BALDOR®

S–BTS 10 R–Series

Smart Brushless Servo Amplifier

Installation & Operating Manual

7/89 **TM15838**

Warning!

These instructions are for use by qualified personnel only.

In order to avoid electrical shock, do not perform any servicing other than that contained in the Operating and Service Manual unless you are qualified to do so.

Dangerous voltage exists on the screw terminals of power inlet and outlet when energized. Exercise extreme care when working on an energized circuit.

When a unit needs to be replaced, wait at least 2 minutes to allow a discharge of the power-capacitors and touch only the handle on the front-side. Use isolated tools for removal of connecting wires and avoid to touch the contacts.

Change Notice

This reprint V 1.5 includes the following changes:

Page 4	-	Drawing updated
Page 5	-	Drawing updated
Page 13	-	Default Parameter on Floppy Disk added
Page 14/16	-	i46/i48 exchanged
Page 17	-	"i12 ≥ 100 for BSM 6 R" added
Page 25	-	Drive Disable Input Filter
	-	Aux. Input Assignment
	-	24 V Input Power added

Contents

Contents (Continued)

S-BTS 10 R

Servo Positioner Specification Sheet

PARAMETER	Units	200-2.5	200-5	200-10	200-15	200-22.5
GENERAL						
Nominal DC Bus Voltage[1]	V DC	200.0				
Voltage Range	V DC	160 - 240				
Nominal Output Voltage ph/ph	V AC	130.0				
Cont. Phase Current	A(rms)	2.5	5.0	10.0	15.0	22.5
Max. Peak Current 2.5 s	A(rms)	5.0	10.0	20.0	30.0	45.0
Cont. Output Power	kW	0.6	1.2	2.4	3.7	5.5
Switching Frequency	kHz	10.5	10.5	10.5	10.5	10.5
MECHANICAL						
Mounting		Rack				Rack
Dimensions 6 HE	mm	220x60				220x120
Weight	kg	2.0				4.0

POWER SUPPLY BPS 10 R	Units	200-020 R	200-040 R	200-060 R
Input Voltage 3 phase	V AC	140.0		
Output Voltage	V DC	200.0		
Cont. Output Current	A	20.0	40.0	60.0
Max. Output Current 2.5 s	A	40.0	80.0	120.0
Nominal Power	kW	4.0	8.0	12.0
Regeneration Switching Current	A	20.0	20.0	20.0
Regeneration Resistor (internal[2])	W	80.0	80.0	80.0
MECHANICAL				
Mounting		Rack		
Dimensions	mm	6 HE 220 x 60		
Weight	kg	1.0		

TEMPERATURE S-BTS/BPS 10 R		
Ambient for nominal ratings	deg.C	25
Operating Range	deg.C	0 to +45
Storage	deg.C	-20 to +70

[1] 24/48 V also available [2] or 320 W external on order

S-BTS 10 R

Servo Positioner Specification Sheet

POSITIONING/VELOCITY LOOP	
SERVO PERFORMANCE	
Normal mode	500 microseconds
Handwheel mode only	150 microseconds
Execution Rate	200 Blocks/second
POSITIONING LOOP	
Range	+/- 67 million encoder counts
Accuracy	+/- one encoder count
VELOCITY LOOP	
Range	.005 to 1 200 000 encoder counts/s
Accuracy (long therm)	0.002 %
(short therm)	0.5 % to 1 %
Repeatability	0.001 %
ELECTRICAL	
Digital In-Outputs	TTL Compatible
Aux. Function (inputs)	0 to +5 Volt
(outputs)	12 V 100 mA sink
Interface	RS232
Memory Capacity	32 k ROM, 8 k RAM, 8 k EEROM
POSITIONING FEEDBACK (Resolver)	
Resolution	1024 pulses per revolution
Accuracy	+/- 10 min.
Max. input rate	1 000 000 counts/second
HANDWHEEL ENCODER	
Signal	Line Receiver 5 V TTL
Max. input rate	600 000 counts/second

DRAWING NUMBER 15703 B

CW LIMIT	7/1
CCW LIMIT	7/2
START/	12/1
STOP/	12/2
STEP/	12/3
HOLD/	12/4
JOG+/	13/1
JOG-/	13/2
AUX INPUT 1/	14/1
AUX INPUT 2/	14/2
AUX INPUT 3/	14/3
HOME FLAG/	7/3
USER FLAG/	7/4
SYNC/	7/7
INIT/	7/8
HOME/	7/10
MAO 2/	15/1
MAO 3/	15/2
BUFFER FULL	7/6
IN POS	7/5

HANDWHEEL INPUT	
c	10/2
c/	10/3
B	11/1
B/	10/4
A	11/3
A/	11/2

13816

ANA IN

6/3

TP6

RP1

A

R

R/D

TP11 ω_o

ϑ mech

2

7,2 kHz
21 Vpp

TP8 ENCA
TP9 ENCB
TP10 ENCC

EEROM 512 x 8 Bit

CPU 78312
INTERNAL
8K ROM
512 B RAM

12 MHz
TP3

RS 232

	P5	BP ST
RXD/	2	8/3
TXD/	3	9/1
DTR/		
DGND	5	7/9
DSR		
RTS	7	9/2
CTS	8	9/3
BRTS		8/1
BTXD		8/2

6333 SRVD

µSMCC

LSI

PHA 1
PHA 3

PWM FILTER

TP2
TP1

Icom U
Icom V

DEC

EPROM 32 K

S RAM 8K

EEROM 8K

JEXP (20 PIN-HEADER)
+15V
+5V
GND
-15V
IOWR
IORD
ALE
MCS
MWT/SV2
AD0.....7

13811

TP3

Iact.U Iact.V

$I_{act.\omega}$

It

RP 11

ANA MPY

ANA MPY

13812

Iact. U

TP1

Icom U*

Icom V*

TP2

Iact. V

$\frac{K_2}{sT_2+1}$

$\frac{K_2}{sT_2+1}$

10,5kHz

TP9

PWM

PWM

PWM

POWER STAGE

It WARNING	16/1
F0	16/2
F1	16/3
F2	16/4
FAULT SIGNAL	3/1
RELAIS CONTACT	3/2
DRIVE DISABLE	3/3

13815

U

ISOL AMP

Iact. U

13817

ISOL AMP

Iact. V

W

V

SURFACE ROUGHNESS	TOLERANCES	MATERIAL		PROTECTIVE FINISH
	—	—		

TITLE SBTS 10R
µSMCC - AND CONTROL CARD
FUNCTIONAL BLOCKDIAGRAM

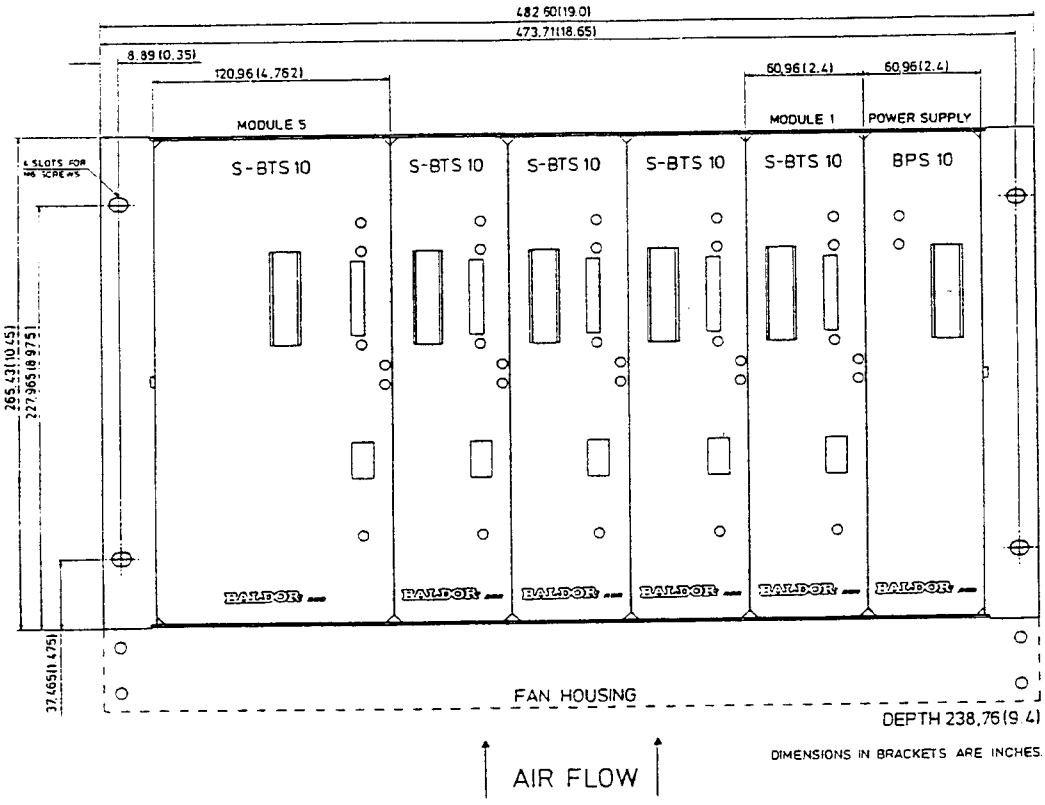
SCALE

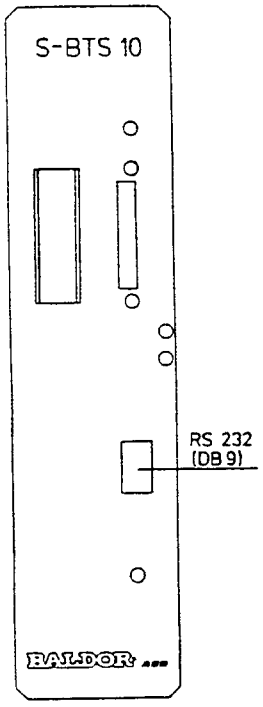
DRAW.-NO 15703 B

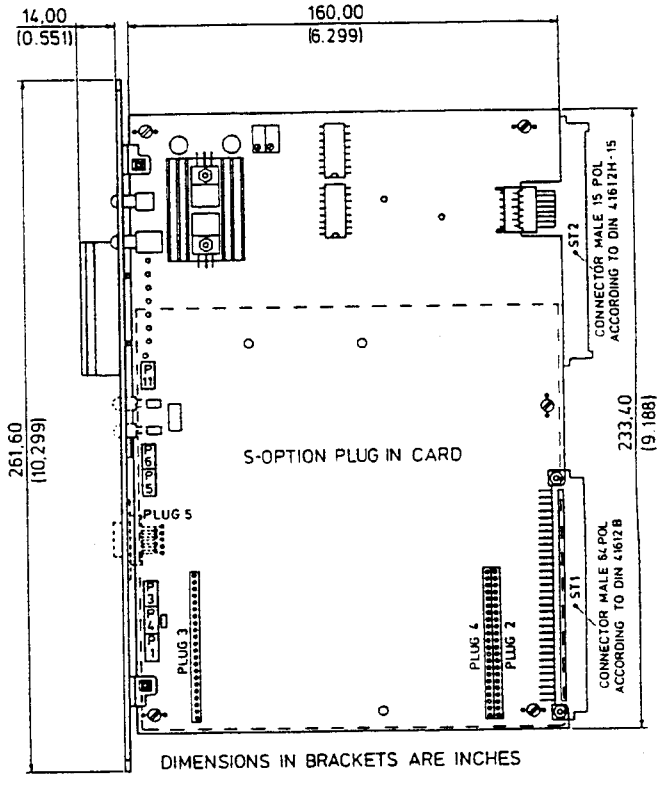
1988	DATE	NAME	REV.-NO
DRAWN	24.6.88	SCHWEITZ.	
CHECK			
NORM			

