

Z155, ST3000 Autopilot Service Manual

Warning

CE Marking of Equipment/Replacement Parts

If the Autohelm equipment under repair, test, calibration, installation or setting to work carries the European CE mark, only parts and components supplied or approved for such use by Raytheon should be used in order to maintain compliance with the relevant CE requirements.

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Chapter 1. Before Dismantling

Before dismantling the autohelm ST3000 check the phase of the autopilot (If PCB condition allows) by driving the pilot, in standby mode, with the course change keys.

	+10 key	-10 key
Aft facing actuator	Clockwise actuator rotation	Anticlockwise actuator rotation
Forward facing actuator	Anticlockwise actuator rotation	Clockwise actuator rotation

All new spares PCBs are factory set to operate the pilot with the drive unit facing aft. A replacement PCB for an installation with the drive unit facing forward requires resetting.

To reset the operating sense press the +1° and -1° course keys together for 5 seconds.

The unit beeps for 10 seconds to confirm changeover and the display shows the new setting, either 'Port' (actuator sprocket facing forward) or 'Starb' (actuator sprocket facing aft).

The autopilot may be calibrated to suit a particular vessel. Note the calibration settings and set up the new PCB if required.

If the spares PCB contains software of a higher issue than before then the relevant Operating Supplement must be supplied when the equipment is returned to the customer.

Note: Replacement PCBs require setting up to ST3000.
Refer to *Autopilot type selection* on page 3 for instructions.

Chapter 2. Special Functions

Display test

A display test feature included in ST3000 software checks that the display assembly has been re-fitted correctly. Display test is switched on by momentarily pressing the -1° and +10° keys together

The display scrolls all four characters through from 0 to 9 and then displays each annotation. This sequence continues until either the 'Standby' or 'Auto' key is pressed or the unit is powered down.

Autopilot type selection

The Autohelm range of cockpit pilots all contain the same software but each pilot runs a different program. This is contained within the same chip but needs to be selected as follows:

1. Press the -10° and +1° degree keys until the display shows the pilot type number (Approximately 5 seconds)
2. Press the -10° and +1° degree keys again until the display flashes the pilot type number (Approximately 5 seconds)
3. Select the correct pilot type using the +1° and -1° degree keys
4. Save the setting by pressing the -10° and +1° degree keys until the normal Standby display appears (Approximately 2 seconds)

Note: Changing Autopilot type will clear all calibration settings.

Display of software code

The software code of the pilot can be displayed as follows:

1. Switch the pilot to standby mode
2. Press the Standby key until the display shows P followed by a number. (Approximately 10 seconds)

The number indicates the version of software fitted, e.g. P 0 6 indicates Version 6 software

