

## DPAT Hispec test/calibration results.

Production No. Date

Drg List Iss. Concessions ....

Serial No.

## Processor production test @95v

110v	[ ]	Keyboard	[	Batt V	(3.1-3.25v)
E Bond	[ ]	Comms		Unreg V	(14.75-15.25v)
EEPROM	[ ]	Watchdog	[	+5v	(4.9-5.1v)
RAM	[ ]			-5v	(-4.75 -5.0v)
				Pwr fail	(53-58v)

Initials

Calibration initial check at 110v +/- 1v.

Load user defined defaults

Measure and load Param 9 (High current EB scaling factor) [ ]

EB probe voltage	....	(120-140mV)
EB 26A 1.9 Ohm	..../..../....	(1.8-1.95Ohm)
EB 8A 1.9 Ohm	..../..../....	(1.8-1.95Ohm)
EB 100mA 1.9 Ohm	..../..../....	(1.8-1.95Ohm)
Fuse 9k	Pos 1	.... (P)
Fuse 11k	Pos 3	.... (F)
Insul 15.7 MOhm	Pos 1	..../..../.... (15.0 - 16.5MOhm)
Flash PN-E 2.25mA	Pos 2	.... (2.1-2.4mA)
Flash Probe 2.25mA	Pos 2	.... (2.1-2.4mA)
Run 0.6kVA/4.0mA	Pos 3	(P) .... (R) .... (L) .... (Pretest 0.5-0.6kVA, Run 0.5-0.6kVA, Leak 3.7-4.2mA)

Modify parameters if necessary (record new values).

0	750	(100mA sense)	....	12	5456	(Batt scale)	....
1	32768	(100mA scale)	....	13	1119	(Flash scale)	....
2	25	(Lead res)	....	14	8226	(Leak scale)	....
3	687	(8A sense)	....	15	14126	(Run scale)	....
4	120	(26A sense 1)	....	16	21848	(Pre sense)	
5	103	(26A sense 2)	....				
6	103	(26A sense 2)	....				
7	11414	(Fuse thresh)	....				
8	1257	(Insul scale)	....				
9	32768	(8/26A scale)	....				
10	46832	(Insul volts)	....				

## Calibration check at 240v+/-1v

EB	1.9 Ohm	26A	(1.85-1.94Ohm)
EB	1.9 Ohm	8A	(1.85-1.94Ohm)
EB	1.9 Ohm	100mA	(1.85-1.94Ohm)
EB	0.1 Ohm	26A	(0.09-1.10 Ohm)
EB	0.1 Ohm	8A	(0.09-1.10 Ohm)
EB	0.1 Ohm	100mA	(0.09-1.10 Ohm)
Fuse	9kOhm	Pos 1	(P)
Fuse	11kOhm	Pos 3	(F)
Insul	15.7MOhm	Pos 1	(15.3-16.1 MOhm)
Insul	2MOhm	Pos 2	(1.8-2.2 MOhm)
Insul	100kOhm	Pos 3	(0-0.1 MOhm)
Flash PN-E	0/C	Pos 4	(0.0mA)
Flash PN-E	10 kOhm	Pos 1	(>3mA)
Flash PN-E	270 kOhm	Pos 2	(2.1-2.4mA)
Flash PN-E	2MOhm	Pos 3	(0.6-0.7mA)
Flash Probe	0/C	Pos 4	(0.0mA)
Flash Probe	10 kOhm	Pos 1	(>3mA)
Flash Probe	270 kOhm	Pos 2	(2.1-2.4mA)
Flash Probe	2MOhm	Pos 3	(0.6-0.7mA)
Run 0kVA/0mA		Pos 4	(P) .... (R) .... (L) .... (Pretest N/A, Run 0.0kVA, Leak 0.0mA)
Run 0kVA/1.0mA		Pos 2	(P) .... (R) .... (L) .... (Pretest N/A, Run 0.0kVA, Leak 0.8-1.2mA)
Run 1kVA/9.7mA		Pos 3	(P) .... (R) .... (L) .... Volts .... (Pretest 0.9-1.1kVA, Run 1kVA +/- 0.1 @240, Leak 9.7mA +/- 0.5 @240v)
Run 3kVA/9.7mA		Pos 3	(P) .... (R) .... (L) .... Volts .... (Pretest 2.9-3.1kVA, Run 3kVA +/- 0.1 @240, Leak 9.7mA +/- 0.5 @240v)
IEC P-N correct			(P)
IEC EB @26A			(0.04-0.05 Ohm)
IEC P-N reversed			(F)

Calibration carried out by. (Init).

