Weighbatch

Auto Profile Control

Operating Manual

Software Version 1.21

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Introduction

Thank you for purchasing your new Weighbatch Auto Profile Control. We have taken every care in designing and assembling your Profile Control to ensure it operates efficiently, is easy to use, and has many useful features.

For safety reasons, and to obtain maximum benefit from your Profile Control we recommend that you read and follow the advice contained in this manual before operating your unit.

In the unlikely event that you experience any problems with your unit, please refer to the **Alarms** and then **Trouble Shooting** sections of this manual before contacting us for service. We have attempted to cover the most likely problems. This will help you gain a better understanding of the system and may result in a quicker solution.

The instructions in this manual are designed for the Profile Control as a stand alone Weighbatch unit. If you have other Weighbatch products linked to your Profile Control, such as Weighbatch Weight Control units, the manuals accompanying these products should be read in conjunction with this manual.

In particular the Profile Control is intended to be used with the Weighbatch AdvanTec supervisory system with the WPC software running on a Windows based PC used to provide a high level operator interface. Like all Weighbatch products, the Profile Control can act as a standalone unit without the use of the AdvanTec system. For this reason this manual describes the use of the Profile Control only. The use of the AdvanTec system with the Profile Control is described in a separate addendum to the AdvanTec system.

Principle of Operation

The job of the Profile Control is to measure the variation in gauge around a circular die or across the width of a flat die, and to generate control outputs to modify the die to achieve a uniform gauge.

It is not the job of the Profile Control to alter the average gauge, just to improve its uniformity. Typically a gravimetric extrusion throughput control system is used to control the overall gauge.

Because the Profile Control monitors the gauge as part of the control process it is also used in systems which only monitor the gauge profile and have no control function. These systems are used when manually adjusting the die and to monitor the gauge uniformity for unacceptable variation.

The Auto Profile "system" actually has three parts of which the Profile Controller is only one.

1. A gauging head is used to measure the material thickness around or across the product. For a blown film this would be around the circumference of the bubble. For a cast line it would be across the surface of the sheet or film. This may be a system which moves the head independently, such as on a circular track around the bubble. Alternatively, it may be a system with a fixed position, such as a head attached to the bubble cage with a rotating die.

2. A die or air ring with the ability to modify the thickness of the finished product over a number of small zones. A typical Auto Profile air ring will allow gauge control over between 32 and 120 zones. Normally the thickness modification is done using heaters, which act either on the die itself or on the air cooling the product. For this reason the Profile Control refers to the control outputs as "heaters".

3. The Auto Profile Controller takes the gauge data and calculates the output to each of the control zones in order to minimise the variation of gauge. The Weighbatch Profile Control does this job and has been designed to work with a number of third party gauging systems and automatic dies or air rings.

During operation the Profile Control collects gauge information over a full scan of the product surface. For an independent gauging system such as one on a moving carriage the gauge data is read through a serial data link along with the head position. For a blown film line with a simple fixed gauge the gauge may be a simple analog signal with the position is determined by the speed and direction inputs from the hauloff.

Blown film lines with a rotating die or hauloff have the additional complication that the gauge position must be corrected for the effects of bubble twist.

At the end of each scan the Profile Control has a record of the thickness variations across the product. It then recalculates the zone control (ie. heater) outputs to try to reduce the variation: increasing the output where the material is too thick and decreasing the output where it is too thin. The average control output is kept constant. Remember we are not using these outputs to control overall gauge, just uniformity.

Safety

The following is a list of safety points that should be adhered to at all times:

Treat your Profile Control with the respect you give to any other electrical machinery in your plant.

Do not modify your Profile Control without consulting Weighbatch.

Only use Weighbatch supplied spares or recommended parts if you are replacing any parts.

Depending on the configuration, there may be multiple boards carrying lethal mains voltage. Access to the electronics should be done with the power turned off. If live access is necessary, it must only be done by trained staff.

Glossary of Terms

Gauge. The product thickness at a point. Typically expressed in microns.

Scan. One complete traverse over the product surface by the gauge measurement head.

Heater. The physical element which alters the gauge at a point. It may not actually be a heater as such. For example it may be a direct acting piezo element. We talk about heaters for convenience. Increased “heater” power typically thins the film at that point.

Position. For circular dies positions are specified by degrees in the range 1 through 360 increasing clockwise looking into the die. For flat dies positions are specified by distance (mm) from the left hand side looking into the die.

SSR. Solid State Relay. The electrical device typically used to switch heaters off/on.

Profile Control Layout

The Profile Control is a purely electronic unit with all parts contained in one or more cabinets. The controller can be sub-divided into two sections. First is the control processor (the “brains”) and the I/O modules that allow it to monitor the state of the line and to communicate with the gauging system.

Second is the power outputs that control the heaters or whatever mechanism is used to alter the gauge. This power section may be supplied by someone other than Weighbatch.

Third is the supervisory computer. This is an optional part of the system which greatly enhances the ease of operation. It may be a Weighbatch supplied AdvanTec system or it may be a non-Weighbatch system. It may be used solely for the profiling system and be physically attached to the Profile Control or it may be used for other parts of the line operation and be mounted elsewhere.

There are four standard Profile Control products each with different physical layouts:

AP-CTRL-CO The simplest layout is used with non-Weighbatch power outputs or for monitor-only systems. In this case the Profile Control is supplied in a small wall mounted cabinet. If used, the AdvanTec PC is supplied and mounted separately. The APC output control modules are mounted inside the cabinet of the non-Weighbatch power outputs with a single communications cable back to the Profile Control cabinet. These control modules must be ordered separately.

AP-CTRL-WC This product is supplied with SSR power outputs in a single wall mounted cabinet. The AdvanTec PC is supplied separately but can be mounted on the APC cabinet if required.

AP-CTRL-FC This product is supplied with SSR power outputs in a single free standing floor mounted cabinet. The AdvanTec PC is supplied separately but can be mounted inside the APC cabinet if required.

AP-CTRL-AT The most integrated product. Supplied with SSR power outputs in a free standing floor mounted cabinet with the AdvanTec PC included and installed inside the cabinet.

All layouts have the operator display panel and external alarm strobe/siren attached to the control cabinet. These can be relocated if required.

Controller Section

The electronics for the Profile Control controller section are the same regardless of the actual APC product. This section is made up of:

- 24V power supply
- Control module, the “brains”
- Line speed and general I/O module
- Hauloff I/O monitoring module
- Analog gauging I/O module
- Gauging system serial data communications module
- External wiring connectors.
- 5 port Ethernet switch (AT system only)

A description of each of the modules used can be found in the **Circuit Boards and Modules** section. The wiring diagrams are in the separate Profile Control **Electrical Layout** document.

For the WC wall mount layout, the controller section is mounted on the rear of the left hand door. For the FC and AT layouts the controller section is mounted at the rear of the top part of the cabinet. The controller section requires a single phase supply. In the case of the WC/FC/AT products this is supplied from the power output section,

Power Section

The electronics for the power output section are the same for the WC and FC/AT layouts but are physically arranged slightly differently. This section is made up of:

- Three phase + neutral input and main isolation switch
- Three phase contactor and E/Stop switch
- Single phase supply to each SSR board through individual circuit breakers. The boards are divided as evenly as possible between the three phases
- Fused single phase supply to cooling fans and controller section
- Solid state relay heater output boards. There are 6 boards as standard with provision for a further 2 boards for systems with up to 128 heaters

For the WC layout all 8 SSR boards are mounted on the panel at the rear of the cabinet and number from 1 at the top left to 8 at the bottom right. For the FC/AT layout the first 6 SSR boards are mounted on the panel at the rear of the lower cabinet with 1 at the top and 6 at the bottom. The 7th and 8th SSR boards are mounted on a separate panel on the right hand side of the lower cabinet.

Installation

Make sure you have the correct control output modules !!

If you have ordered the controller only (AP-CTRL-CO) version of the Profile Control to be used with non-Weighbatch control outputs, then prior to ordering you should have had a discussion with your supplier about the type and number of control output modules you need. This depends on the type of auto control die or air ring you are using. Refer to the **Circuit Boards and Modules** section for a description of the different types of output module.

Profile Control Cabinet

The Profile Control cabinet can be mounted wherever is convenient. Ensure there is access to the cabinet and bear in mind the cables from the heater outputs to the die.

For controller only Profile Controls, connect the Profile Control to a single phase power supply. You can use the power lead provided or can replace this with your own cable wired directly into the electrical cabinet. The power supply can be 80–250VAC. Consumption is minimal (200W).

For SSR output types (WC/FC/AT), the Profile Control must be connected to a three phase + neutral supply. Total power is dependent on the number and types of zones being controlled. Typically these would be 200W per zone maximum, 100W per zone average. The internal Profile Control load is minimal.