Calibration lockout

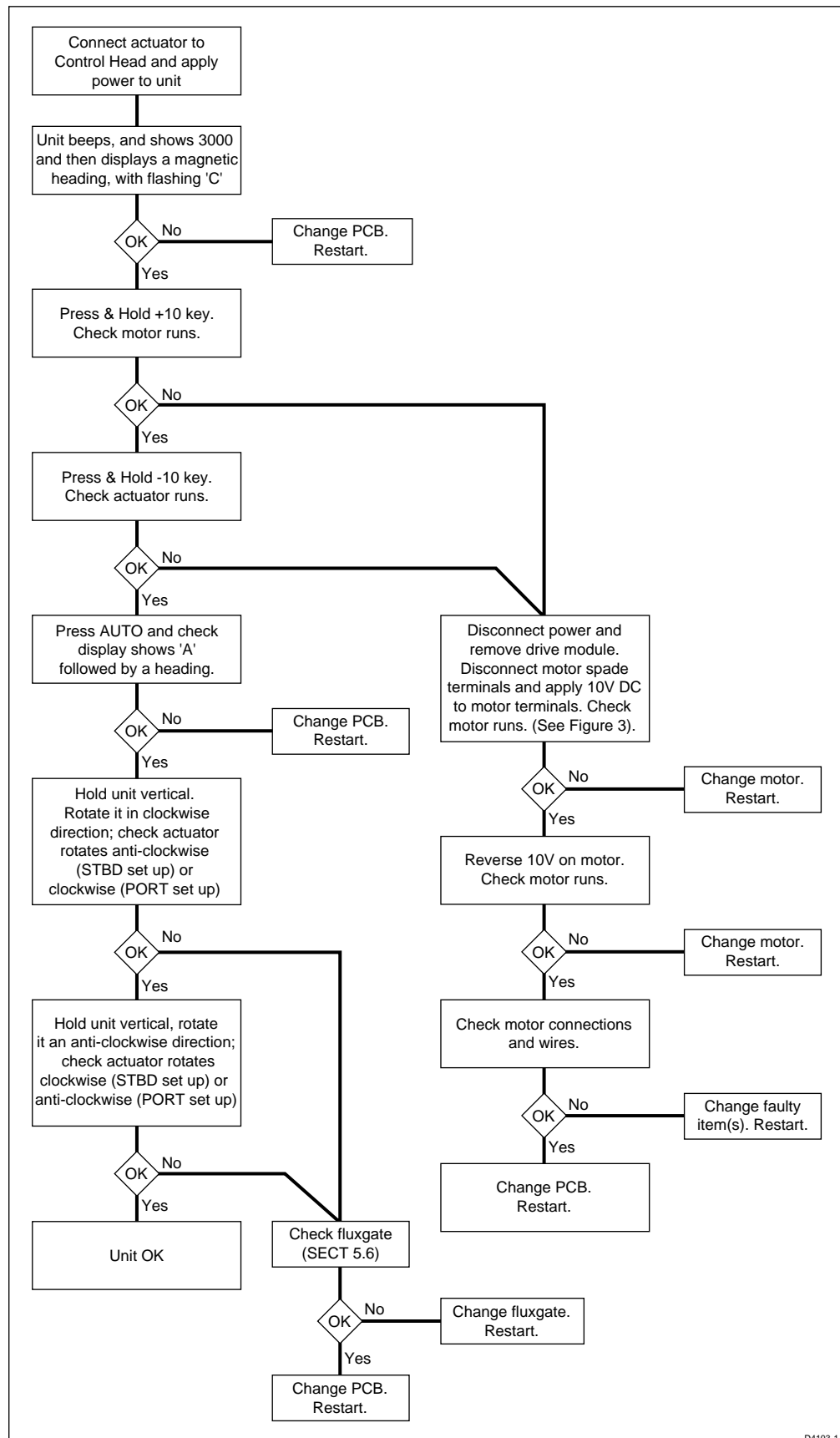
To stop access to compass linearisation and calibration functions on the ST3000 autopilot:

1. Press the -1° and Standby keys for 10 seconds until the display shows CAL ON (or CAL OFF)
2. Toggle between CAL ON and CAL OFF using the -1° and +1° keys
3. Store the selected setting by pressing the -1° and Standby keys for 10 seconds, when the control head returns to normal operation.

Any attempt to linearise the compass or enter calibration when the lockout function is enabled will result in the display showing Cal Off. In this condition the user cannot change any settings.

Chapter 3. Functional Test

Overall function



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Fluxgate compass assembly

Remove the fluxgate assembly (see Figure 2).

The compass can be checked with a DVM as follows:

Connect meter across	Resistance
1 and 2	<10 ohms
3 and 5	< 5 ohms
3 and 4	< 5 ohms
1 and 3	Open circuit