PROPRIETARY NOTICE BALDOR

BALDOR ASR





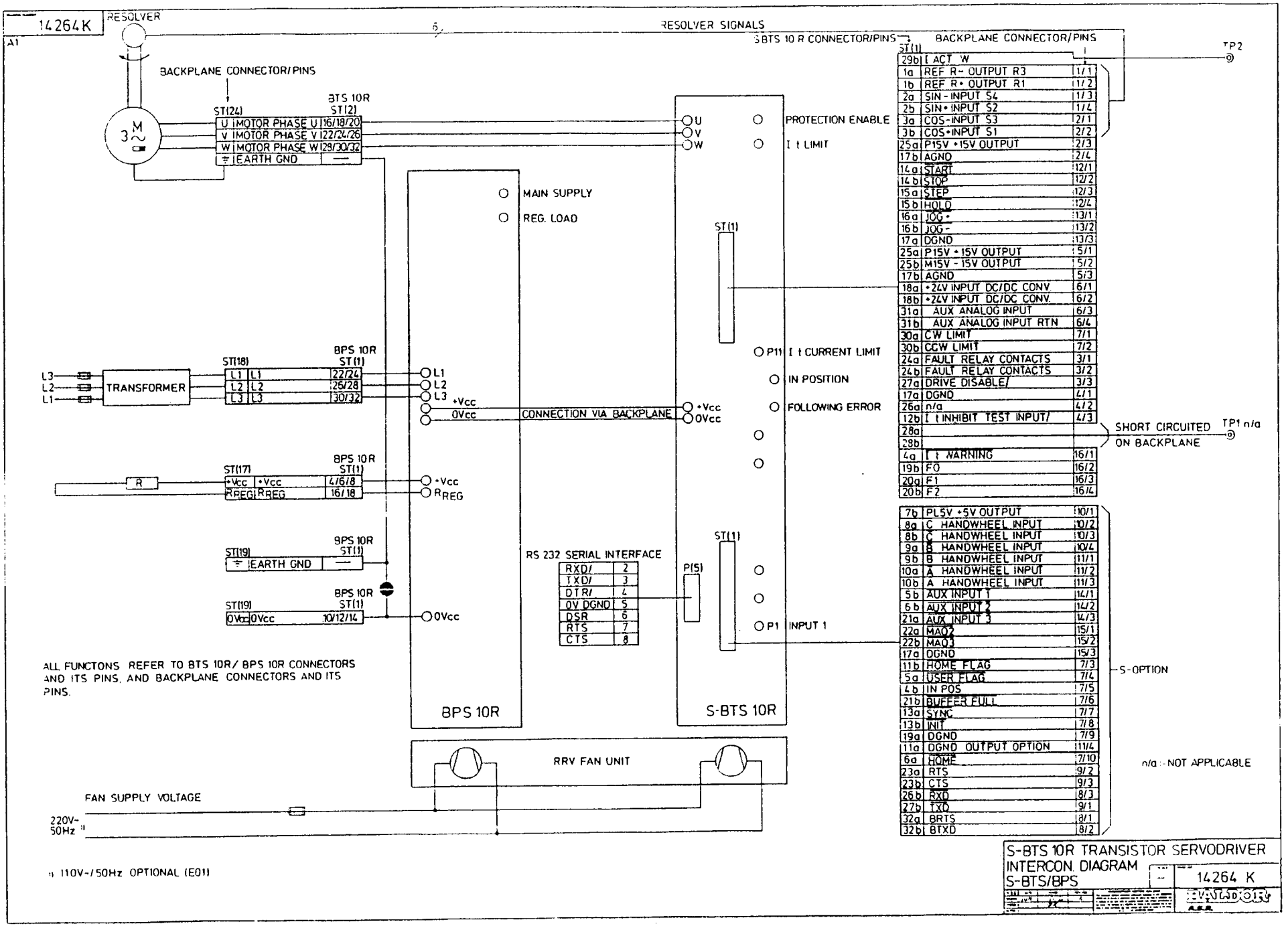


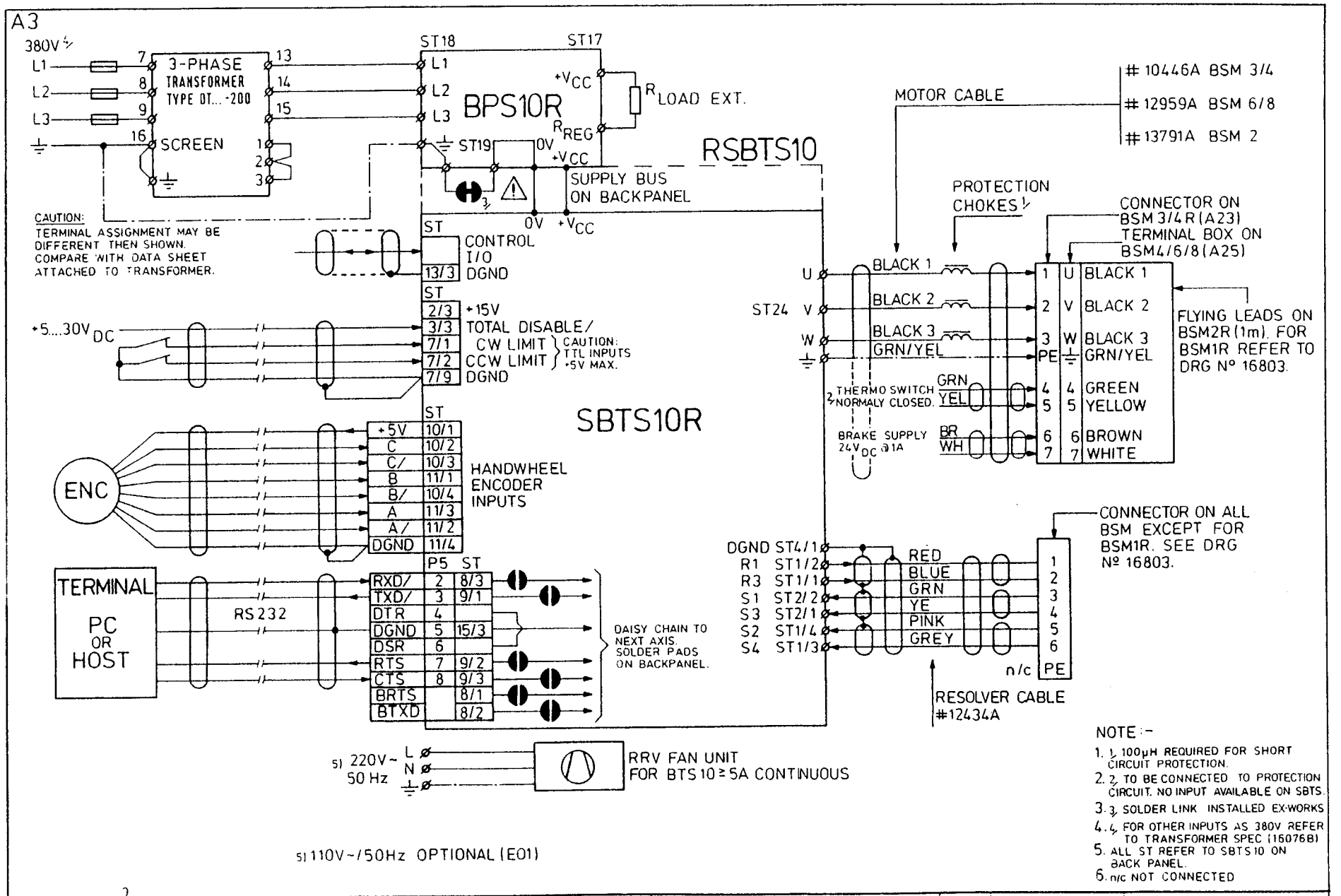
PROTECTIVE FINISH		DRAW NO	15161 C
MATERIAL		SCALE	
TOLERANCES		TITLE	S-BTS 10 MECHANICAL SYSTEM CONFIG
SURFACE ROUGHNESS			

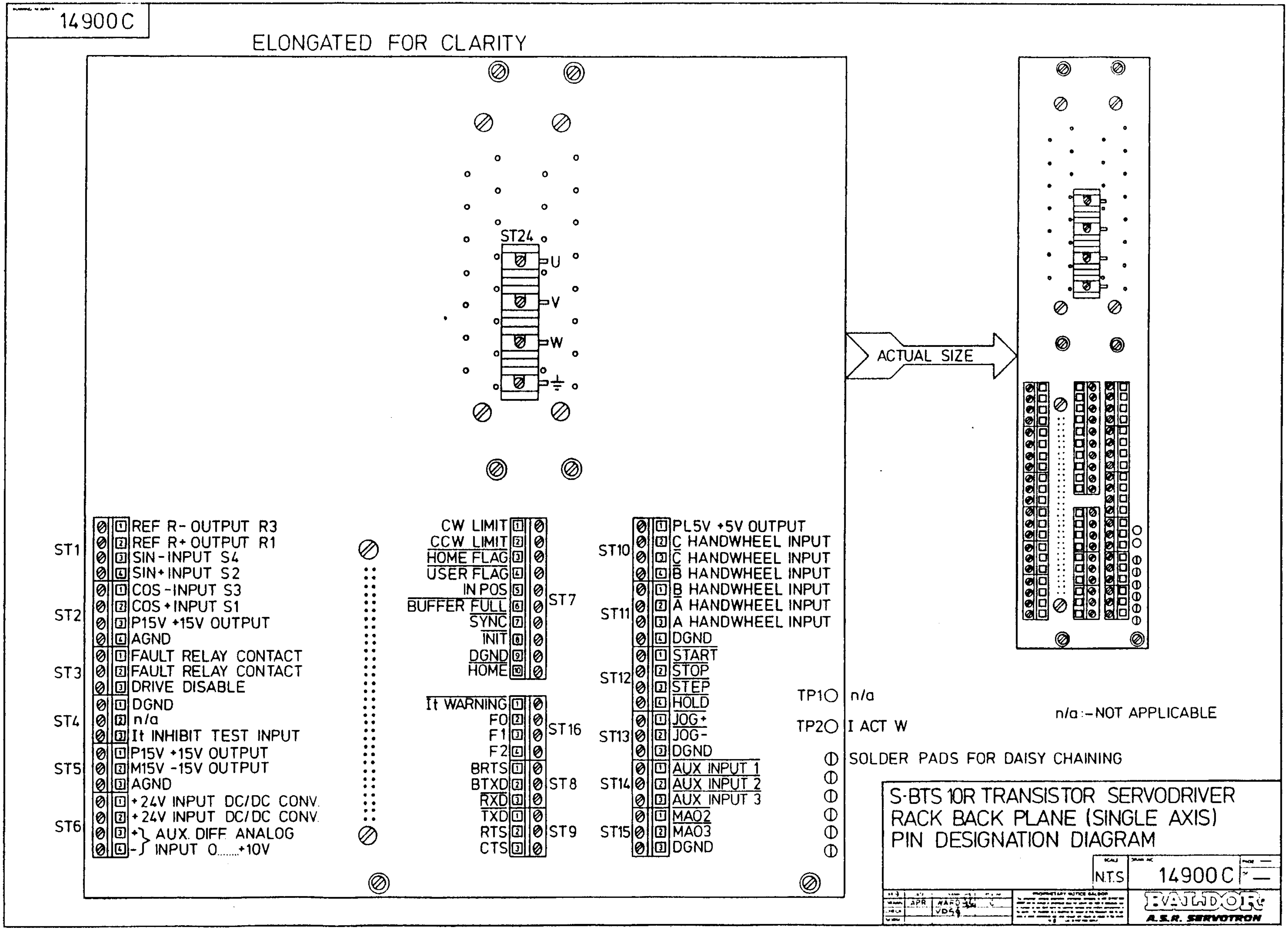
	DATE	NAME	REV-NO
DRAWN	17.11.88	MICEVIC	C
CHECK			
NORM			

PROPRIETARY NOTICE BALDOR

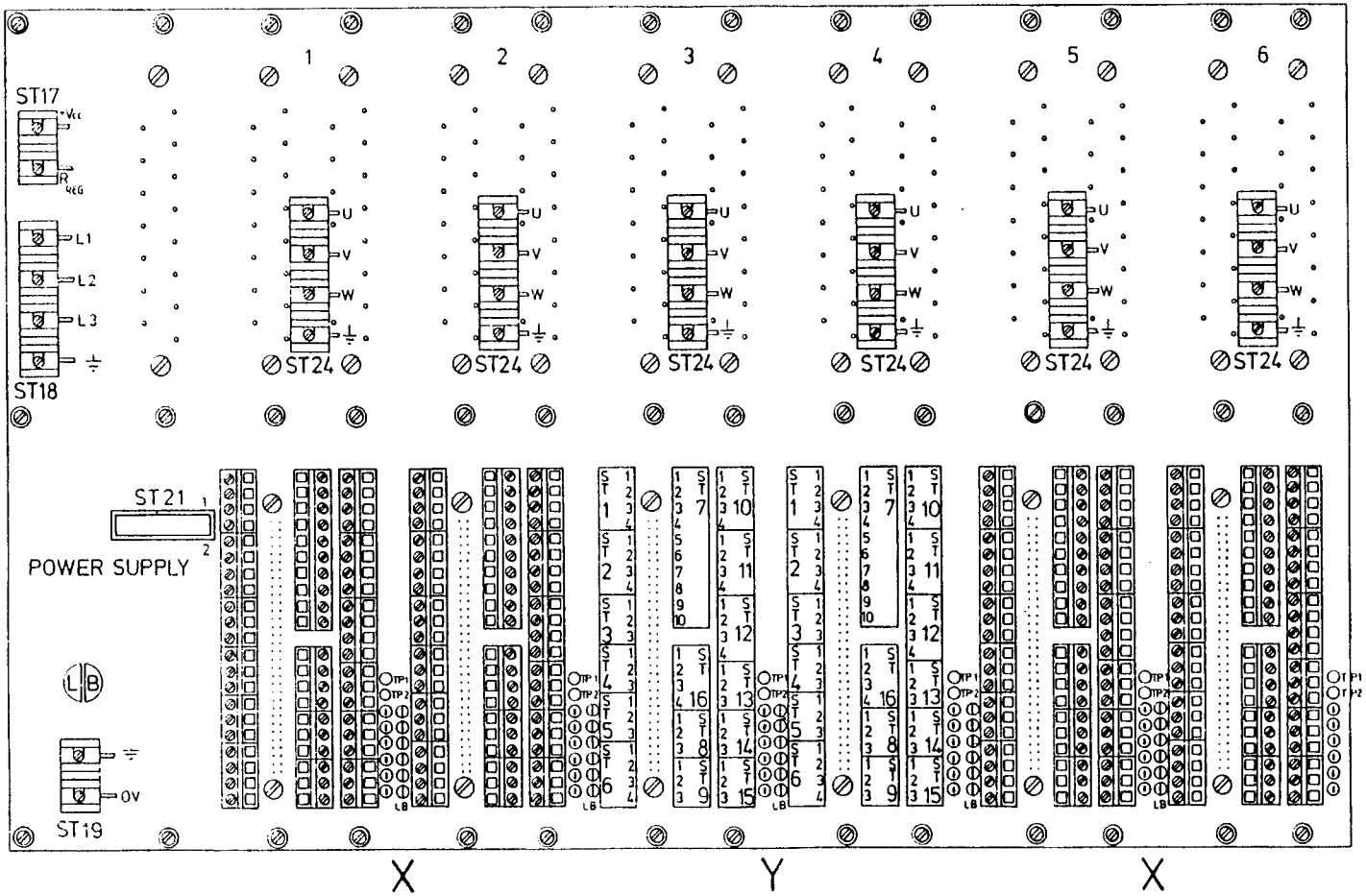
BALDOR ASR


14264K
A1
RESOLVER
RESOLVER SIGNALS
BACKPLANE CONNECTOR/PINS
BTS 10R CONNECTOR/PINS
ST(24)
BTS 10R ST(2)
U MOTOR PHASE U 16/18/20
V MOTOR PHASE V 22/24/26
W MOTOR PHASE W 29/30/32
EARTH GND
MAIN SUPPLY
REG. LOAD
BPS 10R
S-BTS 10R
PROTECTION ENABLE
I t LIMIT
I t CURRENT LIMIT
IN POSITION
FOLLOWING ERROR
INPUT 1
CONNECTION VIA BACKPLANE
+Vcc
0Vcc
L1
L2
L3
TRANSFORMER
ST(18)
BPS 10R ST(1)
L1 22/24
L2 26/28
L3 30/32
R
ST(17)
+Vcc 4/6/8
RREG 16/18
ST(19)
EARTH GND
0Vcc 10/12/14
RS 232 SERIAL INTERFACE
RXD/ 2
TXD/ 3
DTR/ 4
0V DGND 5
DSR 6
RTS 7
CTS 8
P(5)
ST(1)
RRV FAN UNIT
FAN SUPPLY VOLTAGE
220V~ 50Hz
1) 110V~/50Hz OPTIONAL (E01)
ALL FUNCTONS REFER TO BTS 10R/ BPS 10R CONNECTORS AND ITS PINS, AND BACKPLANE CONNECTORS AND ITS PINS.
BACKPLANE CONNECTOR/PINS
ST(1)
29b I ACT W
1a REF R- OUTPUT R3 1/1
1b REF R+ OUTPUT R1 1/2
2a SIN - INPUT S4 1/3
2b SIN + INPUT S2 1/4
3a COS - INPUT S3 2/1
3b COS + INPUT S1 2/2
25a P15V +15V OUTPUT 2/3
17b AGND 2/4
14a START 12/1
14b STOP 12/2
15a STEP 12/3
15b HOLD 12/4
16a JOG + 13/1
16b JOG - 13/2
17a DGND 13/3
25a P15V +15V OUTPUT 5/1
25b M15V -15V OUTPUT 5/2
17b AGND 5/3
18a +24V INPUT DC/DC CONV 6/1
18b +24V INPUT DC/DC CONV. 6/2
31a AUX ANALOG INPUT 6/3
31b AUX ANALOG INPUT RTN 6/4
30a CW LIMIT 7/1
30b CCW LIMIT 7/2
24a FAULT RELAY CONTACTS 3/1
24b FAULT RELAY CONTACTS 3/2
27a DRIVE DISABLE/ 3/3
17a DGND 4/1
26a n/a 4/2
12b I t INHIBIT TEST INPUT/ 4/3
28a
28b
4a I t WARNING 16/1
19b FO 16/2
20a F1 16/3
20b F2 16/4
SHORT CIRCUITED ON BACKPLANE
TP1 n/a
TP2
7b PL5V +5V OUTPUT 10/1
8a C HANDWHEEL INPUT 10/2
8b C HANDWHEEL INPUT 10/3
9a B HANDWHEEL INPUT 10/4
9b B HANDWHEEL INPUT 11/1
10a A HANDWHEEL INPUT 11/2
10b A HANDWHEEL INPUT 11/3
5b AUX INPUT 1 14/1
6b AUX INPUT 2 14/2
21a AUX INPUT 3 14/3
22a MAO2 15/1
22b MAO3 15/2
17a DGND 15/3
11b HOME FLAG 7/3
5a USER FLAG 7/4
4b IN POS 7/5
21b BUFFER FULL 7/6
13a SYNC 7/7
13b INIT 7/8
19a DGND 7/9
11a DGND OUTPUT OPTION 11/4
6a HOME 7/10
23a RTS 9/2
23b CTS 9/3
26b RXD 8/3
27b TXD 9/1
32a BRTS 8/1
32b BTXD 8/2
S-OPTION
n/a = NOT APPLICABLE
S-BTS 10R TRANSISTOR SERVODRIVER
INTERCON. DIAGRAM
S-BTS/BPS
14264 K
DYNAPAR