Title: Maintenance instructions Hispec DPAT

Drg ????

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Maintenance instructions : Hispec DPAT

Approved:

Title: Maintenance instructions Hispec DPAT

Drg ????

DOCUMENT HISTORY SHEET

DATE	ISS	REF	CHANGES	APPRVD
20.01.95	A		First draft.	

Issue: A

Date: 20.01.95

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## DPAT Hispec maintenance instructions

### 1. SAFETY

High voltages are present within the DPAT. i.e.

Mains at 240v.

Insulation test voltage at 400v ac.

Flash test voltage at 1500/3000v ac.

**DO NOT HANDLE THE DPAT ELECTRONICS WHEN POWER IS APPLIED TO THE UNIT.**

FOR TEST AND INVESTIGATION PURPOSES CONNECT THE DPAT TO THE MAINS VIA AN ISOLATING TRANSFORMER THAT HAS THE SECONDARY EARTH AND NEUTRAL COMMONED AND FLOATING WITH RESPECT TO THE MAINS EARTH.

MAINS POWERED TEST INSTRUMENTS SHOULD ALSO BE CONNECTED TO THE SAME SUPPLY.

If an isolating transformer is used as above an operator should be protected if he touches one side of a DPAT supply with one hand.

DO NOT APPLY POWER TO THE DPAT UNLESS THE TWO CIRCUIT BOARDS ARE SECURELY FIXED TO THE DPAT CHASSIS. OTHERWISE HIGH CURRENT AND/OR HIGH VOLTAGE POWER SUPPLIES CAN SHORT TO POINTS WHICH MAY CAUSE DAMAGE TO THE ELECTRONICS.

### 2. Access to the electronics.

Remove the 4 screws from the DPAT feet on the bottom of the case.

Open the lid of the DPAT and withdraw the chassis. Be careful not to damage the transformer wires that project from the back of the chassis.

Undo the 4 M4 nuts that hold the two halves of the chassis together and separate the two halves. If the chassis is turned so that the transformers are to the front, the front panel and circuit boards can be hinged towards you and laid flat on the bench. Be careful not to catch or trap any wires as the panel and 'U' section of the chassis are separated.

The upper (power) circuit board can be separated from the lower (processor) board by disconnecting the live and neutral wires from

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terminals TB18,19,21,22 removing the 4 screws at the corners of the power board, and lifting the power board to separate the interboard connectors. Once the connectors are separated the power board can be hinged backwards to gain access to the processor board.

### 3. Reassembly.

When reconnecting the power board to the processor board check to ensure that the connectors on the two boards are correctly mated. It is easy to incorrectly align the connectors (one pin out), or to bend one pin (usually the end one) so that it does not enter the female part of the connector.

Fit the four corner screws (with their lock washers). If it is difficult to line up the holes in the board with the mounting pillars check the alignment of the interboard connectors.

Reconnect the mains wires to TB18,19,21,22.

Hinge the front panel back onto the top of the 'U' section part of the chassis and locate the four studs in the front panel into the holes in the 'U' section flange. Be careful to avoid trapping cables. The cables should run as follows:-

- 1) The primary (brown,blue) wires from both transformers should run between the transformers and not be trapped in any way between the top of the transformers and the electronics. The tags which connect these wires to the circuit board should be clear of the transformers.
- 2) The 400v (grey wire) secondary from the large transformer should run along the back of the transformers to the horizontal PCB tags.
- 3) The Orange secondary from the large transformer should run down the side of the large transformer and not be trapped between the transformer and the circuit board. The green resistors on the circuit board get hot and will melt the insulation on the orange wire if it comes in contact.
- 4) The secondary (pink,yellow,black red) of the small high voltage transformer should run close to the bottom and side of the 'U' section chassis and not be bent upwards towards the PCBs.
- 5) The High Voltage probe cable (Red) should be pulled to

run towards the front of the 'U' section chassis.