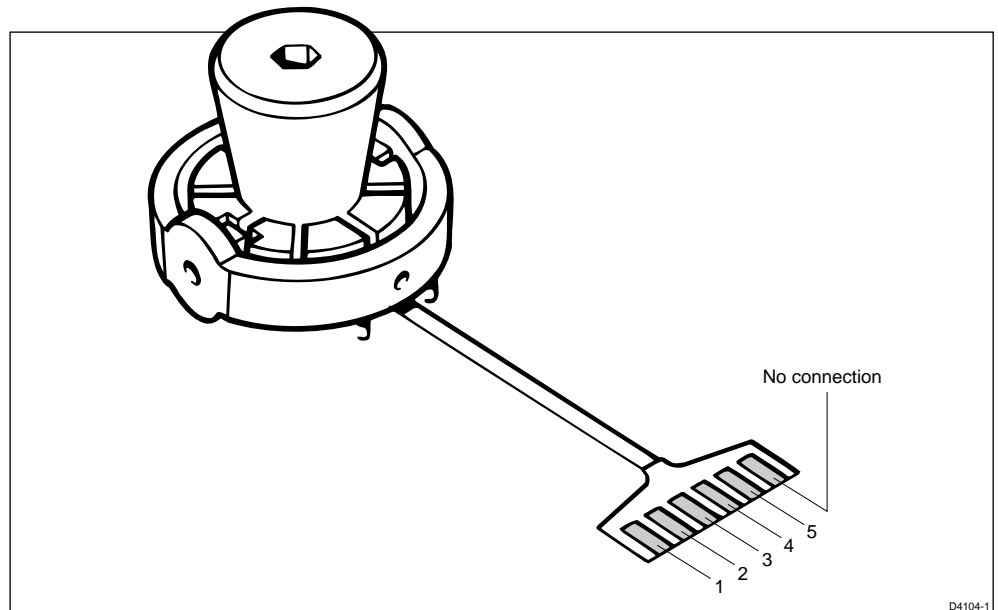
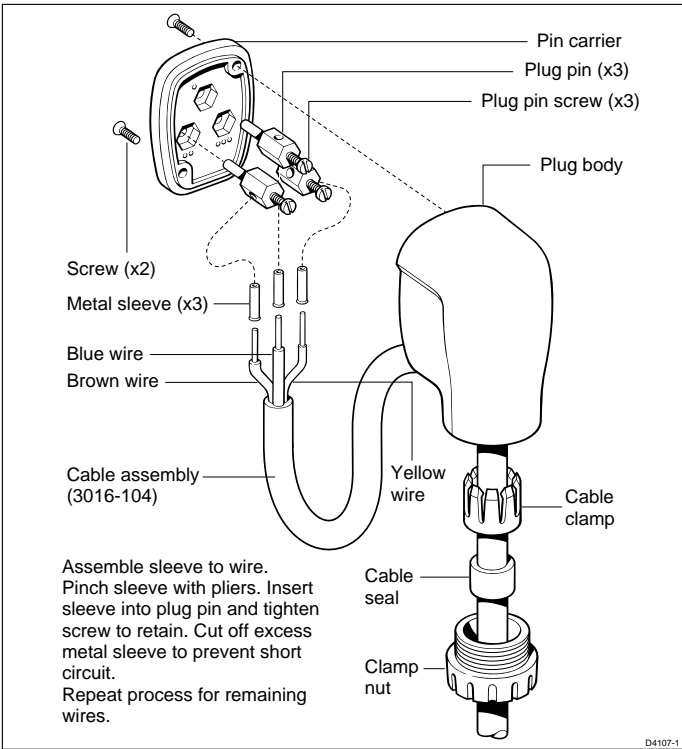


Figure 1. Fluxgate electrical connections

Chapter 4. Disassembly/Assembly

SeaTalk Deck Plug



Electrical connections

Wire colour	Description
Brown	+12V nominal supply
Blue	0V supply

ST3000 Autopilot Display Unit

Spare parts list

The **item** numbers refer to Figure 2: ST3000 Autopilot display unit.

Item	Spare Description	Part No.	Comments
–	Control Head	Q056	Complete head
	LCD kit, <i>including</i>	Q053	
4	LCD surround		
5	LCD		
6	Elastomer		
7	Diffuser		
8	Reflector		
27	Locking wedge (x5)		
9	PCB assembly	Q044	LCD not included
13	Fluxgate assembly	M022	
30	SeaTalk deck plug assembly	D326	

