Acquisition • Measurement • Control


# Tracker 300
## Reference Guide

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# Contents

# Chapter 1 **Product Description**

The Tracker 300 Series is a range of DIN rail mounted instrumentation designed for Control and Instrumentation Applications covering:

- signal conditioning and isolation,
- data acquisition,
- alarm trip,
- PID control,
- condition (plant) monitoring, or
- any combination of the above.

## Tracker 320/330 Series

The Tracker 300 series comprises three analogue instruments, each available either as mains powered (90–265V AC 50/60Hz) or low voltage (10–32V AC/DC) versions:

| Model Number | Universal Input + RS485 Comm | Sensor Excitation (10/24V DC) | Analogue Output (option) | Autotune PID Control | 1 × Relay + 1 × SSR Outputs | Notes |
|---|---|---|---|---|---|---|
| Tracker 321 | ✔ | ✔ | ✔ | | | |
| Tracker 331 | ✔ | | ✔ | ✔ | ✔ | No Relay contacts. Optionally 2 × relay (replaces SSR drive) |
| Tracker 332 | ✔ | ✔ | ✔ | ✔ | | Requires an analogue output or T340 module for PID control |

### Key Features (all standard unless specified):

- Universal input for Millivolt (±100), Milliamp (±20), Volts (±10), Resistance, Thermocouple and RTD.
- Isolated RS485 serial interface with MODBUS RTU compatibility.
- Four process alarms with latching, hysteresis, delay, blocking features and high, low and deviation actions.
- Sensor/transmitter excitation supplies (*not T331*).
- Thermocouple ageing alarm.
- PID control (*not T321*) with autotune and heat/cool which can use logic or analogue outputs.
- Load failure/partial load monitor (for 1 × PWM control output).
- Isolated analogue output for signal retransmission or PID use (*option for all models*).
- Logic Expansion Module (*option for all models*).

## Tracker 340 Series – Logic Expansion Modules

All the above analogue models can be connected to a single Tracker 340 Logic Expansion Module if required. These Expansion Modules are powered and controlled by the Tracker 321, 331 or 332 Analogue Module. They are mounted next to the Analogue Module and are connected by a small ribbon cable via connectors on the front panel. All Modules have 2 logic inputs that can be configured to allow remote control of functions by using external volt free contacts or TTL outputs. There are three standard models offering different logic output combinations:

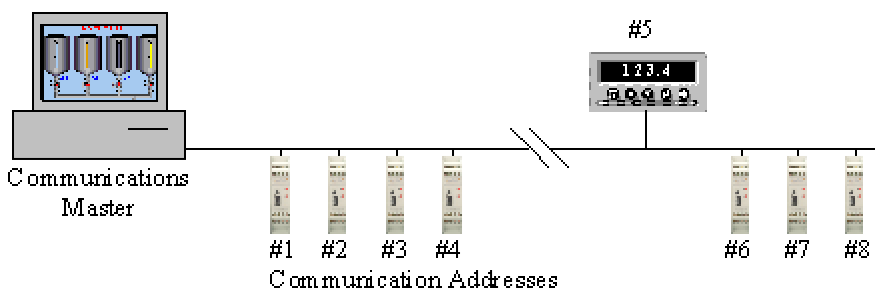
| Model Number | Relay C/O Contacts | TTL Outputs | Status (Logic) Inputs |
|---|---|---|---|
| Tracker 341 | 4 | | 2 |
| Tracker 342 | 3 | 1 | 2 |
| Tracker 343 | | 4 | 2 |


A Tracker 332 connected to a Tracker 341 Logic Expansion Module

# Chapter 2 **Overview**

This section describes all the instrument's configuration, system and real time data locations available via the communications interfaces.

The instrument supports two communication protocols, MODBUS (RTU and ASCII) and DTPI (ASCII). At default the 2-wire RS485 interface uses MODBUS RTU and the front panel interface uses the DTPI protocol. Only one interface can be used at a time. The instrument acts as a slave, only responding to commands from a communication master device. Each instrument connected to the RS485 communications interface has a unique communication address number in the range 1–247.




Different types of instruments, even from different manufacturers, can be connected together on a single link as long as they share the same communications protocol and have a 2-wire RS485 interface. The MODBUS RTU protocol has been widely adopted by many manufacturers of control and instrumentation equipment. Up to 32 slave devices can be connected on a RS485 link without the need for repeaters. Converters are commercially available for compatibility to most Fieldbus and ethernet-based systems.

The instrument can be configured by using the RS485 serial interface or by using the '300-CONF' configuration cable which plugs into the socket on the front panel. The 300-CONF cable converts an RS232 serial interface to TTL signals compatible with the instrument. Inserting the 300-CONF front panel jack plug disables the RS485 interface. Removing the jack plug re-enables the RS485 interface.

Normally, the PC compatible software supplied with the instrument would be used for configuration. For system integrators who need to read and write data to the instrument during runtime, all the instrument's data locations are described in this document.

Data locations are either analogue for numeric values, or logic for ON/OFF values.

Locations marked RO are read only. An example would the measured process variable (PV) value. Locations marked RW allow both read and write, e.g. an alarm setpoint. RW locations can be write protected after configuration if required (see L1 and L2).

**Note:** Throughout this manual, analogue and logic locations are shown as A*x* and L*x*, respectively, where *x* is the location number.

## Factory Default Values

All locations have a factory default value. Turning ON L156 restores the instrument to the factory default. It is a good idea to default the instrument if has previously been used in another application, before reconfiguration.

## Self-clearing Logic Locations

Most logic locations store their ON or OFF state until changed by another communication command or because the process being monitored has changed. Some locations, like the max/ min reset location (L162) will automatically turn OFF when the function is completed. Other self-clearing locations include zero (L164) and sample PV input (L159). Although instructed to turn ON, these locations will always read as OFF as soon as the instrument completes the 'one shot' function.

## Unsaved Locations

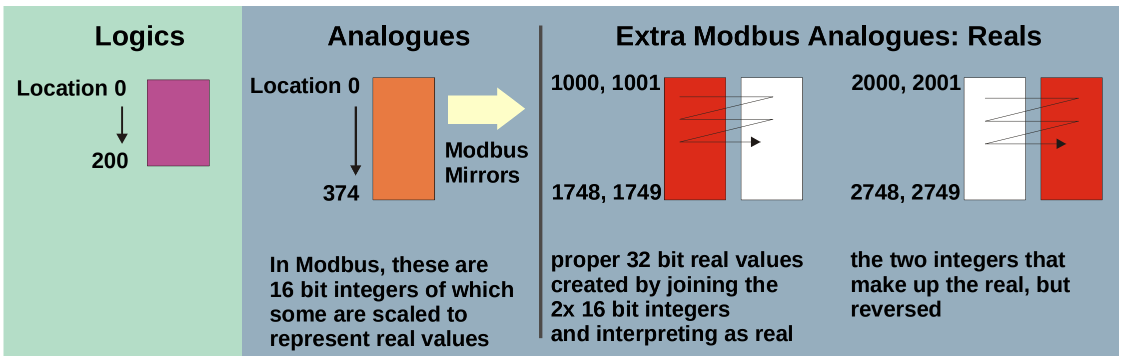
Some locations are designed to be modified for a limited period and will automatically revert to their default value when the instrument is repowered or reset. These locations are normally associated with the serial communication interfaces and changes made are only valid for the user's current communications or configuration session.

## Broadcast Messages

The instrument's communication address number (A213) can be set between 1 and 247. If a command is sent with an address of 000, it is regarded as a broadcast and all instruments will receive and act on the command but (warning) will not reply with an acknowledgement. Only Store Analogue and Store Logic commands can be used in a broadcast message.

# Chapter 3 Communications and Protocols

Communications with the instrument is achieved by accessing entries in its memory map using one of the following protocols: DTPI ASCII, Modbus ASCII or Modbus RTU. Memory map entries are either analogue (numbers) or logic (states).




Analogues and logics may be read-only or writable.

## The DTPI (ASCII) Protocol

The DTPI protocol is designed to be simple to implement.

The default RS485 communications settings are:

- Baud 9600
- Parity None
- Data bits 8
- Stop bit 1
- Analogue locations range between A0 and A999
- Logic locations range between L0 and L999

### Example

A command is sent to an instrument with a communications address of 27. The instrument's Alarm 1 setpoint (A14) is to be set to a value of 123.4:

`;027SA14 123.4<CR><LF>`

| | |
|---|---|
| `;` | Start of message. |
| `027` | Instrument address - always three digits between 000–247. 000 is used to broadcast to all instruments. |
| `SA` | Command– SA = Store Analogue.<br>RA = Read Analogue.<br>SL = Store Logic.<br>RL = Read Logic. |
| `14` | Data location number – A14 = Alarm 1 setpoint value. |

`<Space>` Separator.
`123.4` Data –For write commands, this is the value to be stored.
For logic data this is ON or OFF.
For read commands this would be the number of consecutive parameters to be read.
`<CR>` Carriage return – ASCII 13 decimal.
`<LF>` Line feed – ASCII 10 decimal.

If the command is successful the instrument will reply:

```
OK<CR><LF>
```

### Example

Read the setpoint values for Alarms 1–4 (A14–A17):

```
;001RA14 4<CR><LF>
```

The instrument will reply:

```
+0123.4 −3727.3 +4322.8 ?99999.<CR><LF>
```

?99999 or ?19999 indicate an over/under-range analogue value.

All numeric data values are seven characters long, are preceded with a space character and have a range of -99999. to +99999. (five digits + decimal point + sign). Turning L193 ON temporarily makes analogue values seven digits (-9999999 – +9999999). Five-digit mode is always re-established when the instrument is repowered or reset.

### Example

Read the state of the four alarms (L39–L42):

```
;001RL39 4<CR><LF>
```

The instrument will reply:

```
OFF OFF ON OFF<CR><LF>
```

In this example Alarm 3 (L41) is in an alarm state.

### Example

Reset the PV max/min memory values (L162):

```
;001SL162 ON<CR><LF>
```

Acknowledgement reply if successful:

```
OK<CR><LF>
```

**Note:** Setting a logic location to a state it is already in will still generate the 'OK' acknowledgement.

## Reserved Locations

Reserved logic location always read as OFF. Reserved analogue locations return a value of zero. Attempting to write to a reserved location can cause an error message #7 to be returned (see hereafter).

### Error Messages

| Number | Possible Cause |
|---|---|
| **#1** | Invalid command (SA, SL, RA and RL only allowed). Numeric data used in logic command. |
| **#2** | Attempted to write to read only or protected location. |
| **#3** | Data location does not exist, start location or number of locations invalid. |
| **#4** | Invalid data value, space missing or syntax error. |
| **#7** | Attempt to write a non-zero value to a reserved location. |

### Broadcast Messages

The instruments communication address number (A213) can be set between 1 and 247. If a command is sent with an address of 000 all connected instruments will receive and act on the command but (warning) will not reply with an acknowledgement. Only Store Analogue (SA) and Store Logic (SL) commands can be used in a broadcast message.

#### Example

Clear all latched alarms on all connected instruments:

```
;000SL168 ON<CR><LF>
```

No reply will be received from any of the instruments.

## Using the Modbus RTU Protocol

The Tracker 300 Series supports the following MODBUS functions:

| | | |
|---|---|---|
| 01 | Read coil status | Read a group of logic locations (coils) |
| 02 | Read input status | Read a group of logic locations (discrete inputs) |
| 03 | Read holding registers | Read values in one or more analogue (memory) locations |
| 04 | Read input registers | Read values in one or more input (real time) locations |
| 05 | Force single coil | Set a logic location to state of ON or OFF |
| 06 | Preset single register | Set a value in an analogue location (holding register) |
| 15 | Force multiple coils | Set a series of consecutive logic locations |
| 16 | Preset multiple registers | Set a series of consecutive analogue locations |

**Note:** The instrument treats functions 01 and 02 identically, the same applies for functions 03 and 04.

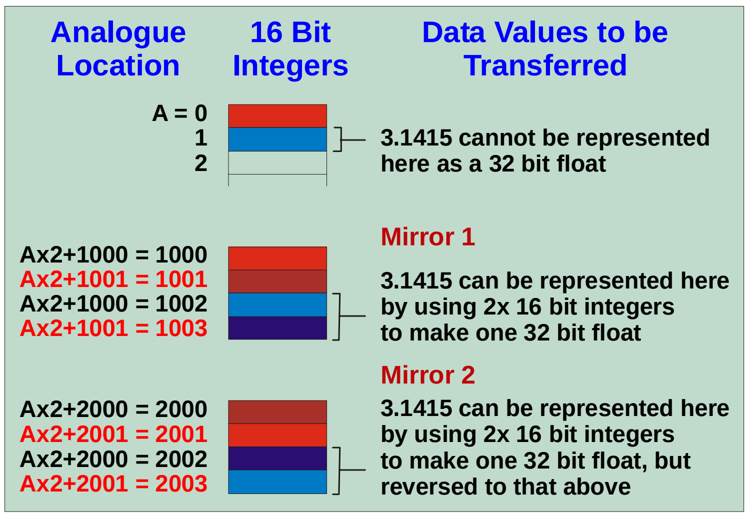
The default communications settings are:

- Baud 9600
- Parity None
- Data bits 8
- Stop bit 1

Standard MODBUS RTU analogue integer locations (registers) are between 0 and 999. For MODBUS RTU master devices or software that can support floating point (real) values, the instrument also provides floating-point locations. This allows the user to have a higher resolution than the standard MODBUS integer value (normally just 1 part in 32000) and an increased numeric range. Although two registers need to be read for each 32-bit value, no scaling is required to be undertaken by the instrument or the MODBUS master device.

Many well known SCADA, data acquisition and HMI products now support floating point values within the MODBUS RTU protocol. However, there is no standard for which way round the high and low order values are accessed. To over come this, the instrument provides high order followed by low order between locations **A1000** and **A1999**, and low order followed by high order between locations **A2000** and **A2999**.

The diagram below shows the analogue location at 0+ and the float locations at 1000+ and 2000+. Values are transferred as real numbers to/from the float locations.




## Example

**L235** (hours the instrument has been powered) has a value of 209.8711.

If accessed at the float locations **A1470** and **A1471** we read:

> 17233 and 57089 decimal = 4351 and DF01 hex – the standard IEEE 751 representation of the value 209.8711 as a 32-bit floating point number.

If accessed at the float locations **A2470** and **A2471** we read:

> 57089 and 17233 decimal = DF01 and 4351 hex = 4351 and DF01 hex = 209.8711

For more information on MODBUS protocols visit www.modbus.org or www.modicom.com and search for PI-MBUS-300.

# Chapter 4 **Data Locations**

Communication data locations are normally only of interest to system designers who wish to use the RS485 interface during runtime. The PC compatible software will store configuration data in to the instrument without the user ever needing to know about the use of data locations.

## Write Protection

All data locations can be read via communications. Writing to a location can also be allowed where permitted. L1 and L2 controls write commands to the instrument via the RS485 Interface. To configure the instrument via the serial interface, L1 and L2 need to be turned OFF.

If the programming jack plug is used the states of L1 and L2 are ignored and full read/write access is available. L1, when turned ON, sets all locations to read only (except L1). L2, when turned ON, sets all locations to read only, except real-time locations (listed later in this document) and L1.

These analogue and logic locations can generally be split into six different types.

### 1. Configuration Locations

A configuration location would normally be set just once during the setup of the instrument. For example an alarm type may be OFF (not used), high, low or deviation. It is unlikely (although not impossible) that the alarm type would ever be changed after installation. (see also L1 and L2).

### 2. Runtime Process (Read Only) Locations

These locations are only used on systems that use the RS485 interface during runtime. These values include the PV measurement values and alarm states. These are read only locations as the values generated are generally based on the process plant measurements.

### 3. Runtime Process (Read/Write) Locations

These locations where a system master device may write data to the instrument during runtime. Alarm setpoint values may be required to change dependent on the process plant conditions. Zero and tare control locations may be written to on a regular basis for a weighing application.

### 4. Process Error Locations

Process error locations allow warnings that associated devices need attention. In general process errors are faults that can be attended too externally to the instrument (e.g. thermocouple ageing warning/alarm).

### 5. System Error Locations

System errors are potential problems associated with the instrument. Values can be monitored to determine the health of the instrument's memory and communication interface.

## 6. Instrument Test and Identification Locations:

In general, data location types 2, 3 and 4 are mainly used in runtime systems that use the RS485 communications, however, there are no restrictions on the user accessing any of the location types any time, including identification location, e.g. software version, hours run, etc.

Data Maps for the Tracker 300 series and 340 expansion models follow.

# TRACKER 321, 331 & 332 DATA MAP FOR INTEGER LOCATIONS

Calibration Sample Point Number (A057)

Start Measurement Sample L159

### Input (A1 & A21)

| | |
|---|---|
| Input Signal Type | A030 |
| Temperature Units | A049 |
| Scaling points used | A058 |
| Scale Eng. Units | A059-076 |
| Input Values | A083-100 |
| S.G. Value | A052 |
| Square Root Enable | L051 |
| ADC Saturation Low | L011 |
| Under Range | L012 |
| ADC Saturation High | L013 |
| Over Range | L014 |
| Thermocouple Break | L015 |

Calculate new scaling L160

Max Memory Value A003

Reset Max/Min L162

Min Memory Value A004

| | |
|---|---|
| Reset Zero | L163 |
| Zero PV | L164 |
| Tare PV | L165 |

### Input Conditioned (A2)

| | |
|---|---|
| Decimal Point Position | A050 |
| Filter Time Constant | A051 |

### Thermocouple Ageing Alarm (L021)

| | |
|---|---|
| T/C Resistence Deviation Setpoint | A031 |
| T/C Resistence when new | A032 |
| Actual resistance - Runtime | A007 |
| T/C Ageing Alarm Enable | L047 |

Select an LED and/or a Logic output signal source as "T/C resistance error"

Measure & Store new Thermocouple loop resistance (L046)

### Load Failure Alarm (L022)

| | |
|---|---|
| Low ON Current Setpoint | A034 |
| ON Current (No CT Fitted) | A035 |
| Monitor Inteval Time | A036 |
| CT Response Time | A037 |
| Max PWM Extension Time | A038 |
| CT Full Scale Output | A041 |
| Over Load Setpoint | A042 |
| Low ON Current Setpoint | A043 |
| 0-10V/4-20mA Select | L050 |
| Runtime ON Current (Mean) | A008 |
| ON Load Current | A009 |
| OFF Load Current | A010 |
| OFF Current Too High | L023 |
| ON Current Too Low | L024 |
| ON Current Too Low (Partial) | L025 |
| ON Current Too High | L026 |
| CT Fitted | L049 |

Select an LED and/or a Logic output signal source as "Load Current Error"

## PID Controller Block (not T321)

### General Controller Settings

| | |
|---|---|
| Max CH1 (Heat) Power | A200 |
| Max CH2 (Cool) Power | A201 |
| Auto Tune CH1 Max Power | A194 |
| Auto Tune CH2 Max Power | A195 |
| O/P Max Slew Rate | A187 |
| Max SP Ramp Rate | A186 |
| SP/PV Deviation Band SP | A199 |
| SP/PV Deviation Band Hold | L139 |
| T/C Break Power | A198 |
| Control Type | A188 |
| Cooling Type | A190 |
| Control Action | A136 |
| Comms RX Timeout Period | A220 |
| Comms RX Timeout Action | A180 |
| Auto Tune Setpoint | A193 |

Integral Hold L175

PID Set Select L174

### Run Time Values

| | |
|---|---|
| Target Setpoint | A018 |
| Working Setpoint | A019 |
| Target Output Power | A020 |
| PV Measured Value | A021 |
| Status Word | A025 |
| Error Term PV-SP | A341 |
| P O/P Component | A342 |
| I O/P Component | A343 |
| D O/P Component | A344 |

Auto Manual L177

Auto Tune Active L176

### PID

| PID | SET 1 | SET 2 |
|---|---|---|
| Setpoint | A182 | A183 |
| Proportional | A172 | A173 |
| Integral | A174 | A175 |
| Derivative | A176 | A177 |
| Dead Band | A178 | A179 |
| Manual Reset | A170 | A171 |
| Cutback | A184 | A185 |
| Relative Gain | A168 | A169 |

Output Power Demand A022

### PWM1

| | |
|---|---|
| Source (On=Heat O/P) | L152 |
| Duty Cycle Time | A205 |
| Power (L152=OFF) | A027 |
| PWM State | L154 |

Channel 1 (Heat) Output Power 0-100% A023

Channel 2 (Cool) Output Power 0-100% A024

### PWM2

| | |
|---|---|
| Source (On=Heat O/P) | L153 |
| Duty Cycle Time | A206 |
| Power (L152=OFF) | A028 |
| PWM State | L155 |

Select an LED and/or a Logic output signal source as "PWM1"

Select analogue output signal source as either PID Heat% or PID Cool% (if available)

Select an LED and/or a Logic output signal source as "PWM2"

Select analogue output source as "measured value" (if available)

Comms Source A026

### Analogue Output (Option)

| | |
|---|---|
| Output Type | A140 |
| Signal Source | A141 |
| Damping Filter Time | A142 |
| PV Value = 100% | A143 |
| PV Value = 0% | A144 |

### Communications Interface

| | |
|---|---|
| Device Address | A213 |
| Baud Rate | A214 |
| TX Delay | A215 |
| Modbus Integer Range | A217 |
| Modbus Range High | A218 |
| Modbus Range Low | A219 |
| RX Timeout | A220 |
| TX Timeout | A221 |
| Write Inhibit All | L096 |
| As above - not runtime | L097 |
| RTU On (session only) | L003 |
| Reset Comms Session | L004 |
| Data Overflow | L008 |
| Comm Lockup Flag | L009 |
| RX Timeout (Latching) | L016 |
| RX Timeout (Auto-reset) | L017 |

RX Timeout (L017) Select an LED and/or a Logic output signal source as "Comms Error"

### System Parameters

| | |
|---|---|
| Tag Characters 1 & 2 | A222 |
| Tag Characters 3 & 4 | A223 |
| Tag Characters 5 & 6 | A224 |
| Expansion Model Type | A226 |
| Model Number | A000/228 |
| Software Version | A229 |
| Serial No Digits 1-4 | A230 |
| Serial No Digits 5-8 | A231 |
| Hours Powered | A235 |
| Number of Resets - High | L236 |
| Number of Resets - Low | A237 |
| Factory Calibration Fault | L005 |
| User Calibration Fault | L006 |
| Checksum Fail (Memory) | L007 |

### Alarm 1

| | |
|---|---|
| Alarm Action | A108 |
| Setpoint | A014/109 |
| ON Hysteresis | A110 |
| OFF Hysteresis | A111 |
| ON Delay | A112 |
| Off Delay | A113 |
| Deviation High | A114 |
| Deviation Low | A115 |
| Alarm/PID SP | L055 |
| Latching | L056 |
| Blocking | L057 |
| Alarm State | L039 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 1"

### Alarm 2

| | |
|---|---|
| Alarm Action | A116 |
| Setpoint | A015/117 |
| ON Hysteresis | A118 |
| OFF Hysteresis | A119 |
| ON Delay | A120 |
| Off Delay | A121 |
| Deviation High | A122 |
| Deviation Low | A123 |
| Alarm/PID SP | L059 |
| Latching | L060 |
| Blocking | L061 |
| Alarm State | L040 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 2"

### Alarm 3

| | |
|---|---|
| Alarm Action | A124 |
| Setpoint | A016/125 |
| ON Hysteresis | A126 |
| OFF Hysteresis | A127 |
| ON Delay | A128 |
| Off Delay | A129 |
| Deviation High | A130 |
| Deviation Low | A131 |
| Alarm/PID SP | L063 |
| Latching | L064 |
| Blocking | L065 |
| Alarm State | L041 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 3"

### Alarm 4

| | |
|---|---|
| Alarm Action | A132 |
| Setpoint | A017/133 |
| ON Hysteresis | A134 |
| OFF Hysteresis | A135 |
| ON Delay | A136 |
| Off Delay | A137 |
| Deviation High | A138 |
| Deviation Low | A139 |
| Alarm/PID SP | L067 |
| Latching | L068 |
| Blocking | L069 |
| Alarm State | L042 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 4"

### LED

| | |
|---|---|
| Programmable Action | A167 |

### Logic Output 1

| | |
|---|---|
| Signal Source | A151 |
| Output Action | L081 |
| Output State | L027 |

### Logic Output 2

| | |
|---|---|
| Signal Source | A152 |
| Output Action | L082 |
| Output State | L028 |

Tracker 331 only

## Legend

Analogue outputs and signal sources

Logic outputs and signal sources

# TRACKER 321, 331 & 332 DATA MAP FOR FLOAT LOCATIONS

Calibration Sample Point Number (1114, 1115)

Start Measurement Sample L159

### Input (1001,1002 & 1042,1043)

| | |
|---|---|
| Input Signal Type | 1060, 1061 |
| Temperature Units | 1098, 1099 |
| Scaling points used | 1116, 1117 |
| Scale Eng. Units | 1118-1153 |
| Input Values | 1166-1201 |
| S.G. Value | 1104, 1105 |
| Square Root Enable | L051 |
| ADC Saturation Low | L011 |
| Under Range | L012 |
| ADC Saturation High | L013 |
| Over Range | L014 |
| Thermocouple Break | L015 |

Calculate new scaling L160

Max Memory Value 1006, 1007

Reset Max/Min L162

Min Memory Value 1008, 1009

| | |
|---|---|
| Reset Zero | L163 |
| Zero PV | L164 |
| Tare PV | L165 |

### Input Conditioned (1004,1005)

| | |
|---|---|
| Decimal Point Position | 1100, 1101 |
| Filter Time Constant | 1102, 1103 |

### Thermocouple Ageing Alarm (L021)

| | |
|---|---|
| T/C Resistence Deviation Setpoint | 1062, 1063 |
| T/C Resistence when new | 1064, 1065 |
| Actual resistance - Runtime | 1014, 1015 |
| T/C Ageing Alarm Enable | 1094, 1095 |

Measure & Store new Thermocouple loop resistance (L046)

Select an LED and/or a Logic output signal source as "T/C resistance error"

## PID Controller Block (not T321)

### General Controller Settings

| | |
|---|---|
| Max CH1 (Heat) Power | 1400, 1401 |
| Max CH2 (Cool) Power | 1402, 1403 |
| Auto Tune CH1 Max Power | 1388, 1389 |
| Auto Tune CH2 Max Power | 1390, 1391 |
| O/P Max Slew Rate | 1374, 1375 |
| Max SP Ramp Rate | 1372, 1373 |
| SP/PV Deviation Band SP | 1398, 1399 |
| SP/PV Deviation Band Hold | L139 |
| T/C Break Power | 1396, 1397 |
| Control Type | 1376, 1377 |
| Cooling Type | 1380, 1381 |
| Control Action | 1272, 1273 |
| Comms RX Timeout Period | 1440, 1441 |
| Comms RX Timeout Action | 1360, 1361 |

Integral Hold L133

PID Set Select L137

### Run Time Values

| | |
|---|---|
| Target Setpoint | 1036, 1037 |
| Working Setpoint | 1038, 1039 |
| Target Output Power | 1040, 1041 |
| PV Measured Value | 1042, 1043 |
| Status Word | 1050, 1051 |
| Error Term PV-SP | 1682, 1683 |
| P O/P Component | 1684, 1685 |
| I O/P Component | 1686, 1687 |
| D O/P Component | 1688, 1689 |

Auto Manual L135

Auto Tune Active L134

| PID | SET 1 | SET 2 |
|---|---|---|
| Setpoint | 1364, 1365 | 1366, 1367 |
| Proportional | 1344, 1345 | 1346, 1347 |
| Integral | 1348, 1349 | 1350, 1351 |
| Derivative | 1352, 1353 | 1354, 1355 |
| Dead Band | 1356, 1357 | 1358, 1359 |
| Manual Reset | 1340, 1341 | 1342, 1343 |
| Cutback | 1368, 1369 | 1370, 1371 |
| Relative Gain | 1336, 1337 | 1338, 1339 |

Output Power Demand 1044, 1045

### PWM1

| | |
|---|---|
| Source (On=Heat O/P) | L152 |
| Duty Cycle Time | 1410, 1411 |
| Power (L152=OFF) | 1054, 1055 |
| PWM State | L154 |

Channel 1 (Heat) Output Power 0-100% 1046, 1047

Channel 2 (Cool) Output Power 0-100% 1048, 1049

### PWM2

| | |
|---|---|
| Source (On=Heat O/P) | L153 |
| Duty Cycle Time | 1412, 1413 |
| Power (L152=OFF) | 1056, 1057 |
| PWM State | L155 |

Select an LED and/or a Logic output signal source as "PWM1"

Select analogue output signal source as either PID Heat% or PID Cool% (if available)

Select an LED and/or a Logic output signal source as "PWM2"

Select analogue output source as "measured value" (if available)

Comms Source 1052, 1053

### Analogue Output (Option)

| | |
|---|---|
| Output Type | 1280, 1281 |
| Signal Source | 1282, 1283 |
| Damping Filter Time | 1284, 1285 |
| PV Value = 100% | 1286, 1287 |
| PV Value = 0% | 1288, 1289 |

### Communications Interface

| | |
|---|---|
| Device Address | 1426, 1427 |
| Baud Rate | 1428, 1429 |
| TX Delay | 1430, 1431 |
| Modbus Integer Range | 1434, 1435 |
| Modbus Range High | 1436, 1437 |
| Modbus Range Low | 1438, 1439 |
| RX Timeout | 1440, 1441 |
| TX Timeout | 1442, 1443 |
| Write Inhibit All | L096 |
| As above - not runtime | L097 |
| RTU On (session only) | L003 |
| Reset Comms Session | L004 |
| Data Overflow | L008 |
| Comm Lockup Flag | L009 |
| RX Timeout (Latching) | L016 |
| RX Timeout (Auto-reset) | L017 |

RX Timeout (L017) Select an LED and/or a Logic output signal source as "Comms Error"

### Load Failure Alarm (L022)

| | |
|---|---|
| Low ON Current Setpoint | 1068, 1069 |
| ON Current (No CT Fitted) | 1070, 1071 |
| Monitor Inteval Time | 1072, 1073 |
| CT Response Time | 1074, 1075 |
| Max PWM Extension Time | 1076, 1077 |
| CT Full Scale Output | 1082, 1083 |
| Over Load Setpoint | 1084, 1085 |
| Low ON Current Setpoint | 1086, 1087 |
| 0-10V/4-20mA Select | L050 |
| Runtime ON Current (Mean) | 1016, 1017 |
| ON Load Current | 1018, 1019 |
| OFF Load Current | 1020, 1021 |
| OFF Current Too High | L023 |
| ON Current Too Low | L024 |
| ON Current Too Low (Partial) | L025 |
| ON Current Too High | L026 |
| CT Fitted | L049 |

