

AMX/ARX - AVANCE

2H Lockswitch 500MHz Technical Manual

Version 004

BRUKER

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W

W4B132147 C 22
W4D132510 A 28
W4L132122 G 25
W4L132146 35
W4S132122 G 24
W4S132144 A 30
W4S132146 34

X

X out 9

General description

1

Description

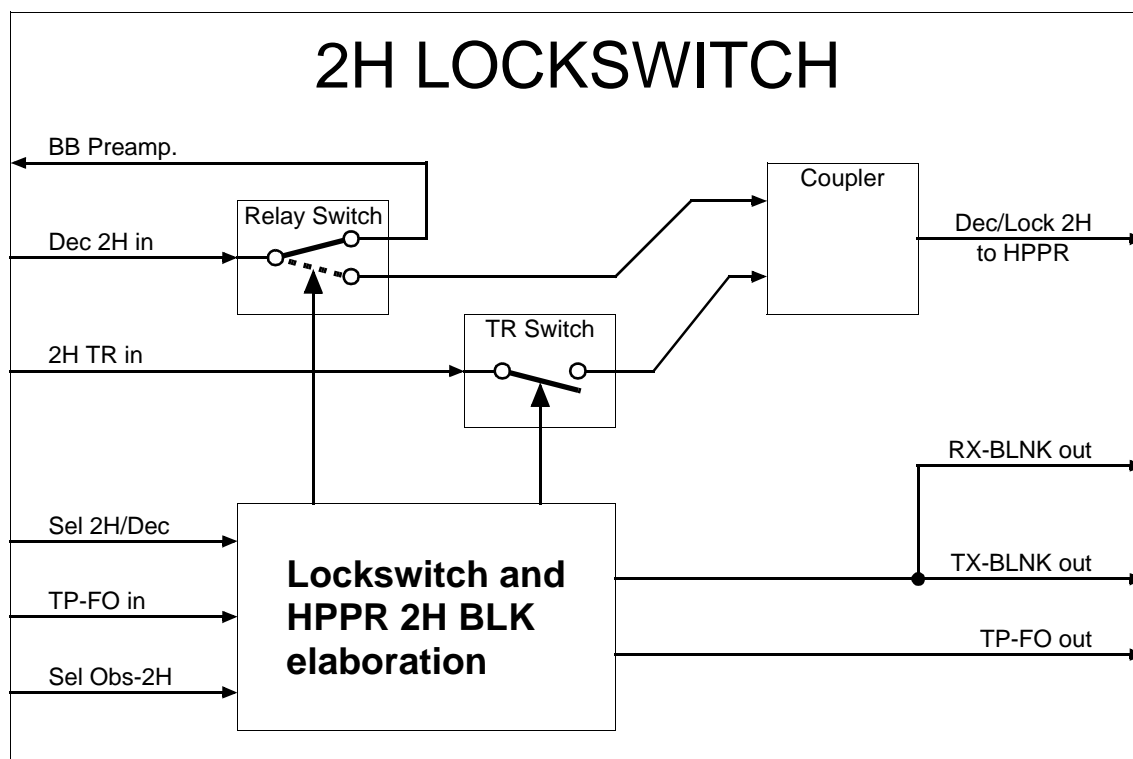
1.1

The 2H Lockswitch system allows to perform experiments with Lock and Deuterium decoupling or just Deuterium observation. It is possible to switch from the X observation to Deuterium observation by using only one X amplifier without doing any cable changes. This manipulation is possible because of the internal «routing» that dispatches the source [channel 1 = ^{13}C (^2H)] either on the «Deuterium» output (Dec / Lock ^2H to HPPR) or on the «X» output (BB Preamplifier).

The commutation for «Lock» and «1H or X» observation is possible with this accessory (automatic).

This system allows also to perform 1 axis «Deuterium Gradient Shimming».