Operator Display

The operator display normally mounts on the electrical cabinet. It can be relocated up to 10m away by replacing the connecting cable. Use four core shielded cable and refer to the electrical wiring drawings. The cable carries low voltage communications signals and should not be run near sources of interference.

Alarm

The strobe/siren alarm normally mounts on the electrical cabinet. It can be relocated by replacing the two core connecting cable. The cable is not noise sensitive but should not be run near sources of severe interference which might couple high voltage spikes back to the Profile Control.

Controller Connections

Input Types

The Profile Control needs a number of inputs from the line in order to operate. Apart from the serial data connection to the gauge sensor (if used) these inputs are either 0-10V analog signals or 24V digital signals.

The analog inputs are fully isolated differential inputs with 0-10V range. There are two terminal points (V- and V+) for each analog input.

The digital inputs are opto-isolated and require a 24V signal at 2mA.

Connect Gauging System

Depending on the type of Gauging System you are using it will be connected either through a serial data connection or by digital and analog signals. Refer to the Electrical Wiring diagrams.

Serial data Gauging System
A Gauging System using a serial data connection can be connected using either RS-232 , RS-485 (2 wire, half duplex) or RS-422 (4 wire, full duplex). The Serial Data module must have its address switch set to "1".

The following table shows the data connections for some typical gauging systems:

Connection	Kundig PCD-LINK
47, Xmt+	Yellow, Rx-
48, Xmt-	Green, Rx+
49, Rcv+	Brown, Tx-
50, Rcv-	White, Tx+

Analog Gauging System
Gauging Systems using I/O signals fall into two types.
- Those that are attached to an oscillating hauloff or are used with an oscillating die.
- Those that scan independently of the die or hauloff

The first type need the following:
- Analog signal that represents the current gauge
- Valid gauge digital signal (or invalid signal). Typically used during periodic auto recalibration.

The second type need the following:
- Analog gauge signal
- Forward motion digital signal, (or running signal)
- Backward motion digital signal (or direction signal)
- Valid gauge digital signal (or invalid signal)

The gauging I/O module must have its address switch set to "3".

Note: For both types of gauging systems there is a 24V digital output available from the gauging I/O module that can be used to activate the gauging system. This may not necessary in the case of serial data gauging systems if there is a command to turn them off/on.

Connect Hauloff Inputs

For blown film lines with rotating hauloffs, you need to provide inputs to indicate this movement to the Profile Control. Again, refer to the Electrical Wiring diagrams.

The inputs that need to be provided are:
- Analog speed signal
- Forward motion digital signal, (or running signal)
- Backward motion digital signal (or direction signal)

The oscillator I/O module must have its address switch set to "2".

Connect Line Speed Input

You need to provide an analog signal that represents the line speed. Again, refer to the Electrical Wiring diagrams.

The line speed I/O module (GPIO module) is also used for E/Stop input and Alarm output and must have its address switch set to “1”.

Control Outputs

Controller-only

For controller only systems (without built in SSR outputs) you will need to install the output control modules in the non-Weighbatch cabinet containing the power output devices. These will then need to be connected to the output devices themselves. This may be a simple as a ribbon cable connection (for APO output modules) or may require discrete wiring (for PWO output modules). The control modules also need to be connected back to the Profile Control. Refer to the Electrical Wiring diagrams.

SSR output

For WC/FC/AT type Profile Controls with built in SSR outputs, you will need to cut the power cables to the die to the required length and to terminate these directly on the SSR output boards. There will be a neutral and phase connection to each heater and these are typically high density cables. In other words, lots of cores in small spaces. It is very difficult to fault find incorrect connections afterwards so work carefully and methodically. It helps to work out in advance which core numbers go to which board plugs. This will depend on the core assignments to the heaters which may depend on the plug connections used at the die.

Don’t assume. Check and double check !

By way of example the following are the core assignments for connection to a Gloucester Engineering AutoProfile air ring, using 64 core cable to each group of 32 heaters.

Core	Function
1	Heater 1 phase
2	Heater 2 phase
…	…
31	Heater 31phase
32	Heater 32 phase
33	Heater 1 neutral
34	Heater 2 neutral
…	…
63	Heater 31 neutral
64	Heater 32 neutral

And the assignments to the SSR output board plugs:

Core	Plug
1..8	Board #1, phase outputs 1-8
9..16	Board #1, phase outputs 9-16
17..24	Board #2, phase outputs 1-8
25..32	Board #2, phase outputs 9-16
33..40	Board #1, neutral outputs 1-8
41..48	Board #1, neutral outputs 9-16
49..56	Board #2, neutral outputs 1-8
57..64	Board #2, neutral outputs 9-16

Commissioning

The following section details the steps required to commission the Profile Control after installation.

Turn On Power

Power up the Profile Control.

A number of alarms will be generated during the startup. These can be acknowledged (and the siren silenced!) by pressing the **Select Option** button on the operator panel. This is the button at the top-right.

Ensure that the system starts up correctly. If not, refer to the **Troubleshooting** section.

The operator panel should have its power light on and should have something displayed on the LCD screen. The modules should all have their green Power light on.

Physical Measurements

There are a number of physical measurements that you will need to take that will be needed when setting up the Setup Data.

1) Decide on the basic coordinate system for the die. For a flat die this is a distance from the left hand end. For a circular die it is measured in degrees clockwise. These are taken as looking into the die. You need to decide on where the zero point is. This does not depend on the gauging sensor or heaters. It may be taken at a die bolt but need not.

2) Find the position of the gauging sensor's zero position. The position needs to be determined in terms of the basic coordinate system established in step (1). This will probably be different from the die zero point.

3) Measure the height of the gauge sensor above (or beyond) the die lip.

4) Determine the position of Heater #1 in terms of the die coordinate system established in step (1).

Change Setup Data

Check the Setup data and change as required. Refer to the **Setup** section for the meaning of each parameter. The following are parameters that will need to be set before proceeding to the next stage:

Sensor Type
Sensor Home, set to the position determined in step (2) above.
Sensor Dir, set to NEG if the sensor position decreases with increasing die position
Sensor Height, from step (3) above.
Oscl. Nip, set to YES if required
Num Heater, set to zero if not used for profile control.
Heater Type
Heater Home, from step (4) above.
Heater Dir, set to NEG if the heater number decreases with increasing die position
Ctrl Window, set to approximately 400 / N, where N is the number of heaters.

Initial Tests

These initial tests are best done with the line running and producing film. These tests will not impact on the film quality.

Go to the **Tests** menu (refer to the **Tests** section) and check the following:

Go to the **GPIO** test menu. Go to the **NIP** option and check that the input is not zero. If it is measure the analog voltage input to the General Purpose I/O module and check that it is non-zero and the polarity is correct. Scroll up to the **E/STOP** option and check that the E/Stop button is working and is detected. Scroll up to the **ALARM** option and use the **<Select>** button to test the alarm output.

If your system has an oscillating hauloff then ensure the oscillator is running and go to the **OSCL** test menu. Go to the **OSCL.INP** option and check that the input is not zero. If it is measure the analog voltage input to the Oscillator module and check that it is non-zero and the polarity is correct. Scroll up to the **OSCL.CW** and **OSCL.CCW** options. Check that these are on when the oscillator is moving in that direction. Remember clockwise is from the point of view looking into the die, ie. from above the hauloff, not from below it as you probably are! If the signals are reversed then you can change the **OSCL.DIR** option in the Setup data.

If your system has an analog gauging system then ensure that it is running and go to the **ANALOG** menu. Go to the **ANALOG INP** option and check that the input is not zero. If it is measure the analog voltage input to the Gauging module and check that it is non-zero and the polarity is correct. Scroll up to the **ANALOG RUN** and **ANALOG CW** options and check that these inputs are working. Again, the ANALOG CW input should be active when the gauging system is moving in a clockwise direction. If possible check that the **ANALOG ZERO** input is on when the gauging system is invalid, eg. during self calibration.

If your system has a serial data based gauging system them check that it is powered on and ready to run. Go to the **SENSOR** test menu. The first option shows the sensor status. Ensure that it is communicating. Use the **TURN ON** and **TURN OFF** options to run the sensor. Ensure that the sensor position direction is as expected.

If your system has output control then disconnect the heaters at the cable plugs (if possible) and go to the **HEATERS** menu. Scroll up to the **TEST ALL** option and <Select> it. The Profile Control will now turn each heater on briefly starting from Heater #1 and cycling continually through all heaters. You should be able to see from the heater output devices that they are turning on/off one by one. Press any button to stop the test after completing at least one cycle.