### System Parameters

| | |
|---|---|
| Tag Characters 1 & 2 | 1444, 1445 |
| Tag Characters 3 & 4 | 1446, 1447 |
| Tag Characters 5 & 6 | 1448, 1449 |
| Expansion Model Type | 1452, 1453 |
| Model Number | 1456, 1457 |
| Software Version | 1458, 1459 |
| Serial No Digits 1-4 | 1460, 1461 |
| Serial No Digits 5-8 | 1462, 1463 |
| Hours Powered | 1470, 1471 |
| Number of Resets - High | L236 |
| Number of Resets - Low | 1474, 1475 |
| Factory Calibration Fault | L005 |
| User Calibration Fault | L006 |
| Checksum Fail (Memory) | L007 |

Select an LED and/or a Logic output signal source as "Load Current Error"

### Alarm 1

| | |
|---|---|
| Alarm Action | 1216, 1217 |
| Setpoint | 1028, 1029 & 1218, 1219 |
| ON Hysteresis | 1220, 1221 |
| OFF Hysteresis | 1222, 1223 |
| ON Delay | 1224, 1225 |
| Off Delay | 1226, 1227 |
| Deviation High | 1228, 1229 |
| Deviation Low | 1230, 1231 |
| Alarm/PID SP | L055 |
| Latching | L056 |
| Blocking | L057 |
| Alarm State | L039 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 1"

### Alarm 2

| | |
|---|---|
| Alarm Action | 1232, 1233 |
| Setpoint | 1030, 1031 & 1234, 1235 |
| ON Hysteresis | 1236, 1237 |
| OFF Hysteresis | 1238, 1239 |
| ON Delay | 1240, 1241 |
| Off Delay | 1242, 1243 |
| Deviation High | 1244, 1245 |
| Deviation Low | 1246, 1247 |
| Alarm/PID SP | L059 |
| Latching | L060 |
| Blocking | L061 |
| Alarm State | L040 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 2"

### Alarm 3

| | |
|---|---|
| Alarm Action | 1248, 1249 |
| Setpoint | 1032, 1033 & 1250, 1251 |
| ON Hysteresis | 1252, 1253 |
| OFF Hysteresis | 1254, 1255 |
| ON Delay | 1256, 1257 |
| Off Delay | 1258, 1259 |
| Deviation High | 1260, 1261 |
| Deviation Low | 1262, 1263 |
| Alarm/PID SP | L063 |
| Latching | L064 |
| Blocking | L065 |
| Alarm State | L041 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 3"

### Alarm 4

| | |
|---|---|
| Alarm Action | 1264, 1265 |
| Setpoint | 1034, 1035 & 1266, 1267 |
| ON Hysteresis | 1268, 1269 |
| OFF Hysteresis | 1270, 1271 |
| ON Delay | 1272, 1273 |
| Off Delay | 1274, 1275 |
| Deviation High | 1276, 1277 |
| Deviation Low | 1278, 1279 |
| Alarm/PID SP | L067 |
| Latching | L068 |
| Blocking | L069 |
| Alarm State | L042 |
| Non-alarm State | L166 |
| Reset Latch | L168 |

Select an LED and/or a Logic output signal source as "Alarm 4"

### LED

Programmable Action 1334, 1335

### Logic Output 1

| | |
|---|---|
| Signal Source | 1302, 1303 |
| Output Action | L081 |
| Output State | L027 |

### Logic Output 2

| | |
|---|---|
| Signal Source | 1304, 1305 |
| Output Action | L082 |
| Output State | L028 |

Tracker 331 only

## Legend

Analogue outputs and signal sources

Logic outputs and signal sources

# Tracker 340 Expansion Module Data Map

## Logic Outputs

| Logic Output 1 | |
|---|---|
| Signal Source | A155 |
| Output Action | L085 |
| Output State | L029 |

| Logic Output 2 | |
|---|---|
| Signal Source | A156 |
| Output Action | L086 |
| Output State | L030 |

| Logic Output 3 | |
|---|---|
| Signal Source | A157 |
| Output Action | L087 |
| Output State | L031 |

| Logic Output 4 | |
|---|---|
| Signal Source | A158 |
| Output Action | L088 |
| Output State | L032 |

## Front Panel LEDs

| LED 1 | |
|---|---|
| Signal Source | A161 |
| Output Action | L091 |
| Output State | L033 |

| LED 2 | |
|---|---|
| Signal Source | A162 |
| Output Action | L092 |
| Output State | L034 |

| LED 3 | |
|---|---|
| Signal Source | A163 |
| Output Action | L093 |
| Output State | L035 |

| LED 4 | |
|---|---|
| Signal Source | A164 |
| Output Action | L094 |
| Output State | L036 |

## Status (Logic) Inputs

| Status Input Function | 1 | 2 |
|---|---|---|
| Input State | L037 | L038 |
| Zero | L101 | L115 |
| Reset Max & Min | L102 | L116 |
| Reset Latched Alarms | L103 | L117 |
| Alarm Block Reset | L104 | L118 |
| Tare | L105 | L119 |
| Alarm Disable | L106 | L120 |
| Analogue O/P Freeze | L107 | L121 |
| PID Manual Power | L108 | L122 |
| PID 2 Settings | L109 | L123 |
| PID Integral Hold | L110 | L124 |
| PID Autotune Enable | L111 | L125 |

**Note**: If using a T340 expansion module, A266 must be set to 1

The following sections describe configuration locations groups for:

- RS485 Serial Port Configuration
- Input Measurement (PV) Configuration (including User Linearisation)
- PID Parameters and Configuration (T33*x* models only)
- Process Alarm Configuration
- T340 Logic Expansion Module (if fitted)
- Assigning Logic (Relay/TTL) Outputs to Alarms (if fitted)
- Thermocouple Ageing Alarm
- Electrical Load Failure/Partial Load Failure Monitor
- Runtime Information (Analogue)
- Runtime Information (Logic)
- Instrument System Remote Control Functions (via Communication Ports)
- Instrument Identification and Test Data Locations

If a particular feature or function is not required/fitted, the section can be ignored.

## Communications Interface

For two wire communications both wires are used for transmitting, then both wires are used for receiving. Data can travel in only one direction at a time. This is known as half duplex. Furthermore, if the slave answers back very fast, the master or the converter hardware may have to switch the RS485 interface very quickly from transmitting to receiving for a reply.

Using automatic device enable hardware relieves the master software from turning the line around from transmitting to receiving. The KK-Systems RS232 to RS485 converter model K2-ADE has this capability. ADE means Automatic Device Enable. See www.kksystems.co.uk.

Often with operating systems like windows there can be a delay between the software command to do this switching and the switching actually happening. The instruments pretransmit delay feature can be used to compensate for the masters operating system delays.

## RS485 Serial Port Configuration

A212/1424-5 RW ***RS485 port parity,*** *default 3*
0 = Even, 1 = Odd, 3 = None.

A213/1426-7 I RW ***RS485 port - communications address***, (1–247), *default 1*
For use on multi-drop applications where a master device (normally a PC or HMI) can be connected to a number of slave devices on a single communications link. Each slave device must have a unique communications address number on the communication link.

A214/1428-9 I RW ***RS485 port baud rate***, (3 = 19200, 2 = 9600, 1 = 4800, 0 = 2400), *default 2*
This parameter selects the data rate for the RS485 serial interface and must be the same as any other devices and the master device.

A215/1430-1 I RW ***RS485 port response TX delay in 4ms units***, (0–255), *default 0*
Some master devices, after sending a request to a slave device, need a certain amount of time to switch off (tri-state) their transmitter and turn on their receiver. Should this be the case a response delay can be set in this location. The delay range is 0–1020ms in 4ms steps.

A217/1434-5 I RW ***MODBUS integer range,*** (0 = 0–32000, 1 = 0–32767, 2 = 0–65535), *default 0*
Modbus integer scale range.

A218/1436-7 F RW ***MODBUS integer range high***, *default 100*
The scaled engineering units value as represented by 32000, 32767 or 65535 as selected in A217.

A219/1438-9 F RW ***MODBUS integer range low***, *default 0*
The scaled engineering units value as represented by zero (see A217 and A218).

### Example

Scaled range required = 0–5000 (engineering units)
0–32000 selected as the MODBUS integer range (A217) = 0
0 = 0 eng units, 32000 = 5000 eng units
High scale (A218) = 5000, low scale (A219) = 0
The value would be scaled 0–32000 = 0–5000 eng units (with a resolution of 1 in 32000)
A MODBUS value of 8000 would be scaled as 1250 eng units

The communications master device must have the same scaling values as the instrument.

A220/1440-1 I RW ***communications RX timeout***, (0–255 seconds), *default 0 (OFF)*
If no valid command is received for a period longer than set at this location, the communication loss PID 'self defence' function will be triggered – see A180. A logic output can also be switched on. Setting this location to zero turns this function off.

A221/1442-3 I RW ***communications TX timeout***, (0–255 seconds), *default 25*
Should the instrument transmit data for more than the time period set then a system error is generated, and the instrument configuration is set.

L96 RW ON ***inhibits write commands to all locations via the RS485 port***, *default OFF*

L97 RW ON ***as above but still allows writes to real-time locations***, *default OFF*

L98 RW ON ***MODBUS RTU protocol enable, RS485 port only***, (OFF = DTPI (ASCII) protocol, ON = RTU), *default ON*

L99 RW ON ***2 stop bits, RS485 port only***, (OFF = 1 stop bit), *default OFF*

# Active Serial Port

The following locations allow a temporary override of the stored serial configuration parameters. If the front panel configuration socket is used the parameters would effect this port. If the jack plug is removed, these parameters effect the RS485 port. The active serial port is mainly used for test purposes and all parameters default back to OFF when repowered or reset.

L193 RW ON ***DTPI protocol 7 digit mode for this session only***, (OFF = 5 digit), *default OFF*

L194 RW ON ***lowers priority of RTU communications so other tasks delayed less***, *default OFF*

L195 RW ON ***allows >125 locations to be read when using MODBUS RTU***, *default OFF*

L197 RW ON ***write protects all locations for this session only***, *default OFF*

L198 RW ON ***write protects all setup locations for this session only***, *default OFF*

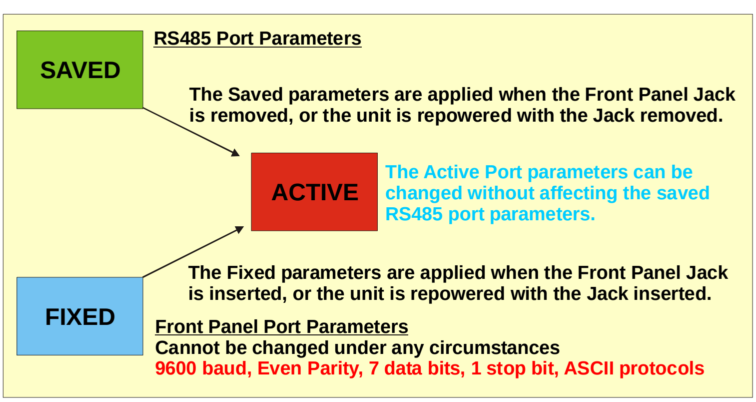
L199 RW ON ***2 stop bits for this session only***, (OFF = 1 stop bit), *default OFF*

When the configuration jack plug is inserted into the front panel socket the communications parameters are always set to 9600 baud, even parity, 7 data bits, 1 stop bit and the DTPI (ASCII) protocol is enabled. If required, these parameters can be changed but only for the duration of the current communication session via the front panel socket. If the jack plug is removed and then reinserted, 9600, N, 8, 1 DTPI (ASCII) parameters would again be set.

When the jack plug is inserted the RS485 interface is disabled. When the jack plug is removed the RS485 port is enabled with the parameters set at A213–221 and L96–99 (RS485 serial port configuration).

## Additional Information

There are three blocks of memory in the T300 associated with comms. Whichever port is in use, it is always controlled by the active comms settings.




When the instrument is rebooted or repowered, the ACTIVE settings are re-copied from the SAVED or FIXED settings depending on whether a jack is inserted in the config port or not.

When a jack is inserted or removed the ACTIVE settings are recopied from the SAVED or FIXED settings depending on whether the jack is inserted into or is currently in the config port or not.

## Input Measurement (PV) Setup

A30/1060-1 I RW ***input signal type***, [0 = mV, 1 = mA, 2 = V, 3 = Ω, 4 = J, 5 = K, 6 = T, 7 = R, 8 = S, 9 = N, 10 = B, 11 = RTD (alpha = 385) 12 = RTD (alpha = 392)], *default 0*

The value at this location determines the sensor or signal type of the process variable (PV) to be measured. If a thermocouple or resistance thermometer is selected, appropriate scaling and linearisation is automatically applied from tables stored in the instrument. The appropriate mV or Ω scaling value is automatically set for 0°C and 100°C scaling as a guide. See also A49.

A49/1098-9 I RW ***engineering units*** [0 = engineering units (not temperature), 1 = °C, 2 = °F, 3 = Kelvin], *default 0*

This location defines the scaling type for the PV measurement. If the sensor is not a thermocouple or a RTD (Resistance Thermometer), set to 0 (engineering units – to be scaled elsewhere).

If a temperature sensor is directly connected (i.e. A30 has been set to between 4 and 12) select a value of 1, 2 or 3 depending on the temperature scaling required. No other scaling information is required. If a 4–20 temperature transmitter is employed, use input type 1 (A30 = 1) and scale as required - see *Scaling Examples* on page 23.

A50/1100-1 I RW ***decimal point position***, (0–4), *default 0* (see A2)

This sets the decimal point position of the fixed resolution analogue locations.

Internally the instrument range is:

0 = -99999 to +99999
1 = -9999.9 to +9999.9
2 = -999.99 to +999.99
3 = -99.999 to +99.999
4 = -9.9999 to +9.9999

A51/1102-3 I RW ***input filter time constant***, (0–99.9 seconds), *default 0 (OFF)*

For PV signals that are noisy some input filtering may be required. The filter acts as a CR network and the value which is set here is the time constant in tenths of a second. The filtered value is only applied on the PV fixed decimal point PV measurement (A2), the maximum stored value (A3) and the minimum stored value (A4).

**Note:** The analogue output has a separate filter (A142) and is not affected by the input filter setting. Alarms monitor the A1 (non-filtered) value.

A52/1104-5 F RW ***specific gravity (SG) compensation***, (0.0001–9), *default 1*

The SG parameter allows the measured value (before any scaling and linearisation) to be divided by the value set. This is particularly useful for tank volume measurement where the SG value of the stored liquid can change.

A57/1114-5 I RW ***scaling/user linearisation calibration sample point***, (1–18), *default 3*

Calibration and scaling data can be entered manually (see later) or the instrument can measure (read) the signal of the sensor or transmitter. If this 'read' function is used, this location indicates which point is being read. For linear signals, normally only two points need to be calibrated, one on or near zero and one on or near span. If you injected a zero signal, this location would be set to 1. The instrument would store the input value in A59. If the span signal was then injected you would set this value to 2 and the measured value would be stored in A60. Each of the PV reads would be associated with engineering unit values, which would be stored in A83 and A84.

To trigger a sample, turn ON L159 (self-clearing – turns OFF automatically when sample is taken). A sample measurement takes approximately 5 seconds. The last sample value is also stored in A56.

The locations below contain the scaling input values and their respective scale value. Input/ measurement values are either entered manually or a signal can be sampled (see **A57** above). Should any changes be made to any of the input or 'display' parameters, **L160** must be turned ON to implement the changes (it turns OFF automatically when calculations are completed).

The signal type or thermosensor will determine the engineering units and range for the input/ measured location values:

| | | |
|---|---|---|
| mV and thermocouples | = | -100 to +100 (mV DC), typical input saturation ±150mV |
| mA | = | -20 to +20 (mA DC), typical input saturation ±32mA |
| Volts | = | -10 to +10 (V DC), typical input saturation ±15V |
| Ohms and RTD | = | 0–4700 (Ω), typical input saturation 4750Ω |

A58/1116-7 F RW ***number of scale/linearisation points used***, (2–18), *default 2*

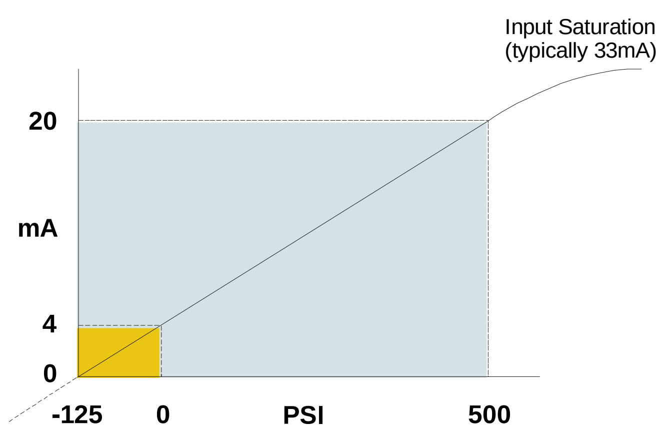
This location determines how many user calibration points are to be used. For the linear input example above, the value would be the 2 (the default), one for the zero point and one for the span point. If you require more calibration/linearisation points (e.g. for tank volume applications) up to 18 points can be used. This can be regarded as one zero point and 17 span points which make a straight-line approximation of the required linearisation curve.

To implement the new scaling turn ON **L160** (turns OFF automatically when calculations are completed).

## Scaling Examples

### Linear Signal Example

Scaling data can be anywhere within the input range if the instrument. These scaling values do not restrict the range so zero and span points do not need to be exactly at the bottom and top of the required scale. Each scaling/calibration point will have a measured value and a corresponding engineering unit 'display' value.




E.g. 4–20mA = 0–500 (PSI),
4mA = 0 (PSI), 20mA = 500 (PSI)

**Note:** With scaling at the 4mA and 20mA points the scale is not restricted to that range. Signals over 20mA would eventually saturate the input. Signals to 0mA, and even through to -20mA would be scaled linearly. For this example a -20mA measured signal would read -750 (PSI).

### Thermocouple/RTD Scaling Example

When a thermosensor is selected as the input signal type, the instrument will assign the correct linearisation and cold junction compensation if a thermocouple is selected. As a guide, the first two scaling points are set for 0°C and 100°C.

**Note:** °C values are always displayed even if °F or Kelvin temperature units are selected (**A49**).

E.g. If a Pt100 input sensor was selected:

A83 = 100.0 (Ω) A59 = 0 (°C)
A84 = 138.5 (Ω) A60 = 100 (°C)

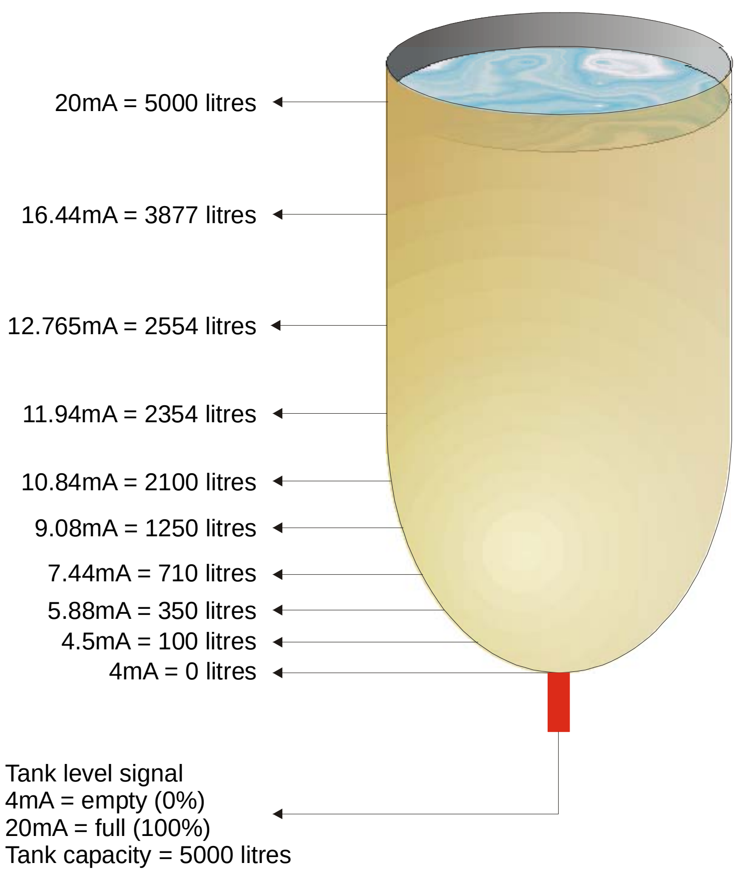
If a Type K thermocouple was selected:

A83 = 0 (mV) A59 = 0 (°C)
A84 = 4.095(mV) A60 = 100 (°C)

The display values can be modified to compensate for known sensor offset and span errors. For example, if a sensor was known to measure 2°C low, both A59 and A60 can be set to 2 and 102 (°C), respectively.

## User-linearised Signal Examples

Internal linearised tables are automatically assigned for thermocouples and resistance thermometer sensors. Other signals may be uniquely non-linear and may need custom linearisation by the user. A good example of this is a volume measurement from a level signal taken from a shaped tank where tank level is not linear to volume.



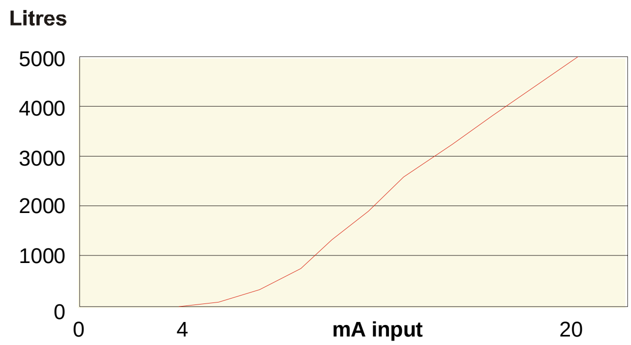

In this example it is known that 4mA = 0 litres and 20mA = 5000 litres but the scale between these points is not linear due to the shape of the tank. More scaling points can be used to create a straight-line approximation of the required linearisation curve. The instrument allows up to 18 scaling points to be used and these points can be programmed in any sequence and point in the range. The measured (PV) values can be read by the instrument or entered manually, in mA for this example. Each mA value is assigned an engineering value, in litres for this example.

A table of mA values and corresponding litre values is entered into the instrument. Generally most linearisation scaling points are used where the tank's curve is most severe.

The following table is made up within the instrument:

| Point | PV (litres) | | Input (mA) | |
|---|---|---|---|---|
| 1 | 0 | (A59) | 4 | (A83) |
| 2 | 100 | (A60) | 4.5 | (A84) |
| 3 | 350 | (A61) | 5.88 | (A85) |
| 4 | 710 | (A62) | 7.44 | (A86) |
| 5 | 1250 | (A63) | 9.08 | (A87) |
| 6 | 2100 | (A64) | 10.84 | (A88) |
| 7 | 2354 | (A65) | 11.94 | (A89) |
| 8 | 2554 | (A66) | 12.765 | (A90) |
| 9 | 3877 | (A67) | 16.44 | (A91) |
| 10 | 5000 | (A68) | 20.00 | (A91) |
| 11 | 1559 | (A69) | 10.03 | (A92) |

(point 11 added later)




The example shows an extra calibration point added and automatically sorted by the instrument. A58 would be modified from 10 to 11 (number of scaling points used). Turning ON **L160** implements the new scaling.

| | | | |
|---|---|---|---|
| A59/1118-9 F RW ***PV display value #1***, | *default 0* | A83/1166-7 F RW ***PV input value #1***, | *default 0* |
| A60/1120-1 F RW ***PV display value #2***, | *default 100* | A84/1168-9 F RW ***PV input value #2***, | *default 100* |
| A61/1122-3 F RW ***PV display value #3***, | *default 0* | A85/1170-1 F RW ***PV input value #3***, | *default 0* |
| A62/1124-5 F RW ***PV display value #4***, | *default 0* | A86/1172-3 F RW ***PV input value #4***, | *default 0* |
| A63/1126-7 F RW ***PV display value #5***, | *default 0* | A87/1174-5 F RW ***PV input value #5***, | *default 0* |
| A64/1128-9 F RW ***PV display value #6***, | *default 0* | A88/1176-7 F RW ***PV input value #6***, | *default 0* |
| A65/1130-1 F RW ***PV display value #7***, | *default 0* | A89/1178-9 F RW ***PV input value #7***, | *default 0* |
| A66/1132-3 F RW ***PV display value #8***, | *default 0* | A90/1180-1 F RW ***PV input value #8***, | *default 0* |
| A67/1134-5 F RW ***PV display value #9***, | *default 0* | A91/1182-3 F RW ***PV input value #9***, | *default 0* |
| A68/1136-7 F RW ***PV display value #10***, | *default 0* | A92/1184-5 F RW ***PV input value #10***, | *default 0* |
| A69/1138-9 F RW ***PV display value #11***, | *default 0* | A93/1186-7 F RW ***PV input value #11***, | *default 0* |
| A70/1140-1 F RW ***PV display value #12***, | *default 0* | A94/1188-9 F RW ***PV input value #12***, | *default 0* |
| A71/1142-3 F RW ***PV display value #13***, | *default 0* | A95/1190-1 F RW ***PV input value #13***, | *default 0* |
| A72/1144-5 F RW ***PV display value #14***, | *default 0* | A96/1192-3 F RW ***PV input value #14***, | *default 0* |
| A73/1146-7 F RW ***PV display value #15***, | *default 0* | A97/1194-5 F RW ***PV input value #15***, | *default 0* |
| A74/1148-9 F RW ***PV display value #16***, | *default 0* | A98/1196-7 F RW ***PV input value #16***, | *default 0* |
| A75/1150-1 F RW ***PV display value #17***, | *default 0* | A99/1198-9 F RW ***PV input value #17***, | *default 0* |
| A76/1152-3 F RW ***PV display value #18***, | *default 0* | A100/1200-1 F RW ***PV input value #18***, | *default 0* |

## Example

4–20mA input = -50.00 to +150.00 (linear)

From the factory default change the following:

| | | |
|---|---|---|
| A30 | = | 1 (mA input signal type) |
| A5 | = | 2 (decimal points – optional) |
| A59 | = | -50 (engineering units value for 4mA input) |
| A60 | = | +150 (engineering units value for 20mA) |
| A83 | = | 4 (mA input for -50 value) |
| A84 | = | 20 (mA input for +150 display value) |

Once the above has been entered, turn **L160** ON to implement the new scaling.

## PV Manipulation

L51 RW ON ***square root***, *default OFF*
If a square root calculation is required turn **L51** ON.

L164 RW ON ***zero PV***, *self-clearing to OFF*
The PV value is zeroed each time **L164** is turned ON. The zero offset value can be read in **A5** and cleared (unzeroed) by turning **L163** ON.

L165 RW ON ***tare activated***
Turning **L165** ON zeros the PV value. Unlike zero above, turning **L165** OFF returns the offset to the PV measured value. The current tare offset can be read in **A6**.

### Reading Measured (PV) Values and Derived Values

A1/1002-3 F RO ***process variable (PV) measured value (ADC)***
This is the primary process variable value as measured by the analogue to digital converter. The value is scaled to engineering units and is not affected by any user configured filtering and user configured decimal point position. Having no fixed decimal point position makes this value autoranging and so displays to the best resolution available.

A2/1004-5 F RO ***process variable (PV) filtered + fixed decimal point***
This value is similar to **A1** above but can be filtered (**A51**) and is set to a user-defined fixed resolution decimal point position (**A50**) When used with the DTPI ASCII protocol.

A3/1006-7 F RO ***PV maximum value retained on power loss***, (L162 resets)
The maximum (peak) measured reading is stored even when power is removed from the instrument. The maximum stored value is reset when **L162** turned ON and will then be set to the current value of **A2**. If a T340 Logic Expansion Module is fitted, a max/min reset can also be activated by using a status logic input from an external switch (see **Ll02** and **L116**).

A4/1008-9 F RO ***PV minimum value retained on power loss***, (L162 resets)
Exactly the same as **A3** above but storing the minimum (valley) measured value.

## Analogue Output Configuration (Option)

A140/1280-1 I RW ***analogue output signal type***, (0 = 0–10V, 1 = 4–20mA, 2 = 0–20mA), *default 1*
This location sets the output signal type.

**Note:** The 4–20mA output will not exceed the 4mA and 20mA limits. The other ranges will exceed 10V/20mA limits before the output saturates.

**Note:** The analogue output mA ranges can be used in active mode (the instrument generating the source voltage) or in sink mode where a source supply is externally generated. This is dependent on how the instrument is installed and is not a software selection.

A141/1282-3 I RW ***analogue output source***, (0 = off, 1 = PV, 2 = minimum, 3 = maximum, 4 = comm, 5 = heat, 6 = cool), *default 0*
The analogue output normally retransmits the PV value, however can be set to retransmit another value instead if required. The stored maximum (**A3**), Minimum (**A4**), or a value between 0–100% sent via the communications interface (**A26**) can be selected to be transmitted as a analogue output. The analogue output can also be used as a PID control output (option 5 or 6).

A142/1284-5 I RW ***analogue output damping filter time constant***, *default 0*
(0–999s). The analogue output has its own filter to stop fast movements of the output signal. This is particularly useful for chart recorders with noisy signals, which would generate 'wide' trend traces.

A143/1286-7 F RW ***analogue output scaling value for 100% output***, *default 100*
This value represents the full-scale output (10V/20mA) as a PV value. E.g. if a range of -100–500°C needs to be transmitted as 4–20mA, this location would be set to 500.

A144/1288-9 F RW ***analogue output scaling value for 0% output***, *default 0*

This value represents the zero output (0V, 0mA or 4mA as set in A140 above) as a PV value. E.g. if a range of -100–500°C needs to be transmitted as 4–20mA, this location would be set to -100.

## Example

Type T thermocouple input signal conditioner/isolator
0–200°C = 4–20mA output (linear to temperature)

From the factory default change:

| | | |
|---|---|---|
| A30 | = | 6 (type T thermocouple input) |
| A49 | = | 1 (°C) |
| A140 | = | 1 (output signal selected as 4–20mA) |
| A14 | = | 1 (signal source selected as PV) |
| A143 | = | 200 (the measured value for 20mA output) |

**Note:** Output type of 4–20mA (A140), source of input (A141) and the 0% = 0°C (A144) are default values that are correct for this application and so did not need modification.