Figure 1.1. Synoptic of 2H Lockswitch



- Power supply: 200 V to 240 V AC (rear socket)
- Range: 62,5 to 125 MHz
- Insertion loss: 4 dB \pm 1 dB in the range (X channel and 2H channel both)
- 2H TR IN Input to DEC 2H IN Input Isolation (when BLKM on RF active state) : 20 dB to 30 dB (DEC/LOCK 2H Output 50 Ohms loaded)
- 2H TR IN Input to DEC 2H IN Input Isolation (when BLKM desactivated state): greater as 75 dB
- 2H TR IN Input to DEC 2H IN Input Isolation (when BLKM desactivated state) : greater as 75 dB
- 2H TR IN Input to DEC/LOCK 2H Output Isolation (when BLKM desactivated state) : greater as 60 dB
- Total switching time : less than 15 μ s for "SEL 2H/DEC & SEL OBS-2H" and less than 0,5 μ s for TP-FO
- Universal Polarity capability on all logical outputs and TP-FO IN Selection (See more details below)
- SEL 2H/DEC & SEL OBS-2H INPUTS OPTO-ISOLATED :
 - Input current > 0,5 mA (1,5 V In) => active level
 - Input current < 0,3 mA (1,0 V In) => unactive level
- High speed TP-FO INPUT OPTO-ISOLATED :
 - Input current > 5 mA (2,8 V In) => active level
 - Input current < 2 mA (1,2 V In) => unactive level


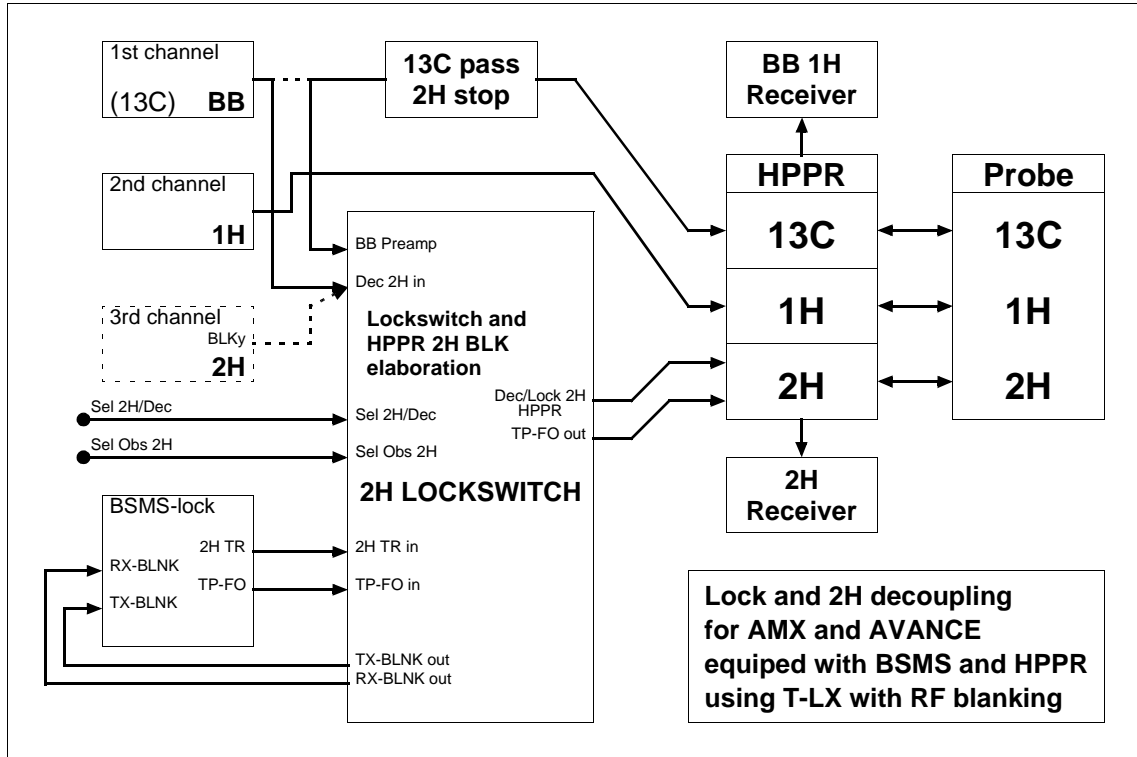
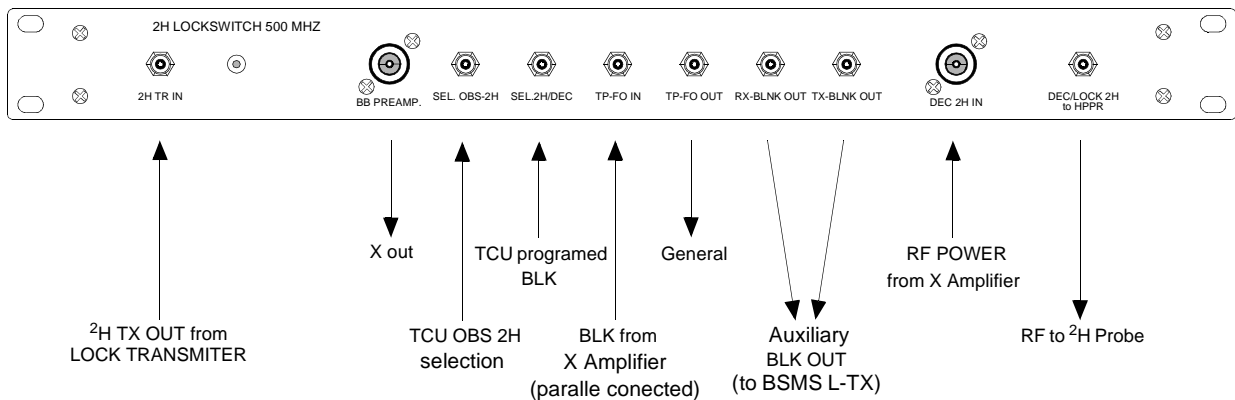
 ***Don't exceed TTL Level; it could cause damage to the Input isolation opto-couplers***