Now connect up the heaters again and restart the **TEST ALL** test and let it run through another complete cycle. The amount of energy put into the heaters in this test is very small and will not affect the film.

Calibration

Having verified that the Profile Control system is properly connected to the line we now need to calibrate the analog inputs. Go to the **Calibrate** menu (refer **Calibration** section).

Go to the **LINE SPEED** option. Press **<Select>**, confirm the recalibration by pressing **<Select>** again and enter the current actual line speed in meters per minute.

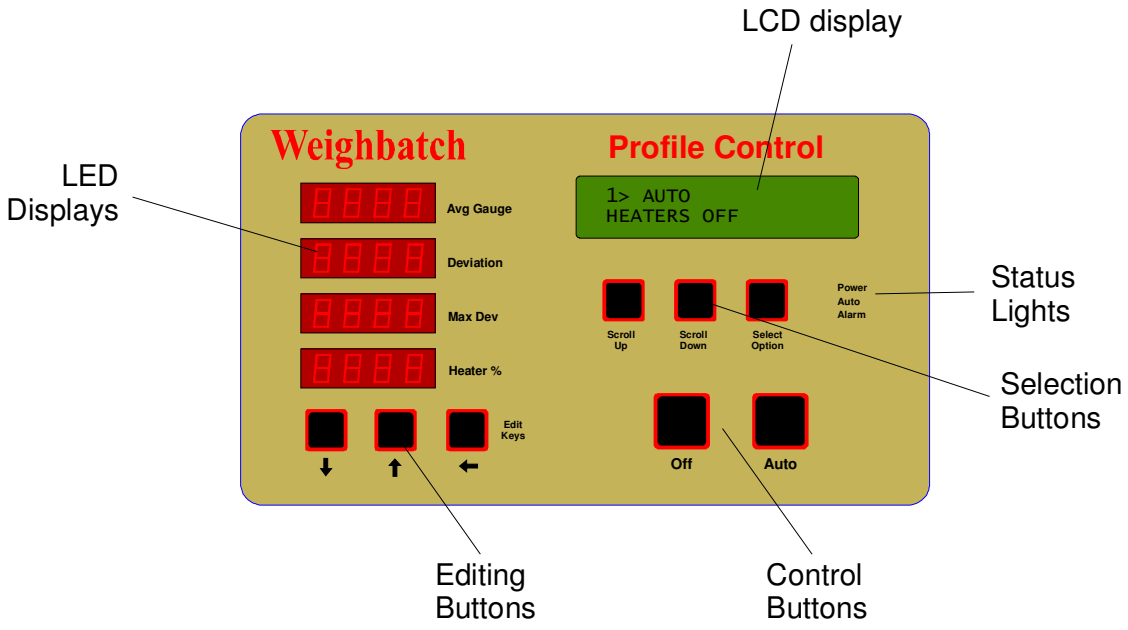
If the line has an oscillating hauloff then ensure it is running and measure/calculate the rotational speed in degrees per minute. Scroll up to the **OSCL SPEED** option and enter the measured speed in degrees per minute.

If the system uses an analog gauging system then scroll up to the **ANALOG GAUGE** option and enter the current measured average gauge in microns.

Operation

Operator panel

The Profile Control is run from a simple operator panel that is normally mounted on the unit. The operator panel is used to set up and monitor the process.



LED Displays

Displays the measured average gauge, the gauge Standard Deviation and the Maximum Deviation during the last scan and the output control spread (ie. maximum output - minimum output).

LCD Display

Displays additional features, operational data, error messages and set-up parameters.

Editing Buttons

Are used to edit settings on both the LED and LCD Displays.

Status Lights

Indicate current status of the Profile Control. Power On, Auto and Alarm. The top green light will be on when the Profile Control's power is on. The main power switch is located at the side of the Profile Control electrical cabinet.

The middle green light will be on when the Profile Control is in "Auto" mode.
The bottom red light will be on when the Profile Control is in alarm status, ie an error has occurred. The LCD Display will give an error description. The errors are listed in the **Alarms** section.

Selection Buttons

Scroll Up and **Scroll Down** are used to scroll through the different LCD Displays available. The **Select Option** button is used to select or edit an option.

Off and Auto Buttons

Are used to switch the Profile Control between Manual and Auto control modes. Pressing the **Auto** button will turn on the control outputs and will switch to auto control mode. Pressing the **Off** button will switch off auto control but will leave the heater outputs at their current settings. Pressing the **Off** button again for three seconds will turn off the heaters. The middle green light will flash during this time.

Starting the Profile Control

Step 1

Turn the power on with the switch mounted on the control cabinet on the side of the Profile Control.

The Power On indicator light on the front panel should now be on and the LCD Display will show:

```
WEIGHBATCH
PROFILE CONTROL
```

This display will only last a few seconds, then the Alarm warning light will come on to indicate that the Profile Control has been restarted:

```
5> RESTARTED
PRESS SELECT TO ACK
```

If any input/output modules are not connected these alarms will be displayed first.

Step 2

Press the **Select Option** button to ACK (acknowledge) that the Profile Control has restarted. You will then be prompted that the Profile Control is ready and not on auto-control with the heaters off:

```
1> OFF
```

Step 3

Press the **Auto** button. The Profile Control is put into auto mode and if the gauging system is operational then the LCD display will show :

```
1> AUTO          OK
INITIALISING
```

Once the gauging system has completed a full scan the heater outputs will be calculated and the LCD will show:

```
1> AUTO          OK
MIN=15%    MAX=27%
```

LCD Displays

During normal operation the LCD Display, on the right hand side of the operator panel, shows the current status of the Profile Control as well as other operating data. This information is displayed in a number of formats each prefixed by a display number. All are accessible for viewing during normal operation by the operator.

The current display number is displayed on the first position of the first line.

```
1>
```

The **Scroll UP** and **Scroll DOWN** buttons are used to increment and decrement the display number. For some displays, the **Select Option** button is used to change some value. The ↑, ↓ and ← buttons are used to edit the value in the same way as for the setpoints.

1> STATUS

```
1> AUTO        OK
MIN=15%    MAX=27%
```

Display <1> shows the current status of the Profile Control. If auto control is on then the display will show the current heater output range. If everything is running correctly the status will show as **OK**. Otherwise it will show as **NO SENSOR** or **NO HEATER** depending on which is not running. In this case no auto control will be happening. If auto control is off then the display will show either the gauging sensor status or the heater status depending on which is running.

2> ALARMS

```
2> NO ALARMS
1 WARNING
```

Display <2> is used to show the current alarms, if any. For the full list of alarms refer to the **Alarms** section.

3> WARNINGS

```
3> SENSOR OFF
```

Display <3> shows and warnings, ie. acknowledged alarms which are still active.

4> SENSOR STATUS

```
4> SENSOR
INITIALISING
```

Display <4> shows the status of the Gauging System. From the time the Profile Control starts up the Gauging System passes through a number of statii displayed as follows:

Display	Meaning
OFF	Gauging System turned off
INITIALISING	Gauging System turned on and initialising
STOPPED RETRACTED	Gauging System turned off and gauge head retracted
WAIT POSN "gauge"	Waiting for end of scan or change in direction
ZEROING "gauge"	Zeroing (recalibrating) the gauge head
"posn" RETRACTED	Gauge head retracted
"posn" ERROR	Gauging System error detected
"posn" "gauge"	Normal display showing current position and measured gauge

5> HEATER STATUS

```
5> HEATERS ON
INITIALISING
```

Display <5> shows the current status of the control outputs (heaters). The possible heaters status displays are:

Display	Meaning
INITIALISING	Gauging System turned on and initialising
MIN=xxx% MAX=yyy%	Normal display showing current heater range

6> BUBBLE TWIST

```
6> TWIST          xxx
yyy m/m      zzz deg/m
```

Display <6> shows the current amount of bubble twist caused by the rotating die or hauloff. The display shows the amount of twist (xxx degrees), the current nip speed (yyy meters/min) and the current hauloff rotation speed (zzz degrees/min).

7> CTRL

```
7> CTRL          ERR=xxx%
PWR=yyy%         CHG=zzz%
```

Display <7> shows data related to the gauge control. The display shows the average gauge error as a percentage of the average gauge (xxx), the heater power spread (yyy), ie. the difference between the minimum and maximum heater powers, and the change of heater power following the last scan (zzz).

8> FAILED HEATERS

7> FAILED HEATERS PRESS SEL TO VIEW

Display <8> lists heaters which have been detected as having failed. If the number is small then they will be displayed on this display, otherwise press **Select Option** to list them.

10> SOFTWARE

10> SOFTWARE APC v1.20

Display <10> shows the current version number of the Profile Control software.

NOT CONNECTED

NOT CONNECTED

This message is displayed by the Operator Panel when it has lost communication with the Profile Control CPU module. Refer to the **Fault Finding** section.