## Controlling the Analogue Output via Communications

When the analogue output signal source (A141) is set to 4 (comm) any value between 0–100 sent to A26 will set the output level. If the analogue output is set for 4–20mA (A140 = 1) then a value of 0 to A26 will produce a 4mA output, a value of 100 will produce an output of 20mA. The output will remain at a constant output until a new value is written to A26.

## PID Controller Configuration (Tracker 331/332)

Tracker 33*x* Models include a powerful PID control feature. The Tracker 331 uses the relay/SSR outputs using pulse width modulation (PWM) and/or the optional analogue output. The Tracker 332 must have a Tracker 340 logic expansion module fitted for PWM control or the analogue output option.

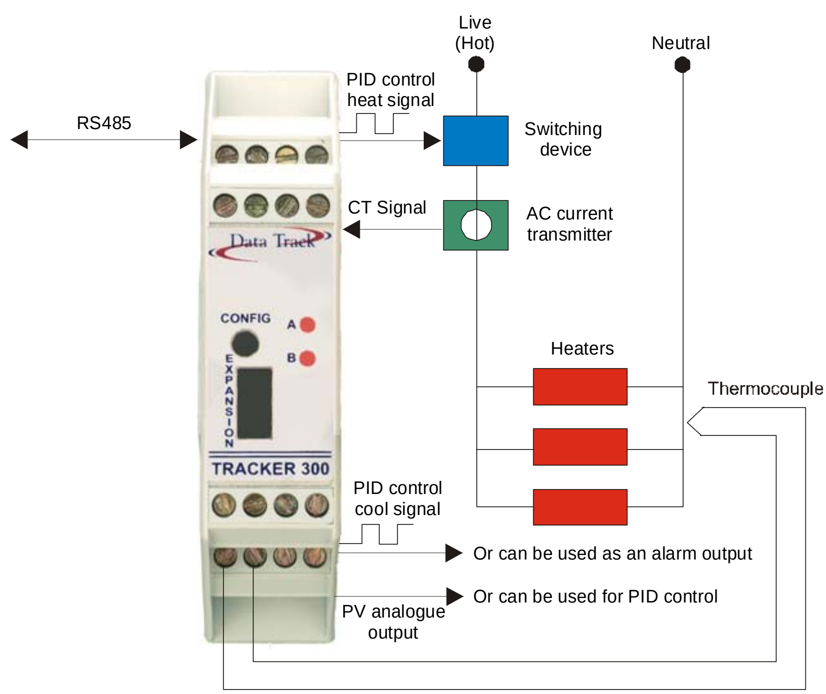
Both models feature an autotune function, which can calculate the Proportional, Integral and Derivative (PID) terms automatically. Two sets of PID and setpoint values can be stored in the instrument and can be switched via communications or using a status input on the Tracker 340 module when fitted. The controller can be configured for heat/cool control applications and the user can select any of the logic or analogue outputs available to be used for the control outputs. Both the controller outputs (Channel 1 and Channel 2) can be configured for reverse action (i.e. for temperature) or direct action.

For control of electrical loads a load/partial load monitor can be used to indicate load errors. If thermocouples are used for temperature measurement a sensor ageing alarm is also available. Both these features allow planned maintenance of the plant and prevent a breakdown while the plant is operating. See thermocouple ageing alarm and partial load failure sections in this manual.

If communications are lost for longer than a preprogrammed time period, the controller can switch automatically to a preset safe 'self defence' state (e.g. turn all control outputs off). Both the controller setpoint and controller output power demand values can be ramped at preprogrammed rates.

*Typical Tracker 331 PID control application.*

*See also partial load failure monitor and Thermocouple ageing alarm functions.*




A18/1036-7 F RO ***target setpoint***, *default 0*

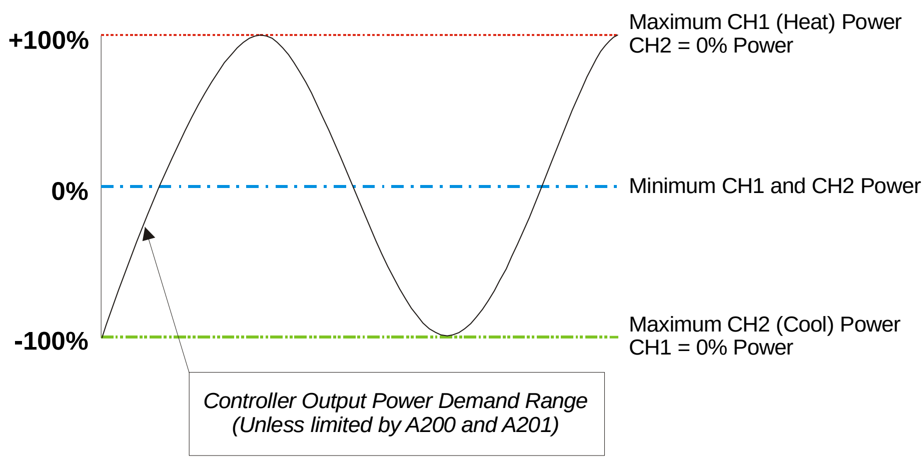
The controller setpoint value in engineering units (see also A 19). The target setpoint is selected from PID set 1 (A182) or PID set 2 (A183). Logic location L174 selects the PID set (OFF = PID set 1).

A19/1038-9 F RO ***working setpoint***, *default 0*

This value is the PID setpoint value the controller is using in real time. If the setpoint ramp feature is used this value may be changing at a pre programmed rate (as set in A186) towards the target setpoint (A18) if the target setpoint has been changed. If the ramping function is not used this value will always be the same as the target setpoint.

A20/1040-1 F RO ***target power output*** (-100 to +100%)

The controller can demand a power value between –100% (Full cooling power) to +100% (full heating power). Maximum power limits for both the heat (CH1) and cool (CH2) outputs can be limited (see A 200 and A201). 0% would give no heating or cooling power demand. Separate heating and cooling power demand values are also available at analogue locations A23 and A24. The rate of change of the power output demand can be limited by a ramping value set in A187 (see also A22).




A21/1042-3 F RO ***measured value***

This is a duplication of analogue A1 to allow a block read of the PID control parameters. This allows increased communications bandwidth, as only one read command is required for the controller's most common parameters.

A22/1044-5 F RO ***working power output*** (-100 to +100%)

This is the controller power output demand in real time. If the power output ramp feature (A187) is used this value may be ramping from a previous target output power value towards a new target power output value (A20). If the output power ramp feature is not used this value will always be the same as the target power output value.

A23/1046-7 F RO ***channel 1 (Heat) control power output*** (0-100%)

Real time output power demand value for Channel 1 only. (100% = maximum heating).

A24/1048-9 F RO ***channel 2 (Cool) control power output*** (0-100%)

Real time output power demand value for Channel 2 only (100% = maximum cooling).

A25/1050-1 I RO ***PID status word***

The value contained here is the addition of from a number of active bits (logics) each of which has an integer value assigned to it. Some HMI/SCADA systems have the ability to display information based on a status word. Some of the conditions are also available as discrete logic locations.

| | | | |
|---|---|---|---|
| Manual (power) Mode | = | 1 | (also L135) |
| Setpoint ramp Active | = | 2 | |
| Setpoint ramp on hold | = | 4 | |
| Integral Limiting | = | 8 | |
| Power Limiting | = | 16 | |
| Sensor Break | = | 32 | (also L138) |
| Integral Hold | = | 64 | (also L133) |
| Autotune Active | = | 128 | (also L134) |

e.g. A value of 160 (32+128) would indicate the autotune is active and the sensor is broken!

A168/1336-7 F RW ***CH1/CH2 (Heat/Cool) relative gain (0.1 – 10.0)– PID Set 1***, *default 1*
This allows the user balance the relative gains between channels. If the cooling effect is more powerful than the heating power then a value less than 1 can be entered.

A169/1338-9 F RW ***CH1/CH2 (Heat/Cool) relative gain (0.1 – 10.0)– PID Set 2***, *default 1*
As A168 but for PID settings #2.

A172/1344-5 F RW ***proportional band – PID Set 1***, *default 1*
This is the proportional band value set in engineering units (e.g. °C)

A173/1346-7 F RW ***proportional band – PID Set 2***, *default 1*
As A172 above but for PID settings #2

A174/1348-9 F RW ***integral time (0-9999 seconds) – PID Set 1***, *default 5*

A175/1350-1 F RW ***integral time (0-9999 seconds) – PID Set 2***, *default 5*

A176/1352-3 F RW ***derivative time (0-9999 seconds) – PID Set 1***, *default 0*

A177/1354-5 F RW ***derivative time (0-9999 seconds) – PID Set 2***, *default 0*

A178/1356-7 F RW ***dead band - PID Set 1***, *default 0*
Used by ON/OFF control only. Provides a band around the setpoint value, entered in engineering units, where no control outputs are energised.

A179/1358-9 F RW ***dead band - PID Set 2***, *default 0*
As A178 but for PID settings #2

A182/1364-5 ***PID setpoint – PID Set 1*** (-19999 to +99999)
This is the PID target setpoint, in PV engineering units, for PID set 1. The PID set is selected by L174 or by using a status input on the Tracker 340 logic expansion module.

A183/1366-6 ***PID setpoint – PID Set 2*** (-19999 to +99999
As A182 but for PID settings #2

A184/1368-9 F RW ***cutback - PID Set 1***, *default 0*
Used in over-powered applications for start-up. This value, entered in engineering units, allows the user to cut the power before the measured value reaches the proportional band (or setpoint when in On/Off control mode).

A185/1368-9 F RW ***cutback - PID Set 2***, *default 0*
As A184 but for PID settings #2

A186/1370-1 F RW ***setpoint ramp rate***, *default 0*
The user can define the setpoint ramp rate, which is used when the controllers target setpoint is changed (A182 or A183). The value is entered in engineering units/second. The setpoint ramp value can be frozen should the PV/setpoint deviation exceed a preset value (see L139 and A199).

A187/1374-5 F RW ***power output slew rate***, *default 0* (Off)
The PID controllers power demand (Target Output Power – A20) can be ramped at a user defined rate. This ramped power value is set in A10 (Working Output Power). If 0 is entered the ramp function is turned off and the working output power will be instantly set by the PID target power output.

A188/1376-7 F RW ***control type, 0=Off, 1=On/Off, 2=P, 3-PD, 4=PI, 5=PID***, *default 0*

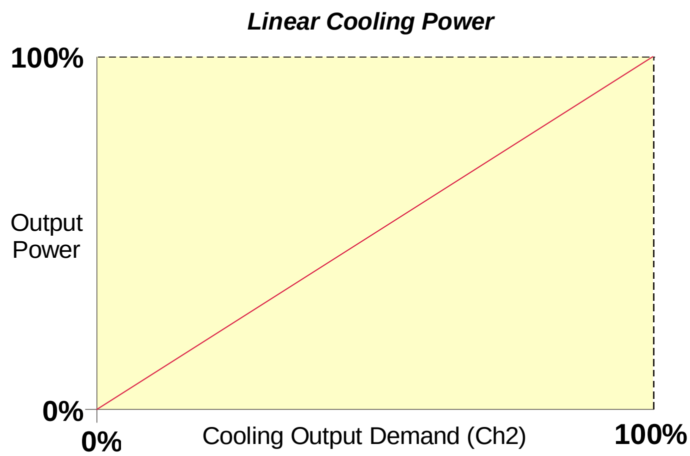
The type of control action can be selected.

0 = Off (No control action)
1 = On/Off control - can be used with dead band (A178/A179)
2 = Proportional band only – can be used with manual reset (A170/A171)

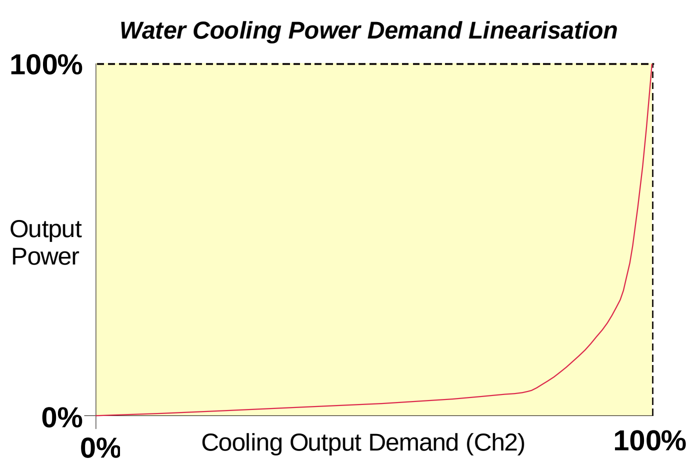
3 = Proportional + Derivative – can be used with manual reset (A170/A171)
4 = Proportional + Integral
5 = Proportional + Integral + Derivative (PID)

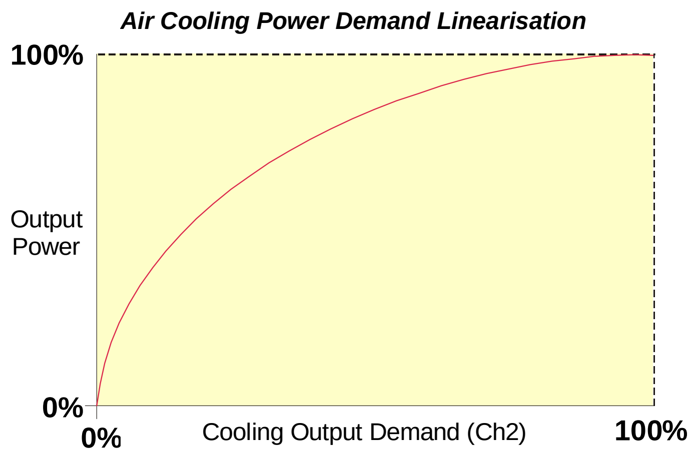
A189/1378-9 F RW ***PID output (heat/cool) control action***, *default 0*
0 = Reverse/Reverse
1 = Direct/Direct
2 = Reverse/Direct
3 = Direct/Reverse

A190/1380-1 I RW ***CH2/cooling output linearisation***, *default 0*
The selections are Linear, Water and Air. Normally Linear would be selected, however, because the properties of using air or water as a cooling medium, different linearity's are used for the cooling output power.




Systems that uses pulsed cooling water, to control loads that are above boiling point, are very non-linear. A small amount of cooling water will flash off to steam, extracting a large amount of heat from the load due to latent heat loss due to vaporisation. The gain of the cooling system should be very low for this condition. As cooling demand increases, so the water flow will increase, until the water is flowing rather than flashing off to steam. Once water is flowing, changes to cooling demand has much less of an effect and so the gain of the controller cooling demand must be increased. Tracker 330 controllers have a non-linear cooling output characteristic, specifically designed to compensate for this problem.






For air cooling the output linearisation gives a higher output at lower cool demand. This allows air coolers (normally fans) power enough to start at smaller PID cool power demand values.

Set this parameter to:

0/ Linear (Default)
1/ Water
2/ Air

A198/1096-7 F RW ***sensor break power*** (–100 to +100%), *default 0*

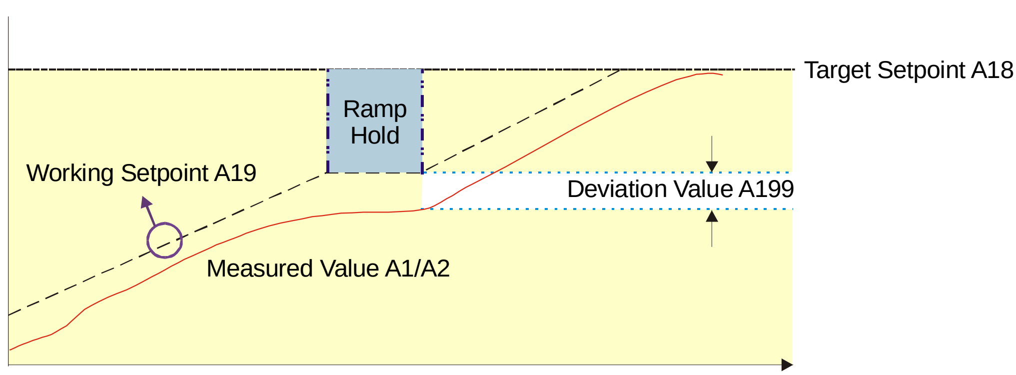
Should the thermocouple sensor break, the controller will automatically set the power output demand to the value set here.

L139 SP/PV ***deviation ramp hold***, *default OFF*

This logic location enables the ramp hold function as described in A199 below.

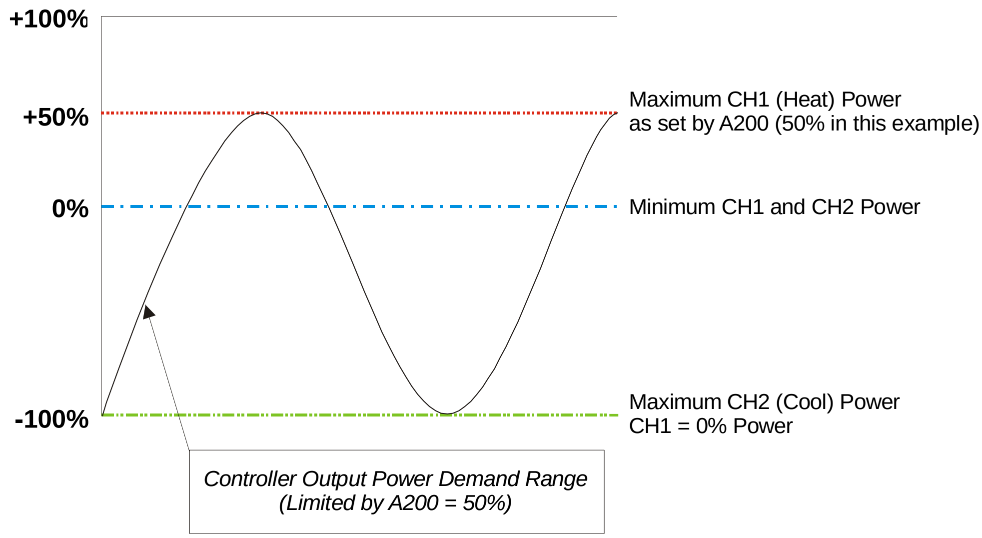
A199/1098-9 F RW ***setpoint ramp deviation alarm setpoint value***, *default 0*

If Logic location L139 is ON then the setpoint ramp hold function is enabled. If the measured value (A1 and A2) deviates from the working setpoint (A19) by more than the value set here, then the working setpoint ramp will stop. When the measured value goes back into the deviation alarm band the working setpoint ramp will continue again towards the Target Setpoint (A18).



A200/1400-1 F RW ***CH1 (Heat) maximum power*** (0-100%), *default 100*

The maximum power output the controller could use for Channel. See also autotune maximum heat power limit (A194).




A201/1402-3 F RW ***CH2 (Cool) maximum power*** (0-100%), *default 100*

The maximum power output the controller could use for Channel 2. See also autotune maximum cool power limit (A195)

## Autotune

The autotune feature can be used to allow automatic setting of the Proportional (P), Integral (I), Derivative (D) and Heat/Cool relative gain parameters. These parameters will be stored in to PID set 1 or set 2 as selected by the user prior to initialisation of the autotune function (L174). The autotune function uses a separate autotune setpoint, not the setpoint values in PID set 1 or 2. The autotune setpoint is not stored after a power loss or when the instrument is reset. The default value is zero.

**Note:** As the PV will normally overshoot the autotune setpoint value and full power is applied to the control outputs, it is the responsibility of the user to ensure no damage to the plant will occur.

Setting the control type will enable the Tracker 330 to tune the appropriate terms, e.g. P + I. Normally PID would be selected. The PWM cycle times are automatically set to minimum and output slew rates are set to maximum during the autotune operation. Any previously set cycle times and slew rates are re-enabled when the autotune function is completed.

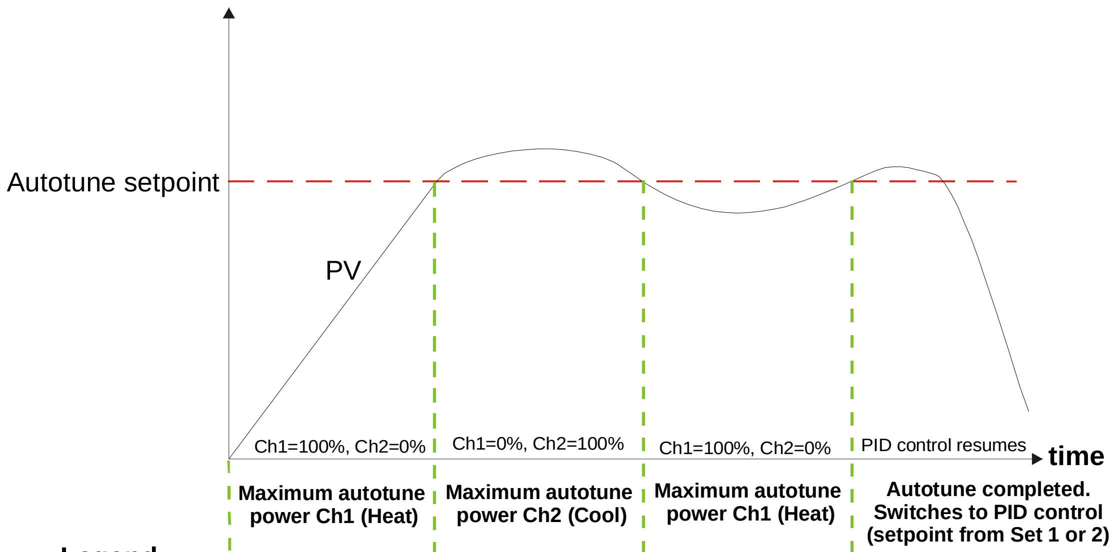
Initially the autotune process will apply full power to the load unless limited by the autotune maximum power CH1 (heating) parameter. The instrument measures the rate of change of the PV value as it approaches the autotune setpoint.

When the PV has reached the autotune setpoint the controller will turn off the CH1 (heating) power and output the maximum CH2 (cooling) power (even if no forced cooling system is used e.g. in heat only applications). The CH2 power level can be limited by the autotune maximum cooling power parameter. The maximum PV overshoot value, overshoot time period and PV “cooling” response is measured and stored.

Once the PV reaches the autotune setpoint again, maximum CH1 autotune (heat) power is applied. When the autotune setpoint is reached again, the maximum PV undershoot value and undershoot time period is measured and stored.

The P, I, D (as set in control type) and heat/cool relative gain parameters values are then calculated and stored into the PID1 or PID2 parameter sets, as previously selected by the user. The current (PID set 1 or 2) target setpoint is then active and control continues using the calculated values.

**Example of Autotune Function**




**Legend**

— — Denotes the autotune setpoint.

– – – Denotes the transition point between the heat, cool and PID control functions.

L176 ***Enable autotune*** (automatically turns OFF when completed), *default OFF*

A194/1388-9 F RW ***CH1 (Heat) autotune maximum power*** (0-100%), *default 100*

This is the maximum power output the controller could use for Channel 1 during autotune. This should be set to the value set in analogue 200 or less.

A195/1390-1 F RW ***CH2 (Cool) autotune maximum power*** (0-100%), *default 100*

This is the maximum power output the controller could use for Channel 2 during autotune. This should be set to the value set in A201 or less.

## Auto Manual

L177 ***auto manual select***, *default OFF* (Auto)

Turning L177 ON selects manual power. The manual power value will the same as the controllers power output at the time of switching. The manual power setting can be adjusted by setting a value between –100 to +100% in A22.

## Loss of Communications 'Self defence' Functions

Unlike conventional panel mounted controllers with displays and buttons, the Tracker 300 series serial interface is often connected to an operator display device, such as a HMI or PC running a SCADA program. This allows for a far more integrated application solution than individual instruments and reduces the amount of panel space and wiring.

Should the Tracker not receive any valid command from the communications master device (i.e. the HMI or SCADA) for longer than a pre set time period (A220) then a fail-safe mode can be selected as described in A180 below.

A180/1360-1 I RW ***comms failsafe 0=None, 1=Preset Setpoint, 2=O/Ps off, 3=Preset Power***, *default 0*

If communications is lost the PID function can automatically switch to:

1 A preset setpoint value
2 Switch the PID control outputs off
3 Go to a preset control power output (manual)

A value of zero will allow the PID to continue at the last setpoint.

A220/1440-1 I RW ***communications time out period*** (0-255 seconds), *default 0* (Off)
If the value is at the default value 0, this function is disabled. If no valid communications commands are received over a time period (set at this location), then the PID failsafe mode will be set as selected in A180 above. The PID will return to normal operation when the next valid command is received. The communications timer can also set a logic output if required.

## Using the Analogue Output Option as a PID Control Output

The analogue output option can be fitted to any Tracker 330 modules and can be used as a PID control output signal. If this function is required set the analogue output source parameter (A141) to:

5 to use with the Heat/CH1 control output.
6 to use with the Cool/CH2 control output.

The default is 4–20mA output = 0–100% power. Other output types available are 0–10V and 0–20mA, see *Analogue Output Configuration (Option)* on page 26.

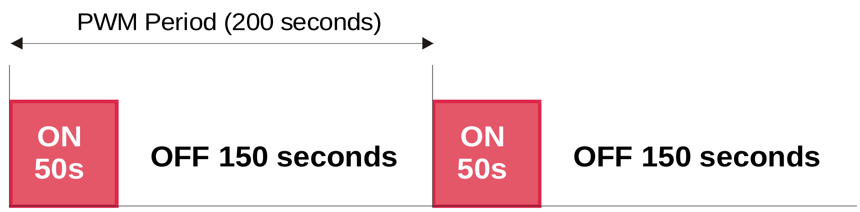
Both a logic output and analogue output can be used with same PID control output allowing PWM load control plus an analogue signal representing the power demand (see *Configuring Pulse Width Modulation (PWM) Control Outputs* on page 36).

L175 ***Integral Hold (Anti-windup)***, *default OFF*
This function is used to hold the integral action and preserve the integral term's contribution to the PID output power demand. The function can be enabled by turning L175 ON or by using a status input on the Tracker 340 logic expansion module.

## Configuring Pulse Width Modulation (PWM) Control Outputs

Two PWM functions are available and can be used by any logic (SSR or Relay) outputs, including the Tracker 340 outputs if fitted, set the 'source' parameter value to 8,for use with PWM 1, or 9 for PWM 2.

The PWM time period is selected by the user and is dependent on the application and the switching device used (see **A205** & **A206**). The controller will modulate the ON time within the PWM time period dependent for the power demand required.




Example: PWM Period = 200 seconds **A205/A206**)
Power Demand = 25%

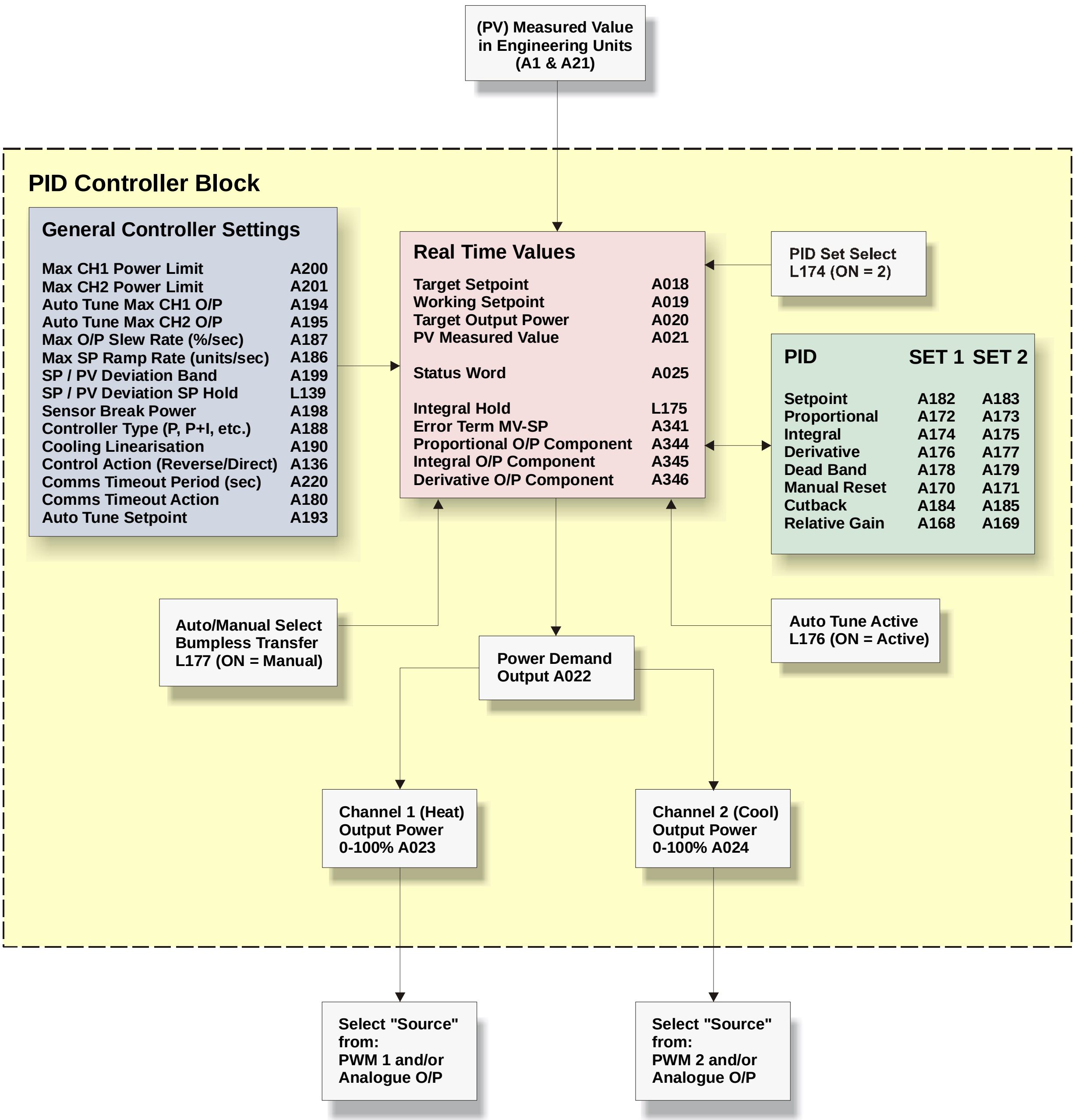
L152 ***PWM 1 duty source***, *default ON*
When set to ON, this parameter sets the duty cycle of PWM1 to be controlled by the Heat/CH1 output of the PID controller. Setting this parameter to OFF allows the 0–100% duty demand to be set via communications using **A27**.