6) The mains cable should not be trapped between the top of the transformers and the circuit boards.

Once the cables are laid correctly the front panel should seat on the flanges of the 'U' section chassis with the fixing studs located and the 4 nuts and lock washers can be fitted to hold the chassis sections together.

Insert the chassis into the outer case taking care not to stress or trap the wires at the back of the transformers.

Insert the 'feet' screws through the holes in the bottom of the case and into the bushes on the bottom of the chassis. Tighten the screws whilst holding the the chassis in place in the case.

Title: Parts List for DPAT Hispec PCB assy.

Drg 3252-00

Parts list: DPAT High specification PCB assy

Customer:

Project: 1407

pproved:

N.J. Lund

## DOCUMENT HISTORY SHEET

DATE	ISSUE	CHANGES	APPRVD
11.07.93	A	First issue.	NJL
16.11.93	B	First issue for preproduction prototypes	NJL
23.11.93	C	Second issue for preproduction prototypes	NJL
07.12.93	D	Third issue for preproduction prototypes	NJL
08.02.94	E	B model.	NJL
10.03.94	F	Initial production version. (B model + Iss 2 mod list)	NJL
28.03.94	1	Production version for release.	NJL
10.08.94	2	EC63 implemented.	

## Parts List: DPAT Hi specification

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
10	2	POWER RESISTOR OR22 9 WATT	WELWYN W23 OR22		R39, 44
20	4	POWER RESISTOR OR47 12 WATT	WELWYN W24 OR47		R7, 9, 10, 16
30	1	POWER RESISTOR OR68 9 WATT	WELWYN W23 OR68		R6
40	3	RESISTOR 1R 0.6W, 1%	PHILIPS MRS25-1R-1		R18, 19, 20,
42	2	RESISTOR 1R5 0.6W, 1%	PHILIPS MRS25-1R5-1		R21, 23
45	1	RESISTOR 8R2 3W 10% WIREWOUND	PHILIPS AC03-8R2		R3
50	1	RESISTOR 18R	PHILIPS MRS25-18R-1		R34
70	1	RESISTOR 100R 3W 10% WIREWOUND	PHILIPS AC03-100R		R62
80	7	RESISTOR 100R 0.75W 1%.	WELWYN MFR5-100R		R1, 2, 4, 5, 37, 52, 53
82	1	RESISTOR 270R 0.75W 1%.	WELWYN MFR5-270R or PHILIPS PR01 270R 1%		R38
85	1	RESISTOR 100R 0.25W 5%.	PHILIPS SFR25-100R		R68
90	2	RESISTOR 220R 0.25W 1%	PHILIPS MRS25-220R-1		R51, 82
100	3	RESISTOR 470R 0.25W 1%	PHILIPS MRS25-470R-1		R64, 105, 106
120	11	RESISTOR 1K 0.6W , 1%	PHILIPS MRS25-1K-1		R8, 35, 36, 69, 71, 72, 77, 85, 87, 98, 102 (NOT FITTED R94, R96)
	(2)				

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
130	3	RESISTOR 3K3 0.25W, 1%	PHILIPS MRS25-3K3-1	R79,93,109	
150	19	RESISTOR 10K 0.25W, 1%	PHILIPS MRS25-10K-1	R26, 65,67,70, 73,74,75,78, 83,84,90,95, 100,101,103, 104,107,110, 111 (NOT FITTED R63)	
(1)					
160	21	RESISTOR 56K 0.6W, 1%	PHILIPS MRS25-56K-1	R24,25,27, 28,40,41,42, 43,45,46,47, 48,54,55,56, 57,58,59,60, 61,66	
165	1	RESISTOR 68K 0.6W, 1%	PHILIPS MRS25-68K-1	R22	
170	2	RESISTOR 82K 0.6W, 1%	PHILIPS MRS25-82K-1	R14,30	
180	8	RESISTOR 100K 0.6W, 1%	PHILIPS MRS25-100K-1	R17,81,88, 91,92,97, 99,108	
190	1	RESISTOR 1M	PHILIPS MRS25-1M-1	R89	
200	4	RESISTOR 10M (4)	PHILIPS MRS25-10M-1	R13,15,80,86 (NOT FITTED R11,12,49, 50)	
210	2	RESISTOR 27M 0.5W 2200V.	PHILIPS VR37-27M	R29,32	