Alarms

Acknowledging Alarms

During operation of the Profile Control alarms may be raised to indicate equipment faults, error conditions or critical events. When an alarm is raised the Profile Control switches to display <2> and displays the alarm, eg:

```
2> OUTPUT #1 N/C
SELECT TO ACK
```

The alarm will continued to be displayed on display <2> until it is acknowledged by pressing the **Select Option** button. Pressing **Select Option** as soon as the alarm is displayed will result in the alarm being cleared and the display returning to the previous display number. Alternatively you may use the normal **Scroll** buttons to view other displays before returning to display <2> to acknowledge the alarm. You can only acknowledge the alarm when it is displayed. If more than one alarm is active the most recent one is displayed first although you can use the **Scroll** buttons to view the other active alarms.

Alarm messages

This section lists all possible alarm messages in alphabetic order. Each alarm message is followed by things to check to determine the cause of the alarm. Many of these will refer you to the **Checks** section of this manual.

2> ANALOG N/C

```
2> ANALOG N/C
SELECT TO ACK
```

Means that the Profile Control has been set up for simple analog gauging but the analog input module is not communicating with the Profile Control unit.

Check:
Should analog gauging be set up.

If the module is connected check:
- Is module address switch set to 3.
- Refer **Checks/Modules**.

2> E/STOP ON

```
2> E/STOP ON
SELECT TO ACK
```

Means that the E/Stop switch has been pressed. Power to the heater output boards will have ben cut off.

Check:
- E/Stop switch.

2> GPIO N/C

```
2> GPIO N/C
SELECT TO ACK
```

Means that the general purpose I/O module is not communicating with the Profile Control unit.

If the module is connected check:
- Is module address switch set to 1.
- Refer **Checks/Modules**.

2> HEATER FAIL

```
2> HEATER FAIL
SELECT TO ACK
```

Means that the Profile Control has detected a failure of one or more heaters. Refer to display <8> for a list of failed heaters.

2> HEATERS OFF

```
2> HEATERS OFF
SELECT TO ACK
```

Means that the Profile Control is running in Auto but the heater outputs have been turned off.

2> OSCL N/C

```
2> OSCL N/C
SELECT TO ACK
```

Means that the Profile Control has been set up for an oscillating hauloff but the oscillator input module is not communicating with the Profile Control unit.

Check:
Should the oscillating hauloff be set up.

If the module is connected check:
- Is module address switch set to 2.
- Refer **Checks/Modules**.

2> OUTPUT #n N/C

```
2> OUTPUT #n N/C
SELECT TO ACK
```

Means that the specified heater output module is not communicating with the Profile Control unit.

If the module is connected check:
- Is module address switch set to the correct number. This will depend on the number of heaters controlled by each module.
- Refer **Checks/Modules**.

5> RESTARTED

```
5> RESTARTED
SELECT TO ACK
```

Means that the Profile Control has been restarted. Normally occurs only when power is first turned on but can occur if the CPU processor resets due to a power supply problem.

2> SENSOR ERROR

```
2> SENSOR ERROR
SELECT TO ACK
```

- Means that some error has been detected with the gauging system. Refer to display <4> for a description of the error.

2> SENSOR OFF

```
2> SENSOR OFF
SELECT TO ACK
```

- Means that the Profile Control is in Auto but the gauging sensor has been turned off.

Setup

The Profile Control has a series of set-up parameters used to alter the way the it performs. During normal operation it will not be necessary to access these parameters and care is necessary when viewing or editing them.

Entering Setup Menu

Press the ← and **Select Option** buttons together to enter the Control Options menu:

```
CONTROL OPTIONS:
CALIBRATE
```

Then press the **Scroll UP** button to reach the Change Setup Data option:

```
CONTROL OPTIONS:
CHANGE SETUP DATA
```

Press the **Select** button to enter the Change Setup Data menu:

```
CHANGE SETUP DATA:
SENSOR TYPE=K100
```

Changing Setup Options

Within the Change Setup Data menu you can use the **Scroll UP** or the **Scroll DOWN** buttons to move from one setup option to another. The options are in a continuous list. pressing **Scroll UP** on the last option will take you back to the first option again.

To change a particular option press the **Select Option** button. Where there is a limited choice of values this will change the option value immediately. Continuing to press **Select Option** will cycle through all possible values. For example, if the option displayed is

```
SENSOR TYPE=K100
```

then pressing **Select Option** will change this immediately to:

```
SENSOR TYPE=ANALOG
```

Where the option value is a number then pressing **Select Option** will display the number by itself and allow you to change it with the ↑, ↓ and ← buttons. For example, if the option displayed is

```
SENSOR HOME=30 deg
```

Then pressing **Select Option** will display this as

```
SENSOR HOME:
030 deg
```

One digit is underlined. Pressing the ← button will move the underline to another digit. Pressing the ↑ button will increase the underlined digit by 1. Pressing the ↓ button will decrease it by 1. Pressing any other button will save the changes and return to the normal display.

Leaving Setup Menu

Press the **Manual** button to leave the Change Setup Data menu and return to the Control Options Menu. Press the **Manual** button again to return to normal operation.

The last option in the Change Setup Data menu is

CHANGE SETUP DATA: EXIT

Selecting this option will also leave the Change Setup Data menu.

When you leave the modified setup options are saved to the non-volatile memory on the CPU Module.

If for some reason you do not wish to save the changes you should turn off power to the Profile Control before leaving the Change Setup Data menu.

Setup Options

The remainder of this section describes each of the setup options in the order in which they appear in the Change Setup Data menu. The values shown are the default values.

SENSOR TYPE=K100

The type of gauging sensor used. Options are:

K100	For Kundig K-x00 type profilers used with serial connections.
ANALOG	For simple analog type gauge sensors

SENSOR HOME=0 deg

The position of the sensor system's zero or home point.

SENSOR DIR=POS

Specifies the direction of the sensor system. If **POS** then the sensor's position increases in the standard clockwise direction. If **NEG** then it increases in the reverse or anticlockwise direction.

SENSOR HEIGHT=3.00m

Specifies the height of the sensor above the die.

SENSOR FILTER=1.0

Specifies the amount of filtering used when updating the gauge profile at the end of a scan. It has a value between 0 and 1. 1 results in no filtering whereas a value of 0.5 for example results in only 50% of the new gauge being applied to the profile.

SENSOR BAND=0.0u

Specifies the amount of natural variability in the gauging system. If the gauge differs from the previously measured gauge by more than this value then no filtering is used. If the difference is less than half the specified band then full filtering is used.

The amount of filtering is variable between these limits. A value of zero causes full filtering to be used all the time. If used, this value should be set to approximately 5 times the observed small scale gauge fluctuations.

SENSOR FACTOR=1

Specifies a "fudge" factor that can be used to modify the raw gauge readings from the sensor.

OSCL.NIP=NO

Set to **YES** if the line has an oscillating hauloff. The following options only appear if set to **YES**.

OSCL. DIR=POS

Specifies the direction of the oscillator. This affects the meaning of the CW and CCW inputs. If **POS** then the CW input will be active when the oscillator is moving in the standard clockwise direction. If **NEG** then the CCW input will be active.

NUM HEATER=96

Specifies the number of heaters. The following options only appear if this number is no-zero.

HEATER TYPE=APS

Specifies the type of output module used to control the heaters. Options are:

APS	Self contained 16 channel SSR boards
APO	32 channel digital output module with IDC connector for ribbon cable connection to SSR outputs.
PWO	24 channel digital output module with discrete wiring connections to SSRs.

HEATER HOME=0 deg

The position of heater #1.

HEATER DIR=POS

Specifies the direction of the heaters. If **POS** then the heater's position increases in the standard clockwise direction with increasing heater number. If **NEG** then it increases in the reverse or anticlockwise direction.

HEATER POWER=30

Specifies the average power used by the heaters. Heater power is scaled to maintain this average.

HEATER CYCLE=2 sec

Heater power is controlled by cycling the heaters off and on with a fixed cycle time. This value specifies the cycle time.

HEATER TEST=60 sec

For **APS** type heater modules, specifies the frequency of heater testing. At the specified interval, all of the heaters in an output module are turned off except one and the current monitored for that heater. Too low a current indicates a failed heater.

CTRL EFFECT=50%

Indicates the effect on film thickness caused by a heater running at 100% power. This parameter is best adjusted after the Profile Control has been running in auto and has attempted to correct errors in the die. Then you will be able to see what effect the heaters have on the gauge. The best measure is in zones where the gauge is heavy or light over a large distance which causes a block of heaters to turn on. Say the uncontrolled gauge was 5u heavy on a 50u film and this is fully corrected with a block of heaters running at 80% power with an average heater power of 30%. This means a 10% thickness change has been effected by 50% heater power. So the **Ctrl Effect** (ie at 100% heater power) would be 20% (10% x 2).