L153 ***PWM 2 duty source***, *default ON*
When set to ON, this parameter sets the duty cycle of PWM2 to be controlled by the Heat/CH1 output of the PID controller. Setting this parameter to OFF allows the 0–100% duty demand to be set via communications using **A28**.

A205/1410-1 I RW ***user PWM 1 time period in tenths of a second (5-65535)***, *default 50* (5 secs)
The Pulse Width time period is adjustable between 0.5 seconds and 6553.5 seconds (Approx.1.8 Hours). If the cycle time was set to 300 (30 seconds) and a power duty demand of 50% was set, the output would be on for 15 seconds and off for 15 seconds. Generally a solid state switching device can have a shorter period time than electro–mechanical switches which have a limited life. PWM 1 is generally used as the Heat (CH1) control output.

A206/1412-3 I RW ***user PWM 2 time period in tenths of a second (5-65535)***, *default 50* (5 secs)
As PWM 1 above – generally used for cool control in heat/cool applications.

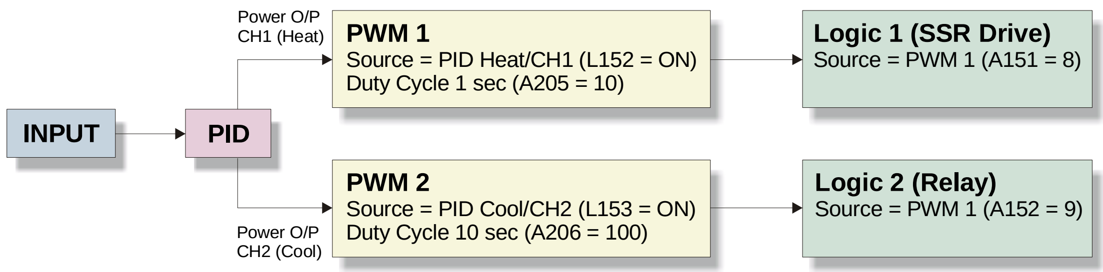
# PID Communication Addresses Overview



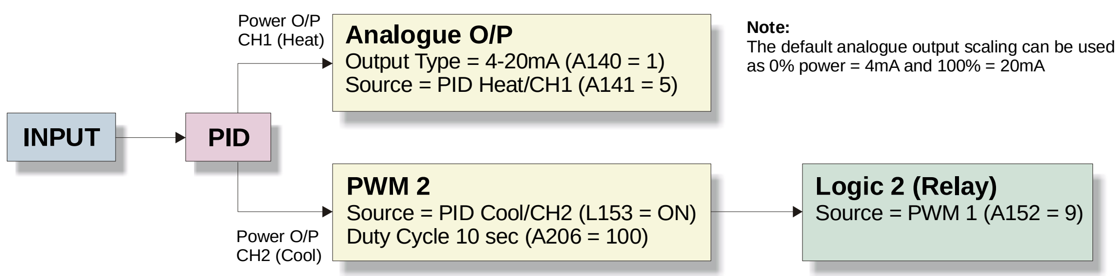
# PID Output Configuration Examples

(Only parameters modified from factory defaults are shown)

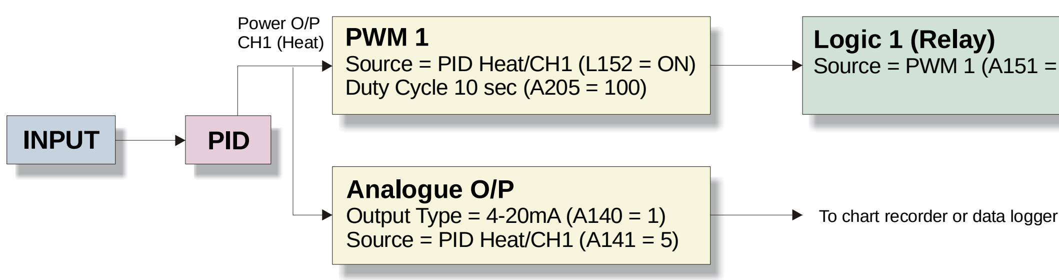
### 1.SSR Heat Output + (optional) Relay Cool Output (Tracker 331)



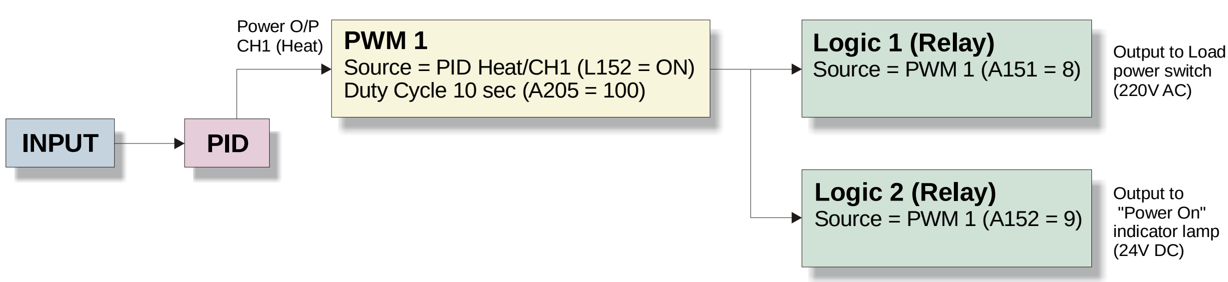

### 2.Analogue Output (4-20mA) Heat + (optional) Relay Cool Output (Tracker 331 with analogue output option)




### 3.Relay Heat Output with (4-20mA) analogue output transmitting heat power demand (for data recording). Tracker 331 with analogue output option




### 4.Dual PWM Relay Heat/CH1 Outputs



# Process Alarm Configuration

All Instruments have four software alarms that can be used to indicate a process error. These alarms can also operate logic outputs to switch external control or alert devices. The logic outputs can take the form of relays or voltage (TTL) switches and a single alarm can switch one or more outputs as required. Two logic outputs are available on the T331 and four outputs are available when a Logic Expansion Module (T340) is fitted to any of the T32*x*/T33*x* units.

A108/1216-7 I RW ***Alarm 1 type*** (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
This location sets the alarm type for Alarm 1. The choices are:

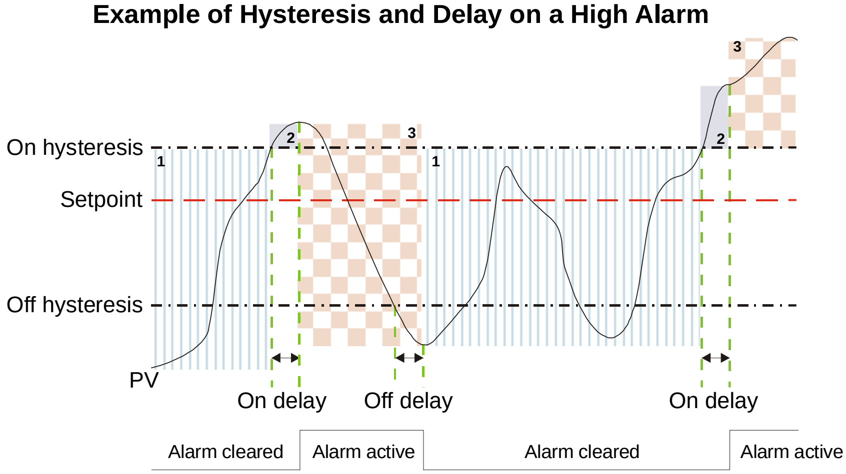
0 = Not used (turned OFF).
1 = High alarm – in an alarm state when the PV value is greater than the setpoint value (A14/A109).
2 = Low Alarm – in an alarm state when the PV value is lower than the setpoint value (A14/A109).
3 = Deviation – in an alarm state when the PV is greater or lower than a band around the setpoint value (A14/A109). The band is defined in A114 (deviation high) and A115 (deviation low) in engineering units.

The outputs are not automatically assigned to each alarm – see assigning logic outputs to alarms.

A109/1218-9 F RW ***Alarm 1 setpoint***, *default 0*
This is a duplication of A14. Changes made to A14 will be duplicated at this location and changes to this location will be duplicated at A14. The setpoint is the PV value that the alarm will react to and are in engineering units. Note that if any of the 4 process alarm setpoints are outside of the scaled range, L20 will turn on.

A110/1220-1 F RW Alarm 1 on hysteresis, *default 0.1*
The amount the PV must move into the alarm point before the alarm is triggered. This function stops fleeting alarms being generated due to noisy signals. Values are entered in engineering units.

**Example of Hysteresis and Delay on a High Alarm**




**Legend**

1 This area denotes when the PV trace is in a ‘Non-alarm’ condition.
2 This area denotes the delay period between the transition from one alarm condition to the other.
3 This area denotes when the PV trace is in an ‘Alarm’ condition.
Denotes the alarm setpoint.
Denotes the transition point between the delay period and the ‘Alarm/Non-alarm’ conditions.
The area between these two lines denotes the hysteresis band.

A111/1222-3 F RW ***Alarm 1 off hysteresis***, *default 0.1*
The amount the PV must move out of the alarm point before the alarm is cleared. Values are entered in engineering units.

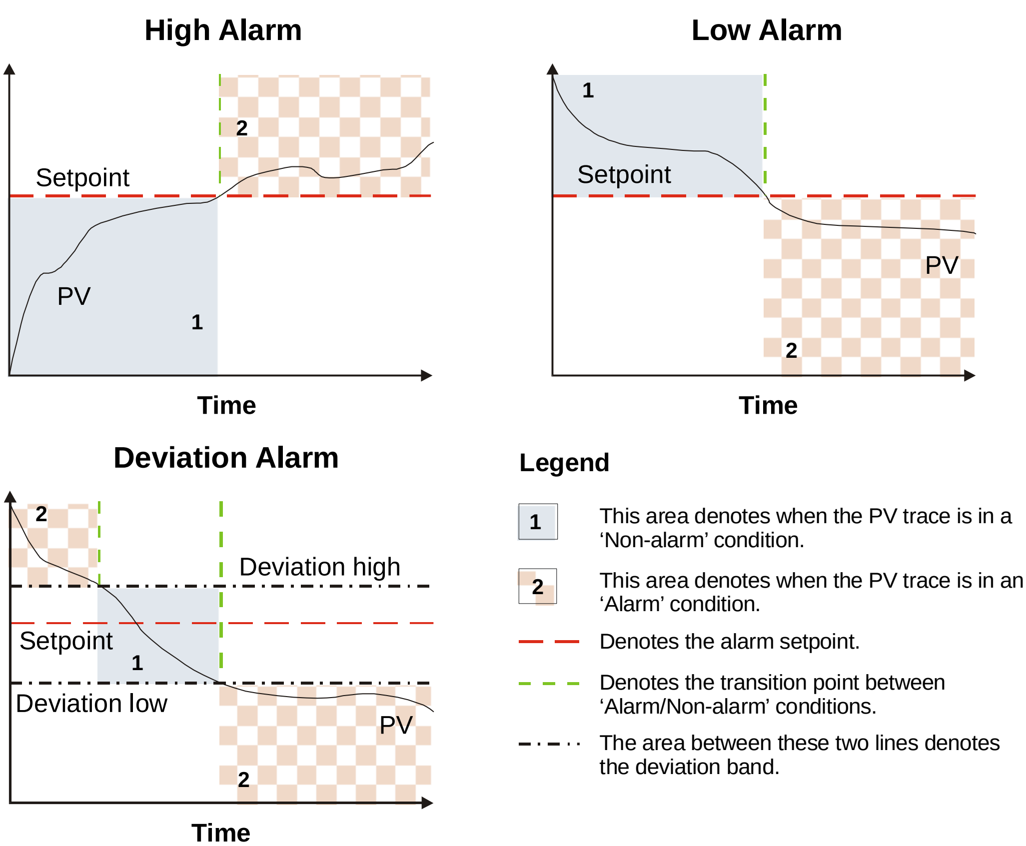
A112/1224-5 I RW ***Alarm 1 on delay*** (0–39996 × 250ms), *default 0*
The PV must continuously be in the alarm state for longer than the time period set here. Only if this condition is true is the alarm is triggered. E.g. For a value of 10 (× 250ms) the PV must be continuously in the alarm condition for 2.5s before the alarm is triggered.

A113/1226-7 I RW ***Alarm 1 off delay*** (0–39996 × 250ms), *default 0*
The PV must continuously be in an out of alarm state for longer than the time period set here. Only if this condition is true is the alarm is deactivated. E.g. For a value of 240 (× 250ms) the PV must be continuously out of the alarm condition for 60s before the alarm is cleared.

A114/1228-9 F RW ***Alarm 1 deviation high (deviation alarm type only)***, *default 0*
Only used if the alarm type is deviation (A108 = 3). This location defines the band, in engineering units, above the setpoint value.

A115/1230-1 F RW ***Alarm 1 deviation low (deviation alarm type only)***, *default 0*
Only used if the alarm type is deviation (A108 = 3). This location defines the band, in engineering units, below the setpoint value.

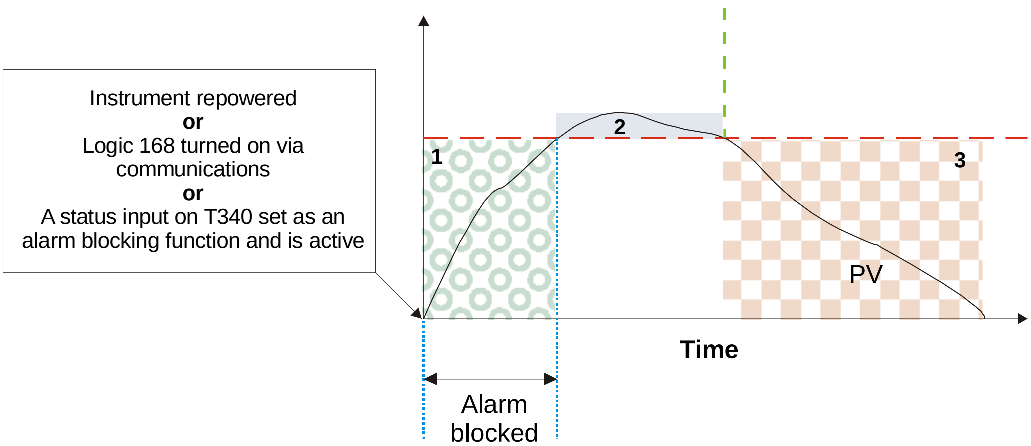
L55 RW ON ***Alarm 1 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A14/A109), *default OFF*
The alarm can be set to follow the PID controller setpoint if this location is set to ON. The default is to follow the alarm setpoint as set in A109 above.



L56 RW ON ***Alarm 1 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*
When this location is set to ON, the alarm will stay in the in the alarm state. To reset a latched alarm the PV must be out of the alarm condition and a reset command via the communications interface must be sent (see L168). External contacts connected to a logic (status) input on the Tracker 340 Logic Expansion Module can also be also be configured as a reset for latched alarms. Latch states are not stored after a power interruption.

L57 RW ON ***Alarm 1 blocking enable***, *default OFF*
The alarm is enabled only when the alarm first reaches the non-alarm state. When the instrument powered on or after L57 is turned OFF and back ON via communications, the blocking action is reset. A status (logic) input on a Logic Expansion Module can also be used for alarm blocking reset (see L104 and L118).

**Example of a Low Alarm with Blocking Function**




**Legend**

1 Denotes that the PV trace is in the 'Alarm blocked' condition.
2 Denotes that the PV trace is in a 'Non-alarm' condition.
3 Denotes that the PV trace is in an 'Alarm' condition.
— — Denotes the alarm setpoint.
– – – Denotes the transition point between the 'Alarm/Non-alarm' conditions.
........ Denotes the start and end points of the alarm blocked condition.

## Alarm 2 Configuration Locations

A116/1232-3 I RW ***Alarm 2 type*** (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A117/1234-5 F RW ***Alarm 2 setpoint, (duplicated at A15)***, *default 0*
A118/1236-7 F RW ***Alarm 2 on hysteresis***, *default 0.1*
A119/1238-9 F RW ***Alarm 2 off hysteresis***, *default 0.1*
A120/1240-1 F RW ***Alarm 2 on delay***, *default 0*
A121/1242-3 F RW ***Alarm 2 off delay***, *default 0*
A122/1244-5 F RW ***Alarm 2 deviation high***, *default 0*
A123/1246-7 F RW ***Alarm 2 deviation low***, *default 0*
L59 RW ON ***Alarm 2 setpoint = PID setpoint***, (OFF = Alarm 2 setpoint value A15/A117), *default OFF*
L60 RW ON ***Alarm 2 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*
L61 RW ON ***Alarm 2 blocking enable reset***, *default OFF*

## Alarm 3 Configuration Locations

A124/1248-8 I RW ***Alarm 3 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A125/1250-1 F RW ***Alarm 3 setpoint***, (duplicated at A16), *default 0*
A126/1252-3 F RW ***Alarm 3 on hysteresis***, *default 0*
A127/1254-5 F RW ***Alarm 3 off hysteresis***, *default 0*
A128/1256-7 F RW ***Alarm 3 on delay***, *default 0*
A129/1258-9 F RW ***Alarm 3 off delay***, *default 0*
A130/1260-1 F RW ***Alarm 3 deviation high***, *default 0*
A131/1262-3 F RW ***Alarm 3 deviation low***, *default 0*
L63 RW ON ***Alarm 3 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A16/A125), *default OFF*
L64 RW ON ***Alarm 3 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*
L65 RW ON ***Alarm 3 blocking enable reset***, *default OFF*

## Alarm 4 Configuration Locations

A132/1264-5 I RW ***Alarm 4 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A133/1266-7 F RW ***Alarm 4 setpoint, (duplicated at A17)***, *default 0*
A134/1268-9 F RW ***Alarm 4 on hysteresis***, *default 0*
A135/1270-1 F RW ***Alarm 4 off hysteresis***, *default 0*
A136/1272-3 F RW ***Alarm 4 on delay***, *default 0*
A137/1274-5 F RW ***Alarm 4 off delay***, *default 0*
A138/1276-7 F RW ***Alarm 4 deviation high,*** *default 0*
A139/1278-9 F RW ***Alarm 4 deviation low***, *default 0*
L67 RW ON ***Alarm 4 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A17/A133), *default OFF*
L68 RW ON ***Alarm 4 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*
L69 RW ON ***Alarm 4 blocking enable reset***, *default OFF*

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# Tracker 340 Status Input Configuration Locations

A Tracker 340 Module is powered and controlled by the T32*x*/T33*x* Module it is connected to. The unit comprises four logic outputs and two logic (status) inputs. The logic outputs are assigned to alarms or control outputs (see *Assigning Logic Outputs* on page 44). The two logic inputs can be connected to external volt free switch contacts or TTL outputs. The state of the logic inputs can be read via the serial communications interface (L37 and L38) and also assigned one or more user-programmable functions as described below.

A226/1452-3 I RW ***Expansion Module fitted***, (0 = none, 1 = Logic Module fitted, 2–255 reserved), *default 0*
This parameter informs the T32*x*/T33*x* Module if an Expansion Module is fitted and its type.

Any of the following functions can be assigned to the status input, e.g. zero PV, reset maximum/minimum memory and reset latched alarms could all be assigned to Status Input 2.

## Status (Logic) Input 1 Function Configuration

Some functions allow access through both the serial interface and status input. For example, reset Max/Min can be enabled via the communications interface or from a status input (if configured as a Max/Min function) at any time. The following functions allow status inputs to enable the function only (associated logic locations act as read only via communications).

PID Set select, PID Integral Hold and PID Autotune

L101 RW ON ***zero, (A1 and A2)***, *default OFF*

The current PV value (A1 and A2) is set to zero when the status input is activated. This function is edge triggered so to zero again, the status input must be deactivated and then reactivated. The zero offset value can be read at A5. To remove an unwanted zero (e.g. set the zero offset to zero, unzero) turn L163 ON.

L102 RW ON ***resets stored maximum and minimum value, (A3 and A4)***, *default OFF*

This function resets the max/min memory to the current PV value. This function is edge triggered so to reset again, the status input must be deactivated and then reactivated. The max/min values are stored in A3 and A4.

L103 RW ON ***resets all latched alarms (if no longer in alarm state)***, *default OFF*

Any active latched alarms will remain latched on, until reset (even after a power loss). As long as the alarm is no longer in an alarm condition, it will be reset when the status input becomes active. All latched alarms are reset by this function. Alarms can also be reset via communications by turning L168 ON.

L104 RW ON ***asserts alarm blocking (until alarm(s) are in non-alarm state)***, *default OFF*

This function only applies to alarms that have been set as alarm blocking types. Alarm blocking disables any alarm action until the alarm has reached the non-alarm condition. Once the non-alarm condition has been met the alarm action is enabled (see example in Alarm 1 configuration). The alarm blocking action is implemented when the instrument is powered. Applying this function to a status input reasserts the blocking action as if the instrument has been repowered. This function is also available via communications by turning L168 ON.

L105 RW ON ***PV tare function enabled***, *default OFF*

If this function is enabled a PV tare will be enabled when the status input is active. The PV value (A1 and A2) will be zero and the tare value offset is stored in A6. When the status input is deactivated the tare offset value is set to zero and added to the current PV value.

L106 RW ON ***all alarms are disabled while Status Input 1 is ON (forces non-alarm state)***, *default OFF*

This function forces all the alarms to their non-alarm condition as long as the status input is active regardless of plant/alarm states. Alarms are re-enabled when the status input is deactivated.

L107 RW ON = ***analogue output hold (freeze) while Status Input 1 is ON***, *default OFF*

This function holds the current analogue output value as soon as (and as long as) the status input is active.

L108 RW ON = ***PID output manual power while Status Input 1 is ON***, *default OFF*

This function puts the PID control output power in manual mode while status input 1 is active. The output power (A22) will remain at the value at the time the input is active. This can be altered via communications by writing a new power value to A22 over the range -100% to +100%. Bumpless transfer to automatic PID control will occur when the input is deactivated.

L109 RW ON = ***PID settings 2 select while Status Input 1 is ON***, *default OFF*

Two sets of PID parameter settings, each with a separate setpoint value, can be stored. If L109 is set to ON, PID settings set 2 will be used while status input 1 is active. PID set 1 will be used when the input is deactivated.

L110 RW ON = ***PID integral hold while Status Input 1 is ON***, *default OFF*

When large disturbances to the PID control are predicted (e.g. when an oven door is to be opened) an external switch can hold the integral action. This prevents 'integral windup' which can cause a further control disturbance. If L110 is turned ON, the integral action will be held while the status input is active.

L111 RW ON = ***PID autotune when Status Input 1 is ON***, *default OFF*
This function enables the 'one shot' autotune function when status input 1 is active. To initiate another autotune the input must be deactivated and then activated again.

## Status Input 2 Function Configuration (functional details as for Status Input 1)

L115 RW ON ***zero*** (A1 and A2), *default OFF*
L116 RW ON ***resets stored maximum and minimum values (A3 and A4)***, *default OFF*
L117 RW ON ***resets all latched alarms (if no longer in alarm)***, *default OFF*
L118 RW ON ***asserts alarm blocking [until alarm(s) are in non-alarm state]***, *default OFF*
L119 RW ON ***PV tare function enabled while Status Input 2 is ON***, *default OFF*
L120 RW ON ***all alarms are disabled while Status Input 2 is ON (forces non-alarm state),*** *default OFF*
L121 RW ON ***analogue output hold (freeze) while Status Input 2 is ON***, *default OFF*
L122 RW ON ***PID output manual power while Status Input 2 is ON***, *default OFF*
L123 RW ON ***PID settings 2 select while Status Input 2 is ON***, *default OFF*
L124 RW ON ***PID integral hold while Status Input 2 is ON***, *default OFF*
L125 RW ON ***PID autotune when Status Input 2 is ON***, *default OFF*

## Logic Outputs and Front Panel Output LEDs' Sense

L81 RW ON ***T331 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*
L82 RW ON ***T331 Output 2 energised in the alarm state,*** (OFF = de-energised in alarm), *default ON*
L85 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*
L86 RW ON ***T340 Output 2 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*
L87 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*
L88 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*
L91 RW ON ***T340 LED 1 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*
L92 RW ON ***T340 LED 2 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*
L93 RW ON ***T340 LED 3 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*
L94 RW ON ***T340 LED 4 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

## Tracker 340 Logic Locations that can be read at Run Time

L29 RO ON ***Logic Output 1 energised***
L30 RO ON ***Logic Output 2 energised***
L31 RO ON ***Logic Output 3 energised***
L32 RO ON ***Logic Output 4 energised***
L33 RO ON ***LED 1 on***
L34 RO ON ***LED 2 on***
L35 RO ON ***LED 3 on***
L36 RO ON ***LED 4 on***
L37 RO ON ***Status (logic) Input 1 is ON*** (active)
L38 RO ON ***Status (logic) Input 2 is ON*** (active)

# Assigning Logic Outputs

The Tracker 331 has two logic outputs and the Logic Expansion Module (Tracker 340), which can be used with any T32*x* or T33*x* module, has four outputs. The outputs are relay contacts or SSR Drive/TTL dependent on model specification. If a Logic Expansion module is fitted, A226 must be set to 1.

As well as the four process alarms, the logic outputs can be used for thermocouple ageing, load monitoring or communications alarm functions. These outputs can also be used as pulse-width modulation (PWM) logic, normally in conjunction with the PID control features.

Configuration allows multiple outputs to be switched by a single alarm, e.g. process Alarm 2 could operate both the Logic Expansion Module's Output 3 to switch mains power (i.e. 220V AC) and Output 4 to switch a low voltage (i.e. 5V DC).

## T331

A151/1302-3 I RW T331 ***Output 1***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A152/1304-5 I RW T331 ***Output 2***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

## T340 Logic Expansion Module (A226 must be set to 1)

A155/1310-1 I RW T340 ***Output 1***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A156/1312-3 I RW T340 ***Output 2***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A157/1314-5 I RW T340 ***Output 3***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A158/1316-7 I RW T340 ***Output 4***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

Logic Output 1 and 2 on the Tracker 331 and Outputs 1–4 on the Logic Expansion Module can be set to:

| | | |
|---|---|---|
| 0 | = | Not used (off) |
| 1–4 | = | Logic output for process Alarm 1, 2, 3 or 4 |
| 5 | = | Logic output for the thermocouple ageing warning alarm |
| 6 | = | Logic output for the load monitoring alarm |
| 7 | = | Logic output for the loss of communications alarm |
| 8 and 9 | = | PWM outputs controlled by the PID controller or via communications |

## Example

Alarm 2 as a high alarm at 400 (°C)
Input type K thermocouple
T340 outputs 3 and 4 to switch on if PV is over 400 (°C) for more than a minute

From factory default change:

| | | | |
|---|---|---|---|
| A30 | = | 5 | type K thermocouple input |
| A49 | = | 1 | °C thermocouple input |
| A116 | = | 1 | high alarm action (Alarm 2) |
| A117 | = | 400 | setpoint in °C (Alarm 2) |
| A120 | = | 60 | ON delay in seconds (Alarm 2) |
| A157 | = | 2 | T340 Output 3 assigned to Alarm 2 |
| A158 | = | 2 | T340 Output 4 assigned to Alarm 2 |
| A226 | = | 1 | Logic Expansion Module fitted |

Once the above has been entered turn **L160** ON to implement the new scaling.

## Logic Output Sense

As default, the logic outputs energise when in the alarm state. The following parameters allow this action to be reversed so that the outputs are de-energised in the alarm state (fail-safe).

### T331

L81 RW ON ***T331 Output 1 energised in the alarm state***, (OFF = de-energised in alarm state), *default ON*

L82 RW ON ***T331 Output 2 energised in the alarm state***, (OFF = de-energised in alarm state), *default ON*

### T340 Logic Expansion Module (A226 must be set to 1)

L85 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm state), *default ON*

L86 RW ON ***T340 Output 2 energised in the alarm state***, (OFF = de-energised in alarm state), *default ON*

L87 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm state), *default ON*

L88 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm state), default ON

### T340 Front Panel LEDs' sense

As default, the front panel LEDs are on when in the alarm state. The following parameters allow this action to be reversed so that the LEDs are ON only when in the non-alarm state (fail-safe).

L91 RW ON ***T340 LED 1 on in alarm condition***, (OFF = LED 1 off in alarm state), *default ON*

L92 RW ON ***T340 LED 2 on in alarm condition***, (OFF = LED 2 off in alarm state), *default ON*

L93 RW ON ***T340 LED 3 on in alarm condition***, (OFF = LED 3 off in alarm state), *default ON*

L94 RW ON ***T340 LED 4 on in alarm condition***, (OFF = LED 4 off in alarm state), *default ON*

### T340 Front Panel LEDs' Functions

A161/1322-3 I RW T340 ***LED 1***, (0 = off, 1–4 = Alarms 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM 1 and 2), *default 0*

A162/1324-5 I RW T340 ***LED 2***, (0 = off, 1–4 = Alarms 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM 1 and 2), d*efault 0*

A163/1326-7 I RW T340 ***LED 3***, (0 = off, 1–4 = Alarms 1–4, 5 = thermocouple age, 6 = load, 7 =comm, 8 and 9 = PWM 1 and 2), *default 0*

A164/1328-9 I RW T340 ***LED 4***, (0 = off, 1–4 = Alarms 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM 1 and 2), *default 0*

Each of the Tracker 340 front panels LEDs can be individually set to:

| | | |
|---|---|---|
| 0 | = | Do nothing (OFF) |
| 1–4 | = | Be the LED for alarm 1, 2, 3 or 4 |
| 5 | = | Be the LED for the thermocouple ageing warning alarm |

| | | |
|---|---|---|
| 6 | = | Be the LED for the load monitoring alarm |
| 7 | = | Loss of communications alarm |
| 8 and 9 | = | Follow the PWM (outputs controlled by the PID controller or via communications) |

A167/1334-5 I RW ***user-programmable LED B (T32x, T33x)***, *default 5*

OUTPUTS: 0 = off, 1 = SSR/Relay 1, 2 = Relay 2, 3 = inverse of 1, 4 = inverse of 2. If PWM is selected, short pulses may not be seen.

COMMS: 5 = *MODBUS RTU active* (default), 6 = RX byte toggle, 7 = addressed pulse, 8 = jack state, 9 = comms serviced, 10 = comms TX state

MISC: 11 = tared, 12 = watchdog, 13 = PWM1 period, 14 = read user linearisation/calibration input. If PWM is selected, short pulses may not be seen.

