13   Diagnostics

The display on the drive gives various information about the status of the drive. These fall into three categories:

- Trip indications
- Alarm indications
- Status indications

![WARNING] Users must not attempt to repair a drive if it is faulty, nor carry out fault diagnosis other than through the use of the diagnostic features described in this chapter.
If a drive is faulty, it must be returned to an authorized Control Techniques distributor for repair.

13.1   Trip indications

If the drive trips, the output of the drive is disabled so that the drive stops controlling the motor. The lower display indicates that a trip has occurred and the upper display shows the trip. If this is a multi-module drive and a power module has indicated a trip, then the upper display will alternate between the trip string and the module number.

Trips are listed alphabetically in Table 13-1 based on the trip indication shown on the drive display. Refer to Figure 13-1.

If a display is not used, the drive LED Status indicator will flash if the drive has tripped. Refer to Figure 13-2.

The trip indication can be read in Pr **10.20** providing a trip number. Trip numbers are listed in numerical order in Table 13-2 so the trip indication can be cross referenced and then diagnosed using Table 13-1.

Example
1. Trip code 3 is read from Pr **10.20** via serial communications.
2. Checking Table 13-2 shows Trip 3 is an OI.AC trip.

No.	Trip
3	OI.AC
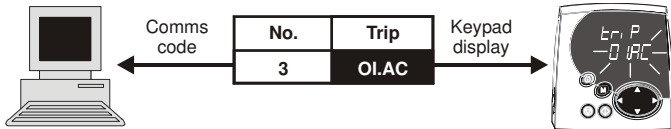
3. Look up OI.AC in Table 13-1.
4. Perform checks detailed under *Diagnosis*.
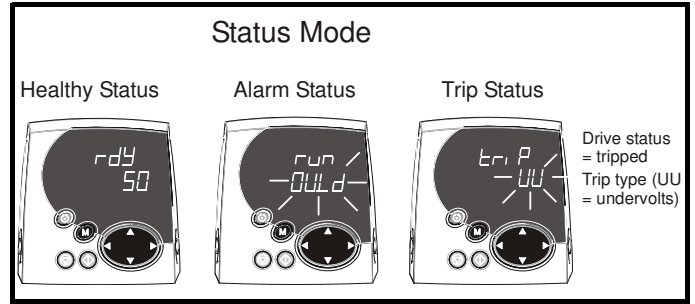
Figure 13-1   Keypad status modes

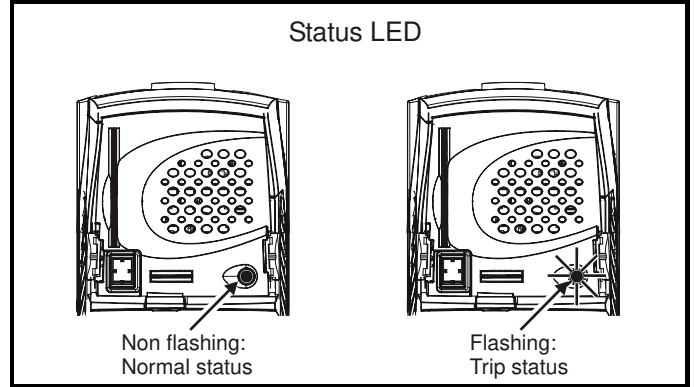**Figure 13-2   Location of the status LED**

Trip	Diagnosis
OI.AC	**Instantaneous output over current detected: peak output current greater than 225%**
3	Acceleration / deceleration rate is too short. If seen during autotune reduce voltage boost Pr **5.15** Check for short circuit on output cabling Check integrity of motor insulation Check feedback device wiring Check feedback device mechanical coupling Check feedback signals are free from noise Is motor cable length within limits for that frame size? Reduce the values in speed loop gain parameters – Pr **3.10**, Pr **3.11** and Pr **3.12** (closed loop vector and servo modes only) Has offset measurement test been completed? (servo mode only) Reduce the values in current loop gain parameters - Pr **4.13** and Pr **4.14** (closed loop vector and servo modes only)

Table 13-1   Trip indications

Trip	Diagnosis
C.Acc	**SMARTCARD trip: SMARTCARD Read / Write fail**
185	Check SMARTCARD is fitted / located correctly Replace SMARTCARD
C.boot	**SMARTCARD trip: The menu 0 parameter modification cannot be saved to the SMARTCARD because the necessary file has not been created on the SMARTCARD**
177	A write to a menu 0 parameter has been initiated via the keypad with Pr **11.42** set to auto(3) or boot(4), but the necessary file on the SMARTCARD has not bee created Ensure that Pr **11.42** is correctly set and reset the drive to create the necessary file on the SMARTCARD Re-attempt the parameter write to the menu 0 parameter
C.bUSY	**SMARTCARD trip: SMARTCARD can not perform the required function as it is being accessed by a Solutions Module**
178	Wait for the Solutions Module to finish accessing the SMARTCARD and then re-attempt the required function
C.Chg	**SMARTCARD trip: Data location already contains data**
179	Erase data in data location Write data to an alternative data location
C.cPr	**SMARTCARD trip: The values stored in the drive and the values in the data block on the SMARTCARD are different**
188	Press the red ⊝ reset button
C.dAt	**SMARTCARD trip: Data location specified does not contain any data**
183	Ensure data block number is correct
C.Err	**SMARTCARD trip: SMARTCARD data is corrupted**
182	Ensure the card is located correctly Erase data and retry Replace SMARTCARD
C.Full	**SMARTCARD trip: SMARTCARD full**
184	Delete a data block or use different SMARTCARD
cL2	**Analogue input 2 current loss (current mode)**
28	Check analogue input 2 (terminal 7) current signal is present (4-20mA, 20-4mA)
cL3	**Analogue input 3 current loss (current mode)**
29	Check analogue input 3 (terminal 8) current signal is present (4-20mA, 20-4mA)
CL.bit	**Trip initiated from the control word (Pr 6.42)**
35	Disable the control word by setting Pr **6.43** to 0 or check setting of Pr **6.42**
C.OPtn	**SMARTCARD trip: Solutions Modules fitted are different between source drive and destination drive**
180	Ensure correct Solutions Modules are fitted Ensure Solutions Modules are in the same Solutions Module slot Press the red ⊝ reset button
C.rdo	**SMARTCARD trip: SMARTCARD has the Read Only bit set**
181	Enter 9777 in Pr **xx.00** to allow SMARTCARD Read / Write access Ensure card is not writing to data locations 500 to 999