CTRL WINDOW=4

Specifies number of degrees of gauge readings used to give an average gauge to be used in controlling each heater. This can be used to spread the effect of each heater over a wider zone than that physically covered by the heater. It also filters sudden changes in gauge between heaters.

CTRL FEEDBACK=0.50

Specifies the amount of control correction applied to the heaters each scan. Smaller values give slower but more stable control.

CTRL FILTER=1.000

Specifies the amount of smoothing of power output between adjacent heaters. There is a natural tendency for the control system to adjust each heater to correct small variations between adjacent heaters. Over time this will cause adjacent heaters to have widely different power levels. Applying a smoothing filter over all heaters counteracts the tendency and gives a more stable heater profile. A **Ctrl Filter** value of 1 gives no smoothing. A value of 0 gives complete smoothing. If used, a value of 0.8 is typical.

TCP/IP

Press **<Select Option>** to modify network settings as follows:

MODE	**MANUAL**=specified IP address. **AUTO**=DHCP assigned IP address.
IP	Specified (or assigned) IP address.
MAC	MAC address of controller (read only).

RESET SETUP DATA

Pressing the **Select Option** button three times will cause the setup and configuration data to be reset to its default values.

Calibration

The Profile Control has a number of analog inputs which must be calibrated to the actual real-world values. This is done through the Calibrate Menu. During normal operation it will not be necessary to access these parameters and care is necessary when viewing or editing them.

Entering Calibrate Menu

Press the ← and **Select Option** buttons together to enter the Control Options menu:

CONTROL OPTIONS:
CALIBRATE

Press the **Select** button to enter the Calibrate menu:

CALIBRATE:
LINE SPEED=0.00

Changing Calibration

Within the Calibrate menu you can use the **Scroll UP** or the **Scroll DOWN** buttons to move from one calibration to another. The options are in a continuous list. pressing **Scroll UP** on the last option will take you back to the first option again.

To recalibrate press the **Select Option** button. The calibrations are similar. One of the following will be displayed.

CANNOT CALIBRATE
NOT CONNECTED

This will be displayed if the calibration cannot be done because the particular I/O module is not connected.

CANNOT CALIBRATE
ZERO INPUT

This will be displayed if the calibration cannot be done because the particular input has a zero value.

RECALIBRATE ?

Calibration is possible. Press **<Select Option>** to continue or any other key to abort.

CUR MPM=0.00

Enter the current real-world value. The input will be calibrated using this value and the current input value.

Leaving Calibrate Menu

Press the **Manual** button to leave the Calibrate menu and return to the Control Options Menu. Press the **Manual** button again to return to normal operation.

The last option in the Calibrate menu is

CALIBRATE:
EXIT

Selecting this option will also leave the Calibrate menu.

When you leave the modified calibrations are saved to the non-volatile memory on the CPU Module.

Tests

In order to help resolve problems with the Profile Control there is a menu of tests which enable individual operations to be monitored and manually controlled.

To enter the Test menu press the ← and **Select Option** buttons together to enter the Control Options menu:

CONTROL OPTIONS: **CALIBRATE**	Press **Scroll UP** two times to move to the Tests option.
CONTROL OPTIONS: **TESTS**	Press **Select Option** to enter the Tests menu. The following options are then available with the **Scroll UP** and **Scroll DOWN** buttons.
GPIO	Allows you to monitor the line speed input, e/stop input, fan running input and to control the alarm output.
OSCL	Allows you to monitor the oscillator speed input and the oscillator clockwise (CW) and anti-clockwise (CCW) running inputs.
ANALOG	Allows you to monitor the analog gauge input and the gauge running, clockwise (CW) and zeroing inputs.
SENSOR	Allows you to check the serially connected gauging system status and to turn the sensor on/off.
HEATERS	Allows you to enable or disable the heaters, to reset all heaters to the target, to set all heaters to zero or to set one heater to a specified value.

There is also a **Test All** option which will cycle through all heaters turning each heater on for a short time. If available the result of the heater current measurement test will be shown. This process will continue until you press any button.

Trouble Shooting

This section addresses problems that you may encounter with your Profile Control that are not covered by the Alarms section.

You should always refer to and follow any guidelines in the Alarms section before using this section.

Won't Go

Profile Control will not function at all. There is no readable message on the LCD Display. This is probably caused by an electronics problem. Refer to the **Fault Finding** section.

Won't Run

Profile Control will not run. There is a readable message on the LCD Display. If the message does not start with a number, eg. **1>, 2>** etc, then check that the Profile Control is not in one of the Control Options by pressing the **Stop** button several times.

If the message does start with a number try pressing the **Scroll** buttons to change to display number <2> to see if there is an alarm message.

If the display does not respond to button presses the refer to the **Fault Finding** section.

Circuit Boards and Modules

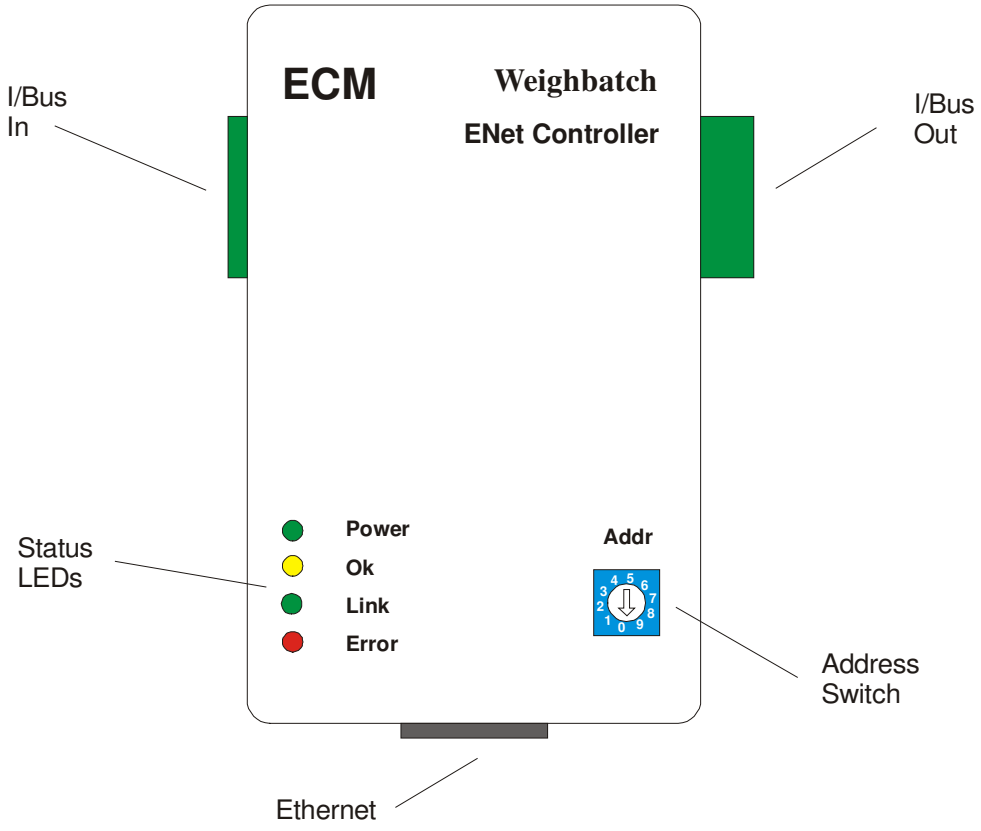
I/Bus Connection

Communication between boards and modules within the Profile Control is done with a 4 wire serial data connection we term the **I/Bus**. This bus also carries power to the boards and modules. The same connector pins are used in all I/Bus connectors and are listed below to avoid repetition for each board or module.

Pin	Use
1	Clock
2	0V
3	+24V
4	Data

ECM Module

The E/Net Control Module is the "brains" of the Profile Control. It contains the main processor, the APC software. It has connections for Ethernet communications to the AdvanTec PC and I/Bus communications to other boards and modules.



The **I/Bus** connectors allow this module to be connected to adjacent modules mounted on the same DIN rail and to the I/Bus cabling to remote boards and modules such as the display and the heater outputs.