ADC: 15 = main, 16 = offset, 17 = aux, 18 = load monitor on, 19 = load monitor off, 20 = load monitor, 21 = main sampled, 22 = offset sample, 23 = auxilary sample, 24 = load on sample, 25 = load off sample, 26= load on and off sample.

This LED has user-programmable functions which are used mainly for test purposes.

## Thermocouple Ageing Alarm

If a thermocouple is directly connected, a thermocouple ageing alarm feature can be used to warn of a possible failure. Generally, thermocouples that are heated and cooled over a large temperature range frequently will deteriorate quicker than a thermocouple used at steady or lower temperatures. Other environmental conditions also contribute to thermocouple ageing effects. This feature allows planned maintenance (replacement of the thermocouple) before it fails in service.

As the thermocouple ages, its loop resistance will increase. The thermocouple loop resistance is measured when a new sensor is fitted and the value stored (Ω). This loop resistance is periodically measured and is compared with the stored new resistance. Should the difference between the new value and the latest measured value be over a predefined value, the thermocouple ageing alarm will be activated.

A31/1062-3 I RW ***thermocouple ageing monitor deviation alarm value***, (0–4700Ω), *default 500*
This location is the deviation alarm setpoint for the ageing alarm. If the loop resistance of a new thermocouple was 100Ω, setting a value of 200Ω at this location would trigger the ageing alarm when the loop resistance is at (100+200) 300Ω or more. **L21** will be turned ON when the ageing monitor is in the alarm state. Logic outputs on the Tracker 331 and Tracker 340 Logic Expansion Module can also be used for the thermocouple ageing alarm (see Assigning Logic Outputs to Alarms).

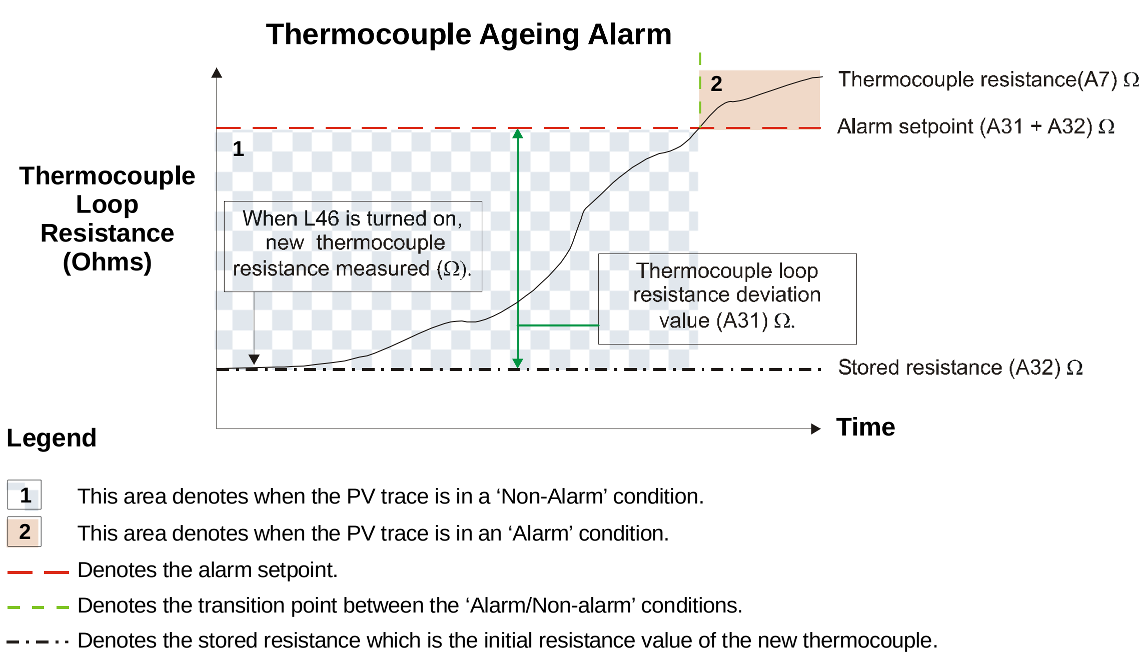
A32/1064-5 I RW ***resistance of thermocouple when new***, (0–4700Ω), *default 10*
When using the thermocouple ageing alarm, the Tracker 300 will take a sensor loop resistance measurement when a new thermocouple is connected. The value of the new thermocouple loop resistance is stored at this location. Turning **L46** ON triggers a new reading.

L46 RW ON ***measure new thermocouple loop resistance, (stores value in A32)***, *self-clearing to OFF*

L47 RW ON ***enables the thermocouple ageing alarm function***, *default OFF*

The current thermocouple resistance value (Ω) can be read at A7

### Example



# Electrical Load Failure Monitor (for PWM channel 1 output only)

The load monitor is used to indicate a failure or partial failure of an electrical load, which is being controlled by PWM channel 1 output. The monitor works by feeding back the signal from an external current transmitter (CT) measuring the load current when in the ON and OFF states. A logic output can be used for alert purposes.

The load failure monitor can warn for:

1. Partial load failure – ON current too low
2. Total load failure or the switching device is open circuit (ON current near or at zero)
3. Overload – ON current too high
4. Switching device failure – OFF current above zero (switch short circuit or conductive)

If the primary (PV) signal is 0–10V, a 4–20mA CT signal type must be used and vice versa.

## Load Monitoring Configuration (Analogue Locations)

A35/1070-1 I RW ***load ON current (in tenths of Amps), used if no external CT is fitted***, *default 120*
If no CT is fitted but a real-time calculation of the mean current applied to the load is still required (see A8), the ON load current can be stored here. If a CT is to be used L49 must be turned ON.

A36/1072-3 I RW ***load monitor interval***, (0 = 1h, 1 = 30m, 2 = 15m, 3 = 5m, 4 = 1m, 5 = 30s, 6 = 15s), *default 6*
In some cases the load monitor will modify the duty cycle period of the PWM output to cater for the response time of the current transmitters (see A37 below). This would be particularly true if a short PWM period time was configured as the period time would need to be increased for the sample. This location allows the user to set the time periods between load monitoring samples. Both the on and off load currents are sampled and are stored at A9 and A10, respectively.

A37/1074-5 I RW ***load monitor current transmitter response time***, (0–2000ms), *default 800*
This value would be as recommended by the supplier of the current transmitter. It allows the CT output to settle before the load monitor measures the on and off load currents.

A38/1076-7 I RW ***×1 to ×255 maximum PWM1 extension time for load monitor***, *default 10*
The load monitor attempts to maintain the power demand on/off (PWM) ratio during the load current samples. This location defines the maximum time that the PWM power demand output can multiply for any on or off period within the sample cycle.

A41/1082-3 I RW ***load monitor CT FSO rating in tenths of amps***, (0–2000), *default 200*
This is the scaling range for the current transmitter providing the load current feedback. For a current transmitter with a full-scale output of 20A the value 200 would be entered. The CT signal must be either 4–20mA or 0–10V DC output as selected by L50.

A11/1022-3 I RW ***load monitor error***, (0–2000), *default 130*
0 = No error, 1 = OFF current too high (faulty switching device), 2 = ON current too low (open circuit load), 3 = ON current too low (partial load failure), 4 = ON current too high (overload).

A42/1084-5 I RW ***load monitor, high ON load setpoint in tenths of amps***, (0–2000), *default 130*
To warn of an electrical load drawing too high a current, causing a possible overload, this parameter acts as a high alarm setpoint for the loads on current. E.g. for a high current alarm setpoint of 25A, this value would be set to 250.

A43/1086-7 I RW ***load monitor, low ON load current setpoint in tenths of amps***, (0–2000), *default 110*

To warn of an electrical load drawing too low a current due to a partial load failure, this parameter acts as a low alarm setpoint for the loads on current. E.g. For a low current alarm of 15A, this value would be set to 150.

The value at this location is the low on current setpoint. For example if you load comprised of 3×5A heaters wired in parallel, your normal on current would be 15A. Should a single heater fail (open circuit) the on current would drop to 10A. A setpoint at 12.5A would indicate partial failure of the electrical load.

A44/1088-9 I RW ***load monitor CT, expected OFF load in tenths of amps***, (0–2000), *default 40*

This location is the value of the healthy load (and switching device) when switched off. In some cases a small amount of current may flow when the switching device is in its off state. Set this value to the maximum acceptable off state current. E.g. for zero current set the value to 1 (1/10th of an Amp).

## Load Monitoring Configuration (Logic Locations)

L48 RW ON ***enables load monitoring alarm function***, *default OFF*

L49 RW ON ***current transducer feedback fitted***, *default OFF* (see A35)

L50 RW ON ***current transducer output signal is 4–20mA*** (OFF = 0–10V), *default OFF* (see A41)

Load current measurements in real time are available from:

A8 ***mean load on current (A9 or A35 × % power = amps)***

A9 ***ON load current (amps)***

A10 ***OFF load current (amps)***

## Load Error Logic Locations

L22 ON = general load error

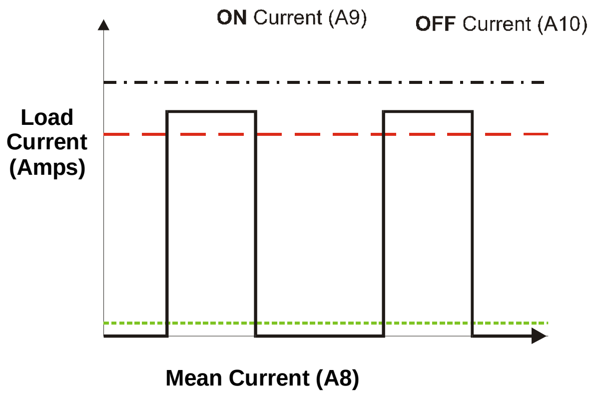
L23 ON = OFF current too high (faulty switching device)

L24 ON = total load failure

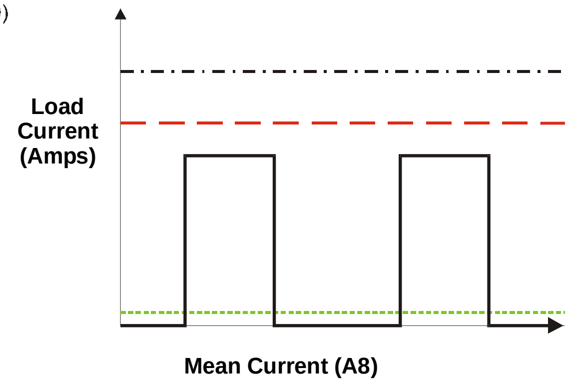
L25 ON = partial load failure

L26 ON = overload (ON current too high)

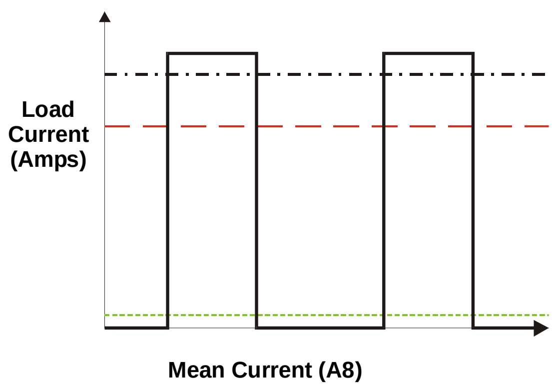
## Load Monitor
(Healthy load and switching device)



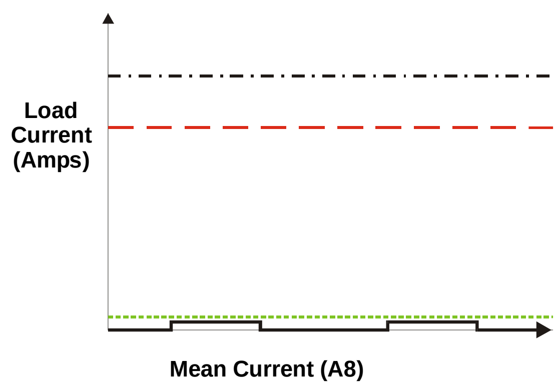

## Load Monitor
(Partial load failure)
Logic 22 on - general load fault
Logic 25 on - partial load failure



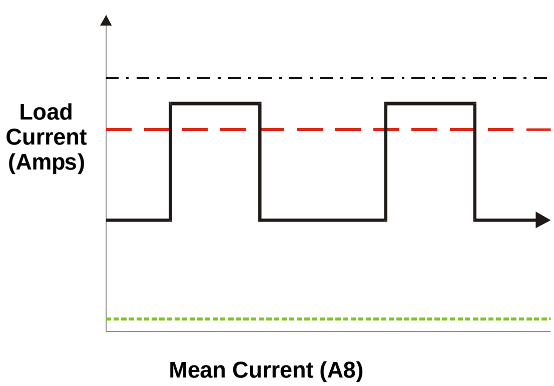

## Load Monitor
(Partial overload)
Logic 22 on - general load fault
Logic 26 on - overload



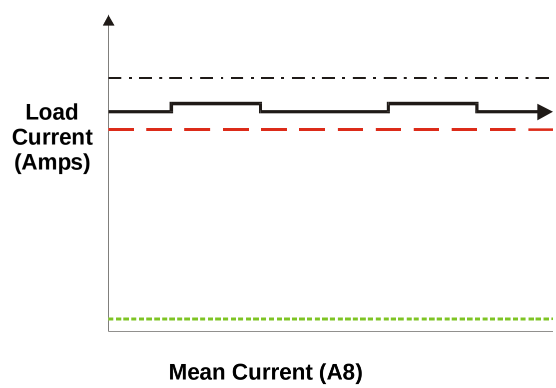

## Load Monitor
(Switching device is open circuit or total load failure)
Logic 22 on - general load fault
Logic 24 on - total load failure
Logic 25 on - partial load failure




## Load Monitor
(Faulty switching device - conducting when in OFF state e.g. SSR/thyristor half wave fault)
Logic 22 on - general load fault
Logic 23 on - off current too high




## Load Monitor
(Faulty switching device - fully conducting when in the OFF state, i.e. short circuit switching device)
Logic 22 on - general load fault
Logic 23 on - off current too high




### Legend

Denotes the overload setpoint (A42).

Denotes the partial load failure setpoint (A43).

Denotes the ON current total load failure setpoint & the OFF current high setpoint (A44).

# Instrument Identification and Test Data Locations

## Identification Locations

A0 /1000-1 I RO ***instrument model (321, 331 or 332)***
The value refers to the model number of the instrument (duplicated at A228). Fitted options, such as relay and analogue output, can also be identified by reading other data locations (see below).

L184 RO ON ***Analogue Output Module fitted***, (OFF = no analogue output fitted)

L185 RO ON ***Relay Module fitted***, (OFF = transducer supply fitted)

L186 RO ON ***Relay Module with 1 × SSR drive + 1 × relay output fitted or 2 × relays***

A226/1452-3 I RW ***Expansion Module fitted***, (0 = none, 1 = Logic Module, 2–255 reserved), *default 0*
This parameter informs the T32x/T33x Module if an Expansion Module is fitted and which type. If a Logic Expansion Module is to be fitted this location must be set to 1.

A228/1456-7 I RO ***instrument type 321, 331 or 332 (duplication of A0)***

A229/1458-9 F RO ***software version***, e.g. 1.09

A230/1460-1 I RO ***serial number (1) first four digits (HEX/BCD)***
Indicates month and year of the serial number mmyy (e.g. 1539 decimal is 0603 Hex/BCD = June 2003).

A231/1462-3 I RO ***serial number (2) last four digits (HEX/BCD)***
The manufactured number *nnnn* (e.g. 4643 decimal is 1223 = 1223th unit manufactured this month).

## Test Locations

L188 RO ON ***Expansion Module fitted***, (OFF = no Expansion Module fitted)

L189 RO ON ***Expansion Module detected and accepted as a Logic Module (T340)***

L191 RO ON ***front panel configuration jack plug inserted***

A235/1470-1 F RO ***hours powered***
This location has the value of hours the instrument has been powered.

A236/1472-3 F RO ***number of resets (high word)***

A237/1474-5 F RO ***number of resets (low word)***
These locations store the number of power up resets that have been applied to the instruments.

# Run Time Data (Analogue)

A1/1002-3 F RO ***process variable (PV) measured value in engineering units (ADC)***
This is the primary process variable value as measured by the analogue to digital converter. The value is scaled to engineering units and is not affected by any user configured filtering and decimal point position. Having no fixed decimal point position makes this variable auto ranging.

A2/1004-5 F RO ***process variable (PV) in engineering units filtered + fixed decimal point***
This variable is similar to A1 above but can be filtered (A51) and is set to a user defined resolution/decimal point position (A50).

A3/1006-7 F RO ***maximum PV value memory in engineering units***

The maximum measured reading is stored even when power is removed from the instrument. The maximum stored value is reset when L162 is turned ON. The maximum stored value will then be set to the current value of A2. A maximum/minimum reset can also be achieved by using the status (logic) inputs if a T340 Logic Expansion Module is fitted.

A4/1008-9 F RO ***minimum PV value memory in engineering units***

Exactly the same as A3 above but stored as the minimum measured value. This value is reset by setting L162 to ON.

A5/1010-1 F RO ***zero offset in engineering units***

If the Tracker 300 has been zeroed either by using communications (turning L164 ON) or using a status logic input on a T340 Logic Expansion Module if fitted. The offset value is stored in this location in engineering units. Turning ON L163 clears this offset to zero, effectively unzeroing the instrument.

A6 /1012-3 F RO ***tare offset in engineering units***

Similar to A5 above, the tare offset value is stored here in engineering units. Unlike the zero function, tare is a temporary zero, which is implemented when L165 is turned ON, cleared when L165 is ON but turned back OFF. A status input on a T340 Logic Expansion Module (if fitted) can also be configured to control the tare function.

A7/1014-5 I RO ***actual thermocouple loop resistance*** (Ω)

If the thermocouple ageing alarm is used the Tracker 300 will read the sensor's loop resistance. The latest measurement is stored at this location in Ohms and is updated approximately four times a minute.

A8/1016-7 F RO ***load monitoring mean load current (ON amps x power % = amps)***

If the Tracker 331 or 332 is being used as a controller, the output power demand (0–100%) is the multiplied load current rating. For example 25% power demand for a 20A load would return a value of 5A.

A9/1018-9 F RO ***ON current [only available if load monitoring is enabled (amps)]***

When used as a controller, the Tracker can use an external current transmitter (CT) to alert the user to problems with the electrical load. The measured ON current is available at this location.

A10/1020-1 F RO ***OFF current [only available if load monitoring is enabled (amps)]***

As A9 above, feedback from the CT can also detect any current flowing through a load when it is switched off and warn appropriately. An OFF current alarm is normally due to a faulty switching device.

## Process Alarms

A12/1024-5 I RW ***process error (resets to zero on instrument reset or power up)***

If any process error is detected a non-zero value will be found at this location. A process error is defined to be any error that can be rectified externally from the instrument. The value at this location will indicate the nature of the problem, which could be a broken sensor, communication time out, etc. Each error type will generate a value. A value of zero indicates no process errors. Any of these faults will also cause LED A to flash at 2Hz.

| | | | |
|---|---|---|---|
| No errors | = | 0 | |
| ADC saturated (low) | = | 1 | |
| ADC over range (low) | = | 2 | over-range value |
| ADC saturated (high) | = | 4 | |
| ADC Over range (high) | = | 8 | under-range value |
| Thermocouple ageing monitor | = | 16 | |
| Thermocouple break | = | 32 | |
| Load monitor alarm (general) | = | 64 | (see also A11) |
| Communications time out alarm | = | 128 | (RX only) |

In the case of multiple process errors occurring, the sum of the values can identify all errors, e.g. should a load monitor alarm (64) and a thermocouple ageing alarm (16) both be active, the value would be 80. When the faults have been cleared, the value 0 should be written to A12 to reset the alarm value or the instrument reset or repowered.

**Note:** These process errors are also viewable at logic locations starting at L11.

A14/1028-9 F RW ***Alarm 1 setpoint (duplicated at A109)***

A15/1030-1 F RW ***Alarm 2 setpoint (duplicated at A117)***

A16/1032-3 F RW ***Alarm 3 setpoint (duplicated at A125)***

A17/1034-5 F RW ***Alarm 4 setpoint (duplicated at A133)***

## Instrument Control Functions (via Serial Communications)

A26/1052-6 F RW ***analogue output control via communications*** (0–100%), *default 0*
When the analogue output (data) source is comm (A141 = 4), the output is controlled by the serial interface allowing remote control. If the analogue output is set for a 4–20mA output, a value of 0 (%) would set an output value of 4mA and 100 (%) would set an output of 20mA. The output value set would remain until a new value is sent to A226.

A27/1054-5 F RW ***PWM duty 1 on 0–100%***, (write only if L152 = OFF), *default 0*

A28/1056-7 F RW ***PWM duty 2 on 0–100%***, (write only if L153 = OFF), *default 0*
The two pulse-width modulation outputs duty cycles can be independently controlled via communications if the PMW source parameter is set for comm at L153 (PWM1) and L154 (PWM2). The PWM cycle period is set by setting A205 and A206 and can be set anywhere between 0.5 and 6553 seconds (1.8 hours).

## System Errors

A13/1026-7 I RW ***system error (resets to zero on instrument reset or power up)***
Similar to the process error above, a system error indicates a problem within the instrument which could be a calibration data loss or a check sum error when first turned on. When the faults have been cleared the value 0 should be written to L13 to reset the alarm value, or the instrument repowered (see also A239). Any of these faults will also cause LED A to flash at 4Hz.

| | | | |
|---|---|---|---|
| No Errors | = | 0 | |
| Lost factory calibration | = | 1 | return to supplier |
| Factory data void | = | 2 | return to supplier |
| No setup (not configured) | = | 4 | all instrument locations at factory defaults values |
| Comms error | = | 64 | communications buffer(s) corrupted or full |
| Transmitter time out | = | 128 | instrument too long in transmit state – comms reset (see A221) |

**Note:** These system errors are also viewable at logic locations starting at L5.

# Run Time Information (Logic)

## Process Alarm

L39 RO ON ***Alarm 1 is in an alarm state***
L40 RO ON ***Alarm 2 is in an alarm state***
L41 RO ON ***Alarm 3 is in an alarm state***
L42 RO ON ***Alarm 4 is in an alarm state***

## Load Monitor Alarm (if enabled)

L22 RO ON ***load monitor alarm in alarm state*** (general alarm – see next four locations)
L23 RO ON ***load off current too high – faulty switching device*** (see A44)
L24 RO ON ***load on current too low – total load failure*** (see A44)
L25 RO ON ***load on current too low – partial load failure*** (see A43)
L26 RO ON ***load on current too high – overload condition*** (see A42)

## Thermocouple Alarm (if a thermocouple is used as the PV sensor)

L15 RO ON ***thermocouple broken***
L21 RO ON ***thermocouple ageing monitor in alarm state (if alarm enabled)***

## Input Output States

L27 RO ON ***T331 Output 1 energised***
L28 RO ON ***T321 Output 2 energised***
L29 RO ON ***T340 Output 1 energised***
L30 RO ON ***T340 Output 2 energised***
L31 RO ON ***T340 Output 3 energised***
L32 RO ON ***T340 Output 4 energised***
L33 RO ON ***T340 LED 1 on***
L34 RO ON ***T340 LED 2 on***
L35 RO ON ***T340 LED 3 on***
L36 RO ON ***T340 LED 4 on***
L37 RO ON ***T340 Status (logic) Input 1 is on***
L38 RO ON ***T340 Status (logic) Input 2 is on***
L39 RO ON ***Alarm 1 is in an alarm state***
L40 RO ON ***Alarm 2 is in an alarm state***
L41 RO ON ***Alarm 3 is in an alarm state***
L42 RO ON ***Alarm 4 is in an alarm state***

## System Errors

L5 RO ON ***factory calibration lost, contact supplier***
L6 RO ON ***factory calibration default, contact supplier***
L7 RO ON ***checksum failed, reconfigure, contact supplier if problem persists***
L8 RO ON ***communications data overflowed, slow down requests for data***
L9 RO ON ***communications lockup automatically rectified (warning only)***
L11 RO ON ***analogue input (ADC) at low saturation***
L12 RO ON ***measured value under range with decimal point position setting***
L13 RO ON ***analogue input (ADC) at high saturation***
L14 RO ON ***measured value over range with decimal point position setting***
L16 RW ON ***communication RX timeout, latching***, *reset by writing OFF*
L17 RO ON ***communication RX timeout error as above*** *but self-clearing*
L18 RO ON ***analogue output source higher than analogue output span scaling value***

L19 RO ON ***analogue output source lower than analogue output zero scaling value***
L20 RO ON ***one or more setpoints are over or under range***

## Instrument System Control Functions (via communication ports)

L156 RW ON ***defaults all analogue and logic locations to factory settings***, *self-clearing to OFF*
L159 RW ON ***sample input value and store reading – calibration***, *self-clearing to OFF*
L160 RW ON ***implement new scaling***, *self-clearing to OFF*
L161 RW ON ***implement power-up reset***, *self-clearing to OFF*
L162 RW ON ***reset maximum/minimum values***, *self-clearing to OFF*
L163 RW ON ***clear user PV zero offset (to zero)***, *self-clearing to OFF*
L164 RW ON ***zero PV***, *self-clearing to OFF*
L165 RW ON ***tare***
L166 RW ON ***disable all alarms (forces all alarms to their non-alarm state)***, *default OFF*
L167 RW ON ***analogue output hold (freeze)***, *default OFF*
L168 RW ON ***reset all latched alarms (if alarm condition has cleared)***, *default OFF*
L173 RW ON ***PID manual power enabled***, *default OFF*
L174 RW ON ***PID 2 settings enabled***, (OFF = PID 1 = settings enabled), *default OFF*
L175 RW ON ***PID integral action hold (freeze)***
L176 RW ON ***PID 1 shot tune enable***, *self-clearing to OFF*
L181 RW ON ***ADC reads all inputs once, then resumes normal sampling sequence***, *self-clearing to OFF*

# Chapter 5 **Specifications**

All features are standard unless specified:

## Maths Functions

18-point user linearisation, maximum/minimum (peak/valley) memory, square root, specific gravity, correction, zero, tare. Built in thermocouple and RTD linearisation.

## Alarm Functions

High, low, deviation (band), on delay time, off delay time, hysteresis, output selection (one alarm can switch more than one output), outputs energised or de-energised in the alarm state.

## PID Control (Tracker 331 & 332 only)

| | |
|---|---|
| Type: | PID with autotune. |
| Control action: | reverse, direct or heat/cool. |
| SSR/Relay cycle times (2): | 0.1 second to 30 minutes (independent per output). |
| Relative gain (cool output): | 0.1–1 of heat output. |
| Overlap/deadband: | in Engineering Units. |
| Proportional band: | 0–99999 Engineering Units. |
| Integral time constant: | 0 (off), 1–9999 seconds. |
| Derivative time constant: | 0 (off), 1–9999 seconds. |
| Integral hold switching: | via logic input (T340) or communications. |
| PID1 to PID2 switching: | via logic input (T340) or communications. |
| Auto/manual switching: | via logic input (T340) or communications. |
| Control output power limit: | 0–100% Heat and 0–100% Cool. |
| Setpoint range: | -99999 to +99999. |
| Communications loss timeout: | 10–255 seconds. |
| Control on communications failure: | continue, go to preset setpoint, go to preset power level or turn all control outputs off. |

## Load & Partial Load Failure Function (PWM only)

Measures 4–20mA or 0–10V DC input from an external current transmitter. CT input scaled to Amps, checks on and off load currents, calculates mean current for relay/SSR outputs.

