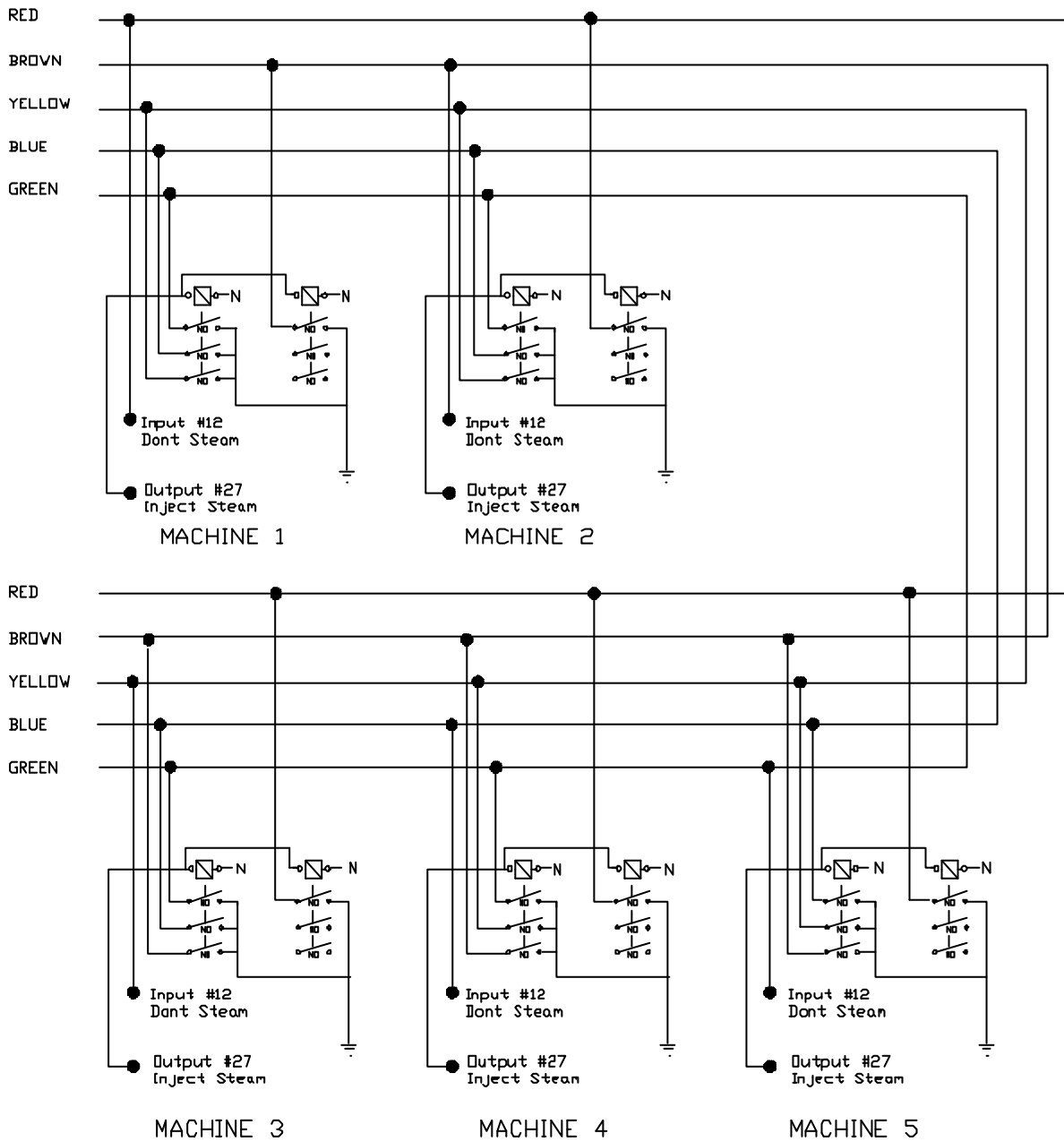
- Multicore cable. If you have 5 machines to interlock you must use at least 5 core cable etc.
- Relays and Relay bases. You can use multi pole relays. You must have at least one set of normally open contacts for every machine you want to interlock. I.e. if you have to interlock 5 machines then you require say 2 x 3 pole relays for every machine  
You must also match the relay voltage to what ever is the steam solenoid coil voltage.
- Appropriate glands, fittings and din rail.