Trip	Diagnosis
C.rtg	**SMARTCARD trip: SMARTCARD attempting to change the destination drive ratings** **No drive rating parameters have been transferred**
186	Press the red ⊖ reset button Drive rating parameters are: | Parameter	Function
2.08	Standard ramp voltage
4.05/6/7, **21.27/8/9**	Current limits
4.24	User current maximum scaling
5.07, **21.07**	Motor rated current
5.09, **21.09**	Motor rated voltage
5.10, **21.10**	Rated power factor
5.17, **21.12**	Stator resistance
5.18	Switching frequency
5.23, **21.13**	Voltage offset
5.24, **21.14**	Transient inductance
5.25, **21.24**	Stator inductance
6.06	DC injection braking current
6.48	Mains loss ride through detection level | The above parameters will be set to their default values.
C.TyP	**SMARTCARD trip: SMARTCARD parameter set not compatible with drive**
187	Press the reset button Ensure destination drive type is the same as the source parameter file drive type
dESt	**Two or more parameters are writing to the same destination parameter**
199	Set Pr **xx.00** = 12001 check all visible parameters in the menus for duplication
EEF	**EEPROM data corrupted - Drive mode becomes open loop and serial comms will timeout with remote keypad on the drive RS485 comms port.**
31	This trip can only be cleared by loading default parameters and saving parameters
Enc1	**Drive encoder trip: Encoder power supply overload**
189	Check encoder power supply wiring and encoder current requirement Maximum current = 200mA @ 15V, or 300mA @ 8V and 5V
Enc2	**Drive encoder trip: Wire break (Drive encoder terminals 1 & 2, 3 & 4, 5 & 6)**
190	Check cable continuity Check wiring of feedback signals is correct Check encoder power is set correctly Replace feedback device If wire break detection on the main drive encoder input is not required, set Pr **3.40** = 0 to disable the Enc2 trip
Enc3	**Drive encoder trip: Phase offset incorrect whilst running**
191	Check the encoder signal for noise Check encoder shielding Check the integrity of the encoder mechanical mounting Repeat the offset measurement test
Enc4	**Drive encoder trip: Feedback device comms failure**
192	Ensure encoder power supply is correct Ensure baud rate is correct Check encoder wiring Replace feedback device
Enc5	**Drive encoder trip: Checksum or CRC error**
193	Check the encoder signal for noise Check the encoder cable shielding With EnDat encoders, check the comms resolution and/or carry out the auto-configuration Pr **3.41**
Enc6	**Drive encoder trip: Encoder has indicated an error**
194	Replace feedback device With SSI encoders, check the wiring and encoder supply setting

Trip	Diagnosis
Enc7	**Drive encoder trip: Initialisation failed**
195	Re-set the drive Check the correct encoder type is entered into Pr **3.38** Check encoder wiring Check encoder power supply is set correctly Carry out the auto-configuration Pr **3.41** Replace feedback device
Enc8	**Drive encoder trip: Auto configuration on power up has been requested and failed**
196	Change the setting of Pr **3.41** to 0 and manually enter the drive encoder turns (Pr **3.33**) and the equivalent number of lines per revolution (Pr **3.34**) Check the comms resolution
Enc9	**Drive encoder trip: Position feedback selected is selected from a Solutions Module slot which does not have a speed / position feedback Solutions Module fitted**
197	Check setting of Pr **3.26** (or Pr **21.21** if the second motor parameters have been enabled)
Enc10	**Drive encoder trip: Servo mode phasing failure because encoder phase angle (Pr 3.25 or Pr 21.20) is incorrect**
198	Check the encoder wiring. Perform an autotune to measure the encoder phase angle or manually enter the correct phase angle into Pr **3.25** (or Pr **21.20**). Spurious Enc10 trips can be seen in very dynamic applications. This trip can be disabled by setting the overspeed threshold in Pr **3.08** to a value greater than zero. Caution should be used in setting the over speed threshold level as a value which is too large may mean that an encoder fault will not be detected.
Enc11	**Drive encoder trip: A failure has occurred during the alignment of the analogue signals of a SINCOS encoder with the digital count derived from the sine and cosine waveforms and the comms position (if applicable). This fault is usually due to noise on the sine and cosine signals.**
161	Check encoder cable shield. Examine sine and cosine signals for noise.
Enc12	**Drive encoder trip: Hiperface encoder - The encoder type could not be identified during auto-configuration**
162	Check encoder type can be auto-configured. Check encoder wiring. Enter parameters manually.
Enc13	**Drive encoder trip: EnDat encoder - The number of encoder turns read from the encoder during auto-configuration is not a power of 2**
163	Select a different type of encoder.
Enc14	**Drive encoder trip: EnDat encoder - The number of comms bits defining the encoder position within a turn read from the encoder during auto-configuration is too large.**
164	Select a different type of encoder. Faulty encoder.
Enc15	**Drive encoder trip: The number of periods per revolution calculated from encoder data during auto-configuration is either less than 2 or greater than 50,000.**
165	Linear motor pole pitch / encoder ppr set up is incorrect or out of parameter range i.e. Pr **5.36** = 0 or Pr **21.31** = 0. Faulty encoder.
Enc16	**Drive encoder trip: EnDat encoder - The number of comms bits per period for a linear encoder exceeds 255.**
166	Select a different type of encoder. Faulty encoder.
Enc17	**Drive encoder trip: The periods per revolution obtained during auto-configuration for a rotary SINCOS encoder is not a power of two.**
167	Select a different type of encoder. Faulty encoder.
ENP.Er	**Data error from electronic nameplate stored in selected position feedback device**
176	Replace feedback device
Et	**External trip from input on terminal 31**
6	Check terminal 31 signal Check value of Pr **10.32** Enter 12001 in Pr **xx.00** and check for parameter controlling Pr **10.32** Ensure Pr **10.32** or Pr **10.38** (=6) are not being controlled by serial comms
HF01	**Data processing error: CPU address error**
	Hardware fault - return drive to supplier