A3
380V 4
L1
L2
L3
7
8
9
16
3-PHASE
TRANSFORMER
TYPE DT...-200
SCREEN
13
14
15
1
2
3
ST18
ST17
L1
L2
L3
BPS10R
+VCC
R LOAD EXT.
R REG
ST19
0V
+VCC
SUPPLY BUS
ON BACKPANEL
RSBTS10
10446A BSM 3/4
12959A BSM 6/8
13791A BSM 2
MOTOR CABLE
PROTECTION
CHOKES 1
CONNECTOR ON
BSM 3/4 R (A23)
TERMINAL BOX ON
BSM 4/6/8 (A25)
CAUTION:
TERMINAL ASSIGNMENT MAY BE
DIFFERENT THEN SHOWN.
COMPARE WITH DATA SHEET
ATTACHED TO TRANSFORMER.
ST
CONTROL
I/O
13/3 DGND
ST
2/3 +15V
3/3 TOTAL DISABLE/
7/1 CW LIMIT
7/2 CCW LIMIT
7/9 DGND
CAUTION:
TTL INPUTS
+5V MAX.
+5....30V DC
U
V
W
ST24
BLACK 1
BLACK 2
BLACK 3
GRN/YEL
1 U BLACK 1
2 V BLACK 2
3 W BLACK 3
PE GRN/YEL
FLYING LEADS ON
BSM2R (1m). FOR
BSM1R REFER TO
DRG Nº 16803.
2 THERMO SWITCH
NORMALY CLOSED.
GRN
YEL
4 4 GREEN
5 5 YELLOW
BRAKE SUPPLY
24V DC @1A
BR
WH
6 6 BROWN
7 7 WHITE
SBTS10R
ST
+5V 10/1
C 10/2
C/ 10/3
B 11/1
B/ 10/4
A 11/3
A/ 11/2
DGND 11/4
ENC
HANDWHEEL
ENCODER
INPUTS
CONNECTOR ON ALL
BSM EXCEPT FOR
BSM1R. SEE DRG
Nº 16803.
DGND ST4/1
R1 ST1/2
R3 ST1/1
S1 ST2/2
S3 ST2/1
S2 ST1/4
S4 ST1/3
RED
BLUE
GRN
YE
PINK
GREY
1
2
3
4
5
6
n/c
PE
RESOLVER CABLE
#12434A
P5 ST
RXD/ 2 8/3
TXD/ 3 9/1
DTR 4
DGND 5 15/3
DSR 6
RTS 7 9/2
CTS 8 9/3
BRTS 8/1
BTXD 8/2
TERMINAL
PC
OR
HOST
RS232
DAISY CHAIN TO
NEXT AXIS.
SOLDER PADS
ON BACKPANEL.
5) 220V~ L
50 Hz N
RRV FAN UNIT
FOR BTS 10 ≥ 5A CONTINUOUS
5) 110V~/50Hz OPTIONAL (E01)
NOTE :-
1. 1 100µH REQUIRED FOR SHORT CIRCUIT PROTECTION.
2. 2 TO BE CONNECTED TO PROTECTION CIRCUIT. NO INPUT AVAILABLE ON SBTS.
3. 3 SOLDER LINK INSTALLED EX-WORKS
4. 4 FOR OTHER INPUTS AS 380V REFER TO TRANSFORMER SPEC (16076B)
5. ALL ST REFER TO SBTS 10 ON BACK PANEL.
6. n/c NOT CONNECTED
DRAWN JUN
CHECK
NORM
REV.NO 0
PROPRIETARY NOTICE BALDOR
TOLERANCES —
MATERIAL —
PROTECTIVE FINISH —
TITLE
SBTS10R WIRING DIAGRAM
FOR RESOLVER FEEDBACK
SCALE —
DRAW.NO
15704 E
BALDOR ASR


14900C
ELONGATED FOR CLARITY
ST24
U
V
W
ST1
REF R- OUTPUT R3
REF R+ OUTPUT R1
SIN-INPUT S4
SIN+INPUT S2
ST2
COS-INPUT S3
COS+INPUT S1
P15V +15V OUTPUT
AGND
ST3
FAULT RELAY CONTACT
FAULT RELAY CONTACT
DRIVE DISABLE
ST4
DGND
n/a
It INHIBIT TEST INPUT
ST5
P15V +15V OUTPUT
M15V -15V OUTPUT
AGND
ST6
+24V INPUT DC/DC CONV.
+24V INPUT DC/DC CONV.
+} AUX. DIFF. ANALOG
-} INPUT 0.......+10V
ST7
CW LIMIT
CCW LIMIT
HOME FLAG
USER FLAG
IN POS
BUFFER FULL
SYNC
INIT
DGND
HOME
ST16
It WARNING
F0
F1
F2
ST8
BRTS
BTXD
RXD
ST9
TXD
RTS
CTS
ST10
PL5V +5V OUTPUT
C HANDWHEEL INPUT
C̄ HANDWHEEL INPUT
B HANDWHEEL INPUT
ST11
B̄ HANDWHEEL INPUT
Ā HANDWHEEL INPUT
A HANDWHEEL INPUT
DGND
ST12
START
STOP
STEP
HOLD
ST13
JOG+
JOG-
DGND
ST14
AUX INPUT 1
AUX INPUT 2
AUX INPUT 3
ST15
MAO2
MAO3
DGND
TP1 n/a
TP2 I ACT W
SOLDER PADS FOR DAISY CHAINING
n/a:-NOT APPLICABLE
ACTUAL SIZE
S-BTS 10R TRANSISTOR SERVODRIVER
RACK BACK PLANE (SINGLE AXIS)
PIN DESIGNATION DIAGRAM
N.T.S
14900C
BALDOR
A.S.R. SERVOTRON

COMPONENT SIDE VIEW



NOTE:-

1. HOLES MARKED THUS :- ⊙ ARE SOLDER STUDS.
2. BOTH X SECTIONS ARE ASSEMBLED AS PER Y SECTION.

TITLE S-BTS 10 (VERSIONS 1, 2 & 3) RACK BACK PLANE (COMPLETE) ASSEMBLY DRAWING (COMP SIDE)		SCALE 1 1	14387G
	DATE MAR	WARD	G
			BALDOR A.S.R.

Set up procedure for S-BTS 10 R

1. E-Points

Check all jumpers for correct installation according to following listing:

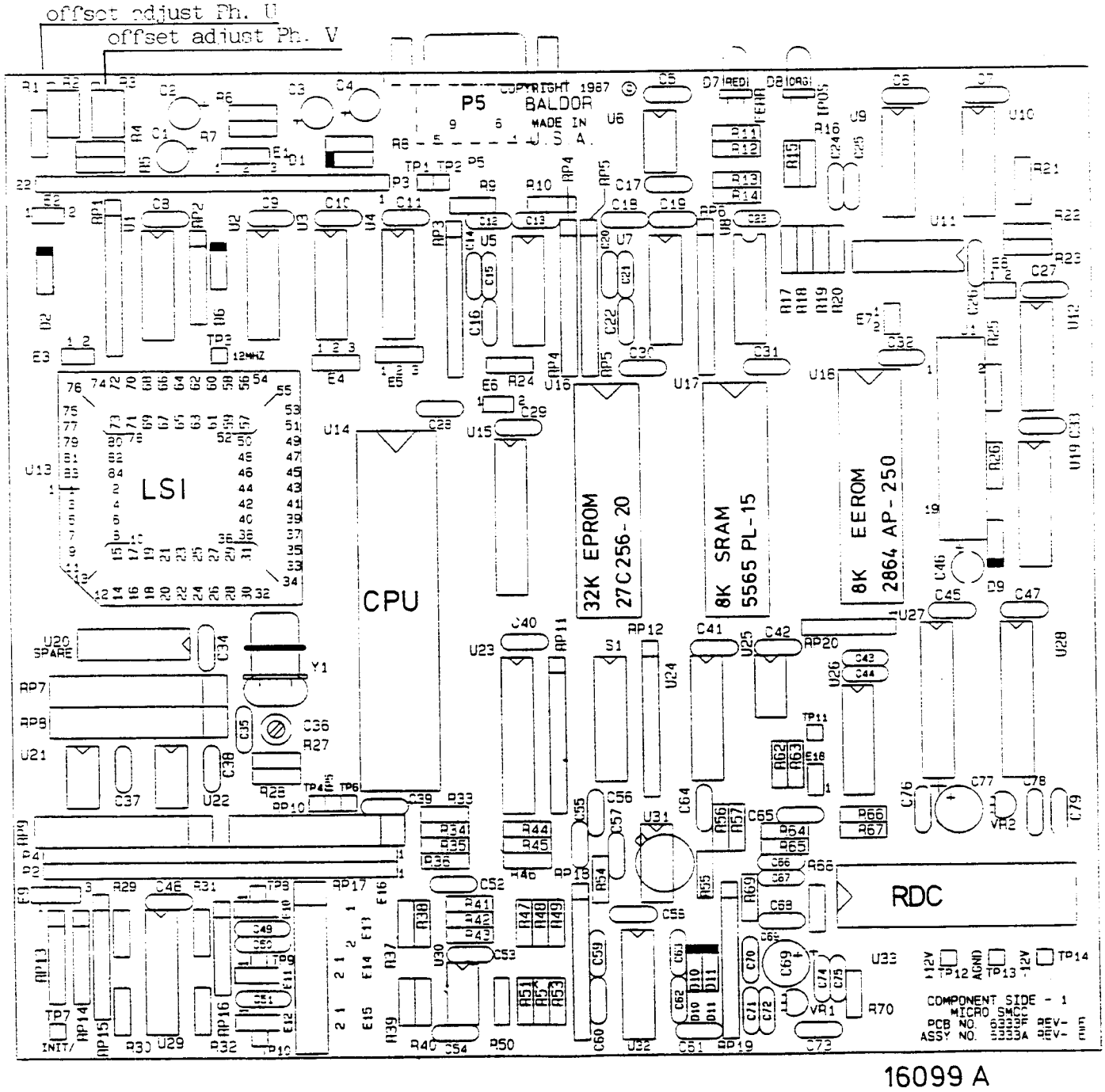
E Point	Physical Layout	Description	Default
E1	* * * 1 2 3	Jumper pin 1-2 for S-BTS series Amplifiers	1-2 installed
E2	* * 1 2		Not installed
E3	* * 1 2	JUMP Pin 1 to Pin 2 to obtain normal X encoder operation. Remove Jumper for digital tach (1/T) X encoder operation.	1-2 installed
E4	1 2 3 * * *	JUMP Pin 2 to Pin 3 to allow phasing without hall effects. JUMP Pin 1 to 2 to phase with hall effects.	2-3 installed
E5	1 2 3 * * *	JUMP Pin 1 to Pin 2 to allow AMPENA/signal (low true) JUMP Pin 2 to Pin 3 to allow AMPENA/signal (high true)	1-2 installed
E6	1 2 * *	JUMP Pin 1 to Pin 2. With jumper installed, EA/ (Pin 51) of CPU is grounded, which causes the CPU to use external memory. Otherwise, EA/ (Pin 51) is pulled up to +5 volts, CPU then uses internal memory only.	Not installed
E7	1 * 2 *	JUMP Pin 1 to Pin 2 for Sync/Out (use on AO card only). Note that if E7-1,2 is installed. E18-1,2 must be removed.	1-2 installed
E8	1 2 * *	HARD RESET	Not installed

Set up procedure for S-BTS 10 R (Continued)

E Point	Physical Layout	Description	Default
E9	* * * 1 2 3	JUMP Pin 2 to Pin 3 to obtain non-differential X encoder input mode, this will bias X encoder negative inputs to 1/2 V_{cc} = 2,5 V.	1-2 installed
E10	1 2 3 * * *	Resolver install pin 2-3 Encoder install pin 1-2	2-3 installed
E11	1 2 3 * * *	Resolver install pin 2-3 Encoder install pin 1-2	2-3 installed
E12	* * * 1 2 3	Resolver install pin 2-3 Encoder install pin 1-2	2-3 installed
E13	--<>--	$SYN\overline{U}$	Not installed (Solder Pad)
E14	--<>--	$SYN\overline{V}$ Hall inputs (optional)	Not installed (Solder Pad)
E15	--<>--	$SYN\overline{W}$	Not installed (Solder Pad)
E16	--<>--	Shield	Installed (Solder Pad)
E17	--<>--	Not used	
E18	2 * 1 *	JUMP Pin 1 to Pin 2 for input Sync. (use on all cards other than AO). Also see E7.	Not installed

Note: All S-BTS 10 R leave ex-works Munich with default settings.