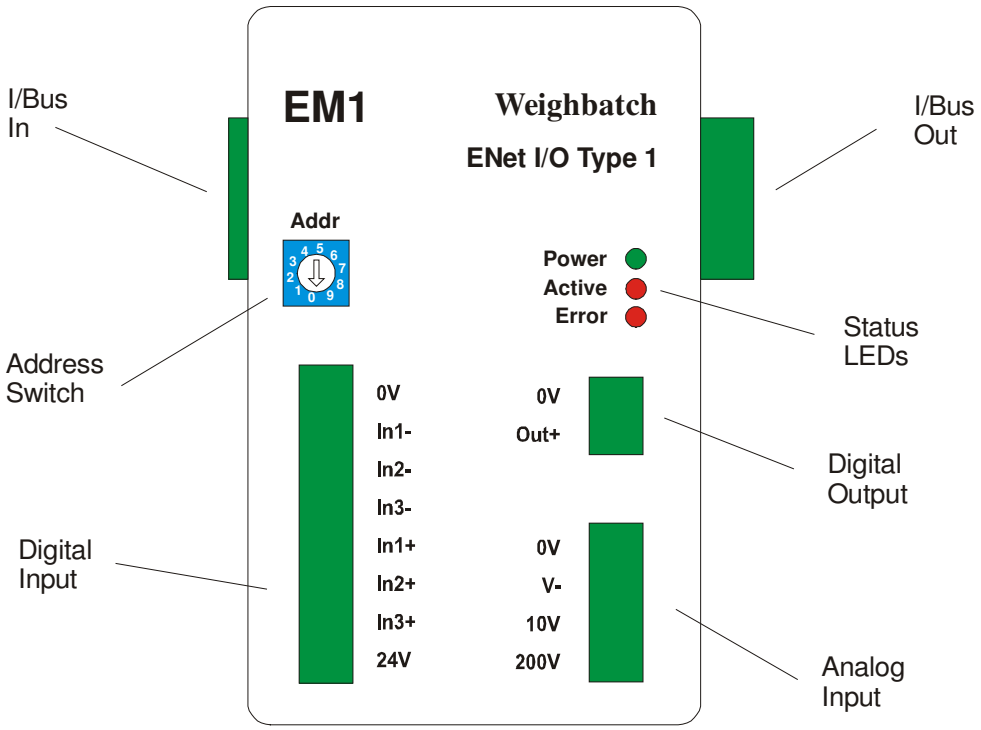
The **Ethernet** connector is used to connect to a 100-BaseT or 10-BaseT network. Typically this connects either directly to the AdvanTec PC or more likely to a network switch. The port is auto polarity detecting.

The **Address Switch** is not used for the Profile Control and must be set to "1".

The **Status LEDs** indicate internal status of the module. The green **Power** LED indicates power is applied to the module. The yellow **Ok** LED flashes on/off once per second to indicate the APC software is running normally. The green **Link** LED flashes to indicate traffic on the Ethernet connection. The red **Error** LED will be on if a software error is detected.

EM1 Module

The E/Net I/O-1 Module is used for I/O to the Profile Control. There are three of these modules used for general I/O, oscillating hauloff and analog gauging. Each module has one analog input, one digital output and three digital inputs. All inputs can be used as isolated inputs if required.



The **I/Bus** connectors allow this module to be connected to adjacent modules mounted on the same DIN rail.

The **Address Switch** is used to identify each module connected to the I/Bus as follows:

Address	Module Use
1	General purpose
2	Oscillating hauloff
3	Analog gauging system

The **Digital Output** connector provides one 24V output at up to 200mA.

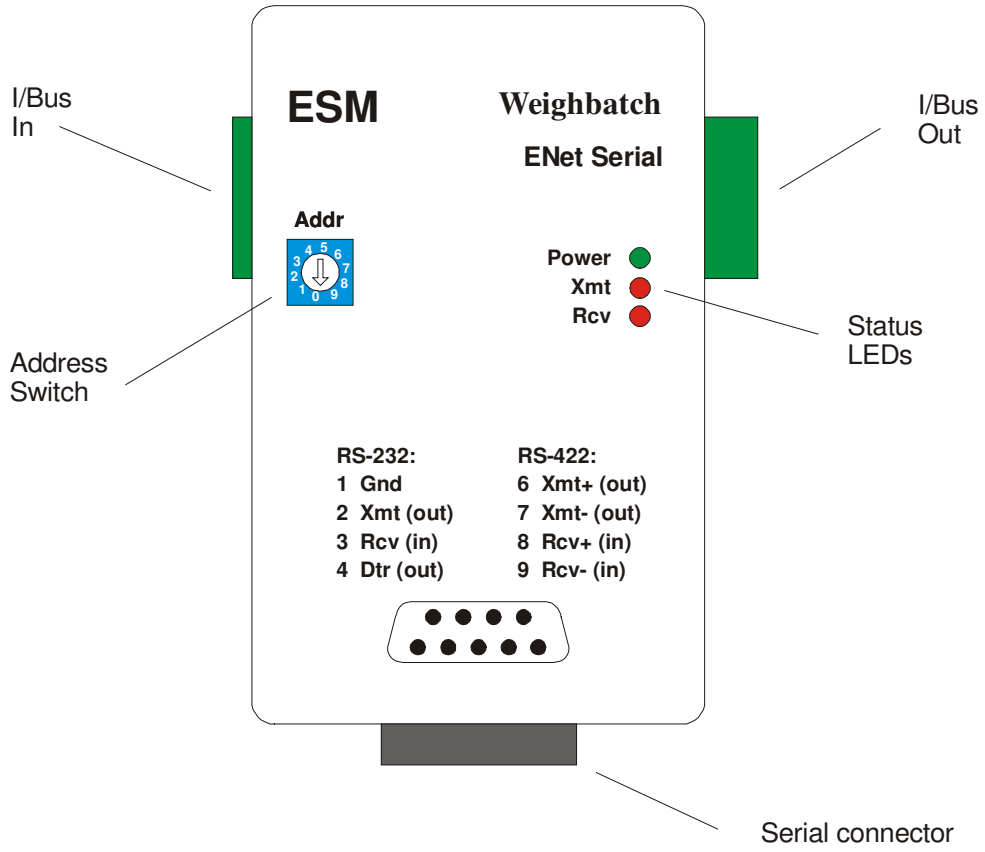
The **Analog Input** connector provides one analog input either 0-10V or 0-200V. The analog signal is connected between the V- and 10V/200V inputs. In this fashion the input is isolated. If a non-isolated input is required then the V- input should be connected to the 0V input.

The **Digital Input** connector provides for up to three independently isolated digital inputs. An active input must have 24V connected between the In- and In+ inputs. The 0V and 24V inputs are connected to the APC power supply. If a non-isolated NPN input is required then the In+ inputs can be connected to the 24V input and the In- inputs switched to the 0V input. If a non-isolated PNP input is required then the In- inputs can be connected to the 0V input and the In+ inputs switched to the 24V input.

The **Status LEDs** indicate internal status of the module. The green **Power** LED indicates power is applied to the module. The red **Active** LED will be on if any input is active. The red **Error** LED will be on if an output malfunction is detected.

ESM Module

The E/Net Serial Module is used for serial data communication with the gauging system.



The **I/Bus** connectors allow this module to be connected to adjacent modules mounted on the same DIN rail.

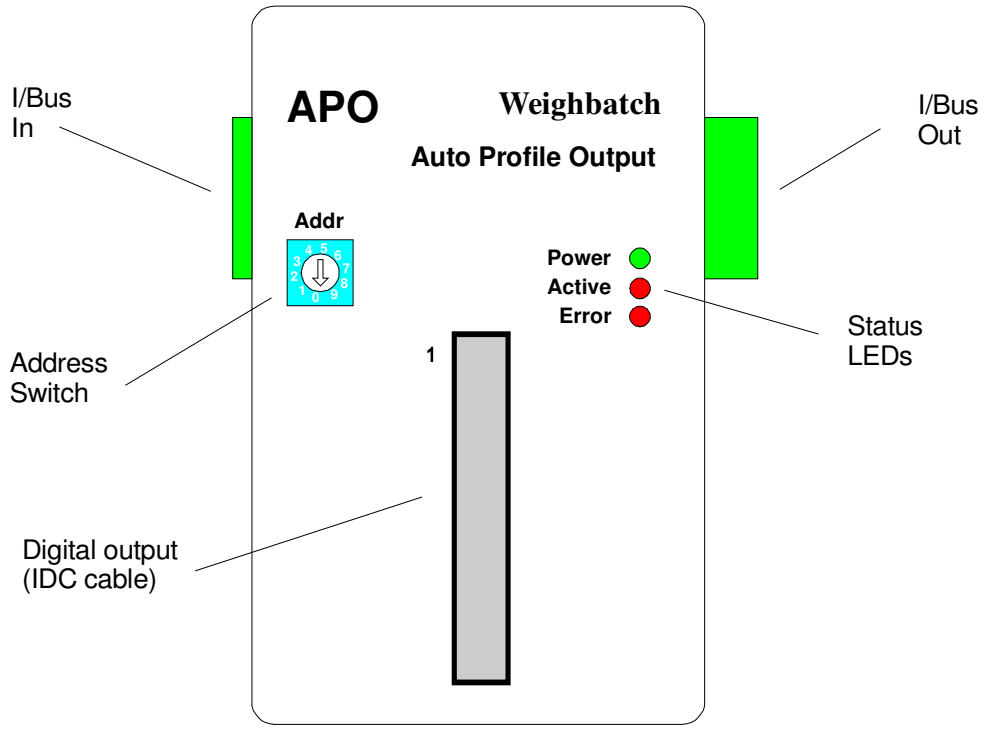
The **Address Switch** is not used for the Profile Control and must be set to “1”.