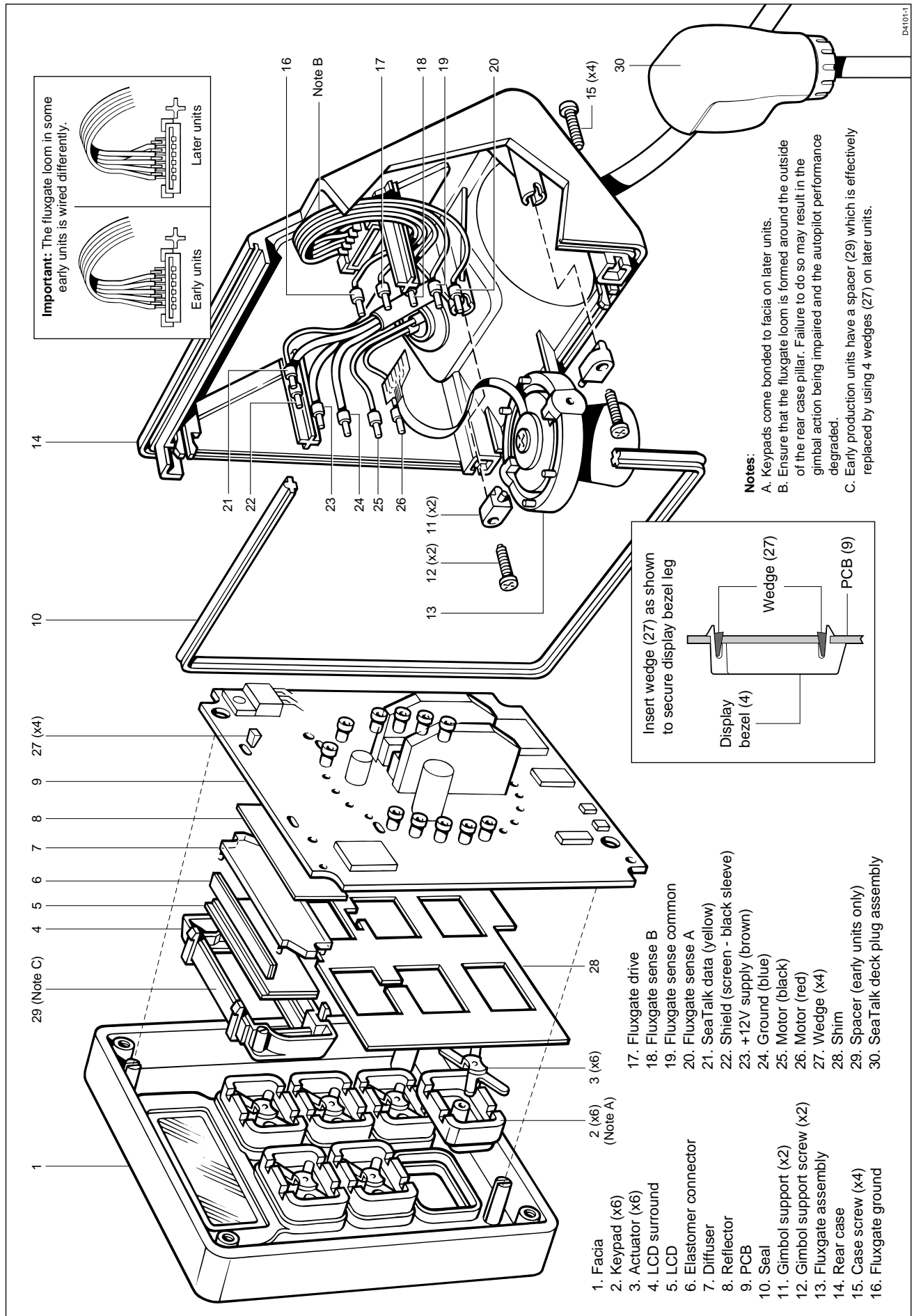


Figure 2: ST3000 Autopilot display unit

ST3000 Drive Actuator

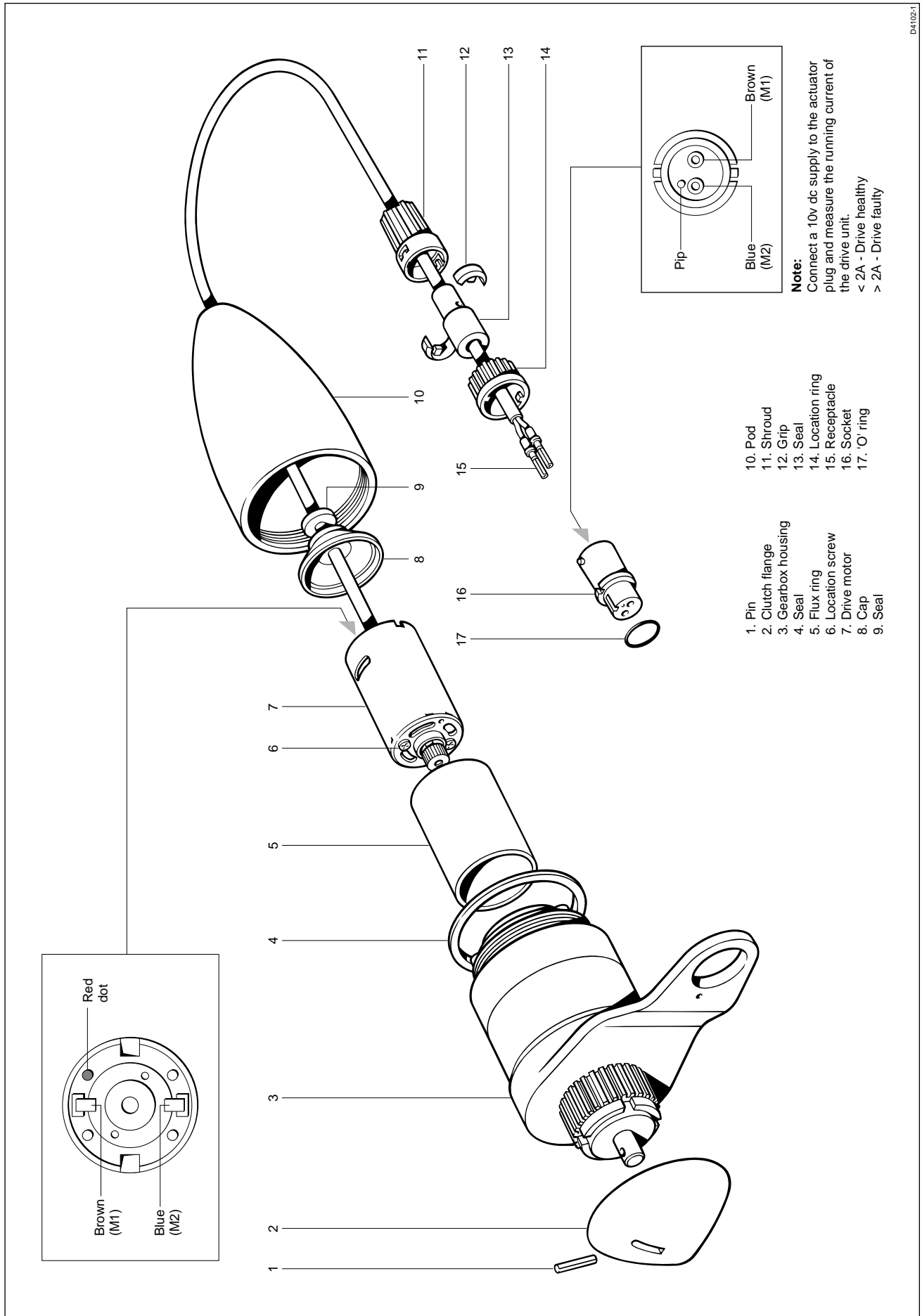
Spare parts list

The **item** numbers refer to Figure 3: ST3000 Autopilot drive actuator.

Item	Spare Description	Part No.	Comments
–	ST3000 drive module	Q45	Complete drive
	ST3000 Gearbox/Drive assembly, <i>including</i>	Q102	
1	Pin		
2	Clutch flange		
3	Gearbox housing		
4	Seal		
2,1	Clutch flange & pin	H006	Also part of Q102
7	Motor	Q101	
10	Pod	H001	

Motor replacement

If the gearbox is noisy when the motor is replaced, remove motor, rotate gearbox a small amount, and refit.



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Figure 3. ST3000 Drive Actuator