µSMCC Component Layout



2. Card address and Baud rate setting

Each card's address can be set-up by setting the DIP switch on the card as follows:

SW 1	SW 2	SW 3	SW 4	
0	0	0	0	card address 0 (standard)
1	0	0	0	" " 1
0	1	0	0	" " 2
1	1	0	0	" " 3
0	0	1	0	" " 4
1	0	1	0	" " 5
0	1	1	0	" " 6
1	1	1	0	" " 7
0	0	0	1	" " 8
1	0	0	1	" " 9
0	1	0	1	" " 10 (a)
1	1	0	1	" " 11 (b)
0	0	1	1	" " 12 (c)
1	0	1	1	" " 13 (d)
0	1	1	1	" " 14 (e)
1	1	1	1	" " 15 (f)

Communication with host computer

The DIP switch is used to select the communication mode and baud rate as follows:

SW 6	SW7	SW8	
0	0	0	9600 Baud (Standard)
1	0	0	4800 "
0	1	0	2400 "
1	1	0	1200 "
0	0	1	---- n/a (disables RS232)
1	0	1	300 Baud
0	1	1	38400 "
1	1	1	19200 "

SW5 of the DIP switch is used to Enable =0 or Disable =1 saving programs and parameters into EAROM memory. Regardless of the switch position, the contents of the EAROM are always uploaded upon power turn on or reset.

When the DIP switch settings are changed, it is necessary to reset the SMCC or cycle power, in order to activate the new set-up.

3. RS232 interface to host PC

Check wiring from PC to µSMCC (P5) as shown below:

(PC) DB9	(DB 25)		P5 (S-BTS 10 R) DB9	
5	(7)	GND	5	
8	(5)	CTS	8	
7	(4)	RTS	7	
2	(3)	RXD/	2	
3	(2)	TXD/	3	
4	(20)	DTR	4	Wire-link on µSMCC (not supported)
6	(6)	DSR	6	

General rules on communication distance are:

38400 Baud 1 m.
19200 Baud 2 m.
9600 Baud 4 m.

Double the distance each time Baud Rate is reduced by half.

Shielding the longer RS232 cables is highly recommended. It is also advised, not to run the RS232 cable next to high power or A.C. signals such as the Servo Amplifier, line voltage etc.

4. Multi Axis S-BTS 10 R

If more than one S-BTS 10 R is fitted in the same rack follow the procedure:

a) Set proper Card Address on the DIP-Switch. Normally starting with A0 on the left and continuing to Ax to the right.

b) Install jumper E7 and leave jumper E18 out on A0.

c) Leave E7 out and install E18 on all other cards.

d) Close the 6 solderbridges on the backpanel for daisy chaining (next to ST13/14/15).

e) Connect SYNC/-ST7/7 and INIT/-ST7/8 from one axis to the other.

5. With all preliminary installation and wiring finished according to drawing no: 15704 (page: 5)
AC-power can be applied to the transformer primary.

   The S-BTS 10 R should not be plugged into the rack yet.

   Apply the proper AC-voltage and note the following:

   - The cooling fan if present should operate.
   - The DC-voltage should be measured at the terminals + V_{cc} and 0V: 200 $V_{nominal}$/240 V_{max}.

   Disconnect AC-power and wait several minutes to allow a discharge of the power supply capacitors.

   Plug the S-BTS 10 R into the rack.

   Before applying power remove motor connector or Disable Amplifier by leaving ST 3/3 open, leave resolver connector connected.

6. Apply power to the system and note the following:

   After automatic power-up reset the Protection Enable LED and In Position LED illuminate green.

   Now connect your PC to the S-BTS 10 R and load terminal program SMCC V3.X from the floppy disc.

   The program will come up with communication information: 9600 Baud, COM 1, X1 Clock.

   Enter "no" and card polling will start.

   The next response should be the number of cards found.

   Now step through all cards and verify the i-parameters using the F1 key.

   Especially check parameter i39 and i40 to be set correctly:

	Option:
i39 = 3	
i40 = 4096 for 2 pole motor (BSM 2 R)	B01
i40 = 2048 for 4 pole motor (BSM 1 R, 3 R, 4 R)	B02
i40 = 1024 for 8 pole motor (BSM 4 F, 6 F, 8 F)	B04
i40 = 4096, i50 = 1 for 6 pole motor (BSM 6 R) <with parabolic only>	B03

   Remark: Default parameters are available on floppy disk from V 3.4 on.
   Filename Standard: ipblstan
   Filename Parabolic: ipblparb.

6. i-Parameter Standard

DEFAULT (NON-PARABOLIC) ONE AXIS D.C. BRUSHLESS MOTOR PARAMETERS

i00	Following Error Limit	0
i01	In-Position Band	100
i02	Manual Data Input	0
i03	Hand Shake Enable	1
i04	Home Feed Rate	100
i05	Servo Time	487
i06	Reference Feed Rate	100000
i07	Time Scale	65498
i08	Accel/Decel Time	100
i09	Pos. Integration Mode	1
i10	Following Error Limit	1000
i11	Feed Hold Slew Control	1
i12	Select 24/6 kHz PWM Frequency	0
i13	Brushless Motor	1
i14	Processor A/D Converter Mode	0
i15	Select Lookup Table	0
i16	Handwheel Mode 1 Control	0
i17	Velocity Display Time Base	7324
i18	Display Formats	3
i19	n/a	-
i20	Proportional Gain Constant X	50
i21	Differential Gain Constant X	240
i22	Differential Gain Time Base X	0
i23	Integral Gain Constant X	10
i24	Home Direction X	0
i25	Home Offset X	0
i26	Home Flag Control X	5
i27	Handwheel Scale Factor X	4096
i28	Handwheel Mode Control 2 X	7
i29	Handwheel Encoder Control X	3
i30	Proportional Gain Multiplier X	1
i31	Jog Feed Rate X	128
i32	Normal PWM Limit Control X	255
i33	Protective PWM Limit Control X	128 *1)
i34	Set Backlash X	0
i35	Software Positive Pos. Limit X	-1
i36	Software Negative Pos. Limit X	-1
i37	Position Range X	0
i38	Pos. Display Scale & Format X	1:1.0
i39	Encoder Control X	3 *2)
i40	Encoder Counts per Rev.	2048 (4 pole)
i41	Phase Advance Scale Factor	64
i42	n/a	0
i43	Lookup Table Address	130
i44	Select 3/4 Phase	1
i45	Phase Offset	0
i46	n/a	0
i47	n/a	768
i48	Star-Delta Connection	7
i49	n/a	3
i50	Resolver Phasing Enable	0
i51	n/a	0

6. i-Parameter Standard (Continued)

i52	Phase Finding Time	40
i53	Phasing PWM Value	20
i54	Resolver Base Address	65464
i55	n/a	-1
i56	n/a	-1
i57	n/a	0
i58	n/a	1:1.0
i59	n/a	3
i60	PLC Enable	0

Note: *1) not applicable
*2) no other values allowed
(standard only)

6. i-Parameter Standard (Continued)

DEFAULT PARABOLIC ONE AXIS D.C. BRUSHLESS MOTOR PARAMETERS

	i00	Following Error Limit	0
	i01	In-Position Band	100
	i02	Manual Data Input	0
PARB	i03	Hand Shake Enable	1
	i04	Home Feed Rate	100
	i05	Servo Time	487
	i06	Reference Feed Rate	100000
	i07	Time Scale	65498
PARB	i08	Accel/Decel Time	100
	i09	Pos. Integration Mode	1
	i10	Following Error Limit	1000
	i11	Feed Hold Slew Control	1
PARB	i12	Move Delay Time	40 *1)
	i13	Brushless Motor Enable	1
	i14	Processor A/D Converter Mode	0
	i15	Select Lookup Table	0
PARB	i16	Handwheel Mode 1 Control	0
	i17	Velocity Display Time Base	14648
	i18	Display Formats	3
PARB	i19	Address of Last Card	0
	i20	Proportional Gain Constant	1000
	i21	Differential Gain Constant	10
PARB	i22	Velocity Feedforward Gain	10
	i23	Integral Gain Constant	0
	i24	Home Direction	0
	i25	Home Offset	0
	i26	Home Flag Control	5
	i27	Handwheel Scale Factor	4096
PARB	i28	Handwheel Mode Control 2	3
	i29	Handwheel Encoder Control	3
PARB	i30	Acceleration Feedforward Gain.....	0
	i31	Jog Feed Rate	128
	i32	PWM Limit	255
	i33	Protective PWM Limit	128 *2)
	i34	Set Backlash	0
	i35	Software Positive Pos. Limit	-1
	i36	Software Negative Pos. Limit	-1
	i37	Position Range	0
	i38	Pos. Display Scale & Format	1:1.0
	i39	Encoder Control	3
	i40	Encoder Counts per Rev.	2048 (4 pole)
	i41	Phase Advance Scale Factor	12
	i42	n/a	0
	i43	Lookup Table Address	130
	i44	Select 3/4 Phase	1
	i45	n/a	0
	i46	n/a	0
	i47	n/a	4096
	i48	Star-Delta Connection	0
	i49	n/a	3
	i50	n/a	0(1 for 6 pole)
	i51	n/a	200

6. i-Parameter Standard (Continued)

	i52	Phase Finding Time	40
	i53	Phasing PWM Value	10
PARB	i54	Phase Offset	0
	i55	n/a	-1
	i56	n/a	-1
	i57	n/a	0
	i58	n/a	1:1.0
	i59	n/a	3
PARB	i60	Deadband X	0
PARB	i61	Deadband Y	0 *2)
PARB	i62	PLC Enable	0
PARB	i63	Parabolic Mode Control	0
PARB	i64	X Encoder/Resolver Base Add.	65464
PARB	i65	Y Encoder/Resolver Base Add.	0 *2)
PARB	i66	Speed of Second X Resolver	0
PARB	i67	Speed of Second Y Resolver	0 *2)
PARB	i68	Second X Resolver Base Address	0
PARB	i69	Second Y Resolver Base Address	0 *2)
PARB	i70	X Encoder/Resolver Bias	0
PARB	i71	Y Encoder/Resolver Bias	0 *2)
PARB	i72	X Encoder/Resolver Size	0
PARB	i73	Y Encoder/Resolver Size	0 *2)
PARB	i74	Second X Resolver Size	0
PARB	i75	Second Y Resolver Size	0 *2)
PARB	i76	X Enc. Data/Strobe Logic Level	1
PARB	i77	Y Enc. Data/Strobe Logic Level	0 *2)
PARB	i78	X Range Mode Control	0
PARB	i79	Y Range Mode Control	0 *2)

Note: *1) i12 ≥ 100 for BSM 6 R
***2) not applicable**

7. Switch power off and wait several minutes to allow discharge. Then connect motorconnector to the motor and take ST 3/3 "high" and ST 7/1, ST 7/2 "low".

   Caution: During initial set-up the motor(s) must be disconnected from the machine to allow proper phasing and to prevent damage (also see User Note 1 on page 38).

   Re-apply AC-power and note the following: After automatic power-on-reset the motor will make a jump left and right and then be stable.
   When turning the motorshaft torque will be developped. The standard gain parameters should ensure stable but not perfect operation. Especially for small motors (BSM 1/2/3) the proportional gain (i20) may be too high causing oscillation. In these cases the value of i20 must be decreased by 50 %. Fine tuning of the different gains should be done later.

   Caution: Do not try to power-up with the Total Disable Input activated. The motor cannot do it's phasing, after enabling, the motor will speed-up and the amplifier will go into current saturation.

8.1 Preventing start-up-phasing jump (with standard CPU)

The S-BTS 10 R is designed to function with resolvers or encoders and to perform automatic phase finding. The phase finding procedure requires that the motor shaft moves a maximum of one half electrical motor revolution (90 degrees for a 4 pole motor) in order to precisely locate correct motor phasing. Even though the phase finding time and torque level are both definable, it is sometimes undesirable to have a "phase finding" cycle on a machine, especially since full torque cannot be guaranteed during phasing and motion occurs bidirectionally.
The procedure to follow for eliminating the initial phasing search when using the resolver is:

a) Be sure that i54 is set correctly: i54 is ffb8 or 65464

   This parameter assigns the memory address at which the resolver is located.

   Also check i50 and i45 to be 0.

   Caution: If i50/i45 ≠ 0, disable amplifier first by taking ST 3/3 low, then change to 0 and enter "s" for save.

b) First do a "HOME" and reset the µSMCC with "$$" or equivalent. S-BTS 10 R will now perform it's normal power on phasing procedure.

c) When phasing is completed, again do a "HOME" by entering "h" with i25 (Home offset parameter) set to 0 (zero offset). This causes the resolver to be at zero position.

d) Now read the value of memory location fe24 by issuing an "r" command for two bytes:

   rfe24,2

   The SMCC will send back 2 hexadecimal bytes (low byte first) as the answer which represents the present phasing position offset. Note that it is important to have done a home with zero offset before this procedure because otherwise the value of the resolver position has to be substracted from the value of fe24.

e) Next, convert the value of fe24 from hexadecimal to decimal and enter this value into i45, phase offset.

   Example: SMCC responds with de04.
   Swap low and high byte to 04de.
   Convert 04de to its decimal value:

   $0 \times 16^3 + 4 \times 16^2 + 13 \times 16^1 + 14 \times 16^0 = 1246$

f) Finally, change the value of i50 from "0" to "1" which tells the µSMCC to skip doing a phasing search and to use the value stored in i45 as the phase offset.
Finish by entering a "save" command: "s".
The user may adjust the value of i45 in order to optimize the phase offset. It is also possible to change the phasing angle as a function of velocity by using i41 to generate a phase shift proportional to velocity. Please refer to the User Notes in the last section of this manual.

8.2 Preventing start-up phasing jump (with parabolic CPU)

The S-BTS 10 R is designed to function with resolvers or encoders and to perform automatic phase finding. The phase finding procedure requires that the motor shaft moves a maximum of one half electrical motor revolution (90 degrees for a 4 pole motor) in order to precisely locate correct motor phasing. Even though the phase finding time and torque level are both definable, it is sometimes undesirable to have a "phase finding" cycle on a machine, especially since full torque cannot be guaranteed during phasing and motion occurs bidirectionally.
The procedure to follow for eliminating the initial phasing search when using a resolver is:

a) Be sure that i64 is set correctly: i64 is ffb8 or 65464

This parameter assigns the memory address at which the resolver is located.