Figure 1.2. Synoptic of 2H Lockswitch in the Spectrometer



Wiring

Figure 1.3. Front panel wiring



General description

Control signal & RF signal route

2

About polarity selection

2.1

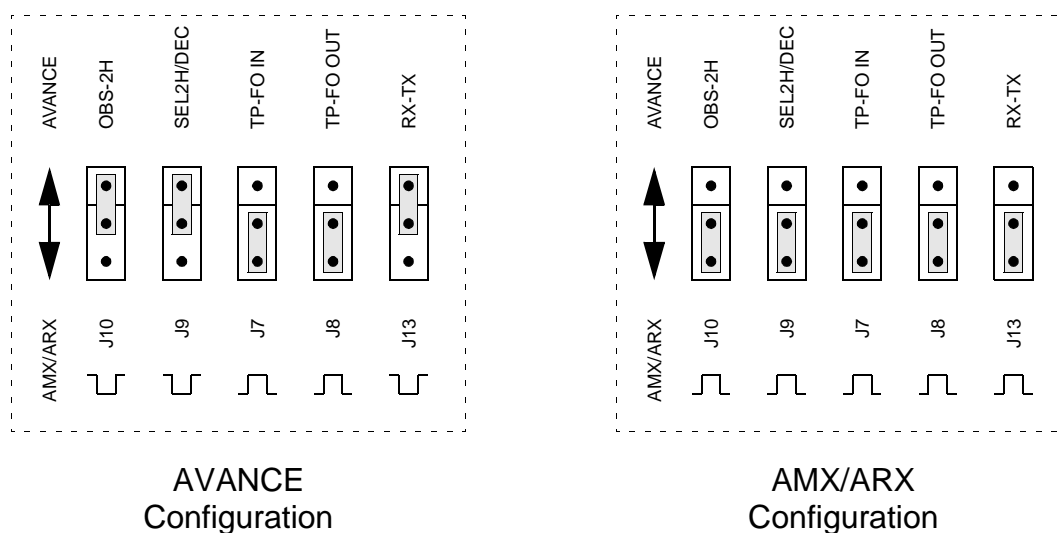
The 3 switches located on the control board (inside the device) allow to solve problems about input and output standard polarity.

- AMX/ARX polarity or \lrcorner shows that the validation is done at **level 1** to output and at a current flow in the used optocouplers (from BLK inputs).
- AVANCE polarity or \llcorner shows that the validation is done at **level 0** to output and with no current flow in the used optocouplers (from BLK inputs).