Chapter 5. PCB Details

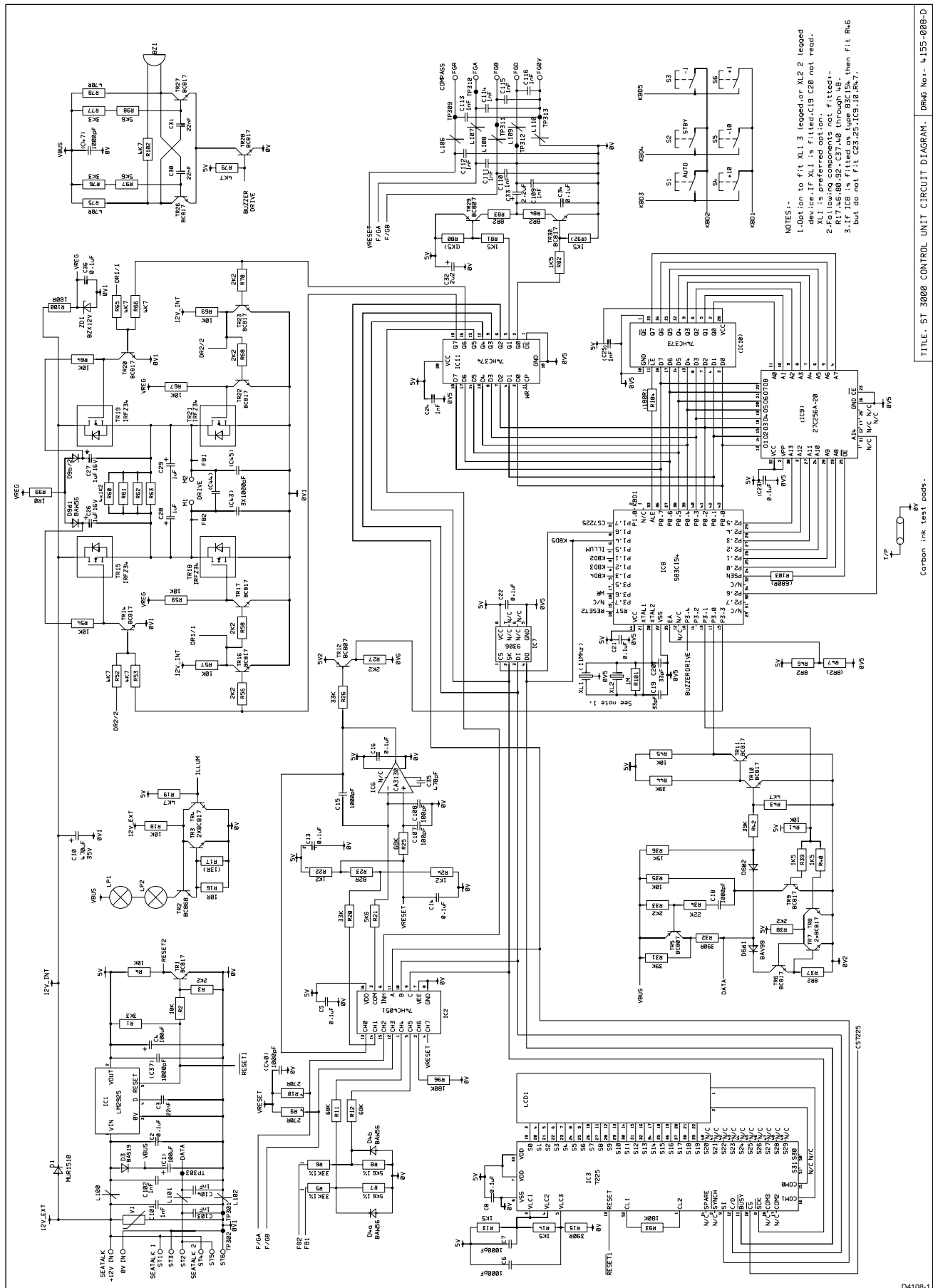


Figure 4: Circuit Diagram

PCB Layout

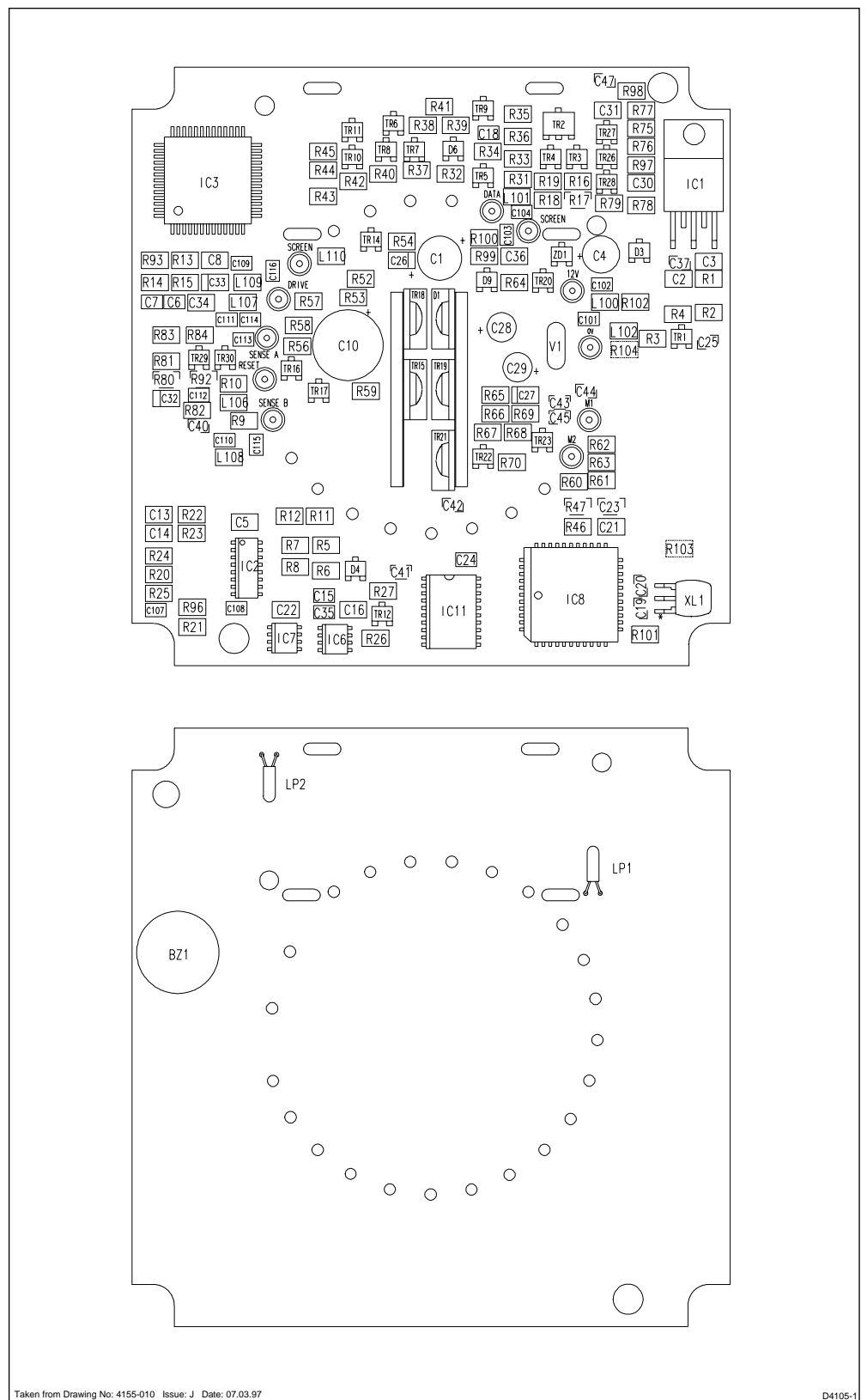


Figure 5: PCB Component Layout

PCB Component list

4155-006	HEATSINK S'ASSY (A)	
4155-007	HEATSINK S'ASSY (B)	
3015-052	P.C.B DETAIL	
3030-035	SOCKET	
01051	VARIATOR ERZCO7DK270 ZNR TYPE 0	V1
15167	MINIATURE LAMP (CM 683 INT) 5V 60mA	LP1,2
15120	COLOUR IDENT LABEL (GREEN)	
EITHER		
15127	CERAMIC RESONATOR CERALOCK (3 PINS)	XL1
OR		
15085	CERAMIC RESONATOR CERALOCK CSA 11.0MT	(XL2)
15136	BUZZER SERIES AT-17 SUB MINIATURE	BZ1
04049	REGULATOR 5V WITH RESET LM2925	IC1
940074HC4051	ANALOG SWITCH CD74HC4051M 8 CHANNEL	IC2
94077225G	LCD DISPLAY DRIVER 7225G-00 (NEC)	IC3
9408S83C154	MICROCONTROLLER 32K MASK S83C154 44PIN PLCC	IC8
9400CA3130	CA3130 OP AMP	IC6
940093061	EEPROM 16 x 16 M93061M1 SGS	IC7
940374374	OCTAL D-TYPE FLIP-FLOP LATCH 8 BITS PC74HC374	IC11
9200BAS19	DIODE SOT23 BAS19	D3
9200BAW56	DIODE SOT23 BAW56	D4,D9
9200BAV99	DIODE SOT23 BAV99	D6
9203BZX12V	ZENER DIODE BZX12V	ZD1
9500BC817	TRANSISTOR SOT23 BC817 NPN	TR1,3,4,6,7,8,9,10,11,TR14,16,17,20,22,23,26,27,28,30