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
230	1	RESISTOR NETWORK 1K 8 COMMON	KYOCERA SRDSA-09P-102 BOURNS 4609X-101-102		RN3
240	2	RESISTOR NETWORK 1M 8 COMMON	KYOCERA SRDSA-09P-105 BOURNS 4609X-101-105		RN1, 2
250	2	VARISTOR	PHILIPS 2322-593-52716		R31, 33
260	2	CAPACITOR 33PF CERAMIC 0.2" PITCH	PHILIPS 683-34339		C36, 38
270	1	3 TERMINAL CAPACITOR 1nF, 20%	MURATA DSS306- 55Y5S102-M100		C42
280	21	CAPACITOR, CERAMIC 100V, 1nF, 5mm PITCH	PHILIPS 630-19102		C5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 37, 64
290	3	CAPACITOR, CERAMIC 500V, 1nF, 5mm PITCH	MURATA DD07B102K -500		C47, 58, 60
295	2	CAPACITOR, CERAMIC 3kV, 1nF, 7.5mm PITCH	MURATA DE1007B102K- 3KV		C61, 62
300	22	CAPACITOR, POLYESTER, 63V, 0.1uF, 5mm PITCH.	THOMPSON IRD607-0.1		C26, 27, 28, 29, 30, 31, 32, 35, 39, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 54, 55, 63
310	3	CAPACITOR 0.1uF, X2 RATED 15mm PITCH	PHILIPS 330-40104		C3, 24, 25
320	1	CAPACITOR AL ELEC AXIAL 47uF, 25V CASE SIZE 3	PHILIPS 030-36479		C33

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
330	1	CAPACITOR AL ELEC RADIAL 1uF, 63v CASE SIZE 11	PHILIPS 037 59108 CASE SIZE 11		C34
340	3	CAPACITOR AL ELEC RADIAL 10uF 50V CASE SIZE 11	PHILIPS 037-51109		C56,57,59
350	2	CAPACITOR AL ELEC RADIAL 2.2uF 400V CASE CODE D	ECC OR NIPPON CHEMI-CON SMEVB-400-2.2		C1,2
360	2	CAPACITOR AL ELEC, AXIAL 470uF 40V. (ONLY 40V REQUIRED) CASE SIZE 00	PHILIPS 021-17471		C40,41
370	1	CAPACITOR AL ELEC, RADIAL 1000uF 25V (ONLY 40V REQUIRED) CASE SIZE 00	PHILIPS 037-56102		C4
380	1	SUB-MINATURE LOUDSPEAKER	IMO 41T70 P015H		X1
390	1	CURRENT TRANSFORMER	OEP 3365 DK MORIARTY E2770 OR SIGA AT 4392		T1 FITTED BY JEKYLL
395	75mm	Wire blue, 7/0.2			For use with item 390
397	1	Cable tie 100mm x 2.5mm	INSULOID T18R		For use with item 390
400	5	DIODE	1N4148		D19,20,25, 26,31
410	5	DIODE	1N4001		D6,7,8,9,10
420	1	HIGH VOLTAGE DIODE	BY584		D1