Trip	Diagnosis
HF02	**Data processing error: DMAC address error**
	Hardware fault - return drive to supplier
HF03	**Data processing error: Illegal instruction**
	Hardware fault - return drive to supplier
HF04	**Data processing error: Illegal slot instruction**
	Hardware fault - return drive to supplier
HF05	**Data processing error: Undefined exception**
	Hardware fault - return drive to supplier
HF06	**Data processing error: Reserved exception**
	Hardware fault - return drive to supplier
HF07	**Data processing error: Watchdog failure**
	Hardware fault - return drive to supplier
HF08	**Data processing error: Level 4 crash**
	Hardware fault - return drive to supplier
HF09	**Data processing error: Heap overflow**
	Hardware fault - return drive to supplier
HF10	**Data processing error: Router error**
	Hardware fault - return drive to supplier
HF11	**Data processing error: Access to EEPROM failed**
	Hardware fault - return drive to supplier
HF12	**Data processing error: Main program stack overflow**
	Hardware fault - return drive to supplier
HF13	**Data processing error: Software incompatible with hardware**
	Hardware or software fault - return drive to supplier
HF17	**Multi-module system thermistor short circuit**
217	Hardware fault - return drive to supplier
HF18	**Multi-module system interconnect cable error**
218	Hardware fault - return drive to supplier
HF19	**Temperature feedback multiplexing failure**
219	Hardware fault - return drive to supplier
HF20	**Power stage recognition: serial code error**
220	Hardware fault - return drive to supplier
HF21	**Power stage recognition: unrecognised frame size**
221	Hardware fault - return drive to supplier
HF22	**Power stage recognition: multi module frame size mismatch**
222	Hardware fault - return drive to supplier
HF23	**Power stage recognition: multi module voltage rating mismatch**
223	Hardware fault - return drive to supplier
HF24	**Power stage recognition: unrecognised drive size**
224	Hardware fault - return drive to supplier
HF25	**Current feedback offset error**
225	Hardware fault - return drive to supplier
HF26	**Soft start relay failed to close, soft start monitor failed or braking IGBT short circuit at power up**
226	Hardware fault - return drive to supplier
HF27	**Power stage thermistor 1 fault**
227	Hardware fault - return drive to supplier

Trip	Diagnosis
HF28	**Power stage thermistor 2 fault or internal fan fault (size 3 and larger)**
228	Hardware fault - return drive to supplier
HF29	**Control board thermistor fault**
229	Hardware fault - return drive to supplier
HF30	**DCCT wire break trip from power module**
230	Hardware fault - return drive to supplier
HF31	**Aux fan failure from power module**
231	Replace auxiliary fan
HF32	**Power stage - a module has not powered up in a multi-module parallel drive**
232	Check AC power supply
It.AC	**Output current overload timed out (I^2t) - accumulator value can be seen in Pr 4.19**
20	Ensure the load is not jammed / sticking Check the load on the motor has not changed If seen during an autotune in servo mode, ensure that the motor rated current Pr **0.46** (Pr **5.07**) or Pr **21.07** is ≤Heavy Duty current rating of the drive Tune the rated speed parameter (closed loop vector only) Check feedback device signal for noise Check the feedback device mechanical coupling
It.br	**Braking resistor overload timed out (I^2t) – accumulator value can be seen in Pr 10.39**
19	Ensure the values entered in Pr **10.30** and Pr **10.31** are correct Increase the power rating of the braking resistor and change Pr **10.30** and Pr **10.31** If an external thermal protection device is being used and the braking resistor software overload is not required, set Pr **10.30** or Pr **10.31** to 0 to disable the trip
L.SYnC	**Drive failed to synchronise to the supply voltage in Regen mode**
39	Refer to the *Diagnostics* chapter in the *Unidrive SP Regen Installation Guide*.
O.CtL	**Drive control board over temperature**
23	Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Check ambient temperature Reduce drive switching frequency
O.ht1	**Power device over temperature based on thermal model**
21	Reduce drive switching frequency Reduce duty cycle Decrease acceleration / deceleration rates Reduce motor load
O.ht2	**Heatsink over temperature**
22	Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Increase ventilation Decrease acceleration / deceleration rates Reduce drive switching frequency Reduce duty cycle Reduce motor load
Oht2.P	**Power module heatsink over temperature**
105	Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Increase ventilation Decrease acceleration / deceleration rates Reduce drive switching frequency Reduce duty cycle Reduce motor load

Trip	Diagnosis
O.ht3	**Drive over-temperature based on thermal model**
27	The drive will attempt to stop the motor before tripping. If the motor does not stop in 10s the drive trips immediately. Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Increase ventilation Decrease acceleration / deceleration rates Reduce duty cycle Reduce motor load
Oht4.P	**Power module rectifier over temperature or input snubber resistor over temperature (size 4 and above)**
102	Check for supply imbalance Check for supply disturbance such as notching from a DC drive Check cubicle / drive fans are still functioning correctly Check cubicle ventilation paths Check cubicle door filters Increase ventilation Decrease acceleration / deceleration rates Reduce drive switching frequency Reduce duty cycle Reduce motor load
OI.AC	**Instantaneous output over current detected: peak output current greater than 225%**