9501BC868	TRANSISTOR SOT89 BC868 NPN	TR2
9500BC807	TRANSISTOR SOT23 BC807 PNP	TR5,12,29
91063K3	RESISTOR 1206 3K3 5% 0.125W	R1,76,77
910610K	RESISTOR 1206 10K 5% 0.125W	R2,4,18,35,41,45,R54,59,64,67,57,69
91062K2	RESISTOR 1206 2K2 5% 0.125W	R3,27,33,38,R56,58,68,70
91035K6	RESISTOR 1206 5K6 1% 0.125W	R7,8,21,97,98
910368K	RESISTOR 1206 68K 1% 0.125W	R11,12,25
9103270R	RESISTOR 1206 270R 1% 0.125W	R9,10
9103180K	RESISTOR 1206 180K 1% 0.125W	R93,96
910310R	RESISTOR 1206 10R 1% 0.125W	R16
910313R	RESISTOR 1206 13R 1% 0.125W	(R17)
910333K	RESISTOR 1206 33K 1% 0.125W	R5,6,20,26
91031K2	RESISTOR 1206 1K2 1% 0.125W	R22,24,60,61,62,63
910639K	RESISTOR 1206 39K 5% 0.125W	R31,42,44
91064K7	RESISTOR 1206 4K7 5% 0.125W	R19,43,52,53,102,R65,66,79
9106390R	RESISTOR 1206 390R 5% 0.125W	R15,R32
910622K	RESISTOR 1206 22K 5% 0.125W	R34
910315K	RESISTOR 1206 15K 1% 0.125W	R36
91068R2	RESISTOR 1206 8R2 5% 0.125W	R37,46,(47),83,84
91031K5	RESISTOR 1206 1K5 1% 0.125W	R13,14,R39,40,(80),81,82,(92)
9106470R	RESISTOR 1206 470R 5% 0.125W	R75,78