Internal polarity selection

2.2

Figure 2.1. AVANCE and AMX/ARX Configurations



⇒ For the delivery, the jumpers are setted for «AVANCE» configuration

Table 2.1. For RX-TX Blanking in AVANCE configuration

SEL 2H/DEC POL IN	TP-FO POL IN	SEL2H/DEC	TP-FO IN	BLMK State	RX & TX BLNK OUT	TP-FO OUT POL SELECT	
						TP-FO OUT State for AMX/ARX	TP-FO OUT State for AVANCE
AMX/ARX	AMX/ARX	No Signal	No Signal	Through	1	0	1
		Current	No Signal	Isolated	0	1	0
		No Signal	Current	Through	1	1	0
		Current	Current	Isolated	0	1	0
AMX/ARX	AVANCE	No Signal	No Signal	Through	1	1	0
		Current	No Signal	Isolated	0	1	0
		No Signal	Current	Through	1	0	1
		Current	Current	Isolated	0	1	0
AVANCE	AMX/ARX	No Signal	No Signal	Isolated	0	1	0
		Current	No Signal	Through	1	0	1
		No Signal	Current	Isolated	0	1	0
		Current	Current	Through	1	1	0
AVANCE	AVANCE	No Signal	No Signal	Isolated	0	1	0
		Current	No Signal	Through	1	1	0
		No Signal	Current	Isolated	0	1	0
		Current	Current	Through	1	0	1

Table 2.2. For RX-TX Blanking in AMX/ARX configuration

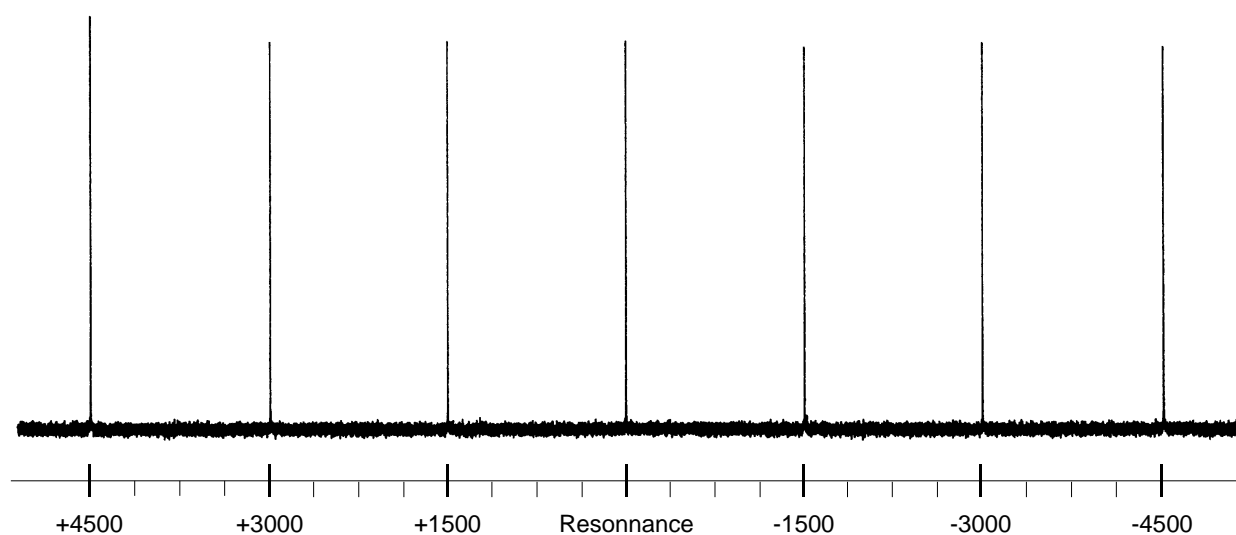
SEL 2H/DEC POL IN	TP-FO POL IN	SEL2H/DEC	TP-FO IN	BLMK State	RX & TX BLNK OUT	TP-FO OUT POL SELECT	
						TP-FO OUT State for AMX/ARX	TP-FO OUT State for AVANCE
AMX/ARX	AMX/ARX	No Signal	No Signal	Through	0	0	1
		Current	No Signal	Isolated	1	1	0
		No Signal	Current	Through	0	1	0
		Current	Current	Isolated	1	1	0
AMX/ARX	AVANCE	No Signal	No Signal	Through	0	1	0
		Current	No Signal	Isolated	1	1	0
		No Signal	Current	Through	0	0	1
		Current	Current	Isolated	1	1	0
AVANCE	AMX/ARX	No Signal	No Signal	Isolated	1	1	0
		Current	No Signal	Through	0	0	1
		No Signal	Current	Isolated	1	1	0
		Current	Current	Through	0	1	0
AVANCE	AVANCE	No Signal	No Signal	Isolated	1	1	0
		Current	No Signal	Through	0	1	0
		No Signal	Current	Isolated	1	1	0
		Current	Current	Through	0	0	1