3	Acceleration /deceleration rate is too short.
	If seen during autotune reduce voltage boost Pr **5.15**
	    Check for short circuit on output cabling
	    Check integrity of motor insulation
	    Check feedback device wiring
	    Check feedback device mechanical coupling
	    Check feedback signals are free from noise
	Is motor cable length within limits for that frame size?
	    Reduce the values in speed loop gain parameters – Pr **3.10**, Pr **3.11** and Pr **3.12** (closed loop vector and servo modes only)
	Has offset measurement test been completed? (servo mode only)
	    Reduce the values in current loop gain parameters - Pr **4.13** and Pr **4.14** (closed loop vector and servo modes only)

OIAC.P	**Power module over current detected from the module output currents**

104	Acceleration /deceleration rate is too short.
	If seen during autotune reduce voltage boost Pr **5.15**
	    Check for short circuit on output cabling
	    Check integrity of motor insulation
	    Check feedback device wiring
	    Check feedback device mechanical coupling
	    Check feedback signals are free from noise
	Is motor cable length within limits for that frame size?
	    Reduce the values in speed loop gain parameters – Pr **3.10**, Pr **3.11** and Pr **3.12** (closed loop vector and servo modes only)
	Has offset measurement test been completed? (servo mode only)
	Reduce the values in current loop gain parameters - Pr **4.13** and Pr **4.14** (closed loop vector and servo modes only)

OI.br	**Braking transistor over-current detected: short circuit protection for the braking transistor activated**
4	Check braking resistor wiring Check braking resistor value is greater than or equal to the minimum resistance value Check braking resistor insulation
OIbr.P	**Power module braking IGBT over current**
103	Check braking resistor wiring Check braking resistor value is greater than or equal to the minimum resistance value Check braking resistor insulation
OIdC.P	**Power module over current detected from IGBT on state voltage monitoring**
109	Vce IGBT protection activated. Check motor and cable insulation.
O.Ld1	**Digital output overload: total current drawn from 24V supply and digital outputs exceeds 200mA**
26	Check total load on digital outputs (terminals 24,25,26)and +24V rail (terminal 22)
O.SPd	**Motor speed has exceeded the over speed threshold**
7	Increase the over speed trip threshold in Pr **3.08** (closed loop modes only) Speed has exceeded 1.2 x Pr **1.06** or Pr **1.07** (open loop mode) Reduce the speed loop P gain (Pr **3.10**) to reduce the speed overshoot (closed loop modes only)

Trip	Diagnosis
OV	**DC bus voltage has exceeded the peak level or the maximum continuous level for 15 seconds**

2	Increase deceleration ramp (Pr **0.04**)
	Decrease braking resistor value (staying above the minimum value)
	Check nominal AC supply level
	Check for supply disturbances which could cause the DC bus to rise – voltage overshoot after supply recovery from a notch induced by DC drives.
	Check motor insulation
	
	Drive voltage rating **Peak voltage** **Maximum continuous voltage level (15s)**
	    200 415 410
	    400 830 815
	    575 990 970
	    690 1190 1175
	If the drive is operating in low voltage DC mode the overvoltage trip level is 1.45 x Pr **6.46**.

OV.P	**Power module DC bus voltage has exceeded the peak level or the maximum continuous level for 15 seconds**

106	Increase deceleration ramp (Pr **0.04**)
	Decrease braking resistor value (staying above the minimum value)
	Check nominal AC supply level
	Check for supply disturbances which could cause the DC bus to rise – voltage overshoot after supply recovery from a notch induced by DC drives.
	Check motor insulation
	
	Drive voltage rating **Peak voltage** **Maximum continuous voltage level (15s)**
	    200 415 410
	    400 830 815
	    575 990 970
	    690 1190 1175
	If the drive is operating in low voltage DC mode the overvoltage trip level is 1.45 x Pr **6.46**.

PAd	**Keypad has been removed when the drive is receiving the speed reference from the keypad**
34	Fit keypad and reset Change speed reference selector to select speed reference from another source
Ph	**AC voltage input phase loss or large supply imbalance detected**
32	Ensure all three phases are present and balanced Check input voltage levels are correct (at full load) **NOTE** Load level must be between 50 and 100% for the drive to trip under phase loss conditions. The drive will attempt to stop the motor before this trip is initiated.
Ph.P	**Power module phase loss detection**
107	Ensure all three phases are present and balanced Check input voltage levels are correct (at full load)
PS	**Internal power supply fault**
5	Remove any Solutions Modules and reset Check integrity of interface ribbon cables and connections (size 4,5,6 only) Hardware fault - return drive to supplier
PS.10V	**10V user power supply current greater than 10mA**
8	Check wiring to terminal 4 Reduce load on terminal 4
PS.24V	**24V internal power supply overload**
9	The total user load of the drive and Solutions Modules has exceeded the internal 24V power supply limit. The user load consists of the drive's digital outputs, the SM-I/O Plus digital outputs, the drive's main encoder supply and the SM-Universal Encoder Plus encoder supply. • Reduce load and reset • Provide an external 24V >50W power supply • Remove any Solutions Modules and reset
PS.P	**Power module power supply fail**
108	Remove any Solutions Modules and reset Check integrity of interface ribbon cables and connections (size 4,5,6 only) Hardware fault - return drive to supplier
PSAVE.Er	**Power down save parameters in the EEPROM are corrupt**
37	Indicates that the power was removed when power down save parameters were being saved. The drive will revert back to the power down parameter set that was last saved successfully. Perform a user save (Pr **xx.00** to 1000 or 1001 and reset the drive) or power down the drive normally to ensure this trip does or occur the next time the drive is powered up.

Trip	Diagnosis
rS	**Failure to measure resistance during autotune or when starting in open loop vector mode 0 or 3**
33	Check motor power connection continuity
SAVE.Er	**User save parameters in the EEPROM are corrupt**
36	Indicates that the power was removed when user parameters were being saved. The drive will revert back to the user parameter set that was last saved successfully. Perform a user save (Pr **xx.00** to 1000 or 1001 and reset the drive) to ensure this trip does or occur the next time the drive is powered up.
SCL	**Drive RS485 serial comms loss to remote keypad**
30	Refit the cable between the drive and keypad Check cable for damage Replace cable Replace keypad
SLX.dF	**Solutions Module slot X trip: Solutions Module type fitted in slot X changed**
204,209,214	Save parameters and reset

Trip	Diagnosis
SLX.Er	**Solutions Module slot X trip: Solutions Module in slot X has detected a fault**

Feedback module category

Check value in Pr **15**/**16**/**17.50**. The following table lists the possible error codes for the SM-Universal Encoder Plus, SM-Encoder Plus and SM-Resolver. See the *Diagnostics* section in the relevant Solutions Module User Guide for more information.