910382R	RESISTOR 1206 82R 1% 0.125W	R23
91031M	RESISTOR 1206 1M 1% 0.125W	R101
91061R0	RESISTOR 1206 1R0 5% 0.125W	R99
9106180R	RESISTOR 1206 180R 5% 0.125W	R100,(104)
03063	CAPACITOR ELECTROLYTIC 100uF ϕ 20% 25V MIN ϕ 7.5 MAX	C1
03067	CAPACITOR TANTALUM 100uF +/-20% 6V3 2.5mm PITCH	C4
93091U	CAPACITOR TANT 1206 1uF 10% 16V	C26,27
03069	CAPACITOR ELECTROLYTIC 470uF ϕ 20% 35V MIN ϕ 12MM MAX. LENGTH 20MM MAX.	C10
93070U1	CAPACITOR X7R 1206 0.1uF 20% 50V	C2,5,8,13,14,C16,21,22,(23),34,36
930522N	CAPACITOR X7R 1206 22nF 5% 50V	C3,30,31
93041000P	CAPACITOR COG 0805 1000pF 2% 50V	C6,7,18,24,101-104,R109-116,(C25,37,40-45,47)
930133P	CAPACITOR COG 0805 33pF 5% 50V	(C19),(20)
9302470P	CAPACITOR COG 0805 470pF 10% 50V	C35
03050	CAPACITOR ELECTROLYTIC 1uF ϕ 20% 63V MIN ϕ 5MM MAX. LENGTH 12MM MAX. PITCH 2MM.	C28,29
93102U2	CAPACITOR TANTALUM 2.2uF 20% 6V3 SIZE A	C32,33
9302100P	CAPACITOR COG 0805 100pF 10% 50V	C107,108
93001000P	CAPACITOR COG 0805 1000pF 10% 50V	C15
9106680R	RESISTOR 1206 680R 5% 0.125W	(R103)
9600L1	SOLID CHIP INDUCTORS	L100-102,106-110

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