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
430	16	ZENER DIODE 3.3V  (4)	BZX79-3V3		D4,5, 11,12,13,14, 15,16,17,18, 21,22,23,24, 28,30 (NOT FITTED D2,3,27,29)
432	1	ZENER DIODE 12V	BZX79-12V		(NOT FITTED D32)
435	3	TRANSISTOR PNP	BC327		TR1,2,3
437	1	FET NPN	ZVN3306A		(NOT FITTED TR4)
440	2	7 NPN DARLINGTON DRIVERS	ST ULN2003A OR TI ULN2003AN		IC19, IC22
450	1	IC QUAD NAND 74HC00	NAT SEMI MM74HC00N OR ST M74HC00B1N OR PHILIPS PC74HC00P		IC6
460	2	IC QUAD NOR 74HC02	NAT SEMI MM74HC02N OR ST M74HC02B1N OR PHILIPS PC74HC02P		IC5, IC10
470	1	IC HEX INVERT BUFFER 74HC04	NAT SEMI MM74HC04N OR ST M74HC04B1N OR PHILIPS PC74HC04P		IC9
480	1	IC OCTAL BUFFER 74HC244	NAT SEMI MM74HC244N OR ST M74HC244B1N OR PHILIPS PC74HC244P		IC13

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
490	1	IC OCTAL LATCH 74HC373	NAT SEMI MM74HC373N OR ST M74HC373B1N OR PHILIPS PC74HC373P		IC2
500	2	IC OCTAL LATCH 74HC273	NAT SEMI MM74HC273N OR ST M74HC273B1N OR PHILIPS PC74HC273P		IC17, IC20
510	1	64Kx8 CMOS EPROM, 200nS, 12.5V PROG.	AMD Am27C512-200DC OR ST 27C512-20/P		IC3 FITTED BY JEKYLL.
520	1	PROCESSOR 80C31 12MHz	INTEL P80C31BH OR PHILIPS PCB 80C31 BH12P		IC1
530	1	SUPERVISORY CIRCUIT 8 PIN	MAXIM MAX691ACPE		IC8
540	1	EEPROM SERIAL 1K 8 PIN	NAT SEMI NMC9346AN OR NM93C46N OR ST ST93C46AB1		IC7
550	1	STATIC RAM 32K*8 120nS ACCESS TIME	HITACHI HM62256LP12 OR HYUNDAI HY62256ALP12		IC4
560	1	CRYSTAL 11.0592MHz 33pF LOAD PARALLEL RESONANT HC18U OR HC49	IQD L108A EUROQUARTZ MK MK 11059C ECM X11.0592M4911E		X2

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
570	2	ANALOGUE MULTIPLEXER 4051	NATIONAL CD4051BCN OR PHILIPS HEF4051BP OR ST HCF4051BEY		IC12, IC16
580	1	VOLTAGE COMPARATOR DUAL 8 PIN	NATIONAL LM393N OR ST LM393N-SGS		IC14
590	1	OPERATIONAL AMP QUAD 14 PIN	NATIONAL LM324N OR ST LM324N-SGS		IC18
600	1	VOLTAGE CONVERTER 7660	SILICONIX SI7660CJ		IC21
610	1	REGULATOR FIXED 5V, 1.5A, TO220 LOW DROP OUT.	NATIONAL LM2940CT		IC11
620	1	VOLTAGE REFERENCE DIODE, 2.5V, TO92	ST LM336Z OR NATIONAL LM336Z25		IC15
630	1	RELAY SPDT 16A 12 VDC COIL	OMRON G2R-1-E-12DC PED 11-752-232-620 (NORSLO)RM81P-12VDC SCHRACK 310-012		RL1
640	2	RELAY DPDT 5A 12 VDC COIL	OMRON G2R-2-12DC SCHRACK RP420-012 (NORSLO)RM82P-12VDC		RL4, 5
650	1	RELAY SPDT 10A 6VDC COIL.	OMRON G2R-1-6DC SCHRACK RP310-006 NORSLO RM81P-6VDC		RL6
655	1	TYPE ZD RELAY SPNO AgCdO CONTACTS DUSTPROOF (NB. OMRON RELAYS MUST BE SUPPLIED WITH PIN 1 REMOVED)	SCHRACK 222012 OR OMRON G8P-1111P-US-12DC- R99C01 (NO PIN 1)		RL2