Trip	Error code	Module	Trip Description	Diagnostic
202,207,212	0	All	No trip	No fault detected
	1	SM-Universal Encoder Plus	Encoder power supply overload	Check encoder power supply wiring and encoder current requirement Maximum current = 200mA @ 15V, or 300mA @ 8V and 5V
		SM-Resolver	Excitation output short circuit	Check the excitation output wiring.
	2	SM-Universal Encoder Plus & SM-Resolver	Wire break	Check cable continuity Check wiring of feedback signals is correct Check supply voltage or excitation output level Replace feedback device
	3	SM-Universal Encoder Plus	Phase offset incorrect whilst running	Check the encoder signal for noise Check encoder shielding Check the integrity of the encoder mechanical mounting Repeat the offset measurement test
	4	SM-Universal Encoder Plus	Feedback device communications failure	Ensure encoder power supply is correct Ensure baud rate is correct Check encoder wiring Replace feedback device
	5	SM-Universal Encoder Plus	Checksum or CRC error	Check the encoder signal for noise Check the encoder cable shielding
	6	SM-Universal Encoder Plus	Encoder has indicated an error	Replace encoder
	7	SM-Universal Encoder Plus	Initialisation failed	Check the correct encoder type is entered into Pr **15**/**16**/**17.15** Check encoder wiring Check supply voltage level Replace feedback device
	8	SM-Universal Encoder Plus	Auto configuration on power up has been requested and failed	Change the setting of Pr **15**/**16**/**17.18** and manually enter the number of turns (Pr **15**/**16**/**17.09**) and the equivalent number of lines per revolution (Pr **15**/**16**/**17.10**)
	9	SM-Universal Encoder Plus	Motor thermistor trip	Check motor temperature Check thermistor continuity
	10	SM-Universal Encoder Plus	Motor thermistor short circuit	Check motor thermistor wiring Replace motor / motor thermistor
	11	SM-Universal Encoder Plus	Failure of the sincos analogue position alignment during encoder initialisation	Check encoder cable shield. Examine sine and cosine signals for noise.
		SM-Resolver	Poles not compatible with motor	Check that the correct number of resolver poles has been set in Pr **15**/**16**/**17.15**.
	12	SM-Universal Encoder Plus	Encoder type could not be identified during auto-configuration	Check encoder type can be auto-configured. Check encoder wiring. Enter parameters manually.
	13	SM-Universal Encoder Plus	Number of encoder turns read from the encoder during auto-configuration is not a power of 2	Select a different type of encoder.
	14	SM-Universal Encoder Plus	Number of comms bits defining the encoder position within a turn read from the encoder during auto-configuration is too large.	Select a different type of encoder. Faulty encoder.
	15	SM-Universal Encoder Plus	The number of periods per revolution calculated from encoder data during auto-configuration is either <2 or >50,000.	Linear motor pole pitch / encoder ppr set up is incorrect or out of parameter range i.e. Pr **5.36** = 0 or Pr **21.31** = 0. Faulty encoder.
	16	SM-Universal Encoder Plus	The number of comms bits per period for a linear encoder exceeds 255.	Select a different type of encoder. Faulty encoder.
	74	All	Solutions Module has overheated	Check ambient temperature Check cubicle ventilation

Trip	Diagnosis
SLX.Er	**Solutions Module slot X trip: Solutions Module in slot X has detected a fault**

Automation (Applications) module category

Check value in Pr **15**/**16**/**17.50**. The following table lists the possible error codes for the SM-Applications and SM-Applications Lite. See the *Diagnostics* section in the relevant Solutions Module User Guide for more information.

Error Code	Trip Description
39	User program stack overflow
40	Unknown error - please contact supplier
41	Parameter does not exist
42	Attempt to write to a read-only parameter
43	Attempt to read from a write-only parameter
44	Parameter value out of range
45	Invalid synchronisation modes
46	Unused
47	Synchronisation lost with CTSync Master
48	RS485 not in user mode
49	Invalid RS485 configuration
50	Maths error - divide by zero or overflow
51	Array index out of range
52	Control word user trip
53	DPL program incompatible with target
54	DPL task overrun
55	Unused
56	Invalid timer unit configuration
57	Function block does not exist
58	Flash PLC Storage corrupt
59	Drive rejected application module as Sync master
60	CTNet hardware failure. Please contact your supplier
61	CTNet invalid configuration
62	CTNet invalid baud-rate
63	CTNet invalid node ID
64	Digital Output overload
65	Invalid function block parameter(s)
66	User heap too large
67	RAM file does not exist or a non-RAM file id has been specified
68	The RAM file specified is not associated to an array
69	Failed to update drive parameter database cache in Flash memory
70	User program downloaded while drive enabled
71	Failed to change drive mode
72	Invalid CTNet buffer operation
73	Fast parameter initialisation failure
74	Over-temperature
75	Hardware unavailable
76	Module type cannot be resolved. Module is not recognised.
77	Inter-option module comms error with module in slot 1
78	Inter-option module comms error with module in slot 2
79	Inter-option module comms error with module in slot 3
80	Inter-option module comms error with module unknown slot
81	APC internal error
82	Communcations to drive faulty

(Trip: **202,207,212**)

Trip	Diagnosis
SLX.Er	**Solutions Module slot X trip: Solutions Module in slot X has detected a fault**

SLX.Er — **202,207,212**

Automation (I/O Expansion) module category

Check value in Pr **15**/**16**/**17.50**. The following table lists the possible error codes for the SM-I/O Plus, SM-I/O Lite, SM-I/O Timer, SM-PELV and SM-I/O 120V modules. See the *Diagnostics* section in the relevant Solutions Module User Guide for more information.