## Resistance Thermometers

| | |
|---|---|
| Configuration: | 3-wire. |
| Excitation current: | 0.25mA (nominally). |
| Engineering units: | °C, °F or Kelvin. |
| Measurement resolution: | 0.1°C, °F or Kelvin. |

| | | Accuracy Including Linearisation | |
|---|---|---|---|
| **RTD Type** | **Range (°C)** | **Worst Case** | **Typical @ 20°C** |
| Pt100 (alpha = 385) | -200 to 850 | ±0.8°C | ±0.4°C |
| Pt100 (alpha = 392) | -270 to 457 | ±0.8°C | ±0.4°C |

## Thermocouple Measurement

| | |
|---|---|
| CJC accuracy: | better than ±0.5°C after 30 mins. |
| Open circuit detection: | upscale. |
| Engineering units: | °C, °F or Kelvin. |
| Measurement resolution: | 0.1°C, °F or Kelvin. |
| Thermocouple ageing alarm: | loop resistance method. |

| | | Accuracy Including Linearisation | |
|---|---|---|---|
| **Thermocouple** | **Range (°C)** | **Worst Case** | **Typical @ 20°C** |
| Type B, Pt30%Rh/Pt6%Rh | 0 to 1820 | ±1.0°C | ±0.5°C |
| Type J, Fe/NiCu | -210 to 1200 | ±1.0°C | ±0.5°C |
| Type K, NiCh/Ni/Al | -270 to 1372 | ±1.0°C | ±0.5°C |
| Type T, Cu/CuNi | -270 to 400 | ±1.0°C | ±0.5°C |
| Type N, Nicrosil-Nisil | -200 to 1300 | ±1.0°C | ±0.5°C |
| Type R, Pt13%-Rh Pt | -50 to 1767 | ±2.0°C | ±1.2°C |
| Type S, Pt10%-RhPt | -50 to 1767 | ±2.0°C | ±1.2°C |

## Analogue to Digital Converter

| | |
|---|---|
| Type: | Sigma Delta. |
| Resolution: | 20 bit plus sign (internally 24 bits). |
| Drift with temperature: | <100ppm/°C. |
| Update rate: | 15/second (PV measurement 7.5/sec). |
| Common mode rejection: | >150dB. |
| Series mode rejection: | >70dB (50 & 60Hz). |

## Voltage & Current Inputs

| | |
|---|---|
| Ranges: | ±100mV, ±10V DC and ±20mA DC 0–4kΩ |
| Scaling: | user selectable to engineering units. |
| Accuracy: | ±0.05% (worst case), 0.02% typical @ 20°C ambient. |
| Impedance (Ω): | <5 (mA), >1000M (mV), >1M (Volt/Resistance). |

## Sensor Excitation Supply (Tracker 321/332)

| | |
|---|---|
| 2-wire loop supply: | 24V DC (nominally) @ 35mA maximum. |
| Bridge supply: | 10V DC regulated @ 35mA maximum. |
| Isolation: | functional isolation only. |

## Logic Outputs (Tracker 331 only)

| | |
|---|---|
| Relay type: | 1 x normally open contacts. |
| Rating: | 1A @ 240V AC, 5A @ 30V DC. |
| Relay isolation: | isolated from each other and all other inputs and outputs. |
| SSR drive output: | 18V DC 20mA nominally. Optionally two relays (replaces SSR drive) (see also Tracker 340 Logic Module). |

## Serial Communications

| | |
|---|---|
| Isolation: | 500V DC/peak AC. |
| Type: | RS485, 2-wire multidrop. |
| Parity: | Odd, even or none. |
| Stop bits: | 1 or 2. |
| Protocols: | Modbus (RTU & ASCII), Modbus 32 bit floating point and DTPI (ASCII). |
| Baud rate: | 1200, 2400, 4800, 9600 and 19200. |

## Analogue Output (Option)

| | |
|---|---|
| Isolation: | 500V DC/peak AC. |
| Output: | selectable 0–10V, 0–20mA or 4–20mA. |
| Maximum current output: | 22mA @18V. |
| Maximum voltage output: | 11V @ 22mA. |
| Temperature drift: | <100ppm. |
| Accuracy: | 0.2% of span (worst case), 0.1% typical @ 20°C ambient. Accuracy is in respect to the measured value. |
| Maximum load (mA): | 900Ω |
| Resolution: | 15bit (1 part in 32768) |
| Scaling: | user programmable to any part of the measurement range. |

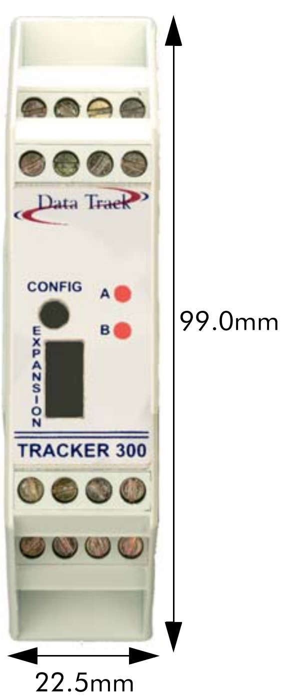
## Tracker 340 Logic Modules (Option)

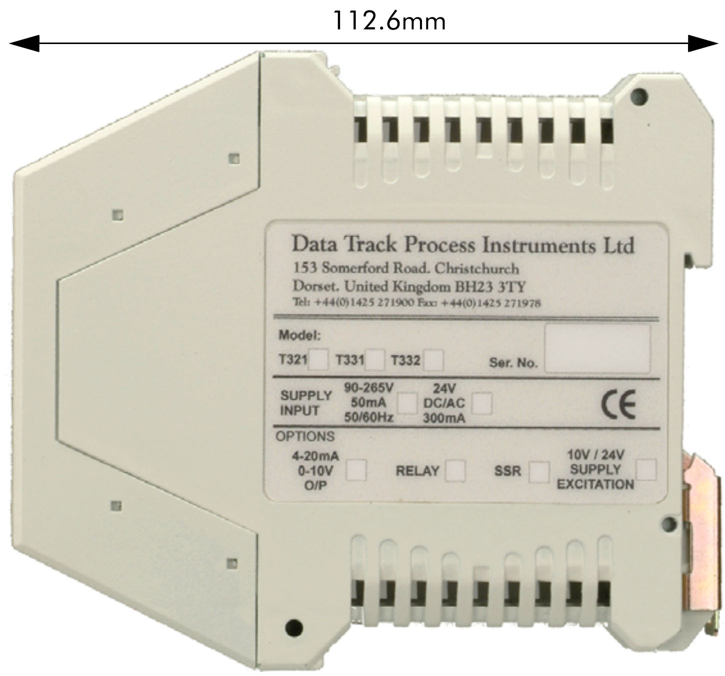
| | |
|---|---|
| Relay types: | change over contacts (4). |
| Rating: | 1A @ 250V AC, 5A @ 30V DC. |
| Relay isolation: | isolated from each other and all other inputs and outputs. |
| TTL drive outputs (replaces relay): | 5V DC 20mA nominal. |
| Logic Inputs (2): | volt free contacts or TTL |
| Protection: | reverse diode protected |

Front panel LED indicates the alarm states and logic input states.

## Physical/Mechanical

| | |
|---|---|
| T330 Module weight: | 167g (maximum), packed weight 223g |
| T340 Module weight: | 167g (maximum), packed weight 223g |
| Dimensions (mm): | see below (both modules) |




## Environmental

| | |
|---|---|
| Temperature: | 0°C to 60°C operating, -10°C to 70°C storage. |
| Humidity: | 10% to 95% RH non-condensing. |

## Safety and EMC

| | |
|---|---|
| Safety: | EN61010-1:2001 |
| Susceptibility: | EN61326:1998 |
| Emissions: | EN61326:1998 |
| CE certified | 2004. |

Specification subject to change without notice. All trade marks acknowledged.

# Chapter 6 **All Locations with Functional Descriptions**

## Analogue Locations

A0/1000-1 I RO ***instrument model*** (321, 331 or 332)
The value refers to the model number of the instrument (duplicated at A228).

A1/1002-3 F RO ***process variable (PV) measured value*** (ADC)
This is the primary process variable value as measured by the analogue to digital converter. The value is scaled to engineering units and is not affected any user configured filtering and decimal point position. Having no fixed decimal point position makes this value auto ranging and so displays to the best resolution available.

A2/1004-5 F RO ***process variable (PV) filtered + fixed decimal point***
This value is similar to A1 above but can be filtered (A51) and is set to a user-defined fixed resolution/decimal point position (A50).

A3/1006-7 F RO ***PV maximum value – retained on power loss*** (L162 resets)
The maximum (peak) measured reading is stored even when power is removed from the instrument. The maximum stored value is reset when L162 is turned ON and will then be set to the current value of A2. If a T340 Logic Expansion Module is fitted a maximum/minimum reset can also be activated by using a status logic input (see L102 and L116).

A4/1008-9 F RO ***PV minimum value – retained on power loss*** (L162 resets)
Exactly the same as A3 above but storing the minimum (valley) measured value.

A5/1010-1 F RO ***zero offset in engineering units***
If the Tracker 300 has been zeroed either by using communications (turning L164 ON) or using a status logic input on a T340 Logic Expansion Module if fitted. The offset value is stored in this location in engineering units. Turning ON L163 clears this offset to zero, effectively unzeroing the instrument.

A6/1012-3 F RO ***tare offset in engineering units***
Similar to A5 above, the tare offset value is stored here in engineering units. Unlike the zero function, tare is a temporary zero, which is implemented when L165 is turned ON, cleared when L165 and turned back OFF. A status input on a T340 Logic Expansion Module (if fitted) can also be configured to control the tare function.

A7/1014-5 I RO ***actual thermocouple loop resistance*** (ohms)
If the thermocouple ageing alarm is used the Tracker 300 will read the sensor's resistance at regular intervals. The latest measurement is stored here in ohms and is updated approximately four times a minute.

A8/1016-7 F RO ***load monitoring mean load current*** (on amps × power % = amps)
If the Tracker 331 or 332 is being used as a controller, the output power demand (0–100%) is multiplied load current rating. Example 25% power demand for a 20A load would return a value of 5A.

A9/1018-9 F RO ***ON current (only available if load monitoring is enabled – amps)***
When used as a controller, the Tracker can use an external current transmitter (CT) to warn the user about problems with the electrical load.

A10/1020-1 F RO ***OFF current (only available if load monitoring is enabled – amps)***

As A9 above. Feedback from the CT can also detect any current flowing through a load when it is switched off and warn appropriately. An OFF current alarm is normally due to a faulty switching device.

A11/1022-3 I RW ***load monitor error***, (0–2000), *default 130*

0 = No error, 1 = OFF current too high (faulty switching device), 2 = ON current too low (open circuit load), 3 = ON current too low (partial load failure), 4 = ON current too high (overload).

A12/1024-5 I RW ***process error (resets to zero on instrument reset or power up)***

If any process error is detected a non-zero value will be at this location. A process error is defined to be any error that can be rectified externally from the instrument. The value at this location will indicate the nature of the problem, which could be a broken sensor, communication time out, etc. Each error type will generate a value. A value of zero indicates no process errors.

| | | | |
|---|---|---|---|
| No error | = | 0 | |
| ADC saturated (low) | = | 1 | |
| ADC over range (low) | = | 2 | over range value (normally due to decimal point position) |
| ADC saturated (high) | = | 4 | |
| ADC over range (high) | = | 8 | under range value (normally due to decimal point position) |
| Thermocouple ageing monitor | = | 16 | |
| Thermocouple break | = | 32 | |
| Load monitor alarm | = | 64 | |
| Communications time out alarm | = | 128 | (RX only) |

In the case of multiple process errors occurring, the sum of the values can identify all errors, e.g. should a load monitor alarm (64) and a thermocouple ageing alarm (16) both be active, the value would be 80. When the faults have been cleared, the value 0 should be written to A12 to reset the alarm value or the instrument reset or repowered.

**Note:** These process errors are also available as discrete logic at L11–L17, L21 and L22.

A13/1026-7 I RW ***system error (resets to zero on instrument reset or power up)***

Similar to the Process error above, a system error indicates a problem within the instrument which could be a calibration data loss or a check sum error when first turned on. When the faults have been cleared the value 0 should be written to A13 to reset the alarm value, or the instrument repowered (See also A239).

| | | | |
|---|---|---|---|
| No Errors | = | 0 | |
| Lost factory calibration | = | 1 | Return to supplier |
| Factory Data Void | = | 2 | Return to supplier |
| No setup (not configured) | = | 4 | All instrument locations at factory defaults values |
| Comms error | = | 64 | Communications buffer(s) corrupted or full |
| Transmitter time out | = | 128 | Instrument too long in transmit state – comms reset (see A221) |

**Note:** These system errors are also available as discrete logic at L5–L9.

A14/1028-9 F RW ***Process Alarm 1 setpoint*** (duplicated at A109)

A15/1030-1 F RW ***Process Alarm 2 setpoint*** (duplicated at A117)

A16/1032-3 F RW ***Process Alarm 3 setpoint*** (duplicated at A125)

A17/1034-5 F RW ***Process Alarm 4 setpoint*** (duplicated at A133)

The alarm setpoints can be at any value within the user's scaled range and are in engineering units. The setpoints define the switching points of the alarm from non-alarm to alarm state dependent on the PV measured value. If one or more setpoints are set with a value outside of the scaled range then L20 will turn on.

A18/1036-7 F RO ***PID target setpoint***, *default 0*

The controller setpoint value in engineering units (see also A 19). The target setpoint is selected from PID set 1 (A182) or PID set 2 (A183). Logic location L137 selects the PID set (OFF = PID set 1).

A19/1038-9 F RO ***PID working setpoint***, *default 0*

This value is the PID setpoint value the controller is using in real time. If the setpoint ramp feature is used this value may be changing at a pre programmed rate (as set in A186) towards the target setpoint (A18) if the target setpoint has been changed. If the ramping function is not used this value will always be the same as the target setpoint.

A20/1040-1 F RO ***PID target power output*** (-100 to +100%)

The controller can demand a power value between -100% (Full cooling power) and +100% (full heating power). Maximum power limits for both the heat (CH1) and cool (CH2) outputs can be limited (see A200 and A201). 0% would give no heating or cooling power demand. Separate heating and cooling power demand values are also available at analogue locations A23 and A24. The rate of change of the power output demand can be limited by a ramping value set in A187 (see also A22).

A21/1042-3 F RO ***measured value (PV)***

This is a duplication of analogue A1 to allow a block read of the PID control parameters. This allows increased communications bandwidth, as only one read command is required for the controller's most common parameters.

A22/1044-5 F RO ***PID working power output*** (-100 to +100%)

This is the controller power output demand in real time. If the power output ramp feature (A187) is used this value may be ramping from a previous target output power value towards a new target power output value (A20). If the output power ramp feature is not used this value will always be the same as the target power output value.

A23/1046-7 F RO ***PID Channel 1 (Heat) control power output*** (0-100%)

Real time output power demand value for Channel 1 only. (100% = maximum heating)

A24/1048-9 F RO ***PID Channel 2 (Cool) control power output*** (0-100%)

Real time output power demand value for Channel 2 only (100% = maximum cooling)

A25/1050-1 I RO ***PID status word***

The value contained here is the addition of from a number of active bits (logics) each of which has an integer value assigned to it. Some HMI/SCADA systems have the ability to display information based on a status word. Some of the conditions are also available as discrete logic locations.

| | | | |
|---|---|---|---|
| Manual (power) Mode | = | 1 | (also L135) |
| Setpoint ramp Active | = | 2 | |
| Setpoint ramp on hold | = | 4 | |
| Integral Limiting | = | 8 | |
| Power Limiting | = | 16 | |
| Sensor Break | = | 32 | (also L138) |
| Integral Hold | = | 64 | (also L133) |
| Autotune Active | = | 128 | (also L134) |

E.g. A value of 160 (32+128) would indicate the autotune is active and the sensor is broken.

A26/1052-6 F RW ***analogue output control via communications*** (0–100%), *default 0*

When the analogue output (data) source is comm (**A141** = 4), the output is controlled by the serial interface allowing remote control. If the analogue output is set for a 4–20mA output a value of 0 (%) would set a output value of 4mA and 100 (%) would set 20mA output. The output value set would remain until a new value is sent to **A26**.

A27/1054-5 F RW ***PWM duty 1 on 0–100%*** (write only if L152 = OFF), *default 0*

A28/1056-7 F RW ***PWM duty 2 on 0–100%*** (write only if L153 = OFF), *default 0*

The two pulse-width modulation output duty cycles can be independently controlled via communications if the PMW source parameter is set for comm at **L152** (PWM 1) and **L153** (PWM 2). The PWM cycle period is set by setting **A205** and **A206** and can be set anywhere between 0.5 and 6553 seconds (1.8 hours).

A29/1058-9 I *RESERVED*

A30/1060-1 I RW ***input signal type***, *default 0*

(0 = mV, 1 = mA, 2 = V, 3 = Ω, 4 = J, 5 = K, 6 = T, 7 = R, 8 = S, 9 = N, 10 = B, 11 = RTD (alpha = 385), 12 = RTD (alpha = 392).

The value at this location determines the sensor or signal type of the process variable (PV) to be measured. If a thermocouple or resistance thermometer is selected then appropriate scaling and linearisation is automatically applied from tables stored in the instrument. The appropriate mV or Ω scaling value is automatically set for 0°C and 100°C scaling as a guide. See also **A49**.

A31/1062-3 I RW ***thermocouple ageing monitor deviation alarm value*** (0–4700Ω), *default 500*

This location is the deviation alarm setpoint for the ageing alarm. If the loop resistance of a new thermocouple was 100Ω, setting a value of 200Ω at this location would trigger the ageing alarm when the loop resistance is at (100+200) = 300Ω or higher. **L21** will be turned ON when the ageing monitor is in an alarm state. Logic outputs on the Tracker 331 and Tracker 340 Logic Expansion Module can also be used for the thermocouple ageing alarm (see *Assigning Logic Outputs* on page 70).

A32/1064-5 I RW ***resistance of thermocouple when new*** (0–4700Ω), *default 10*

When using the thermocouple ageing alarm, the Tracker 300 will take a sensor loop resistance measurement when a new thermocouple is connected. The value of the new thermocouple loop resistance is stored at this location. Turning **L46** ON triggers a new reading.

A33/1066-7 *RESERVED*
A34/1068-9 *RESERVED*

A35/1070-1 I RW ***load ON current (in tenths of Amps), used if no external CT is fitted***, *default 120*

If no CT is fitted but a real-time calculation of the mean current applied to the load is still required (see **A8**) then the on load current can be stored here. If a CT is to be used **L49** must be turned ON.

A36/1072-3 I RW ***load monitor interval***, (0 = 1h, 1 = 30m, 2 = 15m, 3 = 5m, 4 = 1m, 5 = 30s, 6 = 15s), *default 6*

In some cases the load monitor will modify the duty cycle period of the PWM output to cater for the response time of the current transmitters (see **A37** below). This would be particularly true if a short PWM period time was configured as the period time would need to be increased for the sample. This location allows the user to set the time periods between load monitoring samples. Both the on and off load currents are sampled and are stored at **A9** and **A10**, respectively.

A37/1074-5 I RW ***load monitor current transmitter response time***, (0–255ms), *default 800*

This value would be as recommended by the supplier of the current transmitter. It allows the CT output to settle before the load monitor measures the on and off load currents

A38/1076-7 I RW × ***1 to × 255 maximum PWM1 extension time for load monitor***, *default 10*

The load monitor attempts to maintain the power demand on/off (PWM) ratio during the load current samples. This location defines the maximum time that the PWM power demand output can multiply for any on or off period within the sample cycle.

A39/1078-9 *RESERVED*
A40/1080-1 *RESERVED*

A41/1082-3 I RW ***load monitor CT FSO rating in tenths of amps***, (0–2000), *default 200*

This is the scaling range for the current transmitter providing the load current feedback. For a current transmitter with a full-scale output of 20A the value 200 would be entered. The CT signal must be either 4–20mA or 0–10V DC as selected by L50.

A42/1084-5 I RW ***load monitor, high ON load setpoint in tenths of amps***, (0–2000), *default 130*

The value at this location is the low on current setpoint. For example, if your load was comprised of 3×5A heaters wired in parallel, your normal on current would be 15A. Should a single heater fail (open circuit) the on current would drop to 10A. A setpoint at 12.5A would indicate partial failure of the electrical load.

A43/1086-7 I RW ***load monitor low ON load current setpoint in tenths of amps***, (0–2000), *default 110*

To warn of an electrical load drawing too low a current due to a partial load failure, this parameter acts as a low alarm setpoint for the loads on current. E.g. For a low current alarm of 15A this value would be set to 150.

A44/1088-9 I RW ***load monitor CT expected OFF load in tenths of amps***, (0–2000), *default 40*

This location is the value of the healthy load (and switching device) when switched off. In some cases a small amount of current may flow when the switching device is in its off state. Set this value to the maximum acceptable off state current, e.g. for zero current set the value to 1 (1/10th of an Amp).

A45/1090-1 *RESERVED*
A46/1092-3 *RESERVED*
A47/1094-5 *RESERVED*
A48/1096-7 *RESERVED*

A49/1098-9 I RW ***engineering units [0 = eng units (not temperature)***, 1 = °C, 2 = °F, 3 = Kelvin], *default 0*

This location defines the scaling type for the PV measurement. If the sensor is not a thermocouple or a RTD (Resistance Thermometer) then set to 0 (engineering units – to be scaled elsewhere). If a temperature sensor is directly connected (i.e. A30 has been set to between 4 and 12) select a value of 1, 2 or 3 depending on the temperature scaling required. No other scaling information is required.

A50/1100-1 I RW ***decimal point position***, (0–4), *default 1* (see A2)

This sets the decimal point position of the fixed resolution analogue locations. Internally the instrument range is:

0 = -99999 to +99999
1 = -9999.9 to +9999.9
2 = -999.99 to +999.99
3 = -99.999 to +99.999
4 = -9.9999 to +9.9999

A51/1102-3 I RW ***input filter time constant***, (0–99.9 seconds), *default 0 (OFF)*

For PV signals that are noisy some input filtering may be required. The filter acts as a CR network and the value set is the time constant in tenths of a second. The filtered value is only applied on the PV fixed decimal point PV measurement (A2), maximum stored value (A3) and minimum stored value (A4). Note that the analogue output has a separate filter (A142) and is not affected by any setting in this location.

A52/1104-5 F RW ***specific gravity (SG) compensation***, (0.0001–9), *default 1*
The SG parameter allows the measured value (before any scaling and linearisation) to be divided by the value set. This is particularly useful for tank volume measurement where the SG value of the stored liquid can change.

A53/1106-7 *RESERVED*
A54/1108-9 *RESERVED*
A55/1110-1 *RESERVED*

A56/1112-3 RO ***last sampled (measured) input value***, *default 0*
See A57 below.

A57/1114-5 I RW ***scaling/user linearisation calibration sample point***, (1–18), *default 3*
Calibration and scaling data can be entered manually (see below) or the instrument can measure (read) the signal of the sensor or transmitter. If this read function is used, this location indicates which point is being read. For linear signals normally only two points need to be calibrated, one on or near zero and one on or near span. If you injected a zero signal, this location would be set to 1. The instrument would store the input value in A59. If then the span signal was injected, you would set this value to 2 and the measured value would be stored in A60. Each of the PV reads would be associated with engineering unit values, which would be stored in A83 and A84. The last measurement sample is stored in A56.

To trigger a sample turn ON L159 *(self-clearing – turns OFF automatically when sample is taken)*.

The locations detailed hereafter contain the scaling input values and their respective scale value. Input/measurement values are either entered manually or a signal can be sampled (see A57 above). Should any changes be made to any of the input or display parameters L160 must be turned ON to implement the changes (turns OFF automatically when calculations are completed). The signal type or thermosensor will determine the engineering units and range for the input/measured location values:

| | | |
|---|---|---|
| mV and thermocouples | = | -100 to +100 (mV DC) |
| mA | = | -20 to +20 (mA DC) |
| Volts | = | -10 to +10 (V DC) |
| Ohms and RTD | = | 0–4700 (Ω) |

A58/1116-7 F RW ***number of scale/linearisation points used***, (2–18), *default 2*
This location determines how many user calibration points are to be used. For the linear input example above, the value would be 2 (the default), one for the zero point and one for span point. If you require more calibration/linearisation points (e.g. for tank volume applications) up to 18 points can be used. This can be regarded as one zero point and 17 span points making a straight-line approximation of the linearisation curve required.

To implement the new scaling turn ON L160 (turns OFF automatically when calculations are completed).

## Analogue Scaling Locations

Display Values (PV Engineering Units)

| | | |
|---|---|---|
| A59/1118-9 F RW | ***PV display value #1***, | *default 0* |
| A60/1120-1 F RW | ***PV display value #2***, | *default 100* |
| A61/1122-3 F RW | ***PV display value #3***, | *default 0* |
| A62/1124-5 F RW | ***PV display value #4***, | *default 0* |
| A63/1126-7 F RW | ***PV display value #5***, | *default 0* |
| A64/1128-9 F RW | ***PV display value #6***, | *default 0* |
| A65/1130-1 F RW | ***PV display value #7***, | *default 0* |
| A66/1132-3 F RW | ***PV display value #8***, | *default 0* |
| A67/1134-5 F RW | ***PV display value #9***, | *default 0* |
| A68/1136-7 F RW | ***PV display value #10***, | *default 0* |
| A69/1138-9 F RW | ***PV display value #11***, | *default 0* |
| A70/1140-1 F RW | ***PV display value #12***, | *default 0* |
| A71/1142-3 F RW | ***PV display value #13***, | *default 0* |
| A72/1144-5 F RW | ***PV display value #14***, | *default 0* |
| A73/1146-7 F RW | ***PV display value #15***, | *default 0* |
| A74/1148-9 F RW | ***PV display value #16***, | *default 0* |
| A75/1150-1 F RW | ***PV display value #17***, | *default 0* |
| A76/1152-3 F RW | ***PV display value #18***, | *default 0* |

Input Values (Ω, mV, V or mA)

| | | |
|---|---|---|
| A83/1166-7 F RW | ***PV input value #1***, | *default 0* |
| A84/1168-9 F RW | ***PV input value #2***, | *default 100* |
| A85/1170-1 F RW | ***PV input value #3***, | *default 0* |
| A86/1172-3 F RW | ***PV input value #4***, | *default 0* |
| A87/1174-5 F RW | ***PV input value #5***, | *default 0* |
| A88/1176-7 F RW | ***PV input value #6***, | *default 0* |
| A89/1178-9 F RW | ***PV input value #7***, | *default 0* |
| A90/1180-1 F RW | ***PV input value #8***, | *default 0* |
| A91/1182-3 F RW | ***PV input value #9***, | *default 0* |
| A92/1184-5 F RW | ***PV input value #10***, | *default 0* |
| A93/1186-7 F RW | ***PV input value #11***, | *default 0* |
| A94/1188-9 F RW | ***PV input value #12***, | *default 0* |
| A95/1190-1 F RW | ***PV input value #13***, | *default 0* |
| A96/1192-3 F RW | ***PV input value #14***, | *default 0* |
| A97/1194-5 F RW | ***PV input value #15***, | *default 0* |
| A98/1196-7 F RW | ***PV input value #16***, | *default 0* |
| A99/1198-9 F RW | ***PV input value #17***, | *default 0* |
| A100/1200-1 F RW | ***PV input value #18***, | *default 0* |

The locations above contain the scaling input values and their respective scale value. Input/ measurement values are either entered manually or a signal can be sampled (see A57). Should any changes be made to any of the input or display values, L160 must be turned ON to implement the changes (turns OFF automatically when calculations are completed).

The signal type or thermosensor will determine the eng units and range for the input/measured values:

| | | |
|---|---|---|
| mV and thermocouples | = | -100 to +100 (mV DC) |
| mA | = | -20 to +20 (mA DC) |
| Volts | = | -10 to +10 (V DC) |
| Ohms and RTD | = | 0–4700 (Ω) |

A101/1202-3 *RESERVED*
A102/1204-5 *RESERVED*
A103/1206-7 *RESERVED*
A104/1208-9 *RESERVED*
A105/1210-1 *RESERVED*
A106/1212-2 *RESERVED*
A107/1214-5 *RESERVED*

## Alarm Configuration Locations

All Instruments have four software alarms that can be used to indicate a process error. These alarms can also operate logic outputs to switch external control or alert devices. The logic outputs can take the form of relays or voltage (TTL) switches and a single alarm can switch one or more outputs as required. Two logic outputs are available on the T331 and four outputs are available when a logic expansion module (T340) is fitted to any of the T32*x*/T33*x* units.

A108/1216-7 I RW ***Alarm 1 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
This location sets the alarm type for alarm 1. The choices are:

0 = Not used (off)
1 = High alarm – in an alarm state when the PV value is greater than the setpoint value (A14/A109)
2 = Low alarm – in an alarm state when the PV value is lower than the setpoint value (A14/A109)
3 = Deviation – in an alarm state when the PV is greater or lower than a band around the setpoint value (A14/A109). The band is defined in A114 (deviation high) and A115 (deviation low) in engineering units

**Note:** Logic outputs are not automatically assigned to each alarm (see Assigning Logic Outputs to Alarms).

A109/1218-9 F RW ***Alarm 1 setpoint***, *default 0*
This is a duplication of A14. Changes made to A14 will be duplicated at this location and changes to this location will be duplicated at A14. The setpoint is the PV value that the alarm will react to and are in engineering units.

A110/1220-1 F RW ***Alarm 1 on hysteresis***, *default 0*
The amount the PV must move into the alarm point before the alarm is triggered. This function stops fleeting alarms being generated due to noisy signals. Values are entered in engineering units.

A111/1222-3 F RW ***Alarm 1 off hysteresis***, *default 0*
The amount the PV must move out of the alarm point before the alarm is cleared. Values are entered in engineering units.

A112/1224-5 I RW ***Alarm 1 on delay***, (0–39996 × 250ms), *default 0*
The PV must be continuously in the alarm state for longer than the time period set here. Only if this condition is true will the alarm be triggered, e.g. if a value of 20 is set the PV must be continuously in the alarm condition for 5s before the alarm is triggered.

A113/1226-7 I RW ***Alarm 1 off delay***, (0–39996 × 250ms), *default 0*
The PV must be continuously out of the alarm state for longer than the time period set here. Only if this condition is true with the alarm be deactivated, e.g. if a value of 20 is set the PV must be continuously out of the alarm condition for 5s before the alarm is cleared.

A114/1228-9 F RW ***Alarm 1 deviation high (deviation alarm type only)***, *default 0*
Only used if the alarm type is deviation (A108 = 3). This location defines the band, in engineering units, above the setpoint value.

A115/1230-1 F RW ***Alarm 1 deviation low (deviation alarm type only)***, *default 0*
Only used if the alarm type is deviation (A108 = 3). This location defines the band, in engineering units, below the setpoint value.

## Alarm 2

A116/1232-3 I RW ***Alarm 2 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A117/1234-5 F RW ***Alarm 2 setpoint***, *default 0* (duplicated at A15)
A118/1236-7 F RW ***Alarm 2 on hysteresis***, *default 0.1*
A119/1238-9 F RW ***Alarm 2 off hysteresis***, *default 0.1*
A120/1240-1 F RW ***Alarm 2 on delay***, *default 0*
A121/1242-3 F RW ***Alarm 2 off delay***, *default 0*
A122/1244-5 F RW ***Alarm 2 deviation high***, *default 0*
A123/1246-7 F RW ***Alarm 2 deviation low***, *default 0*

## Alarm 3

A124/1248-8 I RW ***Alarm 3 type*** (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A125/1250-1 F RW ***Alarm 3 setpoint***, *default 0* (duplicated at A16)
A126/1252-3 F RW ***Alarm 3 on hysteresis***, *default 0.1*
A127/1254-5 F RW ***Alarm 3 off hysteresis***, *default 0.1*
A128/1256-7 F RW ***Alarm 3 on delay***, *default 0*
A129/1258-9 F RW ***Alarm 3 off delay***, *default 0*
A130/1260-1 F RW ***Alarm 3 deviation high***, *default 0*
A131/1262-3 F RW ***Alarm 3 deviation low***, *default 0*

## Alarm 4

A132/1264-5 I RW ***Alarm 4 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*
A133/1266-7 F RW ***Alarm 4 setpoint***, *default 0* (duplicated at A17)
A134/1268-9 F RW ***Alarm 4 on hysteresis***, *default 0.1*
A135/1270-1 F RW ***Alarm 4 off hysteresis***, *default 0.1*
A136/1272-3 F RW ***Alarm 4 on delay***, *default 0*
A137/1274-5 F RW ***Alarm 4 off delay***, *default 0*
A138/1276-7 F RW ***Alarm 4 deviation high***, *default 0*
A139/1278-9 F RW ***Alarm 4 deviation low***, *default 0*

## Analogue Output

A140/1280-1 I RW ***analogue output signal type***, (0 =0–10V, 1 = 4–20mA, 2 = 0–20mA), *default 0*
This location sets the output signal type. Note that the 4–20mA output will not exceed the 4mA and 20mA limits. The other ranges will exceed 10V/20mA limits before the output saturates.

**Note:** The analogue output mA ranges can be used in active mode (the instrument generating the source voltage) or in sink mode where a source supply is externally generated. This is dependent on how the instrument is installed and is not a software selection.