Table 2.3. For BB PREAMP output device only

SEL OBS 2H POL IN	SEL OBS 2H	Signal from DEC 2H IN routed on
AMX/ARX	No Signal Current	BB PREAMP output DEC/LOCK 2H to HPPR output
AVANCE	No Signal Current	DEC/LOCK 2H to HPPR output BB PREAMP output

Effect on ^{13}C chloroform line of $\pm n \times 1500\text{Hz}$ ^2H decoupling offset switching against on resonance frequency.

Figure 3.1. Resonance spectrum



Observation ^{13}C decoupling ^2H and ^1H , lock ^2H
Sample 10% EB in CDCl_3
Using « ^2H LOCK-SWITCH» accessory
Decoupling sequences:
- On ^1H composit pulse program = WALTZ-16
- On ^2H composit pulse program = GARP
(^2H irradiation frequency $\pm 1500\text{Hz}$ around on-resonance)

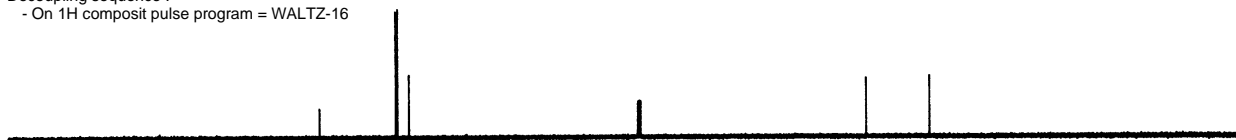
Figure 3.2. 1H WALTZ-16 and 2H GARP

Obsevation 13C decoupling 1H, lock 2H
Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequence :

- On 1H composit pulse program = WALTZ-16



Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALT-16
- On 2H composit pulse program = GARP

(2H irridaition frequency on resonance)



Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALT-16
- On 2H composit pulse program = GARP

(2H irridaition frequency +1500Hz off resonance)



Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALT-16
- On 2H composit pulse program = GARP

(2H irridaition frequency -1500Hz off resonance)



Figure 3.3. 1H WALTZ-16 and 2H WALTZ-16

Obsevation 13C decoupling 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequence :

- On 1H composit pulse program = WALTZ-16



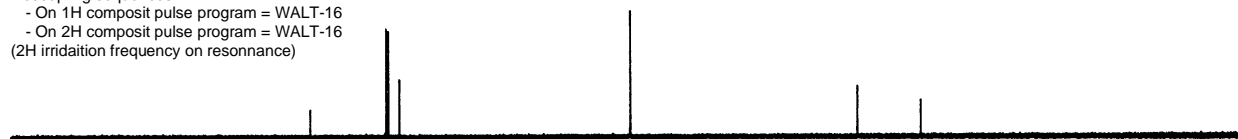
Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALTZ-16
- On 2H composit pulse program = WALTZ-16
(2H irradiation frequency on resonance)



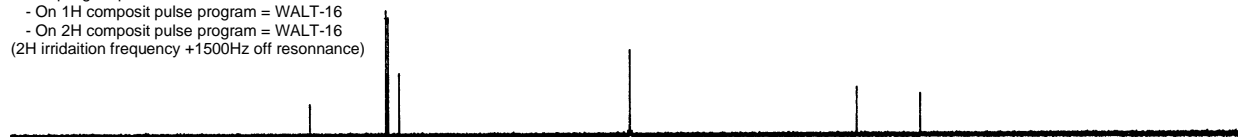
Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALTZ-16
- On 2H composit pulse program = WALTZ-16
(2H irradiation frequency +1500Hz off resonance)