Error code	Module	Reason for fault
0	All	No errors
1	All	Digital output overload
2	SM-I/O Lite, SM-I/O Timer	Analogue input 1 current input too high (>22mA) or too low (<3mA)
	SM-PELV	Digital input overload
3	SM-PELV	Analogue input 1 current input too low (<3mA)
4	SM-PELV	User power supply absent
5	SM-I/O Timer	Real time clock communication error
74	All	Module over temperature

SLX.Er	**Solutions Module slot X trip: Solutions Module in slot X has detected a fault**

SLX.Er — **202,207,212**

Fieldbus module category

Check value in Pr **15**/**16**/**17.50**. The following table lists the possible error codes for the Fieldbus modules. See the *Diagnostics* section in the relevant Solutions Module User Guide for more information.

Error code	Module	Trip Description
0	All	No trip
52	SM-PROFIBUS-DP, SM-Interbus, SM-DeviceNet, SM-CANOpen	User control word trip
61	SM-PROFIBUS-DP, SM-Interbus, SM-DeviceNet, SM-CANOpen, SM-SERCOS	Configuration error
64	SM-DeviceNet	Expected packet rate timeout
65	SM-PROFIBUS-DP, SM-Interbus, SM-DeviceNet, SM-CANOpen, SM-SERCOS	Network loss
66	SM-PROFIBUS-DP	Critical link failure
	SM-CAN, SM-DeviceNet, SM-CANOpen	Bus off error
69	SM-CAN	No acknowledgement
70	All (except SM-Ethernet)	Flash transfer error
	SM-Ethernet	No valid menu data available for the module from the drive
74	All	Solutions module over temperature
75	SM-Ethernet	The drive is not responding
76	SM-Ethernet	The Modbus connection has timed out
80	All (except SM-SERCOS)	Inter-option communications error
81	All (except SM-SERCOS)	Communications error to slot 1
82	All (except SM-SERCOS)	Communications error to slot 2
83	All (except SM-SERCOS)	Communications error to slot 3
84	SM-Ethernet	Memory allocation error
85	SM-Ethernet	File system error
86	SM-Ethernet	Configuration file error
87	SM-Ethernet	Language file error
98	All	Internal watchdog error
99	All	Internal software error

Trip	Diagnosis
SLX.Er	**Solutions Module slot X trip: Solutions Module in slot X has detected a fault**

	SLM module category
	Check value in Pr **15**/**16**/**17.50**. The following table lists the possible error codes for the SM-SLM. See the *Diagnostics* section in the *SM-SLM User Guide* for more information.

202,207,212

Error Code	Trip Description
0	No fault detected
1	Power supply overloaded
2	SLM version is too low
3	DriveLink error
4	Incorrect switching frequency selected
5	Feedback source selection incorrect
6	Encoder error
7	Motor object number of instances error
8	Motor object list version error
9	Performance object number of instances error
10	Parameter channel error
11	Drive operating mode incompatible
12	Error writing to the SLM EEPROM
13	Motor object type incorrect
14	Unidrive SP object error
15	Encoder object CRC error
16	Motor object CRC error
17	Performance object CRC error
18	Unidrive SP object CRC error
19	Sequencer timeout
74	Solutions module over temperature

Trip	Diagnosis
SLX.HF	**Solutions Module slot X trip: Solutions Module X hardware fault**
200,205,210	Ensure Solutions Module is fitted correctly Return Solutions Module to supplier
SLX.nF	**Solutions Module slot X trip: Solutions Module has been removed**
203,208,213	Ensure Solutions Module is fitted correctly Re-fit Solutions Module Save parameters and reset drive
SL.rtd	**Solutions Module trip: Drive mode has changed and Solutions Module parameter routing is now incorrect**
215	Press reset. If the trip persists, contact the supplier of the drive.
SLX.tO	**Solutions Module slot X trip: Solutions Module watchdog timeout**
201,206,211	Press reset. If the trip persists, contact the supplier of the drive.
t010	**User trip defined in 2nd processor Solutions Module code**
10	SM-Applications program must be interrogated to find the cause of this trip
t038	**User trip defined in 2nd processor Solutions Module code**
38	SM-Applications program must be interrogated to find the cause of this trip
t040 to t089	**User trip defined in 2nd processor Solutions Module code**
40 to 89	SM-Applications program must be interrogated to find the cause of this trip
t099	**User trip defined in 2nd processor Solutions Module code**
99	SM-Applications program must be interrogated to find the cause of this trip
t101	**User trip defined in 2nd processor Solutions Module code**
101	SM-Applications program must be interrogated to find the cause of this trip
t111 to t160	**User trip defined in 2nd processor Solutions Module code**
111 to 160	SM-Applications program must be interrogated to find the cause of this trip