A141/1282-3 I RW ***analogue output source***, (0 = off, 1 = PV, 2 = minimum, 3 = maximum, 4 = comm, 5 = heat, 6 = cool), *default 0*
The analogue output normally retransmits the PV value, however can be set to retransmit another value instead if required. The stored maximum (A3), Minimum (A4), or a value between 0–100% sent via the communications interface (A26) can be selected to be transmitted as a analogue output. The analogue output can also be used as a PID control output (option 5 or 6).

A142/1284-5 I RW ***analogue output damping filter time constant*** (0–999s), *default 0*
The analogue output has its own filter to stop fast movements of the signal. This is particularly useful for chart recorders with noisy signals.

A143/1286-7 F RW ***analogue output scaling value for 100% output***, *default 100*
This value represents the full-scale output (10V/20mA) as a PV value. E.g. if a range -100–500°C needs to be transmitted as 4–20mA, this location would be set to 500.

A144/1288-9 F RW ***analogue output scaling value for 0% output***, *default 0*

This value represents the zero output (0V, 0mA or 4mA as set in A140 above) as a PV value. E.g. if a range of -100–500°C needs to be transmitted as 4–20mA, this location would be set to -100.

**Note:** The 4–20mA output will not exceed the 4mA and 20mA limits. The other ranges will exceed 10V/20mA limits before output saturation.

The analogue out put mA ranges can be used in active mode (source voltage supplied) or in sink mode where a source supply is externally generated. This is dependent on how the instrument is installed (not a software selection).

A145/1290-1 *RESERVED*
A146/1292-3 *RESERVED*
A147/1294-5 *RESERVED*
A148/1296-7 *RESERVED*
A149/1298-9 *RESERVED*
A150/1300-1 *RESERVED*

## Assigning Logic Outputs

### T331

A151/1302-3 I RW T331 ***Output 1***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A152/1304-5 I RW T331 ***Output 2***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A153/1306-7 *RESERVED*
A154/1308-9 *RESERVED*

### T340 Logic Expansion Module (A226 must be set to 1)

A155/1310-1 I RW T340 ***Output 1***, (0 = off, 1–4 =Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A156/1312-3 I RW T340 ***Output 2***, (0 = off, 1–4 =Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A157/1314-5 I RW T340 ***Output 3***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A158/1316-7 I RW T340 ***Output 4***, (0 = off, 1–4 = Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

Logic Outputs 1 and 2 on the Tracker 331 and Outputs 1–4 on the Logic Expansion Module can be set to:

| | | |
|---|---|---|
| 0 | = | Not used (off) |
| 1–4 | = | Logic output for process Alarm 1, 2, 3 or 4 |
| 5 | = | Logic output for the thermocouple ageing warning alarm |
| 6 | = | Logic output for the load monitoring alarm |
| 7 | = | Logic output for the loss of communications alarm |
| 8 and 9 | = | PWM outputs controlled by the PID controller or via communications |

A159/1318-9 *RESERVED*
A160/1320-1 *RESERVED*

## Front Panel LED Functions

A161/1322-3 I RW ***T340 LED1***, (0 = off, 1–4 = alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A162/1324-5 I RW ***T340 LED2***, (0 = off, 1–4 = alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A163/1326-7 I RW ***T340 LED3***, (0 = off, 1–4 = alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A164/1328-9 I RW ***T340 LED4***, (0 = off, 1–4 = alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

Each of the Tracker 340 front panels LEDs can be individually set to:

| | | |
|---|---|---|
| 0 | = | Do nothing (OFF) |
| 1–4 | = | Be the LED for alarm 1, 2, 3 or 4 |
| 5 | = | Be the LED for the thermocouple ageing warning alarm |
| 6 | = | Be the LED for the load monitoring alarm |
| 7 | = | Loss of communications alarm |
| 8 and 9 | = | Be the PWM outputs controlled by the PID controller or via communications |

A165/1330-1 *RESERVED*
A166/1332-3 *RESERVED*

A167/1334-5 I RW ***user-programmable LED B (T32x, T33x)***, *default 5*
OUTPUTS: 0 = off, 1 = SSR/Relay 1, 2 = Relay 2, 3 = inverse of 1, 4 = inverse of 2. If PWM is selected, short pulses may not be seen.
COMMS: 5 = *MODBUS RTU active* (default), 6 = RX byte toggle, 7 = addressed pulse, 8 = jack state, 9 = comms serviced, 10 = comms TX state
MISC: 11 = tared, 12 = watchdog, 13 = PWM1 period, 14 = read user linearisation/ calibration input. If PWM is selected, short pulses may not be seen.
ADC: 15 = main, 16 = offset, 17 = aux, 18 = load monitor on, 19 = load monitor off, 20 = load monitor, 21 = main sampled, 22 = offset sample, 23 = auxilary sample, 24 = load on sample, 25 = load off sample, 26= load on and off sample.

This LED has user-programmable functions which are used mainly for test purposes.

A168/1336-7 F RW ***CH1/CH2 (Heat/Cool) relative gain (0.1 – 10.0)– PID Set 1***, *default 1*
This allows the user balance the relative gains between channels. If the cooling effect is more powerful than the heating power then a value less than 1 can be entered.

A169/1338-9 F RW ***CH1/CH2 (Heat/Cool) relative gain (0.1 – 10.0)– PID Set 2***, *default 1*
As A168 but for PID settings #2.

A172/1344-5 F RW ***proportional band – PID Set 1***, *default 1*
This is the proportional band value set in engineering units (e.g. °C)

A173/1346-7 F RW ***proportional band – PID Set 2***, *default 1*
As A172 above but for PID settings #2

A174/1348-9 F RW ***integral time (0-9999 Seconds) – PID Set 1***, *default 5*

A175/1350-1 F RW ***integral time (0-9999 Seconds) – PID Set 2***, *default 5*

A176/1352-3 F RW ***derivative time (0-9999 Seconds) – PID Set 1***, *default 0*

A177/1354-5 F RW ***derivative time (0-9999 Seconds) – PID Set 2***, *default 0*

A178/1356-7 F RW ***dead band - PID Set 1***, *default 0*
Used by ON/OFF control only. Provides a band around the setpoint value, entered in engineering units, where no control outputs are energised.

A179/1358-9 F RW ***dead band - PID Set 2***, *default 0*
As A178 but for PID settings #2.

A180/1360-1 I RW ***comms failsafe*** 0=None, 1=Preset Setpoint, 2=O/Ps off, 3=Preset Power, *default 0*

If communications is lost the PID function can automatically switch to:

0 Continue at the last setpoint value
1 A preset setpoint value
2 Switch the PID control outputs off
3 Go to a preset control power output (manual)

A181/1362-3 *RESERVED*

A182/1364-5 F ***PID target setpoint - Set 1***, *default 0*

A183/1366-7 F ***PID target setpoint - Set 2***, *default 0*

A184/1368-9 F RW ***cutback - PID Set 1***, *default 0*
Used in over powered applications for start-up. This value, entered in engineering units, allows the user to cut the power before the measured value reaches the proportional band (or setpoint when in On/Off control mode).

A185/1368-9 F RW ***cutback - PID Set 2***, *default 0*
As A184 but for PID settings #2

A186/1370-1 F RW ***setpoint ramp rate***, *default 0*
The user can define the setpoint ramp rate, which is used when the controllers target setpoint is changed (A182 or A183). The value is entered in engineering units/second. The setpoint ramp value can be frozen should the PV/setpoint deviation exceed a preset value (see L139 and A199).

A187/1374-5 F RW ***power output slew rate***, *default 0* (Off)
The PID controllers power demand (target output power – A20) can be ramped at a user defined rate. This ramped power value is set in A10 (working output power). If 0 is entered the ramp function is turned off and the working output power will be instantly set by the PID target power output.

A188/1376-7 F RW ***control type***, 0=Off, 1=On/Off, 2=P, 3-PD, 4=PI, 5=PID, *default 0*
The type of control action can be selected.
0 = Off (No control action)
1 = On/Off control - can be used with dead band (A178/A179)
2 = Proportional band only – can be used with manual reset (A170/A171)
3 = Proportional + Derivative – can be used with manual reset (A170/A171)
4 = Proportional + Integral
5 = Proportional + Integral + Derivative (PID)

A189/1378-9 F RW ***PID output (heat/cool) control action***, *default 0*
0 = Reverse/Reverse
1 = Direct/Direct
2 = Reverse/Direct
3 = Direct/Reverse

A190/1380-1 F RW ***PID cooling linearisation***, *default 0*
The selections are Linear, Water and Air. Normally Linear would be selected, however, because the properties of using air or water as a cooling medium, different linearity's are used for the

cooling output power.
0 = Linear
1 = Water
2 = Air

A191/1382-3 *RESERVED*
A192/1384-5 *RESERVED*

A193/1386-7 ***autotune setpoint***, *default 0*

A194/1388-7 F RW ***PID autotune low power*** (0–100%), *default 0*
The minimum power demand allowed during autotune.

A195/1390-9 F RW ***PID autotune high power*** (0–100%), *default 100*
The maximum power demand allowed during autotune.

A196/1392-3 *RESERVED*
A197/1394-5 *RESERVED*

A198/1396-7 F RW ***sensor break power*** (-100 to +100%), *default 0*
Should the thermocouple break (open circuit), the control power output demand can be set to a predetermined value stored at this location.

A199/1098-9 F RW ***setpoint ramp deviation alarm setpoint value***, *default 0*
If L139 is ON then the setpoint ramp hold function is enabled. If the measured value (A1 and A21) deviates from the working setpoint (A19) by more than the value set here, then the working setpoint ramp will stop. When the measured value goes back into the deviation alarm band the working setpoint ramp will continue again towards the Target Setpoint (A18).

A200/1400-1 F RW ***CH1 (Heat) maximum Power*** (0–100%), *default 100*
The maximum power output the controller could use for Channel 1. See also autotune maximum heat power limit (A194).

A201/1402-3 F RW ***CH2 (Cool) maximum Power*** (0–100%), *default 100*
The maximum power output the controller could use for Channel 2. See also autotune maximum cool power limit (A195).

A202/1404-5 *RESERVED*
A203/1406-7 *RESERVED*
A204/1408-9 *RESERVED*

A205/1410-1 I RW ***User PWM 1 time period in tenths of a second*** (5–65535), *default 5*
The Pulse Width time period is adjustable between 0.5 seconds and 6553.5 seconds (Approx.1.8 Hours). If the cycle time was set to 300 (30 seconds) and a power duty demand of 50% was set, the output would be on for 15 seconds and off for 15 seconds. Generally a solid state switching device can have a shorter period time than electro–mechanical switches which have a limited life. PWM 1 is generally used as the Heat (CH1) control output.

A206/1412-3 I RW ***User PWM 2 time period in tenths of a second*** (5–65535), *default 5*
As PWM 1 above – generally used for cool control in heat/cool applications.

A207/1414-5 *RESERVED*
A208/1416-7 *RESERVED*
A209/1418-9 *RESERVED*
A210/1420-1 *RESERVED*
A211/1422-3 *RESERVED*

## RS485 Serial Port Configuration

A212/1424-5 I RW ***RS485 port parity***, *default 0*
0 = Even
1 = Odd
2 = None.

A213/1426-7 I RW ***RS485 port - communications address***, (1–247), *default 1*
For use on multi-drop applications where a master device (normally a PC or HMI) can be connected to a number of slave devices on a single communications link. Each slave device must have a unique communications address number on the communication link.

A214/1428-9 I RW ***RS485 port baud rate***, (3 = 19200, 2 = 9600, 1 = 4800, 0 = 2400), *default 2*
This parameter selects the data rate for the RS485 serial interface and must be the same as any other devices and the master device.

A215/1430-1 I RW ***RS485 port response TX delay in 4ms units***, (0–255), *default 0*
Some master devices, after sending a request to a slave device, need a certain amount of time to switch off (tri-state) their transmitter and turn on their receiver. Should this be the case a response delay can be set in this location. The delay range is 0–102ms in 4ms steps.

A216/1432-5 *RESERVED*

A217/1434-5 I RW ***MODBUS integer range***, (0 = 0–32000, 1 = 0–32767, 2 = 0–65535), *default 0*
Modbus integer scale range.

A218/1436-7 F RW ***MODBUS integer range high***, *default 100*
The scaled engineering units value as represented by 32000, 32767 or 65535 as selected in A217.

A219/1438-9 F RW ***MODBUS integer range low***, *default 0*
The scaled engineering units value as represented by zero (see A217 and A218).

A220/1440-1 I RW ***Communications time out period*** (0–255 seconds), *default 0* (Off)
If the value is at the default value 0, this function is disabled. If no valid communications commands are received over a time period (set at this location), then the PID failsafe mode will be set as selected in A180 previously. The PID will return to normal operation when the next valid command is received. The communications timer can also set a logic output if required (see configuring logic outputs).

A221/1442-3 I RW ***communications TX time out*** (0–255s), *default 25*
Should the instrument transmit data for more than the time period set then a system error is generated.

A222/1444-5 T RW ***tag name 1st 2 characters***, *default =13140 = 3354 Hex = '3T'* ('T3' reversed bytes)

A223/1446-7 T RW ***tag name 2nd 2 characters***, *default =12336 = 3030 Hex = '00'* ('00' reversed bytes)

A224/1448-9 T RW ***tag name 3rd 2 characters***, *default = 8224 = 2020 Hex = ' '* (' ' reversed bytes)
The user can store a tag name of up to six characters into the instrument. *The default tag name is 'T300'*.

A225/1450-1 *RESERVED*

A226/1452-3 I RW ***Expansion Module fitted***, (0 = none, 1 = Logic Module, 2–255 reserved), *default 0*

This parameter informs the T32x/T33x module if an Expansion Module is fitted and its type. If a Logic expansion module is to be fitted this location must be set to 1.

A227/1454-5 *RESERVED*

A228/1456-7 I RO ***instrument type 321, 331 or 332*** (duplication of A0)

A229/1458-9 F RO ***software version***, e.g. 1.09

A230/1460-1 I RO ***serial number (1) first four digits (HEX/BCD)***

Indicates month and year of the serial number mmyy (e.g. 1539 decimal is 0603 Hex/BCD = June 2003)

A231/1462-3 I RO ***serial number (2) last four digits (HEX/BCD)***

The manufactured number *nnnn* (e.g. 4643 decimal is 1223 = 1223th unit manufactured this month).

232/1464-5 *RESERVED*
233/1466-7 *RESERVED*
234/1468-9 *RESERVED*

A235/1470-1 F RO ***hours powered***

This location has the value of hours the instrument has been powered.

A236/1472-3 F RO ***number of resets (high word)***

A237/1474-5 F RO ***number of resets (low word)***

These locations store the number of power up resets that have been applied to the instrument.

238/1476-7 *RESERVED*
239/1478-9 *RESERVED*
240/1480-1 *RESERVED*
241/1482-3 *RESERVED*
242/1484-5 *RESERVED*

# Logic Locations

## Write Protection Control (not saved)

L1 RW ON ***sets all analogue and logic locations (except L1) to read only (RS485 port only)***

L2 RW ON ***protects setup locations but allows real-time parameter writes (RS485 port only)***

## Active Serial Port Control (not saved)

L3 RW ON ***RTU (OFF = ASCII) for the RS485 port,*** *default ON*

L4 RW ON ***resets comms session***, *self-clearing to OFF*
Resets comms session settings as if the front panel jack plug was reinserted (9600, E, 7, 1, ASCII) or when removed (see RS485 port settings A213 – A221).

## Instrument Fault Identification

### System Errors

L5 RO ON ***factory calibration lost (contact supplier)***
L6 RO ON ***defaulted to factory calibration settings (contact supplier)***
L7 RO ON ***communications data overflowed – slow down requests for data***
L8 RO ON ***checksum failed, reconfigure, contact supplier if problem persists***
L9 RO ON ***communications lockup rectified automatically, warning***
L10 *RESERVED*

### Process Errors

L11 RO ON ***analogue input (ADC) at low saturation***
L12 RO ON ***measured value under range with decimal point position setting***
L13 RO ON ***analogue input (ADC) at high saturation***
L14 RO ON ***measured value over range with decimal point position setting***
L15 RO ON ***thermocouple broken***
L16 RW ON ***communication RX timeout, latching, reset by writing OFF***
L17 RO ON ***communication RX timeout error as above*** *but self-clearing*
L18 RO ON ***analogue output source higher than analogue output span scaling value***
L19 RO ON ***analogue output source lower than analogue output zero scaling value***
L20 RO ON ***one or more process alarm setpoints over/under range***
L21 RO ON ***thermocouple ageing monitor in alarm state***
L22 RO ON ***load monitor alarm in alarm state*** (general alarm – see next four locations)
L23 RO ON ***load OFF current too high – faulty switching device*** (see A44)
L24 RO ON ***load ON current too low – total load failure*** (see A4)
L25 RO ON ***load ON current too low – partial load failure*** (see A43)
L26 RO ON ***load ON current too high – overload condition*** (A42)

## Logic Output and Front Panel LED States

L27 RO ON ***T331 Output 1 energised***
L28 RO ON ***T321 Output 2 energised***
L29 RO ON ***T340 Output 1 energised***
L30 RO ON ***T340 Output 2 energised***
L31 RO ON ***T340 Output 3 energised***
L32 RO ON ***T340 Output 4 energised***

L33 RO ON ***T340 LED 1 on***
L34 RO ON ***T340 LED 2 on***
L35 RO ON ***T340 LED 3 on***
L36 RO ON ***T340 LED 4 on***
L37 RO ON ***T340 Status (logic) Input 1 is on***
L38 RO ON ***T340 Status (logic) Input 2 is on***
L39 RO ON ***Alarm 1 is in an alarm state***
L40 RO ON ***Alarm 2 is in an alarm state***
L41 RO ON ***Alarm 3 is in an alarm state***
L42 RO ON ***Alarm 4 is in an alarm state***
L43 *RESERVED*
L44 *RESERVED*
L45 *RESERVED*

## Thermocouple Ageing Alarm Configuration

L46 RW ON **measure 'new' thermocouple loop resistance**, *self-clearing to OFF* (stores value in A32)
L47 RW ON ***enables thermocouple ageing alarm function***, *default OFF*

## Load Monitoring Configuration

L48 RW ON ***enables load monitoring alarm function***, *default OFF*
L49 RW ON ***current transducer feedback fitted***, *default OFF*
L50 RW ON ***current transducer output signal is 4–20mA***, (OFF = 0–10V), *default OFF* (see A41)

## Special Measurement Calculations

L51 RW ON ***square root calculation enabled***, *default OFF*
A52 *RESERVED*
A53 *RESERVED*
A54 *RESERVED*

## Alarm Configuration

L55 RW ON ***Alarm 1 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A14/A109), *default OFF*
The alarm can be set to follow the PID controller setpoint if this location is set to ON. The default is to follow the alarm setpoint as set in A109.

L56 RW ON ***Alarm 1 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*
When this location is set to ON, the alarm will stay in the in the alarm state. To reset a latched alarm the PV must be out of the alarm condition and a reset command via the communications interface must be sent (see L168). External contacts connected to a logic (status) input on the Tracker 340 Logic Expansion Module can also be configured as a reset for latched alarms. Latched states are not stored after a power interruption.

L57 RW ON ***Alarm 1 blocking enable***, *default OFF*
The alarm is enabled only when the alarm first reaches the non-alarm state. When the instrument is powered on or after L104 is turned ON via communications the blocking action is reset. A status (logic) input on a Logic Expansion Module can also be used for alarm blocking reset (see L104 and L108)

L58 RESERVED

L59 RW ON ***Alarm 2 setpoint = PID setpoint***, (OFF = Alarm 2 setpoint value A15/A117), *default OFF*

L60 RW ON ***Alarm 2 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L61 RW ON ***Alarm 2 blocking enable***, *default OFF*

L62 *RESERVED*

L63 RW ON ***Alarm 3 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A16/A125), *default OFF*

L64 RW ON ***Alarm 3 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L65 RW ON ***Alarm 3 blocking enable***, *default OFF*

L66 *RESERVED*

L67 RW ON ***Alarm 4 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A17/A133), *default OFF*

L68 RW ON ***Alarm 4 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L69 RW ON ***Alarm 4 blocking enable***, *default OFF*

L70 *RESERVED*
L71 *RESERVED*
L72 *RESERVED*
L73 *RESERVED*
L74 *RESERVED*
L75 *RESERVED*
L76 *RESERVED*
L77 *RESERVED*
L78 *RESERVED*
L79 *RESERVED*
L80 *RESERVED*

L81 RW ON ***T331 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L82 RW ON ***T331 Output 2 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L83 *RESERVED*
L84 *RESERVED*

L85 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L86 RW ON ***T340 Output 2 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L87 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L88 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L89 *RESERVED*
L90 *RESERVED*

L91 RW ON ***T340 LED 1 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L92 RW ON ***T340 LED 2 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L93 RW ON ***T340 LED 3 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L94 RW ON ***T340 LED 4 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L95 *RESERVED*

## RS485 Serial Port Configuration

L96 RW ON ***inhibits write commands to all locations via the RS485 port***, *default OFF*

L97 RW ON ***as above but still allows writes to real time locations***, *default OFF*

L98 RW ON ***MODBUS RTU protocol enable, RS485 port only***, [OFF = DTPI (ASCII) protocol], *default ON*

L99 RW ON ***2 stop bits, RS485 port only***, (OFF = 1 stop bit), *default OFF*

L100 *RESERVED*

## Status Inputs Configuration (Tracker 340 - Option)

### Status (logic) Input 1 Function Configuration

L101 RW ON ***zero, (A1 and A2)+***, *default OFF*
The current PV value (A1 and A2) is set to zero when the status input is activated. This function is edge triggered so to zero again, the status input must be deactivated and then reactivated. The zero offset value can be read at A5. To remove an unwanted zero (e.g. set the zero offset to zero, unzero) turn L163 ON.

L102 RW ON ***resets stored maximum and minimum value, (A3 and A4)***, *default OFF*
This function resets the max/min memory to the current PV value. This function is edge triggered so to reset again, the status input must be deactivated and then reactivated. The max/min values are stored in A3 and A4.

L103 RW ON ***resets all latched alarms (if no longer in alarm state)***, *default OFF*
Any active latched alarms will remain latched on, until reset (even after a power loss). As long as the alarm is no longer in an alarm condition, it will be reset when the status input becomes active. All latched alarms are reset by this function. Alarms can also be reset via communications by turning L168 ON.

L104 RW ON ***asserts alarm blocking (until alarm(s) are in non-alarm state)***, *default OFF*
This function only applies to alarms that have been set as alarm blocking types. Alarm blocking disables any alarm action until the alarm has reached the non-alarm condition. Once the non-alarm condition has been met the alarm action is enabled. The alarm blocking action is implemented when the instrument is powered. Applying this function to a status input reasserts the blocking action as if the instrument has been repowered. This function is also available via communications by turning L168 ON.

L105 RW ON ***PV tare function enabled***, *default OFF*
If this function is enabled a PV tare will be enabled when the status input is active. The PV value (A1 and A2) will be zero and the tare value offset is stored in A6. When the status input is deactivated the tare offset value is set to zero and added to the current PV value.

L106 RW ON ***all alarms are disabled while Status Input 1 is ON (forces non-alarm state)***, *default OFF*
This function forces all the alarms to their non-alarm condition as long as the status input is active regardless of plant/alarm states. Alarms are re-enabled when the status input is deactivated.

L107 RW ON ***analogue output hold (freeze) while Status Input 1 is ON***, *default OFF*
This function holds the current analogue output value as soon as (and as long as) the status input is active.

L108 RW ON ***PID output manual power while Status Input 1 is ON***, *default OFF*

This function puts the PID control output power in manual mode while status input 1 is active. The output power (A22) will remain at the value at the time the input is active. This can be altered via communications by writing a new power value to A22 over the range -100% to +100%. Bumpless transfer to automatic PID control will occur when the input is deactivated.

L109 RW ON ***PID output manual power while Status Input 1 is ON***, *default OFF*

Two sets of PID parameter settings, each with a separate setpoint value, can be stored. If L109 is set to ON, PID settings set 2 will be used while status input 1 is active. PID set 1 will be used when the input is deactivated.

L110 RW ON ***PID integral hold while Status Input 1 is ON***, *default OFF*

When large disturbances to the PID control are predicted (e.g. when an oven door is to be opened) an external switch can hold the integral action. This prevents 'integral windup' which can cause further control disturbance. If L110 is turned ON then the integral action will be held while the status input is active.

L111 RW ON ***PID integral hold while Status Input 1 is ON***, *default OFF*

This function enables the 'one shot' autotune function when status input 1 is active. To initiate another autotune the input must be deactivated and then activated again.

L112 *RESERVED*
L113 *RESERVED*
L114 *RESERVED*

## Status Input 2 Function Configuration (functional details as Status Input 1)

L115 RW ON ***zero*** (A1 and A2), *default OFF*

L116 RW ON ***resets stored maximum and minimum values (A3 and A4)***, *default OFF*

L117 RW ON ***resets all latched alarms (if no longer in alarm)***, *default OFF*

L118 RW ON ***asserts alarm blocking [until alarm(s) are in non-alarm state]***, *default OFF*

L119 RW ON ***PV tare function enabled while Status Input 2 is ON***, *default OFF*

L120 RW ON ***all alarms are disabled while Status Input 2 is ON (forces non-alarm state)***, *default OFF*

L121 RW ON ***analogue output hold (freeze) while Status Input 2 is ON***, *default OFF*

L122 RW ON ***PID output manual power while Status Input 2 is ON***, *default OFF*

L123 RW ON ***PID output manual power while Status Input 2 is ON***, *default OFF*

L124 RW ON ***PID integral hold while Status Input 2 is ON***, *default OFF*

L125 RW ON ***PID integral hold while Status Input 2 is ON***, *default OFF*

L126 *RESERVED*
L127 *RESERVED*
L128 *RESERVED*
L129 *RESERVED*
L130 *RESERVED*
L131 *RESERVED*
L132 *RESERVED*
L133 *RESERVED*
L134 *RESERVED*
L135 *RESERVED*

L136 *RESERVED*
L137 *RESERVED*

L138 ***Sensor break point type***, *default 1*

This logic location enables the sensor break type function as described in A198.

L139 ***SP/PV deviation ramp hold***, *default OFF*

This logic location enables the ramp hold function as described in A199.

L140 *RESERVED*
L141 *RESERVED*
L142 *RESERVED*
L143 *RESERVED*
L144 *RESERVED*
L145 *RESERVED*
L146 *RESERVED*
L147 *RESERVED*
L148 *RESERVED*
L149 *RESERVED*
L150 *RESERVED*
L151 *RESERVED*

## PWM Output Configuration

L152 ***PWM 1 duty source***

When set to ON, this parameter sets the duty cycle of PWM1 to be controlled by the Heat/CH1 output of the PID controller. Setting this parameter to OFF allows the 0–100% duty demand to be set via communications using A27.

L153 ***PWM 2 duty source***

When set to ON, this parameter sets the duty cycle of PWM2 to be controlled by the Heat/CH1 output of the PID controller. Setting this parameter to OFF allows the 0–100% duty demand to be set via communications using A28.

L154 RO ON ***PWM 1 state (high = ON)***

L155 RO ON ***PWM 2 state (high = ON)***

The two pulse-width modulation outputs duty cycles can be independently controlled via communications if the PMW source parameter is set for comm at L152 (PWM1) and L153 (PWM2). The cycle period is set by A205 (PWM1) and A206 (PWM2) and can be set anywhere between 0.5 and 6553 seconds (1.8 hours).

## Instrument System Control Functions (via communication port)

L156 RW ON ***defaults all analogue and logic locations to factory settings***, *self-clearing to OFF*

L157 *RESERVED*
L158 *RESERVED*

L159 RW ON ***sample input value and store reading – calibration***, *self-clearing to OFF*

L160 RW ON ***implement new scaling***, *self-clearing to OFF*

L161 RW ON ***implement power-up reset***, *self-clearing to OFF*

L162 RW ON ***reset maximum/minimum values***, *self-clearing to OFF*

L163 RW ON ***clear user PV zero offset (to zero)***, *self-clearing to OFF*

L164 RW ON ***zero PV***, *self-clearing to OFF*

L165 RW ON ***tare activated***

L166 RW ON ***disable all alarms (forces all alarms to their non-alarm state)***, *default OFF*

L167 RW ON ***analogue output hold (freeze)***, *default OFF*

L168 RW ON ***reset all latched alarms (if alarm condition has cleared)***, *default OFF*

L169 *RESERVED*
L170 *RESERVED*
L171 *RESERVED*
L172 *RESERVED*

L173 RW ON ***PID manual power enabled***, *default OFF*

L174 RW ON ***PID 2 settings enabled***, (OFF = PID 1 = settings enabled), *default OFF*

L175 RW ON ***PID integral hold***, *default OFF*

L176 RW ON ***PID 1 shot tune enable***, *self-clearing to OFF*

L177 RW ON ***PID auto/manual select (OFF=Auto)***, *default OFF*

Turning L135 ON selects manual power. The manual power value will the same as the controllers power output at the time of switching. The manual power setting can be adjusted by setting a value between -100 and +100% in A22.

L178 *RESERVED*
L179 *RESERVED*
L180 *RESERVED*

L181 RW ON ***ADC reads all inputs once, then resumes normal sampling sequence***, *self-clearing to OFF*

L182 *RESERVED*
L183 *RESERVED*

## Instrument Identification Parameters

L184 RO ON ***Analogue Output Module fitted***, (OFF = no analogue output fitted)

L185 RO ON ***Relay Module fitted***, (OFF = transducer supply fitted)

L186 RO ON ***Relay Module with 1× SSR drive + 1× relay output fitted or 2× relays (T331)***

L187 RO ON ***2nd output is a SSR drive (T331)***

L188 RO ON ***Expansion Module fitted***, (OFF = no Expansion Module fitted)

L189 RO ON ***Expansion Module detected and accepted as a Logic Module (T340)***

L190 *RESERVED*

L191 RO ON ***front panel configuration jack plug inserted***

## Active Communication Configuration Parameters (not saved)

The following locations allow a temporary override of the stored serial configuration parameters. If the front panel configuration socket is used the parameters would effect this port. If the jack plug is removed, these parameters effect the RS485 port. The active serial port is mainly used for test purposes and all parameters default back to OFF when repowered or reset.

L193 RW ON ***DTPI protocol 7 digit mode for this session only***, (OFF = 5 digit), *default OFF*

L194 RW ON ***lowers priority of RTU communications so other tasks delayed less***, *default OFF*

L195 RW ON ***allows >125 locations to be read when using MODBUS RTU***

L196 *RESERVED*

L197 RW ON ***write protects all locations for this session only***, *default OFF*
Duplication of L1.