Obsevation 13C decoupling 2H and 1H, lock 2H

Sample 10% EB in CDC13

Using 2H LOCK-SWITCH accessory

Decoupling sequences :

- On 1H composit pulse program = WALTZ-16
- On 2H composit pulse program = WALTZ-16
(2H irradiation frequency -1500Hz off resonance)



Pulse program

3.2

Sequence for AMX, ASX and ARX spectrometer

3.2.1

```
;zgdc_2h_A
;1D sequence for X-nucleus with 1H and 2H decoupling
;AMX,ASX and ARX version

d11=30m
#define lo_hold_on 45u setf2|9
#define lo_hold_off 45u setf2^9
#define sel_2h_dec_on 45u setf1^7
#define sel_2h_dec_off 45u setf1|7

    d11 h11 cpd db10 dbo sel_2h_dec_off
1 ze
2 d1 dbo lo_hold_off sel_2h_dec_off
  lo_hold_on sel_2h_dec_on
  d11 cpdb
  p1 ph1
  go=2 ph31
  lo_hold_off sel_2h_dec_off
  wr#0
  d11 do dbo
exit

ph1=0 2 2 0 1 3 3 1
ph31=0 2 2 0 1 3 3 1

;h11: ecoupler power level for CPD decoupling
;db10: ecoupler power level for CPDB decoupling
;p1 : 90 degree transmitter high power pulse
;p31: 90 degree pulse for salve timer (cpd-sequence)
;p30: 90 degree pulse for salve timer (cpdb-sequence)
;d1 : relaxation delay; 1-5 * T1
;d11: delay for disk I/O [30msec]
;cpd: cpd-decoupling according to sequence defined by cpdbprg
;cpdb: cpdb-decoupling according to sequence defined by cpdbprg
```