The **Serial Data** connector is a DB9 female connector providing both RS-232 and RS-422/485 outputs.

The **Status LEDs** indicate internal status of the module. The green **Power** LED indicates power is applied to the module. The red **Xmt** and **Rcv** LEDs indicate activity on the serial data lines.

APO Module

The Auto Profile Output Module is one of the optional boards/modules for controlling heater output power. The APO module has 32 pulse width modulated digital outputs with an IDC ribbon cable connector.



The **I/Bus** connectors allow this module to be connected to adjacent modules mounted on the same DIN rail.

The **Address Switch** is used to identify which group of heaters is controlled by this module as follows:

Address	Module Use
1	Heaters 1 through 32
2	Heaters 33 through 64
3	Heaters 65 through 96
4	Heaters 97 through 120

The **Digital Output** connector is an 34 way IDC male connector. The outputs are NPN type, ie. pull to 0V when active. The pin assignments are as follows:

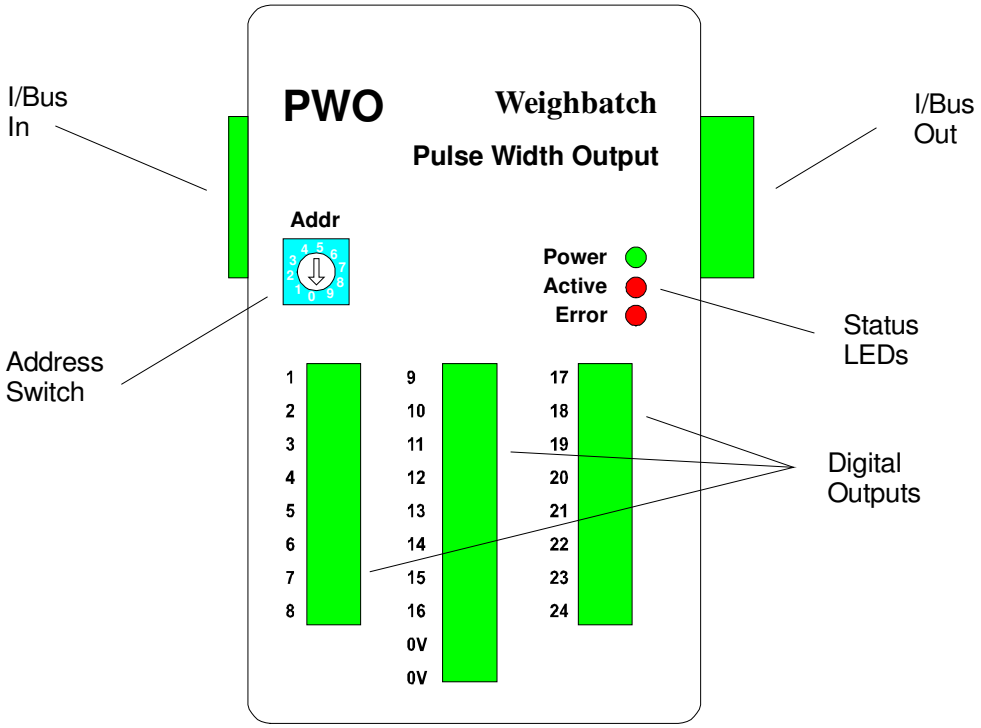
Pin	Use
1	0V
2	Heater 1
3	Heater 2
etc	

33	Heater 32
34	Not used

The **Status LEDs** indicate internal status of the module. The green **Power** LED indicates power is applied to the module. The red **Active** LED will be on if any heater output is active. The red **Error** LED will be on if an output malfunction is detected.

PWO Module

The Pulse Width Output Module is one of the optional boards/modules for controlling heater output power. The PWO module has 24 pulse width modulated digital outputs with standard screw terminal connectors. It is more suited to discretely wired external SSRs than the APO output module.



The **I/Bus** connectors allow this module to be connected to adjacent modules mounted on the same DIN rail.

The **Address Switch** is used to identify which group of heaters is controlled by this module as follows:

Address	Module Use
1	Heaters 1 through 24
2	Heaters 25 through 48
3	Heaters 49 through 72
4	Heaters 73 through 96
5	Heaters 97 through 120

The **Digital Output** connectors provide pulse width controlled outputs to the heaters. The outputs are 24V PNP type, ie. source current when active. The pin assignments are as follows:

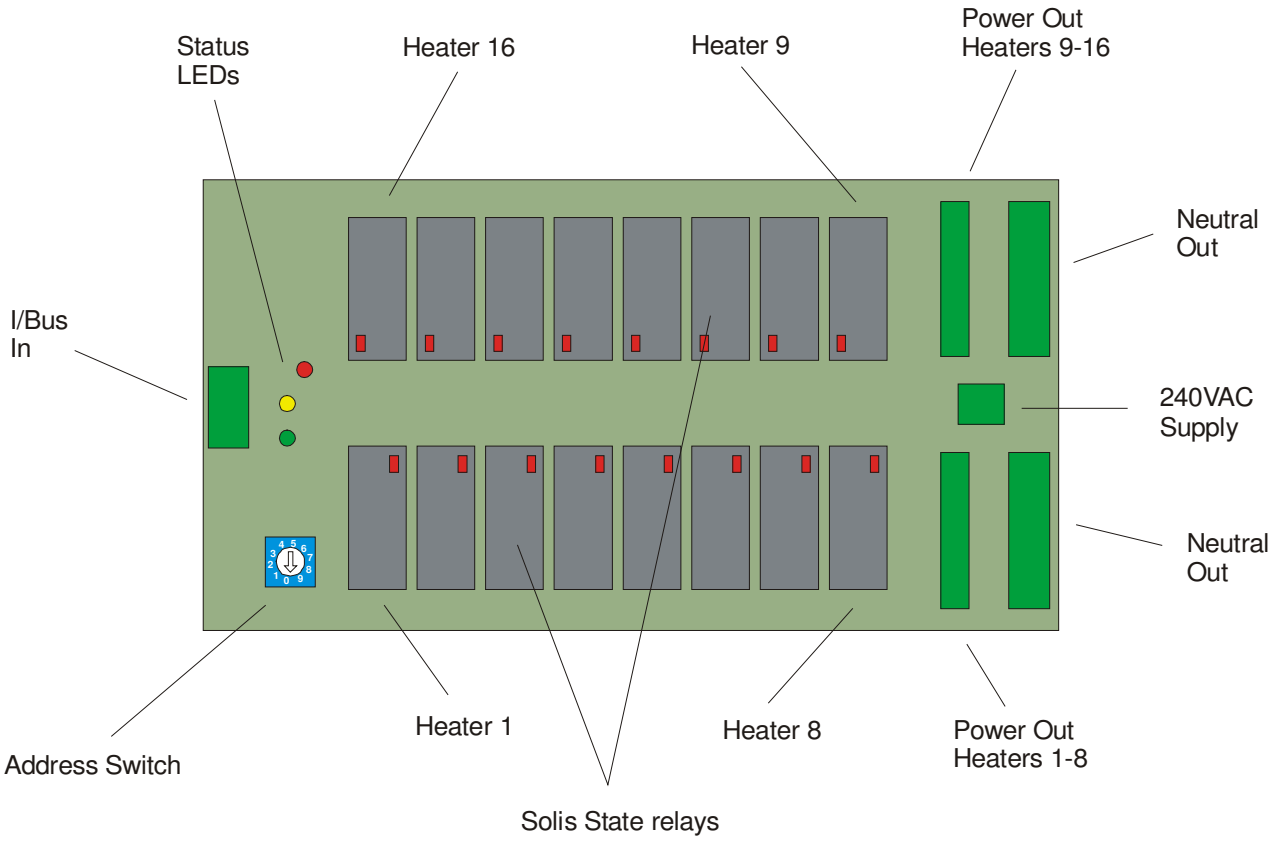
Connector	Pin	Use
1	1 to 8	Heaters 1 to 8

2	1 to 8	Heaters 9 to 16
2	9, 10	0V
3	1 to 8	Heaters 17 to 24

The **Status LEDs** indicate internal status of the module. The green **Power** LED indicates power is applied to the module. The red **Active** LED will be on if any heater output is active. The red **Error** LED will be on if an output malfunction is detected.