L198 RW ON ***write protects all setup locations for this session only***, *default OFF*
Duplication of L2.

L199 RW ON ***2 stop bits for this session only***, (OFF = 1 stop bit), *default OFF*

L200 RW ON ***MODBUS RTU protocol enable for this session only***, *default OFF*

When the configuration jack plug is inserted into the front panel socket the communications parameters are always set to 9600 baud, even parity, 7 data bits, 1 stop bit and the DTPI (ASCII) protocol is enabled. If required, these parameters can be changed but only for the duration of the current communication session via the front panel socket. If the jack plug is removed and then reinserted, 9600, E, 7, 1 DTPI (ASCII) parameters would again be set.

When the jack plug is inserted the RS485 interface is disabled. When the jack plug is removed the RS485 port is enabled with the parameters set at A213–A221 and L96–L99 (RS485 serial port configuration).

# Chapter 7 **All Locations in Numerical Order**

### Legend

| | | |
|---|---|---|
| A*n* | = | Analogue location DTPI & Modbus integer |
| */nnnn-n* | = | Modbus floating point locations (pairs) low/high order |
| I | = | Integer number |
| F | = | Scaled value (float) |
| RO | = | Read only |
| RW | = | Read write |

## Analogue Locations

A0/1000-1 I RO ***instrument model*** (321, 331 or 332)

A1/1002-3 F RO ***process variable (PV) measured value (ADC)***

A2/1004-5 F RO ***process variable (PV) filtered + fixed decimal point***

A3/1006-7 F RO ***PV maximum value – retained on power loss*** (L162 resets)

A4/1008-9 F RO ***PV minimum value – retained on power loss*** (L162 resets)

A5/1010-1 F RO ***zero offset in engineering units***

A6/1012-3 F RO ***tare offset in engineering units***

A7/1014-5 I RO ***actual thermocouple loop resistance*** (Ω)

A8/1016-7 F RO ***load monitoring mean load current*** (on amps × power % = amps)

A9/1018-9 F RO ***ON current (only available if load monitoring is enabled – amps)***

A10/1020-1 F RO ***OFF current (only available if load monitoring is enabled – amps)***

A11/1022-3 *RESERVED*

A12/1024-5 I RW ***process error (resets to zero on instrument reset or power up)***

A13/1026-7 I RW ***system error (resets to zero on instrument reset or power up)***

A14/1028-9 F RW ***Alarm 1 setpoint*** (duplicated at A109)

A15/1030-1 F RW ***Alarm 2 setpoint*** (duplicated at A117)

A16/1032-3 F RW ***Alarm 3 setpoint*** (duplicated at A125)

A17/1034-5 F RW ***Alarm 4 setpoint*** (duplicated at A133)

A18/1036-7 F RO ***target setpoint***, *default 0*

A19/1038-9 F RO ***working setpoint***, *default 0*

A20/1040-1 F RO ***target power output*** (-100 to +100%)

A21/1042-3 F RO ***measured value***

A22/1044-5 F RO ***working power output*** (-100 to +100%)

A23/1046-7 F RO ***channel 1 (Heat) control power output*** (0–100%)

A24/1048-9 F RO ***channel 2 (Cool) control power output*** (0–100%)

A25/1050-1 I RO ***PID status word***

A26/1052-6 F RW ***analogue output control via communications*** (0–100%), *default 0*

A27/1054-5 F RW ***PWM duty 1 on*** (0–100%) (write only if L152 = OFF), *default 0*

A28/1056-7 F RW ***PWM duty 2 on*** (0–100%) (write only if L153 = OFF), *default 0*

A29/1058-9 I *RESERVED*

A30/1060-1 I RW ***input signal type***, *default 0*

A31/1062-3 I RW ***thermocouple ageing monitor deviation alarm value*** (0–4700Ω), *default 500*

A32/1064-5 I RW ***resistance of thermocouple when new*** (0–4700Ω), *default 10*

A33/1066-7 *RESERVED*
A34/1068-9 *RESERVED*

A35/1070-1 I RW ***load on current (in tenths of amps), used if no external CT is fitted***, *default 120*

A36/1072-3 I RW ***load monitor interval***, (0 = 1h, 1 = 30m, 2 = 15m, 3 = 5m, 4 = 1m, 5 = 30s, 6 = 15s), *default 6*

A37/1074-5 I RW ***load monitor current transmitter response time***, (0–255ms), *default 800*

A38/1076-7 I RW × ***1 to*** × ***255 maximum PWM1 extension time for load monitor***, *default 10*

A39/1078-9 *RESERVED*
A40/1080-1 *RESERVED*

A41/1082-3 I RW ***load monitor CT FSO rating in tenths of amps***, (0–2000), *default 200*

A42/1084-5 I RW ***load monitor, high on load setpoint in tenths of amps***, (0–2000), *default 130*

A43/1086-7 I RW ***load monitor low on load current setpoint in tenths of amps***, (0–2000), *default 110*

A44/1088-9 I RW ***load monitor CT, expected off load in tenths of amps***, (0–2000), *default 40*

A45/1090-1 *RESERVED*
A46/1092-3 *RESERVED*
A47/1094-5 *RESERVED*
A48/1096-7 *RESERVED*

A49/1098-9 I RW ***engineering units [0 = eng units (not temperature)***, 1 = °C, 2 = °F, 3 = Kelvin], *default 0*

A50/1100-1 I RW ***decimal point position***, (0–4), *default 1* (see A2)

A51/1102-3 I RW ***input filter time constant***, (0–99.9s), *default 0 (OFF)*

A52/1104-5 F RW ***specific gravity (SG) compensation***, (0.0001–9), *default 1*

A53/1106-7 *RESERVED*
A54/1108-9 *RESERVED*
A55/1110-1 *RESERVED*

A56/1112-3 RO ***last sampled (measured) input value***, *default 0*

A57/1114-5 I RW ***scaling/user linearisation calibration sample point***, (1–18), *default 3*

A58/1116-7 F RW ***number of scale/linearisation points used***, (2–18), *default 2*

A59/1118-9 F RW ***PV display value #1***, *default 0*

A60/1120-1 F RW ***PV display value #2***, *default 100*

A61/1122-3 F RW ***PV display value #3***, *default 0*

A62/1124-5 F RW ***PV display value #4***, *default 0*

A63/1126-7 F RW ***PV display value #5***, *default 0*

A64/1128-9 F RW ***PV display value #6,*** *default 0*

A65/1130-1 F RW ***PV display value #7***, *default 0*

A66/1132-3 F RW ***PV display value #8***, *default 0*

A67/1134-5 F RW ***PV display value #9***, *default 0*

A68/1136-7 F RW ***PV display value #10***, *default 0*

A69/1138-9 F RW ***PV display value #11***, *default 0*

A70/1140-1 F RW ***PV display value #12***, *default 0*

A71/1142-3 F RW ***PV display value #13***, *default 0*

A72/1144-5 F RW ***PV display value #14***, *default 0*

A73/1146-7 F RW ***PV display value #15***, *default 0*

A74/1148-9 F RW ***PV display value #16***, *default 0*

A75/1150-1 F RW ***PV display value #17***, *default 0*

A76/1152-3 F RW ***PV display value #18***, *default 0*

A77/1154-5 *RESERVED*
A78/1156-7 *RESERVED*
A79/1158-9 *RESERVED*
A80/1160-1 *RESERVED*
A81/1162-3 *RESERVED*
A82/1164-5 *RESERVED*

A83/1166-7 F RW ***PV input value #1***, *default 0*

A84/1168-9 F RW ***PV input value #2***, *default 100*

A85/1170-1 F RW ***PV input value #3***, *default 0*

A86/1172-3 F RW ***PV input value #4***, *default 0*

A87/1174-5 F RW ***PV input value #5***, *default 0*

A88/1176-7 F RW ***PV input value #6***, *default 0*

A89/1178-9 F RW ***PV input value #7***, *default 0*

A90/1180-1 F RW ***PV input value #8***, *default 0*

A91/1182-3 F RW ***PV input value #9***, *default 0*

A92/1184-5 F RW ***PV input value #10***, *default 0*

A93/1186-7 F RW ***PV input value #11***, *default 0*

A94/1188-9 F RW ***PV input value #12***, *default 0*

A95/1190-1 F RW ***PV input value #13***, *default 0*

A96/1192-3 F RW ***PV input value #14***, *default 0*

A97/1194-5 F RW ***PV input value #15***, *default 0*

A98/1196-7 F RW ***PV input value #16***, *default 0*

A99/1198-9 F RW ***PV input value #17***, *default 0*

A100/1200-1 F RW ***PV input value #18***, *default 0*

A101/1202-3 *RESERVED*
A102/1204-5 *RESERVED*
A103/1206-7 *RESERVED*
A104/1208-9 *RESERVED*
A105/1210-1 *RESERVED*
A106/1212-2 *RESERVED*
A107/1214-5 *RESERVED*

A108/1216-7 I RW ***Alarm 1 type*** (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*

A109/1218-9 F RW ***Alarm 1 setpoint***, *default 0*

A110/1220-1 F RW ***Alarm 1 on hysteresis***, *default 0*

A111/1222-3 F RW ***Alarm 1 off hysteresis***, *default 0*

A112/1224-5 I RW ***Alarm 1 on delay***, *default 0*

A113/1226-7 I RW ***Alarm 1 off delay***, *default 0*

A114/1228-9 F RW ***Alarm 1 deviation high (deviation alarm type only)***, *default 0*

A115/1230-1 F RW ***Alarm 1 deviation low (deviation alarm type only)***, *default 0*

A116/1232-3 I RW ***Alarm 2 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*

A117/1234-5 F RW ***Alarm 2 setpoint***, *default 0* (duplicated at A15)

A118/1236-7 F RW ***Alarm 2 on hysteresis***, *default 0.1*

A119/1238-9 F RW ***Alarm 2 off hysteresis***, *default 0.1*

A120/1240-1 F RW ***Alarm 2 on delay***, *default 0*

A121/1242-3 F RW ***Alarm 2 off delay***, *default 0*

A122/1244-5 F RW ***Alarm 2 deviation high***, *default 0*

A123/1246-7 F RW ***Alarm 2 deviation low***, *default 0*

A124/1248-8 I RW ***Alarm 3 type*** (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*

A125/1250-1 F RW ***Alarm 3 setpoint***, *default 0* (duplicated at A16)

A126/1252-3 F RW ***Alarm 3 on hysteresis***, *default 0.1*

A127/1254-5 F RW ***Alarm 3 off hysteresis***, *default 0.1*

A128/1256-7 F RW ***Alarm 3 on delay***, *default 0*

A129/1258-9 F RW ***Alarm 3 off delay***, *default 0*

A130/1260-1 F RW ***Alarm 3 deviation high***, *default 0*

A131/1262-3 F RW ***Alarm 3 deviation low***, *default 0*

A132/1264-5 I RW ***Alarm 4 type***, (0 = off, 1 = high, 2 = low, 3 = deviation), *default 0*

A133/1266-7 F RW ***Alarm 4 setpoint***, *default 0* (duplicated at A17)

A134/1268-9 F RW ***Alarm 4 on hysteresis***, *default 0.1*

A135/1270-1 F RW ***Alarm 4 off hysteresis***, *default 0.1*

A136/1272-3 F RW ***Alarm 4 on delay***, *default 0*

A137/1274-5 F RW ***Alarm 4 off delay***, *default 0*

A138/1276-7 F RW ***Alarm 4 deviation high***, *default 0*

A139/1278-9 F RW ***Alarm 4 deviation low***, *default 0*

A140/1280-1 I RW ***analogue output signal type***, (0 =0–10V, 1 = 4–20mA, 2 = 0–20mA), *default 0*

A141/1282-3 I RW ***analogue output source***, (0 = off, 1 = PV, 2 = minimum, 3 = maximum, 4 = comm, 5 = heat, 6 = cool), *default 0*

A142/1284-5 I RW ***analogue output damping filter time constant*** (0–999s), *default 0*

A143/1286-7 F RW ***analogue output scaling value for 100% output***, *default 100*

A144/1288-9 F RW ***analogue output scaling value for 0% output***, *default 0*

A145/1290-1 *RESERVED*
A146/1292-3 *RESERVED*
A147/1294-5 *RESERVED*
A148/1296-7 *RESERVED*
A149/1298-9 *RESERVED*
A150/1300-1 *RESERVED*

A151/1302-3 I RW T331 ***Output 1***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A152/1304-5 I RW T331 ***Output 2***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A153/1306-7 *RESERVED*
A154/1308-9 *RESERVED*

A155/1310-1 I RW T340 ***Output 1***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A156/1312-3 I RW T340 ***Output 2***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A157/1314-5 I RW T340 ***Output 3***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A158/1316-7 I RW T340 ***Output 4***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A159/1318-9 *RESERVED*
A160/1320-1 *RESERVED*

A161/1322-3 I RW ***T340 LED1,*** (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A162/1324-5 I RW ***T340 LED2***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A163/1326-7 I RW ***T340 LED3***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A164/1328-9 I RW ***T340 LED4***, (0 = off, 1–4= Alarm 1–4, 5 = thermocouple age, 6 = load, 7 = comm, 8 and 9 = PWM1 and 2), *default 0*

A165/1330-1 *RESERVED*
A166/1332-3 *RESERVED*

A167/1334-5 I RW ***user-programmable LED B (T32x, T33x)***, *default 5*

A168/1336-7 F RW ***CH1/CH2 (Heat/Cool) relative gain*** (0.1 – 10.0)– PID Set 1, *default 1*

A169/1338-9 F RW ***CH1/CH2 (Heat/Cool) relative gain*** (0.1 – 10.0)– PID Set 2, *default 1*

A170/1340-1 I RW ***manual reset PID 1***, (engineering units), *default 0*

A171/1342-3 I RW ***manual reset PID 2***, (engineering units), *default 0*

A172/1344-5 F RW ***proportional band – PID Set 1***, *default 1*

A173/1346-7 F RW ***proportional band – PID Set 2***, *default 1*

A174/1348-9 F RW ***integral time (0-9999 Seconds) – PID Set 1***, *default 5*

A175/1350-1 F RW ***integral time (0-9999 Seconds) – PID Set 2***, *default 5*

A176/1352-3 F RW ***derivative time (0-9999 Seconds) – PID Set 1***, *default 0*

A177/1354-5 F RW ***derivative time (0-9999 Seconds) – PID Set 2***, *default 0*

A178/1356-7 F RW ***dead band - PID Set 1***, *default 0*

A179/1358-9 F RW ***dead band - PID Set 2***, *default 0*

A180/1360-1 I RW ***comms failsafe*** 0=None, 1=Preset Setpoint, 2=O/Ps off, 3=Preset Power, *default 0*

A181/1362-3 *RESERVED*

A182/1364-5 F RW ***PID target setpoint - Set 1***, *default 0*

A183/1366-7 F RW ***PID target setpoint - Set 2***, *default 0*

A184/1368-9 F RW ***cutback - PID Set 1***, *default 0*

A185/1368-9 F RW ***cutback - PID Set 2***, *default 0*

A186/1370-1 F RW ***setpoint ramp rate***, *default 0*

A187/1374-5 F RW ***power output slew rate***, *default 0* (Off)

A188/1376-7 F RW ***control type***, 0=Off, 1=On/Off, 2=P, 3-PD, 4=PI, 5=PID, *default 0*

A189/1378-9 F RW ***PID output (heat/cool) control action***, *default 0*

A190/1380-1 I RW ***CH2/cooling output linearisation***, *default 0*

A191/1382-3 *RESERVED*
A192/1384-5 *RESERVED*

A193/1386-7 *Auto Tune Setpoint*

A194/1388-9 F RW ***CH1 (Heat) autotune maximum power*** (0–100%), *default 100*

A195/1390-1 F RW ***CH2 (Cool) autotune maximum power*** (0–100%), *default 100*

A196/1392-3 *RESERVED*
A197/1394-5 *RESERVED*

A198/1096-7 F RW ***sensor break power*** (–100 to +100%), *default 0*

A199/1098-9 F RW ***setpoint ramp deviation alarm setpoint value***, *default 0*

A200/1400-1 F RW ***CH1 (Heat) maximum power*** (0–100%), *default 100*

A201/1402-3 F RW ***CH2 (Cool) maximum power*** (0–100%), *default 100*

A202/1404-5 *RESERVED*
A203/1406-7 *RESERVED*
A204/1408-9 *RESERVED*

A205/1410-1 I RW ***User PWM 1 Time period in tenths of a second*** (5–65535), *default 5*

A206/1412-3 I RW ***User PWM 2 Time period in tenths of a second*** (5–65535), *default 5*

A207/1414-5 *RESERVED*
A208/1416-7 *RESERVED*
A209/1418-9 *RESERVED*
A210/1420-1 *RESERVED*
A211/1422-3 *RESERVED*

A212/1424-5 I RW ***RS485 port parity***, *default 0*

A213/1426-7 I RW ***RS485 port – communications address***, (1–247), *default 1*

A214/1428-9 I RW ***RS485 port baud rate***, (3 = 19200, 2 = 9600, 1 = 4800, 0 = 2400), *default 2*

A215/1430-1 I RW ***RS485 port response TX delay in 4ms units***, (0–255), *default 0*

A216/1432-5 *RESERVED*

A217/1434-5 I RW ***MODBUS integer range***, (0 = 0–32000, 1 = 0–32767, 2 = 0–65535), *default 0*

A218/1436-7 F RW ***MODBUS integer range high***, *default 100*

A219/1438-9 F RW ***MODBUS integer range low***, *default 0*

A220/1440-1 I RW ***communications time out period*** (0–255 seconds), *default 0* (Off)

A221/1442-3 I RW ***communications TX timeout***, (0–255s), *default 25*

A222/1444-5 T RW ***tag name 1st 2 characters***, *default =13140* = *3354 Hex* = '3T' ('T3' reversed bytes)

A223/1446-7 T RW ***tag name 2nd 2 characters***, *default =12336* = 3030 Hex = '00' ('00' reversed bytes)

A224/1448-9 T RW ***tag name 3rd 2 characters***, *default = 8224* = 2020 Hex = ' ' (' ' reversed bytes)

A225/1450-1 *RESERVED*

A226/1452-3 I RW **Expansion Module fitted**, (0 = none, 1 = Logic Module, 2–255 reserved), *default 0*

A227/1454-5 *RESERVED*

A228/1456-7 I RO ***instrument type 321, 331 or 332*** (duplication of A0)

A229/1458-9 F RO ***software version***, e.g. 1.09

A230/1460-1 I RO ***serial number (1) first four digits (HEX/BCD)***

A231/1462-3 I RO ***serial number (2) last four digits (HEX/BCD)***

A232/1464-5 *RESERVED*
A233/1466-7 *RESERVED*
A234/1468-9 *RESERVED*

A235/1470-1 F RO ***hours powered***

A236/1472-3 F RO ***number of resets (high word)***

A237/1474-5 F RO ***number of resets (low word)***

A238/1476-7 *RESERVED*
A239/1478-9 *RESERVED*
A240/1480-1 *RESERVED*
A241/1482-3 *RESERVED*
A242/1484-5 *RESERVED*

# Logic Locations

L1 RW ON ***sets all analogue and logic locations (except L1) to read only***

L2 RW ON ***protects setup locations but allows real-time parameter writes***

L3 RW ON ***RTU (OFF = ASCII) for the RS485 port***

L4 RW ON ***resets comms session***, *self-clearing to OFF*

L5 RO ON ***factory calibration lost (contact supplier)***

L6 RO ON ***defaulted to factory calibration settings (contact supplier)***

L7 RO ON ***checksum failed, reconfigure, contact supplier if problem persists***

L8 RO ON ***communications data overflowed – slow down requests for data***

L9 RO ON ***communications lockup rectified automatically, warning***

L10 *RESERVED*

L11 RO ON ***analogue input (ADC) at low saturation***

L12 RO ON ***measured value under range with decimal point position setting***

L13 RO ON ***analogue input (ADC) at high saturation***

L14 RO ON ***measured value over range with decimal point position setting***

L15 RO ON ***thermocouple broken***

L16 RW ON ***communication RX timeout, latching, reset by writing OFF***

L17 RO ON ***communication RX timeout error as above*** *but self-clearing*

L21 RO ON ***thermocouple ageing monitor in alarm state***

L22 RO ON ***load monitor alarm in alarm state*** (general alarm – see next four locations)

L23 RO ON ***load OFF current too high – faulty switching device*** (see A44)

L24 RO ON ***load ON current too low – total load failure***

L25 RO ON ***load ON current too low – partial load failure*** (see A43)

L26 RO ON ***load ON current too high – overload condition*** (A42)

L27 RO ON ***T331 Output 1 energised***

L28 RO ON ***T321 Output 2 energised***

L29 RO ON ***T340 Output 1 energised***

L30 RO ON ***T340 Output 2 energised***

L31 RO ON ***T340 Output 3 energised***

L32 RO ON ***T340 Output 4 energised***

L33 RO ON ***T340 LED 1 on***

L34 RO ON ***T340 LED 2 on***

L35 RO ON ***T340 LED 3 on***

L36 RO ON ***T340 LED 4 on***

L37 RO ON ***T340 Status (logic) Input 1 is on***

L38 RO ON ***T340 Status (logic) Input 2 is on***

L39 RO ON ***Alarm 1 is in an alarm state***

L40 RO ON ***Alarm 2 is in an alarm state***

L41 RO ON ***Alarm 3 is in an alarm state***

L42 RO ON ***Alarm 4 is in an alarm state***

L43 *RESERVED*
L44 *RESERVED*
L45 *RESERVED*

L46 RW ON ***measure 'new' thermocouple loop resistance***, *self-clearing to OFF* (stores value in A32)

L47 RW ON ***enables thermocouple ageing alarm function***, *default OFF*

L48 RW ON ***enables load monitoring alarm function***, *default OFF*

L49 RW ON ***current transducer feedback fitted***, *default OFF*

L50 RW ON ***current transducer output signal is 4–20mA***, (OFF = 0–10V), *default OFF* (see A41)

L51 RW ON ***square root calculation enabled***, default OFF (not available with PID control)

A52 *RESERVED*
A53 *RESERVED*
A54 *RESERVED*

L55 RW ON ***Alarm 1 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A14/A109), *default OFF*

L56 RW ON ***Alarm 1 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L57 RW ON ***Alarm 1 blocking enable***, *default OFF*

L58 *RESERVED*

L59 RW ON ***Alarm 2 setpoint = PID setpoint***, (OFF = Alarm 2 setpoint value A15/A117), *default OFF*

L60 RW ON ***Alarm 2 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L61 RW ON ***Alarm 2 blocking enable***, *default OFF*

L62 *RESERVED*

L63 RW ON ***Alarm 3 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A16/A125), *default OFF*

L64 RW ON ***Alarm 3 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L65 RW ON ***Alarm 3 blocking enable***, *default OFF*

L66 *RESERVED*

L67 RW ON ***Alarm 4 setpoint = PID setpoint***, (OFF = Alarm 1 setpoint value A17/A133), *default OFF*

L68 RW ON ***Alarm 4 latching, requires to be manually reset***, (OFF = automatic reset), *default OFF*

L69 RW ON ***Alarm 4 blocking enable***, *default OFF*

L70 *RESERVED*
L71 *RESERVED*
L72 *RESERVED*
L73 *RESERVED*
L74 *RESERVED*
L75 *RESERVED*
L76 *RESERVED*
L77 *RESERVED*
L78 *RESERVED*
L79 *RESERVED*
L80 *RESERVED*

L81 RW ON ***T331 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L82 RW ON ***T331 Output 2 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L83 *RESERVED*
L84 *RESERVED*

L85 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L86 RW ON ***T340 Output 2 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L87 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L88 RW ON ***T340 Output 1 energised in the alarm state***, (OFF = de-energised in alarm), *default ON*

L89 *RESERVED*
L90 *RESERVED*

L91 RW ON ***T340 LED 1 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L92 RW ON ***T340 LED 2 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L93 RW ON ***T340 LED 3 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L94 RW ON ***T340 LED 4 on in alarm condition***, (OFF = LED 1 off in alarm condition), *default ON*

L95 *RESERVED*

L96 RW ON ***inhibits write commands to all locations via the RS485 port***, *default OFF*

L97 RW ON ***as above but still allows writes to real time locations***, *default OFF*

L98 RW ON ***MODBUS RTU protocol enable, RS485 port only***, [OFF = DTPI (ASCII) protocol], *default ON*

L99 RW ON ***2 stop bits, RS485 port only***, (OFF = 1 stop bit), *default OFF*

L100 *RESERVED*

L101 RW ON ***zero, (A1 and A2)***, *default OFF*

L102 RW ON ***resets stored maximum and minimum value, (A3 and A4)***, *default OFF*

L103 RW ON ***resets all latched alarms (if no longer in alarm state)***, *default OFF*

L104 RW ON ***asserts alarm blocking [until alarm(s) are in non-alarm state]***, *default OFF*

L105 RW ON ***PV tare function enabled***, *default OFF*

L106 RW ON ***all alarms are disabled while Status Input 1 is ON (forces non-alarm state)***, *default OFF*

L107 RW ON = ***analogue output hold (freeze) while Status Input 1 is ON***, *default OFF*

L108 RW ON ***PID output manual power while Status Input 1 is ON***, *default OFF*

L109 RW ON ***PID output manual power while Status Input 1 is ON***, *default OFF*

L110 RW ON ***PID integral hold while Status Input 1 is ON***, *default OFF*

L111 RW ON ***PID integral hold while Status Input 1 is ON***, *default OFF*

L112 *RESERVED*
L113 *RESERVED*
L114 *RESERVED*

L115 RW ON ***zero*** (A1 and A2), *default OFF*

L116 RW ON ***resets stored maximum and minimum values (A3 and A4)***, *default OFF*

L117 RW ON ***resets all latched alarms (if no longer in alarm)***, *default OFF*

L118 RW ON ***asserts alarm blocking [until alarm(s) are in non-alarm state]***, *default OFF*

L119 RW ON ***PV tare function enabled while Status Input 2 is ON***, *default OFF*

L120 RW ON ***all alarms are disabled while Status Input 2 is ON (forces non-alarm state)***, *default OFF*

L121 RW ON ***analogue output hold (freeze) while Status Input 2 is ON***, *default OFF*

L122 RW ON ***PID output manual power while Status Input 2 is ON***, *default OFF*

L123 RW ON ***PID output manual power while Status Input 2 is ON***, *default OFF*

L124 RW ON ***PID integral hold while Status Input 2 is ON***, *default OFF*

L125 RW ON ***PID integral hold while Status Input 2 is ON***, *default OFF*

L126 *RESERVED*
L127 *RESERVED*
L128 *RESERVED*
L129 *RESERVED*
L130 *RESERVED*
L131 *RESERVED*
L132 *RESERVED*
L133 *RESERVED*
L134 *RESERVED*
L135 *RESERVED*
L136 *RESERVED*
L137 *RESERVED*

L138 ***Sensor break point type***, *default 1*

L139 ***SP/PV deviation ramp hold***, *default OFF*

L140 *RESERVED*
L141 *RESERVED*
L142 *RESERVED*
L143 *RESERVED*
L144 *RESERVED*

L145 *RESERVED*
L146 *RESERVED*
L147 *RESERVED*
L148 *RESERVED*
L149 *RESERVED*
L150 *RESERVED*
L151 *RESERVED*

L152 RW ***PWM 1 duty source***, *TBA*

L153 RW ***PWM 2 duty source***, *TBA*

L154 RO ON ***PWM 1 state (high = ON)***

L155 RO ON ***PWM 2 state (high = ON)***

L156 RW ON ***defaults all analogue and logic locations to factory settings***, *self-clearing to OFF*

L157 *RESERVED*
L158 *RESERVED*

L159 RW ON ***sample input value and store reading – calibration***, *self-clearing to OFF*

L160 RW ON ***implement new scaling***, *self-clearing to OFF*

L161 RW ON ***implement power-up reset***, *self-clearing to OFF*

L162 RW ON ***reset maximum/minimum values***, *self-clearing to OFF*

L163 RW ON ***clear user PV zero offset (to zero)***, *self-clearing to OFF*

L164 RW ON ***zero PV***, *self-clearing to OFF*

L165 RW ON ***tare***

L166 RW ON ***disable all alarms (forces all alarms to their non-alarm state)***, *default OFF*

L167 RW ON ***analogue output hold (freeze)***, *default OFF*

L168 RW ON ***reset all latched alarms (if alarm condition has cleared)***, *default OFF*

L169 *RESERVED*
L170 *RESERVED*
L171 *RESERVED*
L172 *RESERVED*

L173 RW ON ***PID manual power enabled***, *default OFF*

L174 RW ON ***PID 2 settings enabled***, (OFF = PID 1 settings enabled), *default OFF*

L175 RW ON ***PID integral hold***, *default OFF*

L176 RW ON ***PID 1 shot tune enable***, *self-clearing to OFF*

L177 RW ON ***PID auto/manual select (OFF=Auto)***, *default OFF*

L178 *RESERVED*
L179 *RESERVED*
L180 *RESERVED*

L181 RW ON ***ADC reads all inputs once, then resumes normal sampling sequence***, *self-clearing to OFF*

L182 *RESERVED*
L183 *RESERVED*

L184 RO ON ***Analogue Output Module fitted***, (OFF = no analogue output fitted)

L185 RO ON ***Relay Module fitted***, (OFF = transducer supply fitted)

L186 RO ON ***Relay Module with 1× SSR drive + 1× relay output fitted or 2× relays (T331)***

L187 RO ON ***2nd output is a SSR drive (T331)***

L188 RO ON ***Expansion Module fitted***, (OFF = no Expansion Module fitted)

L189 RO ON ***Expansion Module detected and accepted as a Logic Module (T340)***

L191 RO ON ***front panel configuration jack plug inserted***

L193 RW ON ***DTPI protocol 7-digit mode for this session only***, (OFF = 5 digit), *default OFF*

L194 RW ON ***lowers priority of RTU communications so other tasks delayed less***, *default OFF*

L195 RW ON ***allows >125 locations to be read when using MODBUS RTU***

L196 *RESERVED*

L197 RW ON ***write protects all locations for this session only***, *default OFF*

L198 RW ON ***write protects all setup locations for this session only***, *default OFF*

L199 RW ON ***2 stop bits for this session only***, (OFF = 1 stop bit), *default OFF*

L200 RW ON ***MODBUS RTU protocol enable for this session only***, *default OFF*