Trip	Diagnosis
t168 to t175	**User trip defined in 2nd processor Solutions Module code**
168 to 175	SM-Applications program must be interrogated to find the cause of this trip
t216	**User trip defined in 2nd processor Solutions Module code**
216	SM-Applications program must be interrogated to find the cause of this trip
th	**Motor thermistor trip**
24	Check motor temperature Check thermistor continuity Set Pr **7.15** = VOLt and reset the drive to disable this function
thS	**Motor thermistor short circuit**
25	Check motor thermistor wiring Replace motor / motor thermistor Set Pr **7.15** = VOLt and reset the drive to disable this function
tunE*	**Autotune stopped before completion**
18	The drive has tripped out during the autotune The red stop key has been pressed during the autotune The secure disable signal (terminal 31) was active during the autotune procedure
tunE1*	**The position feedback did not change or required speed could not be reached during the inertia test (see Pr 5.12)**
11	Ensure the motor is free to turn i.e. brake was released Check feedback device wiring is correct Check feedback parameters are set correctly Check encoder coupling to motor
tunE2*	**Position feedback direction incorrect or motor could not be stopped during the inertia test (see Pr 5.12)**
12	Check motor cable wiring is correct Check feedback device wiring is correct Swap any two motor phases (closed loop vector only)
tunE3*	**Drive encoder commutation signals connected incorrectly or measured inertia out of range (see Pr 5.12)**
13	Check motor cable wiring is correct Check feedback device U,V and W commutation signal wiring is correct
tunE4*	**Drive encoder U commutation signal fail during an autotune**
14	Check feedback device U phase commutation wires continuity Replace encoder
tunE5*	**Drive encoder V commutation signal fail during an autotune**
15	Check feedback device V phase commutation wires continuity Replace encoder
tunE6*	**Drive encoder W commutation signal fail during an autotune**
16	Check feedback device W phase commutation wires continuity Replace encoder
tunE7*	**Motor number of poles set incorrectly**
17	Check lines per revolution for feedback device Check the number of poles in Pr **5.11** is set correctly
Unid.P	**Power module unidentified trip**
110	Check all interconnecting cables between power modules Ensure cables are routed away from electrical noise sources
UP ACC	**Onboard PLC program: cannot access Onboard PLC program file on drive**
98	Disable drive - write access is not allowed when the drive is enabled Another source is already accessing Onboard PLC program - retry once other action is complete
UP div0	**Onboard PLC program attempted divide by zero**
90	Check program
UP OFL	**Onboard PLC program variables and function block calls using more than the allowed RAM space (stack overflow)**
95	Check program
UP ovr	**Onboard PLC program attempted out of range parameter write**
94	Check program
UP PAr	**Onboard PLC program attempted access to a non-existent parameter**
91	Check program

Trip	Diagnosis
UP ro	**Onboard PLC program attempted write to a read-only parameter**
92	Check program
UP So	**Onboard PLC program attempted read of a write-only parameter**
93	Check program
UP udF	**Onboard PLC program un-defined trip**
97	Check program
UP uSEr	**Onboard PLC program requested a trip**
96	Check program
UV	**DC bus under voltage threshold reached**
1	Check AC supply voltage level **Drive voltage rating (Vac)** **Under voltage threshold (Vdc)** 200 175 400 350 575 & 690 435

*If a tunE through tunE 7 trip occurs, then after the drive is reset the drive cannot be made to run unless it is disabled via the Secure Disable input (terminal 31), drive enable parameter (Pr **6.15**) or the control word (Pr **6.42** and Pr **6.43**).

Table 13-2   Serial communications look-up table

No.	Trip	No.	Trip	No.	Trip
1	UV	40 to 89	t040 to t089	184	C.FULL
2	OV	90	UP div0	185	C.Acc
3	OI.AC	91	UP PAr	186	C.rtg
4	OI.br	92	UP ro	187	C.TyP
5	PS	93	UP So	188	C.cPr
6	Et	94	UP ovr	189	EnC1
7	O.SPd	95	UP OFL	190	EnC2
8	PS.10V	96	UP uSEr	191	EnC3
9	PS.24V	97	UP udF	192	EnC4
10	t010	98	UP ACC	193	EnC5
11	tunE1	99	t099	194	EnC6
12	tunE2	100		195	EnC7
13	tunE3	101	t101	196	EnC8
14	tunE4	102	Oht4.P	197	EnC9
15	tunE5	103	OIbr.P	198	EnC10
16	tunE6	104	OIAC.P	199	DESt
17	tunE7	105	Oht2.P	200	SL1.HF
18	tunE	106	OV.P	201	SL1.tO
19	It.br	107	PH.P	202	SL1.Er
20	It.AC	108	PS.P	203	SL1.nF
21	O.ht1	109	OIdC.P	204	SL1.dF
22	O.ht2	110	Unid.P	205	SL2.HF
23	O.CtL	111 to 160	t111 to t160	206	SL2.tO
24	th	161	Enc11	207	SL2.Er
25	thS	162	Enc12	208	SL2.nF
26	O.Ld1	163	Enc13	209	SL2.dF
27	O.ht3	164	Enc14	210	SL3.HF
28	cL2	165	Enc15	211	SL3.tO
29	cL3	166	Enc16	212	SL3.Er
30	SCL	167	Enc17	213	SL3.nF
31	EEF	168 to 175	t168 to t175	214	SL3.dF
32	PH	176	EnP.Er	215	SL.rtd
33	rS	177	C.boot	216	t216
34	PAd	178	C.bUSY	217	HF17
35	CL.bit	179	C.Chg	218	HF18
36	SAVE.Er	180	C.OPtn	219	HF19
37	PSAVE.Er	181	C.RdO	220 to 232	HF20 to HF32
38	t038	182	C.Err		
39	L.SYnC	183	C.dAt		

The trips can be grouped into the following categories. It should be noted that a trip can only occur when the drive is not tripped or is already tripped but with a trip with a lower priority number.

Table 13-3   Trip categories

Priority	Category	Trips	Comments
1	Hardware faults	HF01 to HF16	These indicate fatal problems and cannot be reset. The drive is inactive after one of these trips and the display shows **HFxx**. The Drive Healthy relay opens and the serial comms will not function.
2	Non-resetable trips	HF17 to HF32, SL1.HF, SL2.HF, SL3.HF	Cannot be reset. Requires the drive to be powered down.
3	EEF trip	EEF	Cannot be reset unless a code to load defaults is first entered in Pr **xx.00** or Pr **11.43**.
4	SMARTCARD trips	C.boot, C.Busy, C.Chg, C.OPtn, C.RdO, C.Err, C.dat, C.FULL, C.Acc, C.rtg, C.TyP, C.cpr	Can be reset after 1.0s SMARTCARD trips have priority 5 during power-up
4	Encoder power supply trips	PS.24V, EnC1	Can be reset after 1.0s These trips can only override the following priority 5 trips: EnC2 to EnC8 or Enc11 to Enc17
5	Autotune	tunE, tunE1 to tunE7	Can be reset after 1.0s, but the drive cannot be made to run unless it is disabled via the Secure Disable input (terminal 31), *Drive enable* (Pr **6.15**) or the *Control word* (Pr **6.42** and Pr **6.43**).
5	Normal trips with extended reset	OI.AC, OI.Br, OIAC.P, OIBr.P, OldC.P	Can be reset after 10.0s
5	Normal trips	All other trips not included in this table	Can be reset after 1.0s
5	Non-important trips	th, thS, Old1, cL2, cL3, SCL	If Pr **10.37** is 1 or 3 the drive will stop before tripping
5	Phase loss	PH	The drive attempts to stop before tripping
5	Drive over-heat based on thermal model	O.ht3	The drive attempts to stop before tripping, but if it does not stop within 10s the drive will automatically trip
6	Self-resetting trips	UV	Under voltage trip cannot be reset by the user, but is automatically reset by the drive when the supply voltage is with specification