APS Board

The Auto Profile SSR board is one of the optional boards/modules for controlling heater output power. The APS board has 16 pulse width modulated AC outputs switched by on board solid state relays. The SSR outputs are available at standard screw terminal connectors.



The **I/Bus** connector allows this board to be connected to I/Bus communication with the Profile Controller. With multiple APS boards the I/Bus daisy chains from one board to the next.

The **Address Switch** is used to identify which group of heaters is controlled by this board as follows:

Address	Module Use
1	Heaters 1 through 16
2	Heaters 17 through 32
3	Heaters 33 through 48
4	Heaters 49 through 64
5	Heaters 65 through 80
6	Heaters 81 through 96

7	Heaters 97 through 112
8	Heaters 113 through 120

The **Solid State Relay** modules switch the supplied AC power to each heater. They have small red LEDs on each relay which indicate when the output is active. The SSRs are zero crossing turn-on devices. Each can supply up to 3A but are typically used with 200W heaters.

The **240VAC** Supply connector is the input for the single phase mains supply. The pin assignments are as follows:

Pin	Use
1	Neutral
2	Phase

The **Neutral** connector is used to supply power (neutral side) to the heaters. All neutral pins are commoned and can be used in any order.

The **Power Out** connectors are used to supply power (phase side) to the heaters. The pin assignments are as follows:

Connector	Pin	Use
1	1 to 8	Heaters 1 to 8
2	1 to 8	Heaters 9 to 16

The **Status LEDs** indicate internal status of the module. The green LED indicates power is applied to the module. The yellow LED will flash off/on once per second to indicate the APS board is communicating with the controller and operating normally. The red LED will be on if an output drawing zero current detected, indicating a heater failure.

Fault Finding

If the **Alarms** or **Troubleshooting** sections have led you here your Profile Control has probably stopped or won't respond to button presses on the control panel. This section will isolate which of the Circuit Boards or Input/Output Modules are at fault. Refer to the **Circuit Boards and Modules** section for a description of each of the electronics components. Refer to the **Profile Control Electrical Drawings** manual for wiring diagrams.

Do not jump steps or replace anything unless advised to do so. To replace a board or module prematurely can make a situation worse and leave you with a pile of unknown spares. If in doubt at this point, you should ask your supplier for help first.

The steps to be followed are:

- Verify that the power supply is working and isolate any board or module with a power supply fault.
- Verify that all boards and modules are running
- Isolate any board or module causing I-Bus communication problems

Verify Power Supply

The Power Supply has lethal high voltages on exposed components.

Turn on the main power switch. All of the circuit boards and modules provide a green Power LED. Check that these Power LEDs are ON for all boards and modules. If they are initially on but go OFF after a few minutes then proceed as though there is a power supply problem. If they are ON proceed to **Verify Boards and Modules**.

If there is a power supply problem then determine whether it is due to the power supply having failed or to too high a load on the supply causing it to shutdown. Disconnect the output from the Power Supply and measure the output voltage with no load. This should be 24V. If there is no output then check the input voltage to the power supply. This should be between 85V and 240V AC. If the input voltage is correct then the Power Supply should be replaced. If there is no input voltage then check the Profile Control fuses and the incoming main supply.

If the unloaded Power Supply output voltage is 24V then the fault is too high a load from one or more boards and modules. Unplug the I-Bus Connector from the Control Module and all of the I/Bus connectors from the SSR boards and from any remotely mounted output control modules. Reconnect the Power Supply 24V output. Measure the Power Supply output voltage again. If not 24V then contact your supplier.

Reconnect the Control Module I/Bus Connector. The green Power LEDs on the Control Module and the connected modules (GPIO/Oscl/Gauge/Comms) should go ON. If not then power off, separate the modules and power on again. If the Control Module Power LED now lights then reconnect the remaining modules one at a time. This can be done with the power turned on. If one of these modules causes the Power LEDs to fail then it will need to be replaced.

If the Control and other modules have power then reconnect the SSR boards and any remote output control modules one at a time. Again, this can be done with the power on. If one of these boards or modules causes the Power LEDs to fail then it will need to be replaced.

Verify Boards and Modules are Running

With all boards and modules reconnected and their green Power LEDs ON, check that their yellow Ok LEDs are flashing on and off each second. Replace any faulty boards and modules.

Isolate Communications Problems

All of the separate boards and modules communicate via a serial data bus using the I2C protocol. This bus is referred to as the I-Bus. Two types of problem may occur.

- A faulty board or module which stops all communication
- One board or module which fails to communicate

It is possible for a board or module with a faulty interface to the I-Bus to stop all communication on the bus. Because of this it is easy to confuse which board or module is actually causing the problem. Failure to communicate with any board or module will raise an alarm although this can only be seen on the Operator Display. It is important therefore to firstly re-establish communication with the Operator Display.

If communication to the Operator Display has been lost the display will show the message:

NOT CONNECTED

All boards and modules connected to the I-Bus, except the main Operator Display must be disconnected. This will mean removing any auxiliary displays (if fitted) and disconnecting all modules and SSR boards. If the Operator Display still shows the Not Connected message then either the Display Board or the Control Module is faulty. Replace the Operator Display first. If that does not fix the problem replace the Control Module. If this still does not fix the problem then check the wiring between the Control Module and the Operator Display. If no problem can be found call your supplier.

Once the Operator Display has some reasonable message displayed check that button presses are being read. In particular try to enter the Test menu. Now reconnect each of the previously disconnected boards and modules, one at a time, using the test options to check communication with each board or module as it is connected. Replace any faulty boards or modules as they are found.

Changing the Control Module

The Control Module has on board memory which remains on the board when it is changed. This means that the new Control Module will need to be setup up correctly.

Any changes from the default setup values need to be re entered and the line speed, oscillator speed and analog gauge inputs will need recalibrating.

Changing an I/O Module

Changing an I/O module (GPIO, Oscl, Gauge) will require any analog input to be recalibrated.

Service, Care & Maintenance

Service

Weighbatch machines carry a limited parts warranty as stipulated in Weighbatch's Terms and Conditions of Sale.

If your service request is not covered by this warranty you will be charged for parts, time and disbursements accordingly.

This manual is set out with great care to cover most situations but should you require further assistance please call your supplier. Quote the serial number of your Profile Control when requesting service. The serial number is located on the control cabinet at rear of the Profile Control. In the case of a fault with the unit, please describe clearly the symptoms of the problem.

Warranty Procedure:

If you believe the fault is a warranty problem you need to advise Weighbatch as soon as possible and supply the following details of the fault in writing within 2 weeks of the fault occurring:

- Company Name
- Contact Name
- Date Fault Occurred
- Weighbatch Machine Serial Number
- Your Machine Name/Number
- Description of Fault (Please describe accurately nature of fault)
- Description of circumstances when fault occurred (throughput of your machine etc)

Care

The Profile Control should only be used for the purpose for which it is intended.

It should only be used by your employees that have read and understood the instructions in this manual.

It should not be operated in extreme temperatures or dusty and humid environments.

Maintenance

No scheduled maintenance is required for the Profile Control.

Occasionally check:

- Fans are running and airflow is not blocked.
- Electronic components are clean and free of dust.

Record Sheets

It is important to record the initial setup on the **Initial Setup** sheet and any changes done on the **Setup Changes** sheet. Record when calibrations are done on the **Calibration Record** sheet and any faults that may occur on **Fault Record** sheet**.**

This is necessary to build a history on your Profile Control so that in years to come you are able to see that calibrations have or have not been done regularly, set-up changes have been done by some one that is capable of doing so and if a problem was to re-occur a more informed decision can be made to implement a permanent solution.

Initial Setup

Setup Parameter	Initial Value
SENSOR TYPE	
SENSOR HOME	
SENSOR DIR	
SENSOR HEIGHT	
SENSOR FILTER	
SENSOR FACTOR	
OSCL. NIP	
OSCL. DIR	
NUM HEATER	
HEATER TYPE	
HEATER HOME	
HEATER DIR	
HEATER POWER	
HEATER CYCLE	
HEATER TEST	
CTRL EFFECT	
CTRL WINDOW	
CTRL FEEDBACK	
TCP/IP MODE	
TCP/IP IP ADDR	
TCP/IP MAC ADDR	

Setup Changes

Setup Parameter Changed and Reason	Previous Value	New Value	Date

Calibration Record

Calibration Parameter	Previous Value	New Value	Date

Fault Record

Fault Description	Corrective Action	Date