Also check i54 = 0 and i72 = 0

Caution: If i54/i72 ≠ 0, disable amplifier first by taking ST 3/3 low, then change to 0 and enter "s" for save.

b) Do a "HOME" by entering "h" and reset µSMCC with "$$" or equivalent. S-BTS 10 R will now perfom it's normal power on phasing procedure.

c) When phasing is completed, again do a "HOME" with i25 (Home offset parameter) set to 0 (zero offset). This causes the resolver to be at zero position.

d) Now read the value of Memory location fe26 by issuing an "r" command for two bytes:

rfe26,2

The SMCC will send back 2 hexadecimal bytes as the answer which represents the present phasing position offset. Note that it is important to have done a home with zero offset before this procedure because otherwise the value of the resolver position has to be substracted from the value of fe26.

e) Next, convert the value of fe26 from hexadecimal to decimal and enter this value into i54, phase offset.

Caution: Low byte first!
Swap bytes before convert to decimal.

f) Finally, change the value if i72 from "0" to "3" which tells the SMCC to skip doing a phasing search and to use the value stored in i54 as the phase offset.
Finish by entering a save command: "s".
The user may adjust the value of i54 in order to optimize the phase offset. It is also possible to change the phasing angle as a function of velocity by using i41 to generate a phase shift proportional to velocity. Please refer to the last section of this manual (User Notes).

Please be aware that the motor lead phasing and the resolver phasing must be set correctly, otherwise the system will neither phase nor function correctly.

9. Now the S-BTS 10 R is ready to go. For demonstration and test purposes every S-BTS 10 R has a small program in EAROM.

This program can be run by entering "R" on your PC.
The motor will move 100.000 counts, stop for 1 second and go back to zero again.
After 1 second delay this will be repeated for ever.
The program can be stopped by entering "Q" (Quit).

If the program is not running the buffer may be cleared or the limit switches and/or Feed Hold may be activated.

The next step will be to optimize motor response on the machine by varying the gain parameters.

For the program instructions, please refer to the SMCC Manual.

10. Response Optimization

The step response can be optimized with the i-parameters i20 (proportional gain), i21 (differential gain) and for parabolic also i22 and i30.
In order to achieve proper adjustment it is necessary to observe the velocity waveform on TP 11 (μSMCC) with an oscilloscope. The servo performance is adjusted properly when the velocity waveform shows a single overshoot on applying a step command. At constant velocity the AC-component on TP 11 should be kept as low as possible to avoid excessive motor heating.

The motor speed in rpm can easily be read from the terminal by entering "v".
With parabolic CPU the servo performance analysis can be done by using the Data Gatherer/Plotter feature. Please refer to SMCC manual.

S-BTS 10 R - Testpoints

On µSMCC board (see page 10):

TP1: Phase U Current Command signal to current loop BTS 10.
10 V ≙ peak current (rms)
Rout = 220 Ω

TP2: same as TP 1 for Phase V

TP3: 12 MHz clock
HCMOS output (74HC14)

TP4: SYN $\overline{U}$

TP5: SYN $\overline{V}$ Hall Sensor Signals (optional)

TP6: SYN $\overline{W}$

TP7: Reset/ (INIT/)
Input from ST 7/8

TP8: Encodersimulation
Output from RDC CHA (channel "A")

TP9: same CHB

TP10: same CHC (Zero Marker)
CHA and CHB in quadrature

TP11: Velocity Testpoint 1,67 V/1000 rpm ± 15 %,
$V_{OFFSET} \leq \pm$ 0,25 V

TP12: + 12 V

TP13: AGND

TP14: - 12 V

On S-BTS 10 R Control Card (see page 23):

TP1: Actual current phase U
I_{pk} ≙ 10 V

TP2: Actual current phase V

TP3: Actual current phase W

Note: For torque calculations referring to the actual current the formula is:

$$T = 3 \cdot KT \cdot \frac{V_{TP} \cdot I_{pk}}{10}$$

where T = Motortorque (Nm)

KT = Torque constant per phase (Nm/A)

V_{TP} = Voltage on TP1, 2 or 3 (peak)

I_{pk} = peak rms current rating of amplifier S-BTS 10 R ($I_{pk} \hat{=} 2 \cdot x\ I_{nom}$)

TP6: Analog input signal after potentiometer RP1. For use of this input please refer to SMCC Software Manual, also see parameter i14.

TP9: PWM signal 20 V_{pp}, 10,5 kHz triangle wave (for test purposes only)

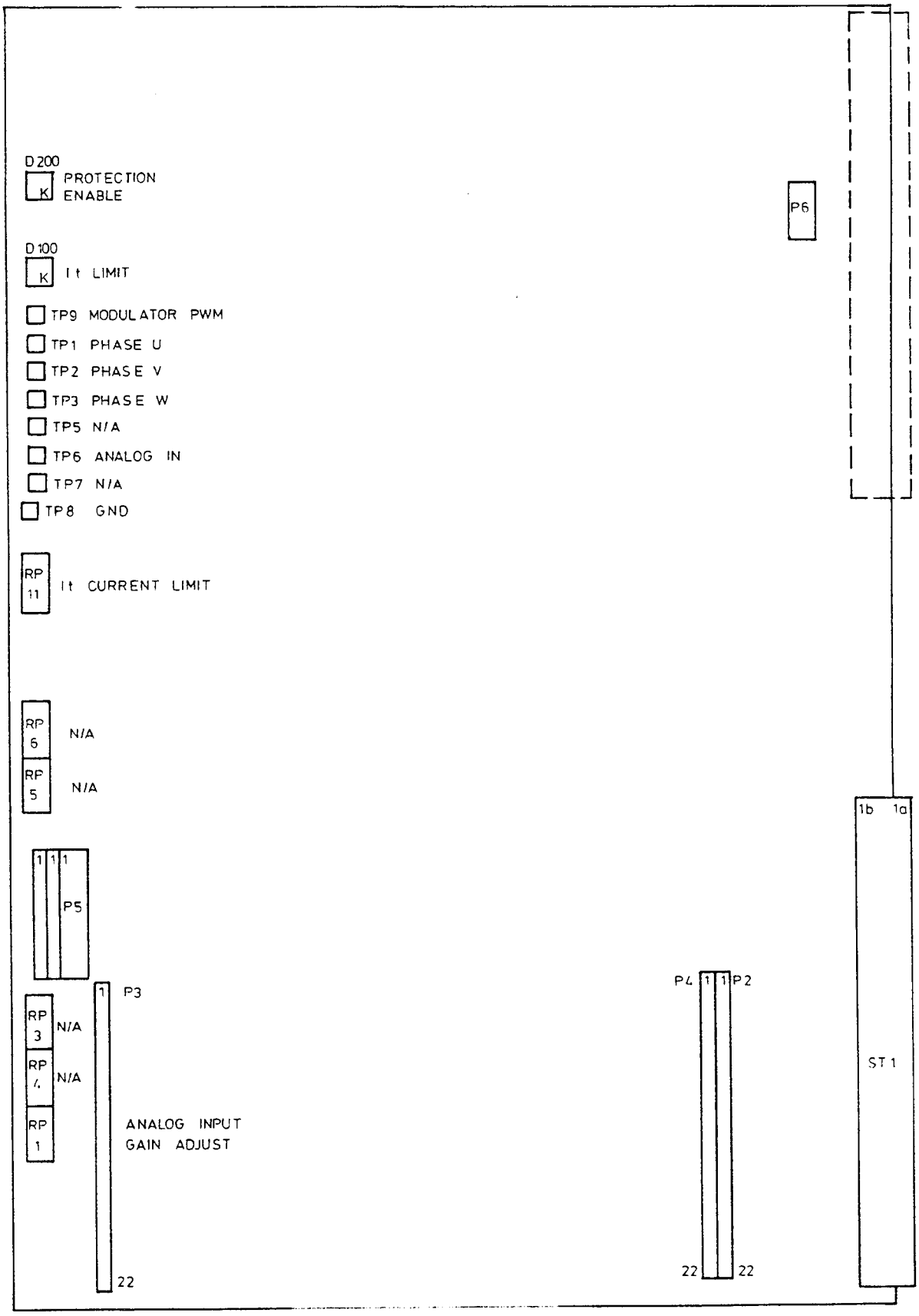
Testpoints on backpanel:

TP1: n/a

TP2: see TP3 on control card

S-BTS 10 R - Control Card

Testpoints and Potentiometer Location



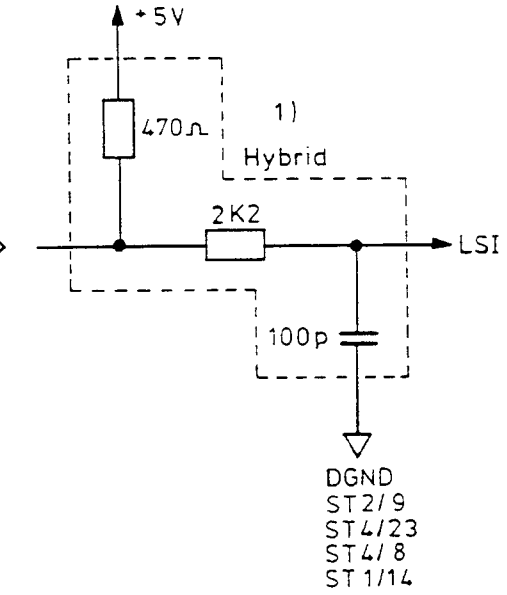
N/A - NOT APPLICABLE

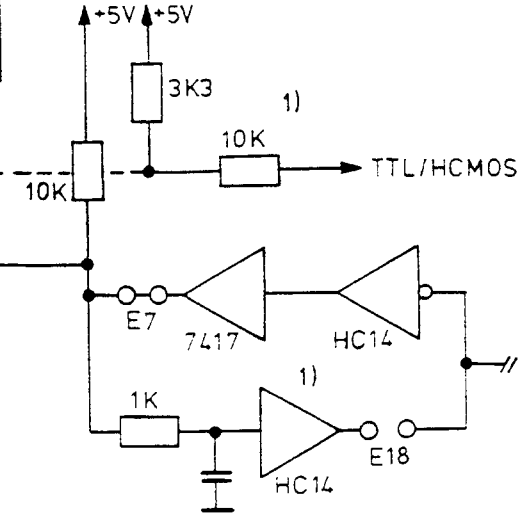
Inputs (unless otherwise stated 5 V TTL)

CW Limit high or open inhibits the move	ST 7/1 (30a)
CCW Limit high or open inhibits the move	ST 7/2 (30b)
Home Flag/ User Flag/	ST 7/3 (11b) ST 7/4 (5a)
See Software Manual i 26	
Aux. Input 1 ($\overline{\text{MAI1}}$) Low is true	ST 14/1 (5b)
Aux. Input 2 ($\overline{\text{MAI2}}$) Low is true	ST 14/2 (6b)
Aux. Input 3 ($\overline{\text{MAI3}}$) Low is true	ST 14/3 (21a)
Home/	ST 7/10 (6a)
Low activates "Seek Home"	
START/ Low is "Start"	ST 12/1 (14a)
STOP/ Low is "Stop"	ST 12/2 (14b)
STEP/ Low is "Step"	ST 12/3 (15a)
HOLD/ Low is "Hold"	ST 12/4 (15b)
JOG+/ Low is "Jog CW"	ST 13/1 (16a)
JOG-/ Low is "Jog CCW"	ST 13/2 (16b)
INIT/ Low is "Reset"	ST 7/8 (13b)
SYNC/ See E-Points E7/E18	ST 7/7 (13a)

Note: ST 7/7 must be linked for multi-axis see page 12 / 4e)

1) On µSMCC



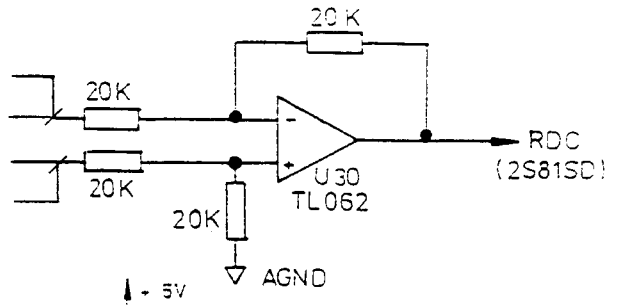


Inputs (Continued)

Resolver

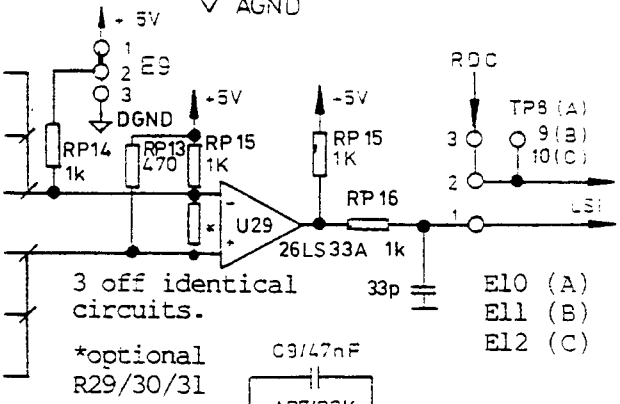
SIN-Input S4 ST 1/3 (2a)
(COS-Input S3) ST 2/1 (3a)

SIN+Input S2 ST 1/4 (2b)
(COS+Input S1) ST 2/2 (3b)



Signal waveform sinusoidal
7,2 kHz, 10 Vpp

Handwheel Input A/ ST 11/2 (10a)
" " B/ ST 10/4 (9a)
" " C/ ST 10/3 (8b)
" " A ST 11/3 (10b)
" " B ST 11/1 (9b)
" " C ST 10/2 (8a)

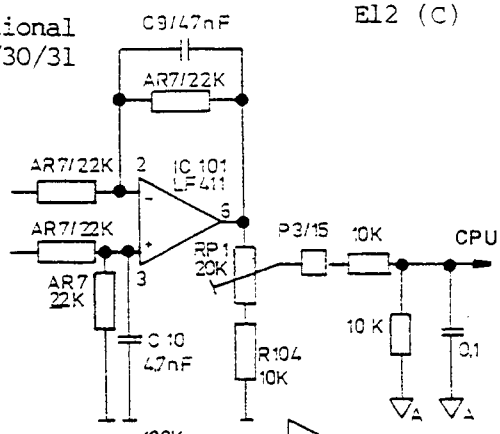


V_{in} max. = + 5 V_{DC}

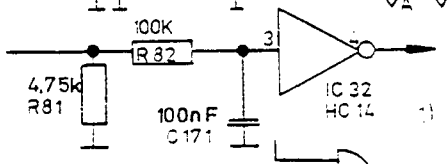
Auxiliary Analog Input 0 V. RTN ST 6/4 (31b)
INPUT ST 6/3 (31a)

0 ... + 10 V_{DC} max.