The interlocking only requires one output and one input from the LC102. They are already assigned to steam interlocking. The output that is used is output number #27, this is also the steam inject output. This output when it is on, energises the steam and the relays which tell the other machines that this machine using the steam.

The input used is input number #07. This tells the LC102 that another machine is using the steam and do not use the steam until the other machine has finished.

On the next page is a typical steam interlocking diagram for a set of machines.

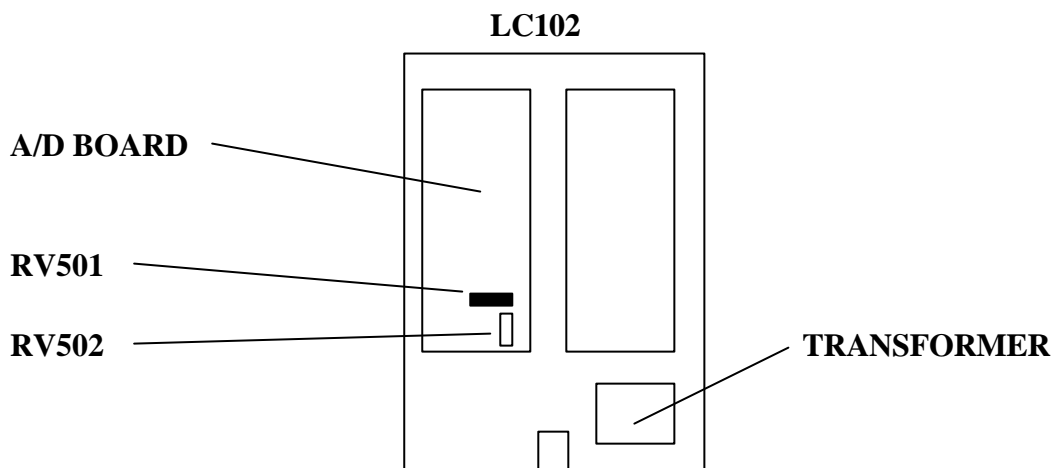
# Steam Interlocking Diagram of 5 Machines



# Washtech LC102 Level Calibration

## Step 1

Open up the Washtech and find the A/D board.



## Washtech Level Setting

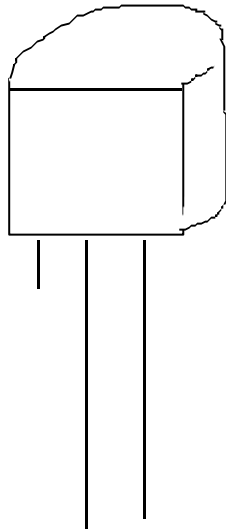
Empty the machine of any garments and go into Manual mode so that you have manual control over the water input and drain output.

Adjust the potentiometers RV501 and RV502 by turning the small screw on top of them.

- 1 Open up the Washtech and find the A/D board.
- 2 RV501 adjusts the zero level. Make sure the machine is empty of water and check to see that the level readout says zero. If it doesn't, adjust RV501 until the level reads 1 cm then tweak the RV501 screw 1/4 turn clockwise so the level now reads 0cm.
- 3 Fill the machine upto 30cm (this is the actual level in the machine that is measure with a ruler on the glass). Read the level on the LC102 and make sure it says 30cm. If it does not then adjust RV502 (Span adjustment) until it does.
- 4 Empty the machine and make sure it drains to level zero on the LC102 screen then fill again and make sure that the level in the machine matches the level on the screen.

## Temperature Probe Repair Instructions

- The temperature IC that is in the bottom of the probe is an LM335z. This IC is available from any local electronics shop.
- Hold the IC up with the flat side towards you.
- Cut off the left hand leg. ( see diagram )



- The middle leg should be soldered to the red wire and the right leg to the white or black depending on the cable that you have. You must also use a piece of heat shrink over one of the legs so that the two legs are insulated and cannot touch each other
- Cut off the shielded part of the 2 core shielded wire.
- Use a large piece of heat shrink tubing to cover the whole IC and the wires.
- In the end of the probe there should be some heat sink conducting grease so that heat transfer from the probe pocket to the IC is good.