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
660	5	TYPE ZD RELAY SPCO, AgCdO CONTACTS DUSTPROOF (NB. OMRON RELAYS MUST BE SUPPLIED WITH PIN 1 REMOVED)	SCHRACK 221012 OR OMRON G8P-111P-US-12DC- R99C01 (NO PIN 1)		RL7,8,9,10, 11
670	1	RELAY DPDT 10uA-2A 12 VDC COIL	OMRON G5V2-12VDC		RL3
672	1	FUSEHOLDER PCB MTG. FOR 5X20MM FUSE.	CAMDEN 5229 (FARNELL 146-123)		FS1
674	1	TRANSPARENT COVER FOR ITEM 672.	CAMDEN 5201 (FARNELL 146-124)		FOR FS1
676	1	FUSE 5x20MM. 3.15A ANTI SURGE. HRC	E.G. BESWICK/ BUSSMAN TDS505 3.15A		FOR FS1
680	19	0.25" VERTICAL 'SPADE' TAG.	HESTO STOCKO F/RM-0118 FARNELL 209-284		TB2,5,6,7,8, 9,10,11,12, 13,14,15,16, 17,18,19,20, 21,22
685	2	0.25" PARALLEL 'SPADE' TAG.	HESTO STOCKO F/RM-0120 FARNELL 209-302		TB3,4
730	1	LITHIUM MANGANESE COIN CELL 200mAH HORIZONTAL PCB MOUNT	VARTA CR2430PCB		B1 FITTED BY JEKYLL
740	1	IC SOCKET, 28 PIN DIL, LOW PROFILE.	AUGAT 200 SERIES 228-AG29D. OR BURNDY DILB 28P8TT		FOR IC3
745	2	TERMINAL PINS, SINGLE SIDED 1MM HOLE.	RS433-854 (=500		LK4,9
750	1	TRANSITION CONNECTOR 14 WAY	VARELCO 00-8399-014-000-302		P5

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
760		LOW PROFILE IDC SOCKET CONNECTOR 14 WAY	VARELCO 008290-014-000-011 OR 3M SCOTCHFLEX 3385-6000EY		FOR P5
770	30mm	14 WAY RIBBON CABLE	3M SCOTCHFLEX 3365/14		FOR ABOVE
780	1	CENTRE HEADER, TIN PLATED, 5 WAY 0.1" PITCH - PIN LENGTH 17.80 TIP/TIP, 14.35mm ABOVE BOARD	MOLEX 4030-05B-102 OR DCT 8280205-05-01		P9
790	2	CENTRE HEADER, TIN PLATED, 12 WAY 0.1" PITCH - PIN LENGTH 17.80 TIP/TIP, 14.35mm ABOVE BOARD	MOLEX 4030-12B-102 OR DCT 8280205-12-01		P6,7
800	1	BOARD CONNECTORS 5 WAY, 0.1" PITCH TOP ENTRY	MOLEX 4455-05CAA		P3 FIT TO WIRING SIDE
810	2	BOARD CONNECTORS 12 WAY, 0.1" PITCH TOP ENTRY	MOLEX 4455-12CAA		P1,2 FIT TO WIRING SIDE
812	1	CONNECTOR 0.1" PITCH, 2 WAY RIGHT ANGLED. FRICTION LOCK.	AMP MTA100 640457-2		P4
820	1	9 WAY PCB MOUNTED FEMALE D TYPE SOCKET.	ITT ADE9S-0L2 OR HARTING 09 67 009 2754		P8 FIT TO WIRING SIDE
822	1	SCREWLOCK KIT 14.5MM STUDS	SELKOM TB195A (D20418-2)		FOR P8
824	2	THREADED SPACER 4.40 UNC (INT) 6MM LONG.	SELKOM TC		FOR P8

## Parts List: DPAT Hi specification

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ITEM	QTY	COMPONENT DESCRIPTION	ORDER NO./FROM	STOCK NO.	REFERENCES
840	15	PCB MOUNTED PUSH TO MAKE SWITCHES	OMRON B3F-4050		SW1-14, SW16 FIT TO WIRING SIDE OF BOARD
850		PCB			

COMPONENTS NOT FITTED ARE:-

R76 (no item no.)  
R94,96 item 120  
R63 item 150  
R11,12,49,50 item 200  
D2,3,27,29 item 430  
D32 item 432  
TR4 item 437