Resolution 8 Bit



Drive Disable ST 3/3 (27a)
high = enable
V_{in} max. = + 5 ... + 30 V_{DC}

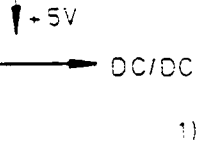


It Inhibit Test ST 4/3 (12b)

Note: For test purposes only,
low disables electronic fusing

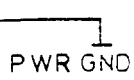
+ 24 V_{DC} Input for Control

logic supply (optional)



ST 6/1 (18a)
ST 6/2 (18b)

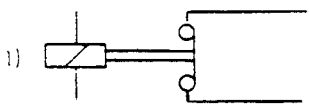
ST 19 (0 V)



Inputrange + 18 ... 60 V_{DC}
Input Power 30 W

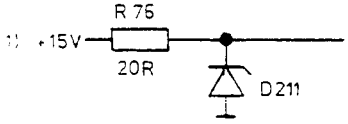
1) On Control Card

OUTPUTS



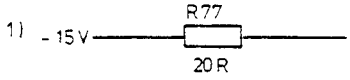
ST 3/1 (24a)
ST 3/2 (24b)

Fault relay contacts, open when fault.
max. load: 48 V_{DC} @ 100 mA



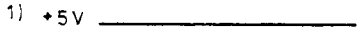
ST 5/1 (25a)
ST 2/3

+ 15 V @ 20 mA



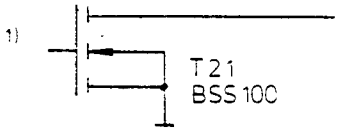
ST 5/2 (25b)

- 15 V @ 20 mA



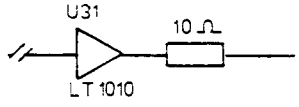
ST 10/1 (7b)

+ 5 V ± 5 % @ 300 mA

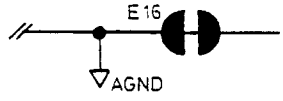


ST 16/1 (4a)

$\overline{\text{It warning}}$
max load 30 V @ 50 mA
low is true

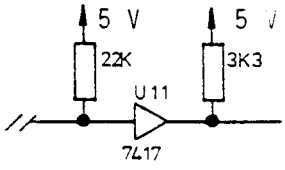


ST 1/2 (1b) Resolver Reference R 3



ST 1/1 (1a) Resolver Reference R 1

Signal waveform sinusoidal 7,2 kHz, 21 V_{pp}

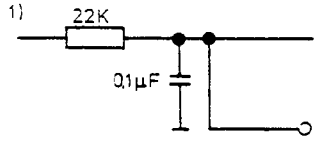


ST 7/6 (21b)

$\overline{\text{Buffer Full}}$
Low is true

V_{OHmax} = 15 V
I_{OLmax} = 40 mA
I_{CEXmax} = 250 µA

CPU DATA REQUEST



(29b)

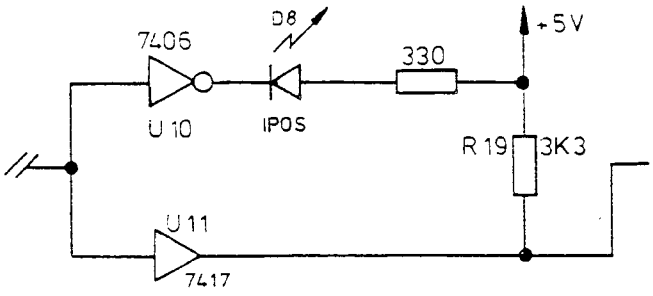
Phase current
I_w actual

10,0 V ≙ I_{pk}
± 5 % accuracy

Note: TP 2 on backpanel

1) On Control Card

OUTPUTS (Continued)

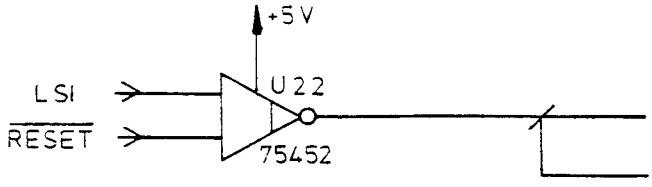


ST 7/5 (4b) IN POSITION
high is true

V_{OHmax} = 15 V

I_{OLmax} = 40 mA

I_{CEXmax} = 250 µA



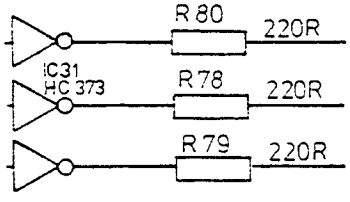
ST 15/1 (22a) $\overline{MAO2}$

ST 15/2 (22b) $\overline{MAO3}$

General purpose
(machine) outputs
low is true
Open Collector

V_{CER} = 30 V max
V_{CESAT} = 0,7 V max
I_{OH} = 300 µA max
I_{OL} = 300 mA max

1)



ST 16/2 (19b) F 0

ST 16/3 (20a) F 1

ST 16/4 (20b) F 2

Error code

5 V Output

	F0	F1	F2	
	0	0	0	OK (BTS 10 is happy)
	0	0	1	Overtemperature
	0	1	0	Undervoltage
	0	1	1	Electronic Fusing
	1	0	0	Overvoltage
15 sec.	1	0	1	Resolverfault
	1	1	0	Overcurrent
	1	1	1	It warning, electronic fusing after 15 sec.

Note: It warning is not latched, all others are.

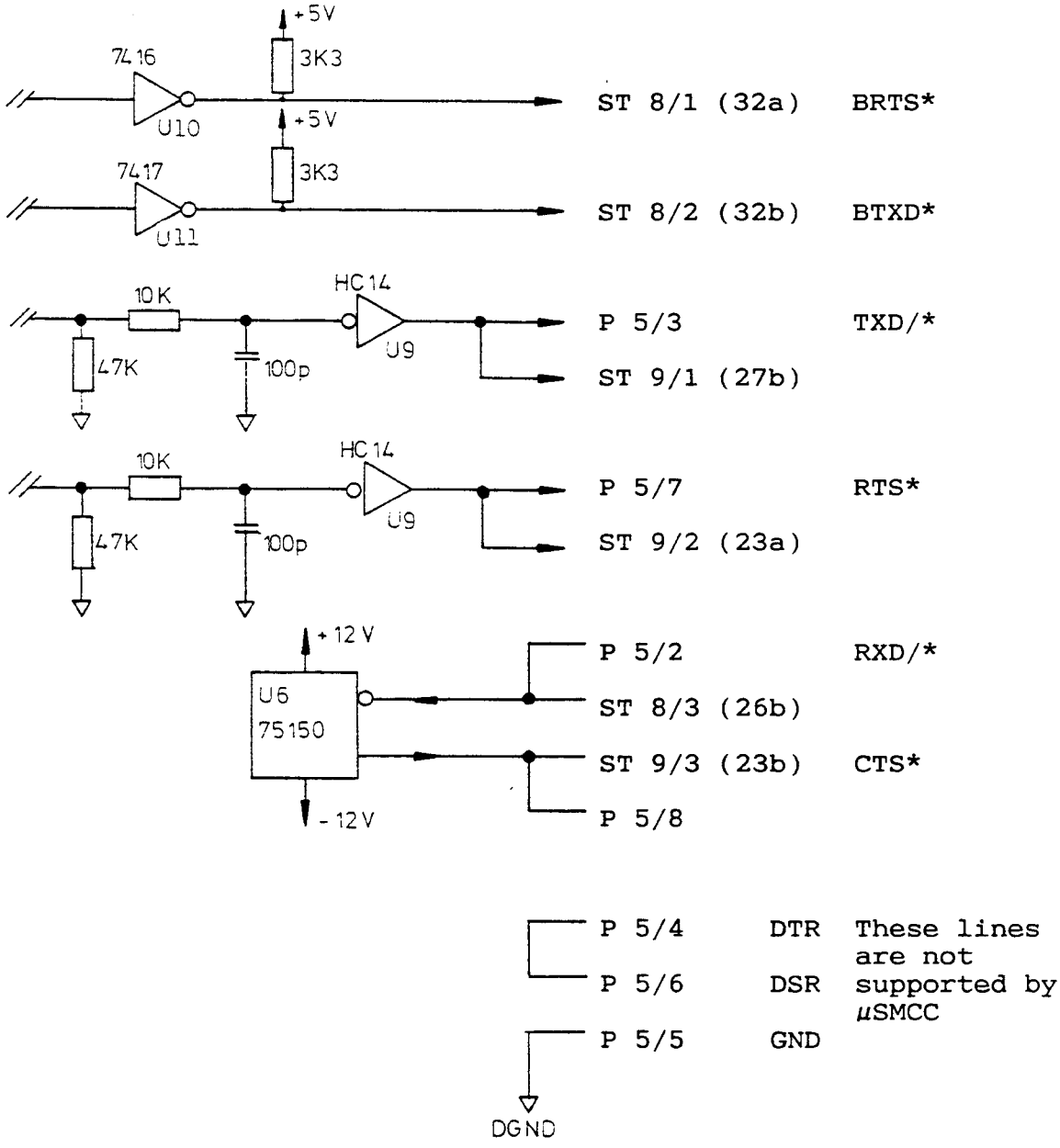
RS232

Data format: 1 Start Bit

8 Data Bits

1 Stop Bit

No Parity.



These lines are not supported by µSMCC

* Daisy Chained on Backpanel

J-Expansion Pin Assignment

(see layout J1 on page 10)

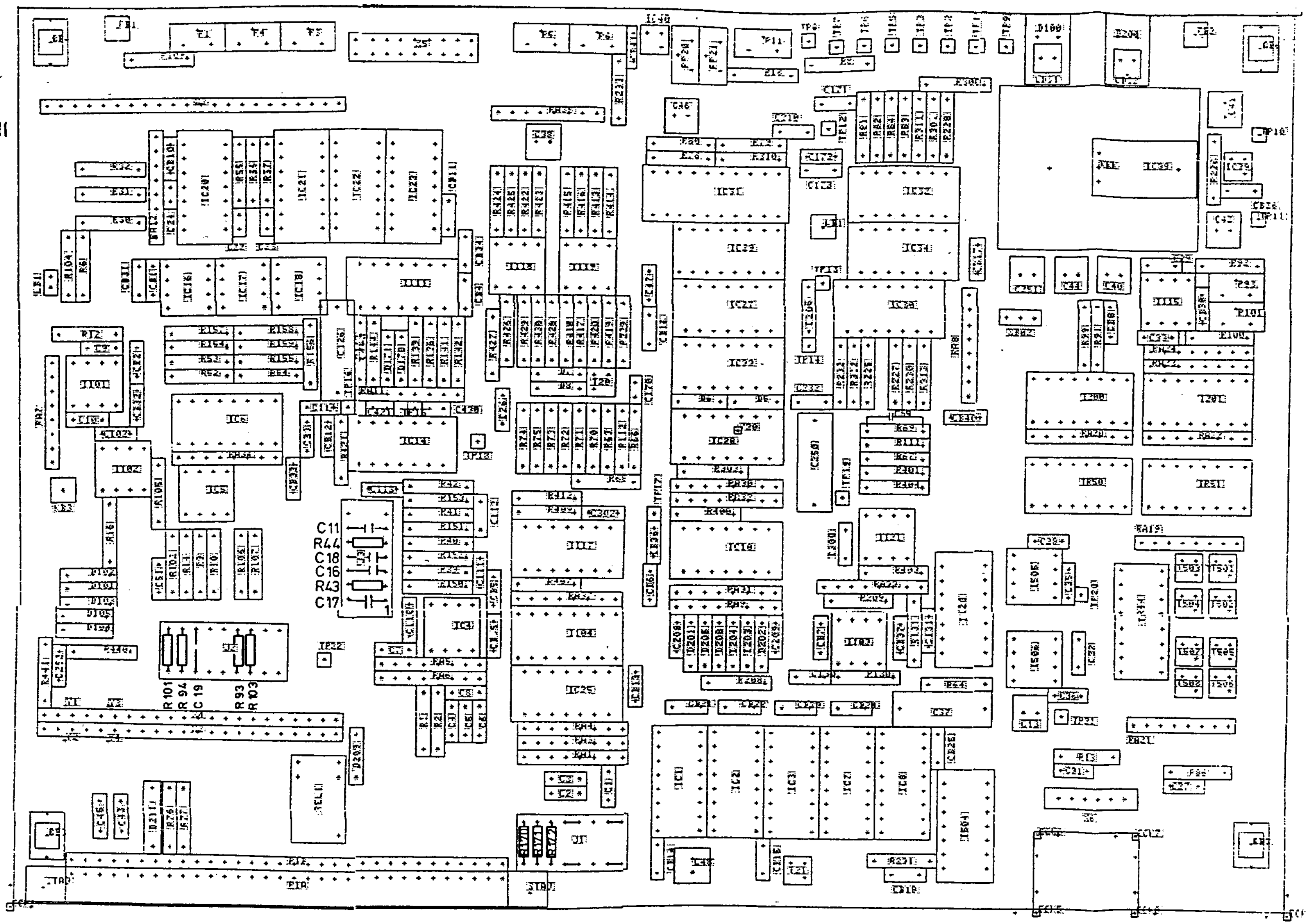
PIN	FUNCTION
1 O/P	- 15 V @ 10 mA
2 O/P	RESET
3 O/P	+ 15 V @ 10 mA
4 O/P	WR/
5	DGND
7	
16 I/O	AD 0
12 I/O	AD 1
8 I/O	AD 2
6 I/O	AD 3
10 I/O	AD 4
14 I/O	AD 5
18 I/O	AD 6
20 I/O	AD 7
9 O/P	+ 5 V @ 100 mA
11	
13 O/P	RD/
15 O/P	DSPCS/
17 O/P	ALE
19 O/P	MMCS

All Signals on TTL Level.

STAND: 17.5.88 *(initials)*
5.7.88 *(initials)*
29.9.88 MI

P5 SOLDER SIDE

FOR TR 44,50,51
CUT PINS 1MM
SHORTER



SURFACE ROUGHNESS	TOLERANCES	MATERIAL	PROTECTIVE FINISH

TITLE BTS 10/1
CONTROL CARD
COMPONENT LAYOUT

SCALE

DRAW.-NO. 13809 C

1988	DATE	NAME	REV.-NO.
DRAWN	22.04.	HARTMANN	
CHECK			
NORM			

PROPRIETARY NOTICE BALDOR

BALDOR ASR

BPS 10-200-R

Power Supply for S-BTS 10 R Series Amplifiers

Together with an external 3-phase isolation-transformer the BPS 10 represents the 200 V DC-Power supply.
It's function besides fullwave rectification and filtering also includes a power shunt or regeneration.
The regeneration circuitry limits the DC-Bus voltage level during deceleration of the motor with it's load thus preventing an overvoltage shut down on the S-BTS 10 R.

On the frontplate there are two indicators:
one for the 200 V DC-supply, the other for the activity of the regeneration.