Although the UV trip operates in a similar way to all other trips, all drive functions can still operate but the drive cannot be enabled. The following differences apply to the UV trip:

1. Power-down save user parameters are saved when UV trip is activated except when the main high voltage supply is not active (i.e. operating in Low Voltage DC Supply Mode, Pr **6.44** = 1).
2. The UV trip is self-resetting when the DC bus voltage rises above the drive restart voltage level. If another trip is active instead of UV at this point, the trip is not reset.
3. The drive can change between using the main high voltage supply and low voltage DC supply only when the drive is in the under voltage condition (Pr **10.16** = 1). The UV trip can only be seen as active if another trip is not active in the under voltage condition.
4. When the drive is first powered up a UV trip is initiated if the supply voltage is below the restart voltage level and another trip is not active. This does not cause save power down save parameters to be saved at this point.

13.2   Alarm indications

In any mode an alarm flashes alternately with the data displayed on the 2nd row when one of the following conditions occur. If action is not taken to eliminate any alarm except "Autotune" the drive may eventually trip.

Table 13-4   Alarm indications

Lower display	Description
br.rS	Braking resistor overload
Braking resistor I^{2}t accumulator (Pr **10.37**) in the drive has reached 75.0% of the value at which the drive will trip and the braking IGBT is active.	
Hot	Heatsink or control board or inverter IGBT over temperature alarms are active
• The drive heatsink temperature has reached a threshold and the drive will trip O.ht2 if the temperature continues to rise (see the O.ht2 trip). Or • The ambient temperature around the control PCB is approaching the over temperature threshold (see the O.CtL trip).	
OVLd	Motor overload
The motor I^{2}t accumulator in the drive has reached 75% of the value at which the drive will be tripped and the load on the drive is >100%	

13.3   Status indications

Table 13-5   Status indications

Upper display	Description	Drive output stage
ACt	Regeneration mode active	Enabled
The regen unit is enabled and synchronised to the supply.		
ACUU	AC Supply loss	Enabled
The drive has detected that the AC supply has been lost and is attempting to maintain the DC bus voltage by decelerating the motor.		
*Auto tunE	Autotune in progress	Enabled
The autotune procedure has been initialised. *'Auto' and 'tunE' will flash alternatively on the display.		
dc	DC applied to the motor	Enabled
The drive is applying DC injection braking.		
dEC	Decelerating	Enabled
The drive is decelerating the motor.		
inh	Inhibit	Disabled
The drive is inhibited and cannot be run. The drive enable signal is not applied to terminal 31 or Pr **6.15** is set to 0.		
PLC	Onboard PLC program is running	Not applicable
An Onboard PLC program is fitted and running. The lower display will flash 'PLC' once every 10s.		
POS	Positioning	Enabled
The drive is positioning/orientating the motor shaft.		
rdY	Ready	Disabled
The drive is ready to be run.		
run	Running	Enabled
The drive is running.		
SCAn	Scanning	Enabled
OL> The drive is searching for the motor frequency when synchronising to a spinning motor. Regen> The drive is enabled and is synchronising to the line.		
StoP	Stop or holding zero speed	Enabled
The drive is holding zero speed. Regen> The drive is enabled but the AC voltage is too low, or the DC bus voltage is still rising or falling.		
triP	Trip condition	Disabled
The drive has tripped and is no longer controlling the motor. The trip code appears on the lower display.		

Table 13-6   Solutions Module and SMARTCARD status indications at power-up

Lower display	Description
boot	
A parameter set is being transferred from the SMARTCARD to the drive during power-up. For further information, please refer to section 9.2.4 *Booting up from the SMARTCARD on every power up (Pr 11.42 = boot (4))* on page 153.	
cArd	
The drive is writing a parameter set to the SMARTCARD during power-up. For further information, please refer to section 9.2.3 *Auto saving parameter changes (Pr 11.42 = Auto (3))* on page 153.	
loAding	
The drive is writing information to a Solutions Module.	

13.4   Displaying the trip history

The drive retains a log of the last 10 trips that have occurred in Pr **10.20** to Pr **10.29** and the corresponding multi-module drive module number (Pr **6.49** = 1) or the trip time (Pr **6.49** = 0) for each trip in Pr **10.41** to Pr **10.51**. The time of the trip is recorded from the powered-up clock (if Pr **6.28** = 0) or from the run time clock (if Pr **6.28** = 1).

Pr **10.20** is the most recent trip, or the current trip if the drive is in a trip condition (with the module number or trip time stored in Pr **10.41** and Pr **10.42**). Pr **10.29** is the oldest trip (with the module number or trip time stored in Pr **10.51**). Each time a new trip occurs, all the parameters move down one, such that the current trip (and time) is stored in Pr **10.20** (and Pr **10.41** to Pr **10.42**) and the oldest trip (and time) is lost out of the bottom of the log.

If any parameter between Pr **10.20** and Pr **10.29** inclusive is read by serial communications, then the trip number in Table 13-1 *Trip indications* on page 276 is the value transmitted.