Input for 200 V DC output: 3 x 140 V AC nominal

Regeneration level: 275 V DC (P1 set and sealed ex works)

Load Resistors:

For all BPS 10 versions an internal load resistor with 80 W continuous powerrating is included. The peak power dissipation should not exceed 4 kW for time intervals shorter than 1 sec.

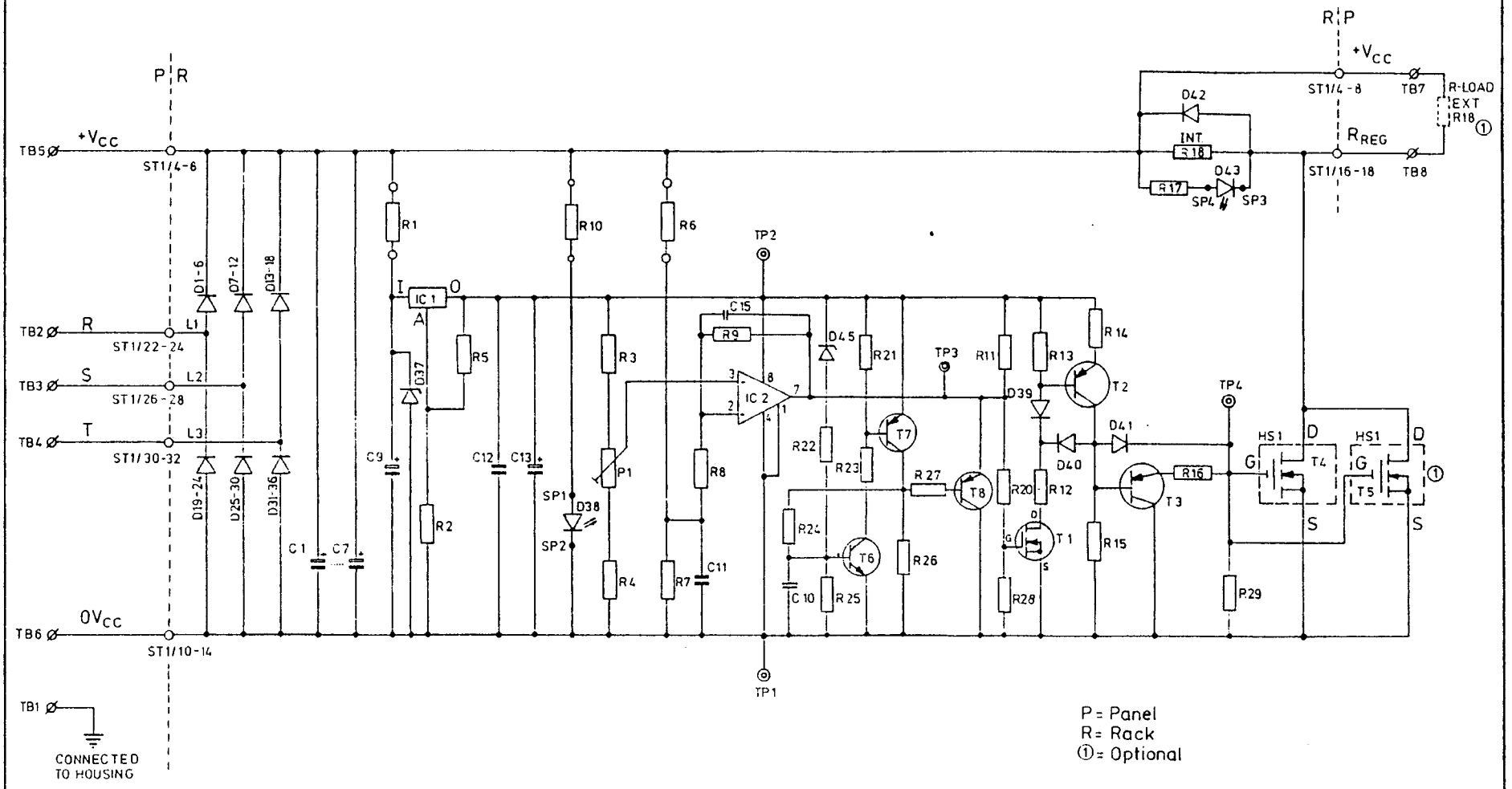
For applications where higher powerratings are needed an external resistor may be connected to ST17 ($+ V_{CC}/R_{REG}$), in this case the internal resistor (R18) has to be removed.

External resistors are available with 320 W powerrating.
(16 kW @ $\leq$ 1 sec.)

Note: The switching current (20 A) may not be increased, hence the resistor value must be $\geq$ 14 Ω.

DRAWING NUMBER 16180 B

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



DRAWN D.G. OCT 88

TOLERANCES —

MATERIAL —

DESIGN EG

SCALE —

PROTECTIVE FINISH —

A.S.R. SERVOTRON

Continental European ASR SERVOTRON AG Group Corporate Office

Av. des Grandes-Communes 6 CH-1213 Petit-Lancy/Geneva Switzerland

Tel. (0)22 92 44 44 Telex 289 936 asr ch

United States ASR SERVOTRON INC 645 Centre Avenue Rancho Palos Verdes, CA 90274 USA

Tel. (213) 544-9193 Telex 0230 791213

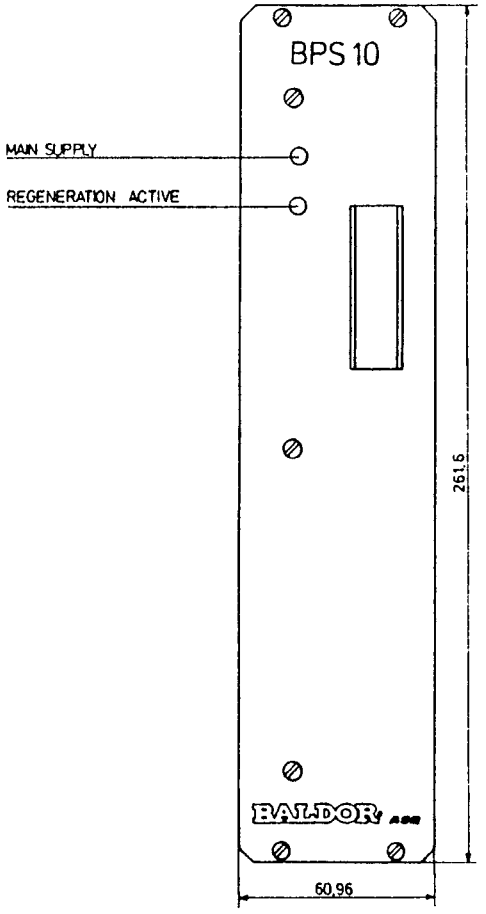
TITLE

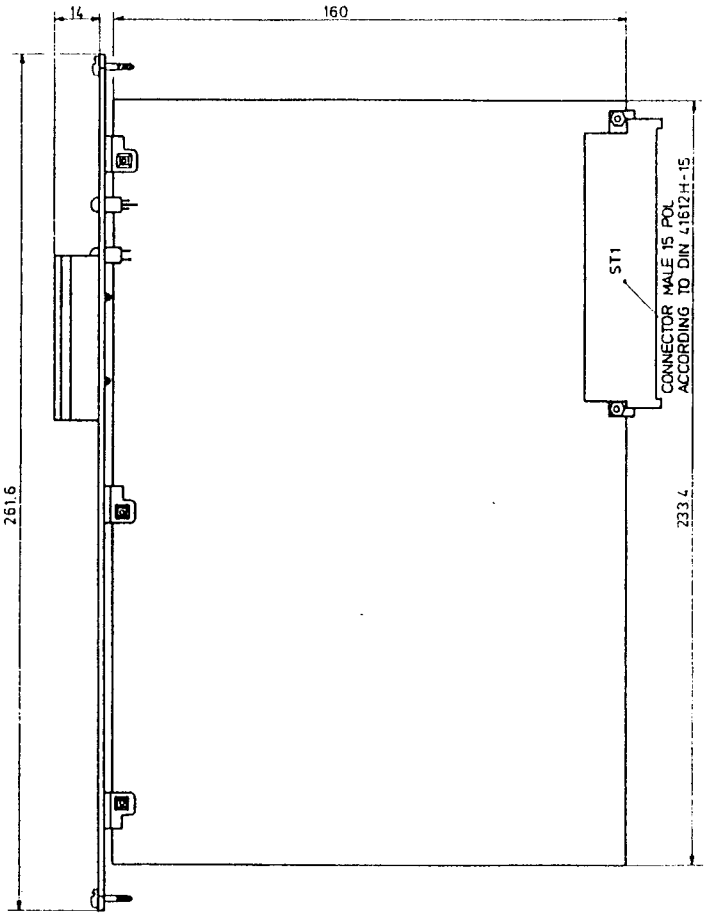
BPS 10 R/P POWER SUPPLY CIRCUIT DIAGRAM

REF DRAWING NO —

DRAWING NUMBER 16180 B

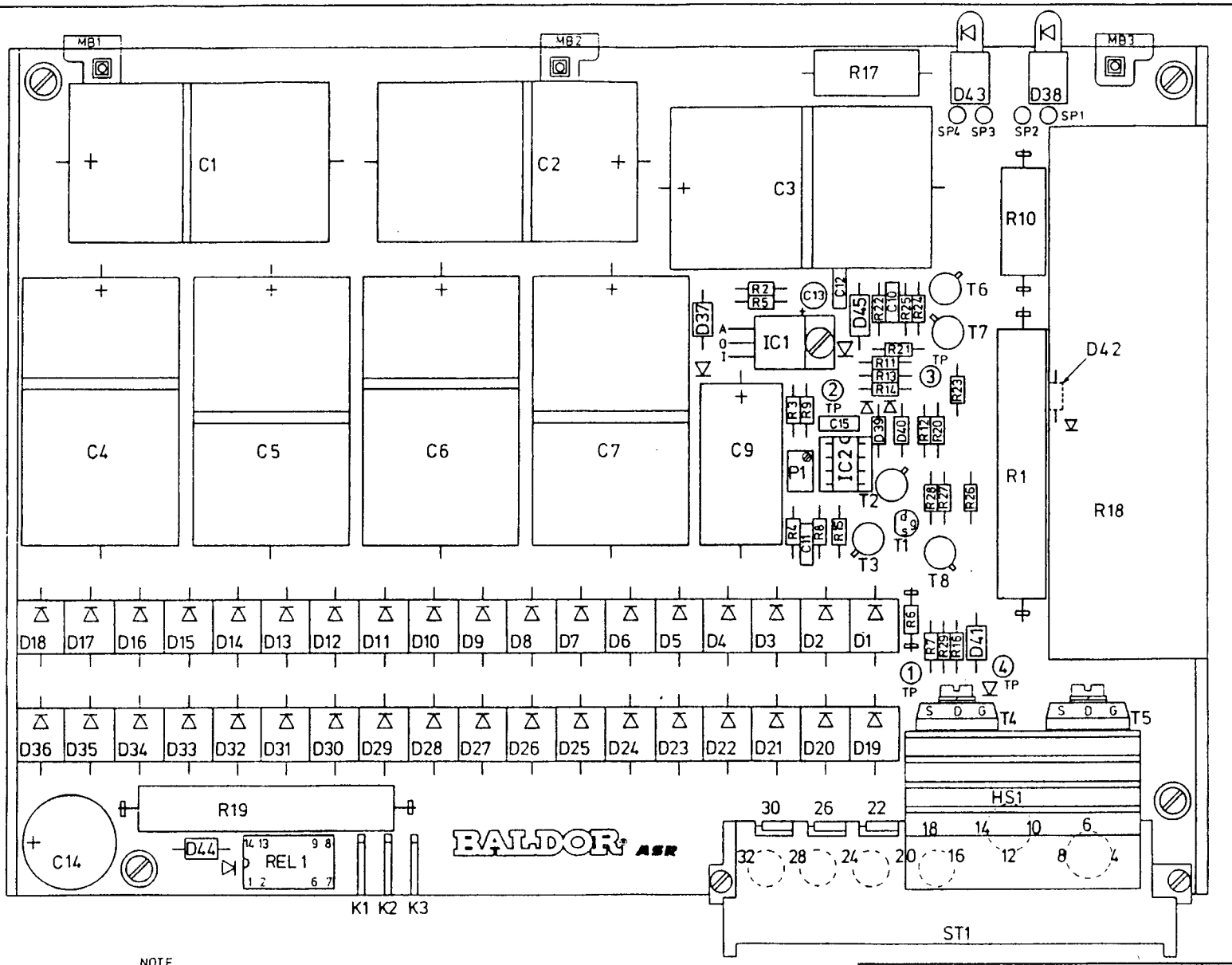
14400B





BPS 10
FRONT PANEL
MOUNTING DETAILS TO PCB

				1:1	14400B
	NOV	WARD			BALDOR A.S.R. SERVOTRON



NOTE
1. HS1 IS MOUNTED ON SPACERS
2. COMPONENTS SHOWN THUS - ⊕ ARE MOUNTED ON SOLDER STUDS
3. ON BPS 10P D38/43 ARE MOUNTED ON A SEPERATE PCB ATTACHED TO THE HOUSING FRONT WALL & THEN WIRED BACK TO THERE RESPECTIVE SOLDER POINT ON THE POWER SUPPLY BOARD

BPS 10 10P 10R POWER SUPPLY COMPONENT OVERLAY	2 1	14476G

BALDOR A.S.R. SERVOTRON

DRAWING NUMBER 160 76 B

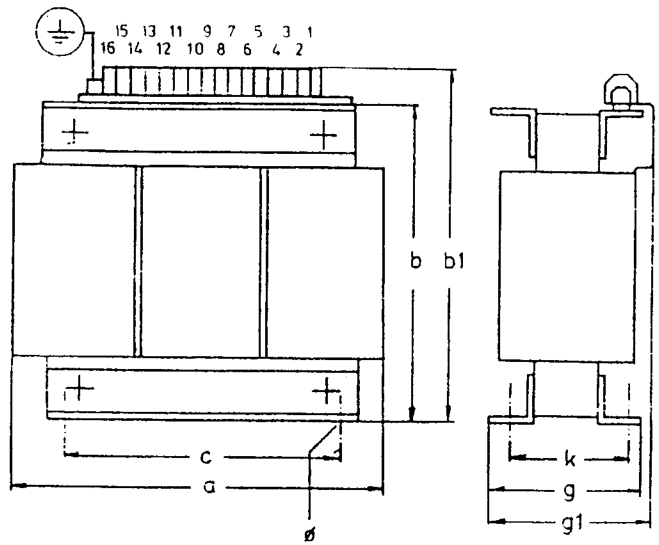
REVISIONS

LTR	DESCRIPTION	DATE	APPROVED

Designation:

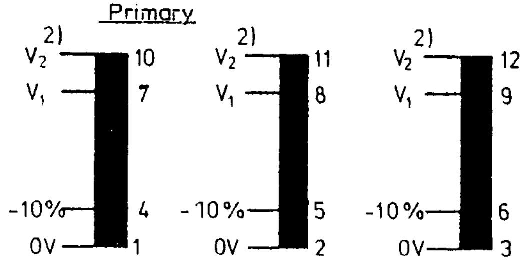
DT - 010 - 200 - 380 / -10% / ...

- 1st primary 380V standard, others on request
- 2nd primary optional
- DC Voltage
- x 100 = P[VA]



TYPE	a_{max}	b_{max}	$b1_{max}$	c	g_{max}	$g1_{max}$	k	ø	kg_{max}
DT 010-200	210	185	241	140	115	135	95	8.8	15
DT 025-200	264	230	285	200	120	150	90	10	27
DT 050-200	300	260	315	224	147	177	119	10	44
DT 075-200	360	310	372	264	158	193	140	10	66
DT 100-200	360	310	372	264	173	208	155	10	76
DT 150-200	420	360	422	316	203	235	173	12	116
DT 200-200	480	380	445	380	232	280	172	13	117
DT 250-200	480	380	445	380	232	280	172	13	126
DT 300-200	510	430	515	380	239	280	179	13	150

Primary



Wiring:

1st primary V_1, 380V Standard

R = 7 — 1
S = 8 — 2 } 1)
T = 9 — 3

2nd primary V_2

R = 10 — 1
S = 11 — 2 } 1)
T = 12 — 3

Sec. (Star)

U 13
V 14 } 143 V~ @no load
W 15

Screen
16

Notes: 1) Instead of 1+2+3, 4+5+6 may be jumpered to obtain 10% higher secondary.
2) Optional on request.

CHECKED 29.9.88 — TRACED Mi — DRAWN 15.09.88

TOLERANCES — ORIGIN — SCALE — MATERIAL — PROTECTIVE FINISH

BALDOR ASR SERVOTRON

TITLE
THREE PHASE TRANSFORMER FOR BPS 10

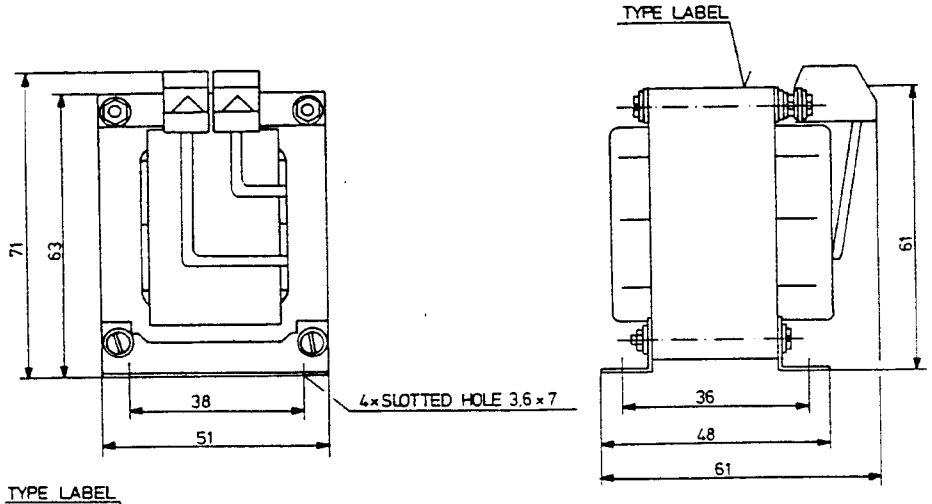
REF DRAWING NO

DRAWING NUMBER 160 76 B

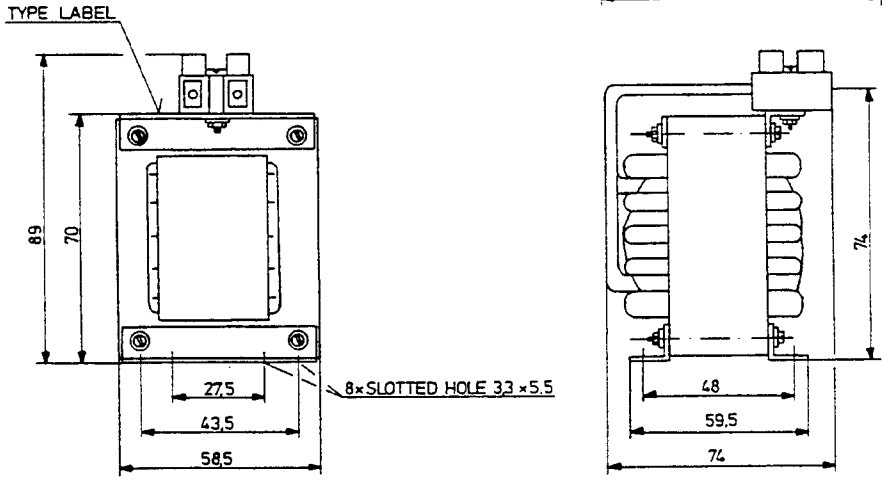
S-BTS 10 R-Protection Chokes

The following chokes are available to protect the amplifier against shorts between the outputs and to ground. One choke in each of the three phases to the motor is needed for full protection.

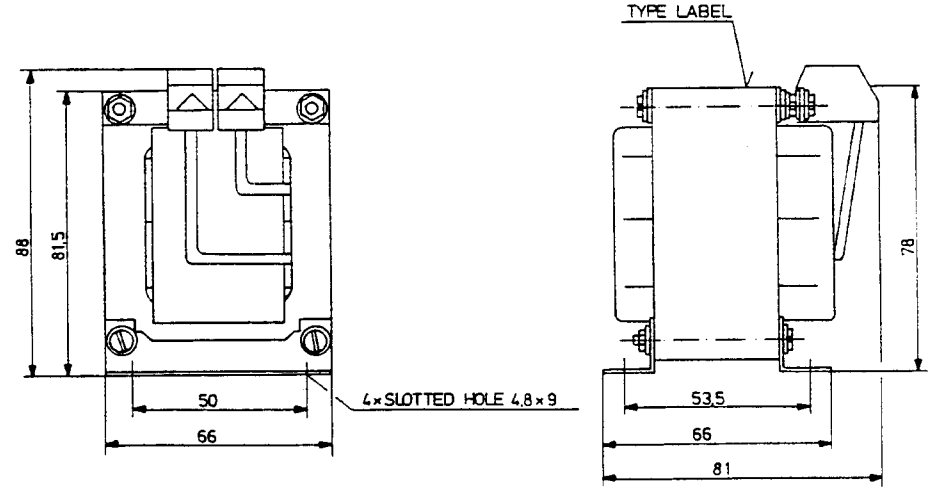
L 100-6
15528A#
1 mH/6 A



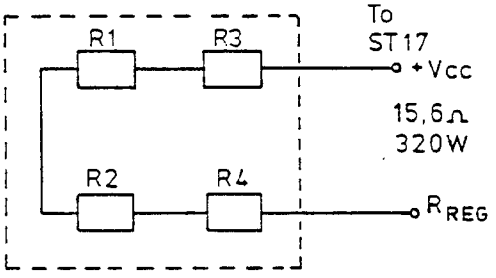
L 040-15
12956A
400 µH/15 A



L 040-20
15527A
400 µH/20 A

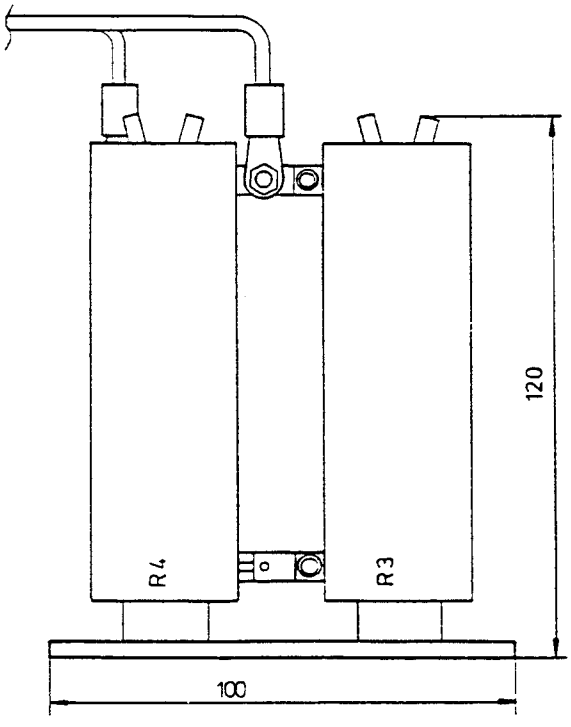


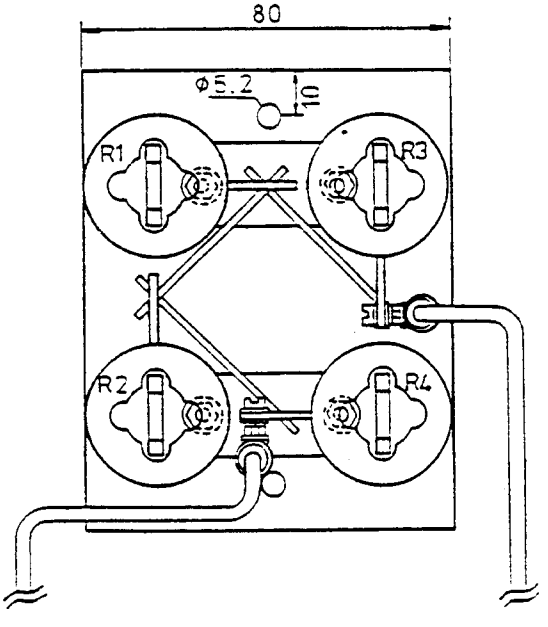
BPS 10 R-External Load Resistor



R 1 ... 4 = 3,9 Ω/80 W
I_{SWITCH} = 17,5 A
14352A

Assembly Drawing and Dimensions





S-BTS 10 R - User Notes

1. Initial Phasing

In some cases the motorshaft cannot be decoupled from the load (ex. gearbox).
Depending on friction, the torque generated during the phasing cycle can be too low. For these applications it is necessary to increase both the "phasing pwm value" (i53) and the "phase finding time" (i52).

2. Grounding

As shown on page 5 it is absolutely necessary to connect the power ground to earth to prevent damage on the RS232 interface.

3. Encoder-Feedback

The S-BTS 10 can also work with encoder feedback instead of resolver feedback. For encoder operation the jumpers E 10, E 11, E 12 have to be changed (see page 9).
Also i40 has to be changed and set as follows:

$$i40 = \frac{8 \times \text{Enc. Res. (ppr)}}{\text{No. of poles}}$$

Encoder feedback is incremental; therefore automatic phasing is not possible: the motor will execute its phasing jumps after each power on.
The encoder signals have to be wired to the Handwheel inputs, consequently the Handwheel mode is not possible for this type of operation.

4. Offset Adjust

The current offsets are adjusted ex factory at an ambient temperature of 25° C.
At higher ambient temperatures a significant DC-component may be introduced in the motor windings due to thermal drift causing additional torque ripple.

Adjustment procedure:

- Remove S-BTS frontplate
- Power on
- Connect PC to S-BTS and start communication
- Enter 0ø (open loop, zero current command)
- Connect DVM to TP 1 (see page 23) and TP 8 (GND). Adjust R 2 (see page 10) until $V_{TP1} = 0,0\ V_{DC}$
- Connect DVM to TP 2 and adjust to Zero with R 3
- Check TP 3 = $0,0\ V_{DC}$
- End.

5. Phase Offset & Phase Advance

The Phase Offset can be optimized (fine tuned) by the following procedure.
Jog the motor in both directions at about 50 % of the nominal speed.
Observe TP 1 (see page 23) with an oscilloscope and note the signal amplitudes for both directions.
Now optimize the offset by varying parameter i45 (std.) or i54 (parabolic) until the signal amplitudes are equal for both directions.
New values for i45/i54 are accepted by the S-BTS after entering a soft reset ($).
The Phase Advance can be optimized with parameter i41 and should be set for lowest amplitude on TP 1.
Now slowly increase the motorspeed up to nominal and correct i45 (i54) and/or i41 if necessary.

Note: Phase offset tuning should be done with an unloaded motor since machine friction can be different for both directions.
Phase Advance tuning should be done with the loaded motor.

6. How to replace the Standard Chip Set by Parabolic and vice versa

a) Replace EPROM and CPU as required.

Caution: Please handle with great care and use appropriate tools. Also avoid electrostatic discharge.

b) Install push-button switches for

START (ST 12.1)
STOP (ST 12.2)
STEP (ST 12.3)

c) Disable Amplifier by taking ST 3/3 low (or left open).

d) With the IBM terminal connected and set to 9600 Baud, turn on power to system while shorting the STOP/ line to Ground. The µSMCC will come in the test mode and you can then follow the instructions on the screen.

```
:RUN FOR PRESENT PARAMS
:STEP FOR DEFAULT PARAMS.....push Step
:RUN FOR BRUSHLESS PARAMS.....push Start
:STEP FOR STANDARD PARAMS
:RUN FOR 3-PHASE PARAMS.....push Start
:STEP FOR 4-PHASE PARAMS
:RUN SYNCHRONOUS PARAMS.....push Start
:STEP INDUCTION PARAMS
```

```
:SWITCH TEST   RUN.............push STOP to bypass any step
:SWITCH TEST   STEP
:SWITCH TEST   HOLD
:SWITCH TEST   HOME
:SWITCH TEST   EQUAL
:SWITCH TEST   JOG +X
:SWITCH TEST   JOG -X
:SWITCH TEST   JOG +Y
:SWITCH TEST   JOG -Y
:SWITCH TEST   LIMIT +X
:SWITCH TEST   LIMIT -X
:SWITCH TEST   LIMIT +Y
:SWITCH TEST   LIMIT -Y
: ENC-X  SNC-Y  HW-X  HW-Y
:     0      0     3     3
```

Use STOP/ key one more time to return to normal operating mode. Do not forget to use an "s" to save the parameters you have loaded.

e) Now load default parameters from diskette

Standard: file name ipblstan
Parabolic: file name ipblparb

or change parameters according to the listings in this manual.

f) Again do not forget to save the parameters you have changed.

g) Remove power to the amplifier and proceed to normal set-up instructions.

7. 24 V-Option

The Control Supplies are normally generated from the 200 V_{DC} - BUS supply.
For some applications it is necessary to keep the control electronics on stand-by (ex. position information).
This can be achieved by using a supplementary external 24 V supply. In this case the internal supplies will be generated from the 24 V.
This feature is not standard and cannot be fitted in the field.