Sequence for Avance spectrometer DMX, DRX**3.2.2**

```

;zgdc_2h_D
1D sequence for X-nucleus with H-1 and H-2 decoupling
;Avance spectrometer DMX,DRX
;jmt SADIS wissembourg

#include <Avance.incl>

d11=30m

1 ze
  H2_LOCK ;define in Avance.incl setnmr8|4
  d12 setnmr0|8 ;gating 1H HPPR in case of using 5 preamp. units
2 d11 pl13:f2 do:f3
  d11 cpds2:f2
  d1 pl14:f3 H2_LOCK ;define in Avance.incl setnmr8|4
  d11 cpds3:f3 H2_PULSE ;define in Avance.incl setnmr8|4
  p1 ph1
  go=2 ph31 cpds2:f2
  wr#0
  d11 do:f2
  d11 do:f3
  d12 setnmr0^8
exit

ph1=0 2 2 0 1 3 3 1
ph11=0 2 2 0 1 3 3 1

;pl13: decoupler power level for decoupling in CDP mode on H-1
;pl14: decoupler power level for decoupling in CDP mode on H-2
;p1 : 90 degree transmitter high power pulse
;p31: 90 degree pulse for salve timer (cpd2:f2-sequence)
;p30: 90 degree pulse for salve timer (cpd3:f3-sequence)
;d1 : relaxation delay; 1-5 * T1
;d11: delay for disk I/O [30msec]

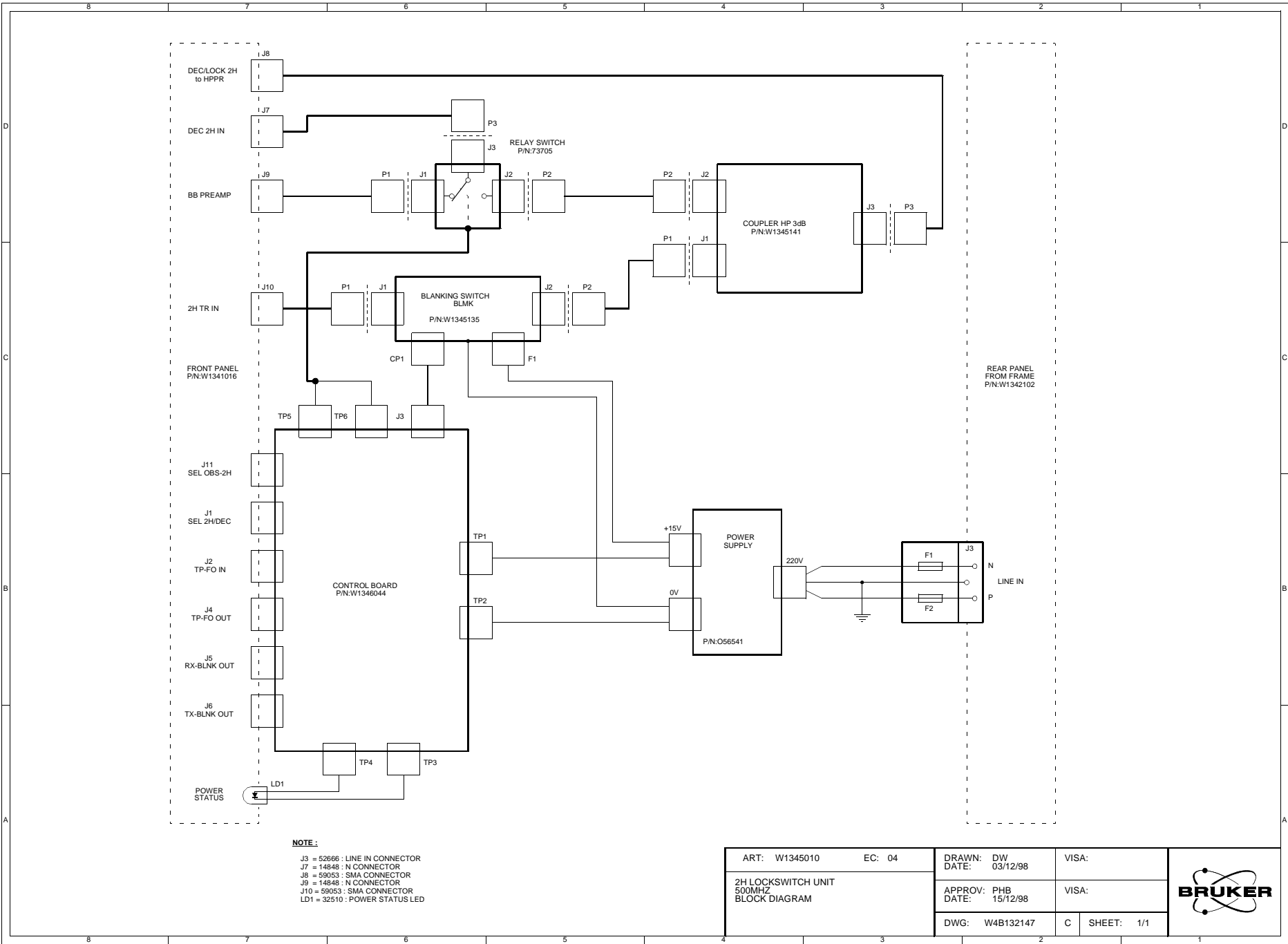
;cpd2:f2: f2-decoupling according to sequence defined by cpdprg2:WALTZ16
;cpd3:f3: f3-decoupling according to sequence defined by cpdprg3:WALTZ16f3

```


2H Lockswitch 500MHZ

4

Figure 4.1. 2H Lockswitch 500MHZ Block Diagram



NOTE:
 J3 = 52666 : LINE IN CONNECTOR
 J7 = 14848 : N CONNECTOR
 J8 = 59053 : SMA CONNECTOR
 J9 = 14848 : N CONNECTOR
 J10 = 59053 : SMA CONNECTOR
 LD1 = 32510 : POWER STATUS LED

ART: W1345010 EC: 04
 2H LOCKSWITCH UNIT
 500MHZ
 BLOCK DIAGRAM

DRAWN: DW
 DATE: 03/12/98

VISA:

APPROV: PHB
 DATE: 15/12/98

VISA:

DWG: W4B132147

C SHEET: 1/1



Control Board

5

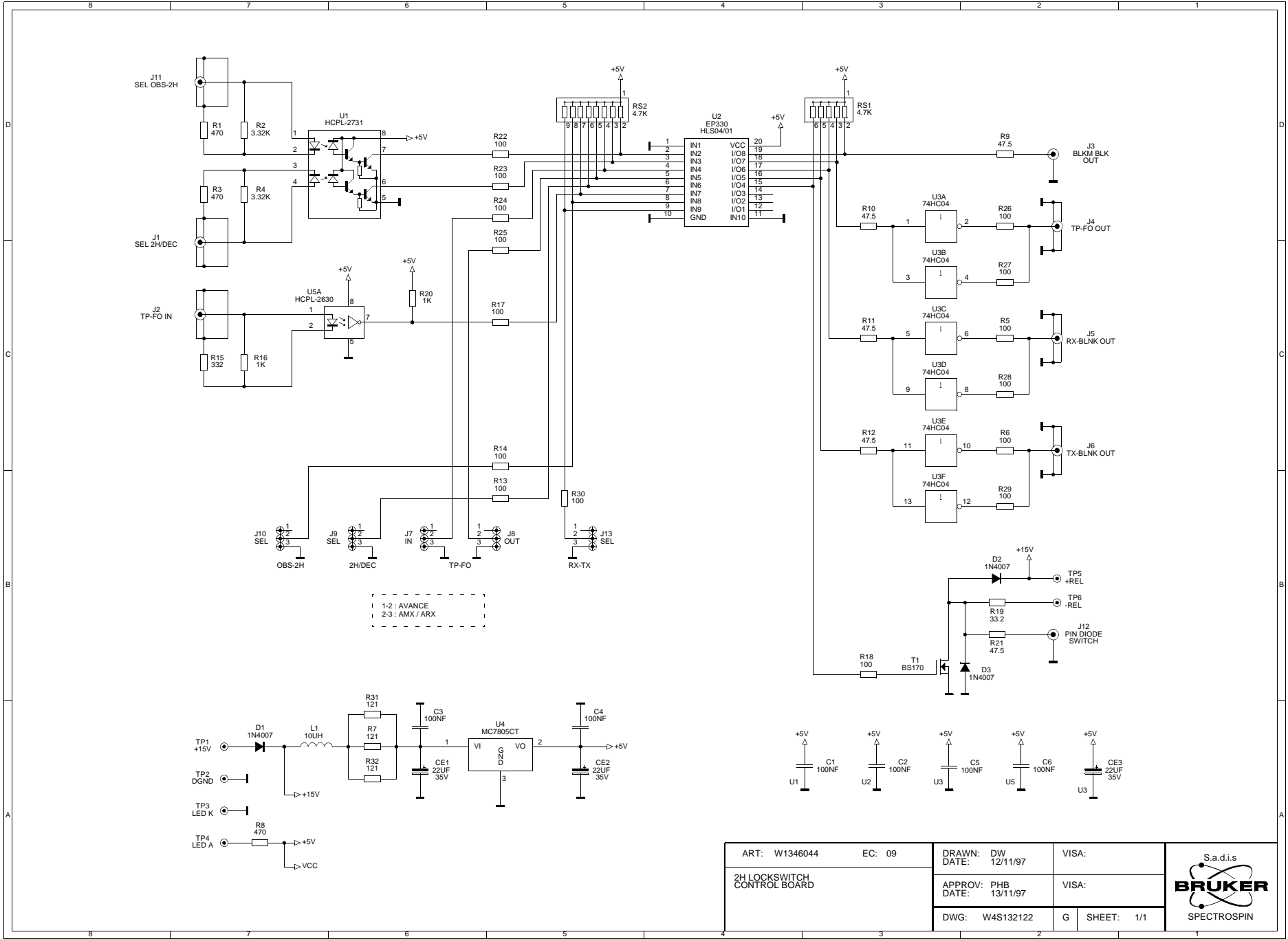
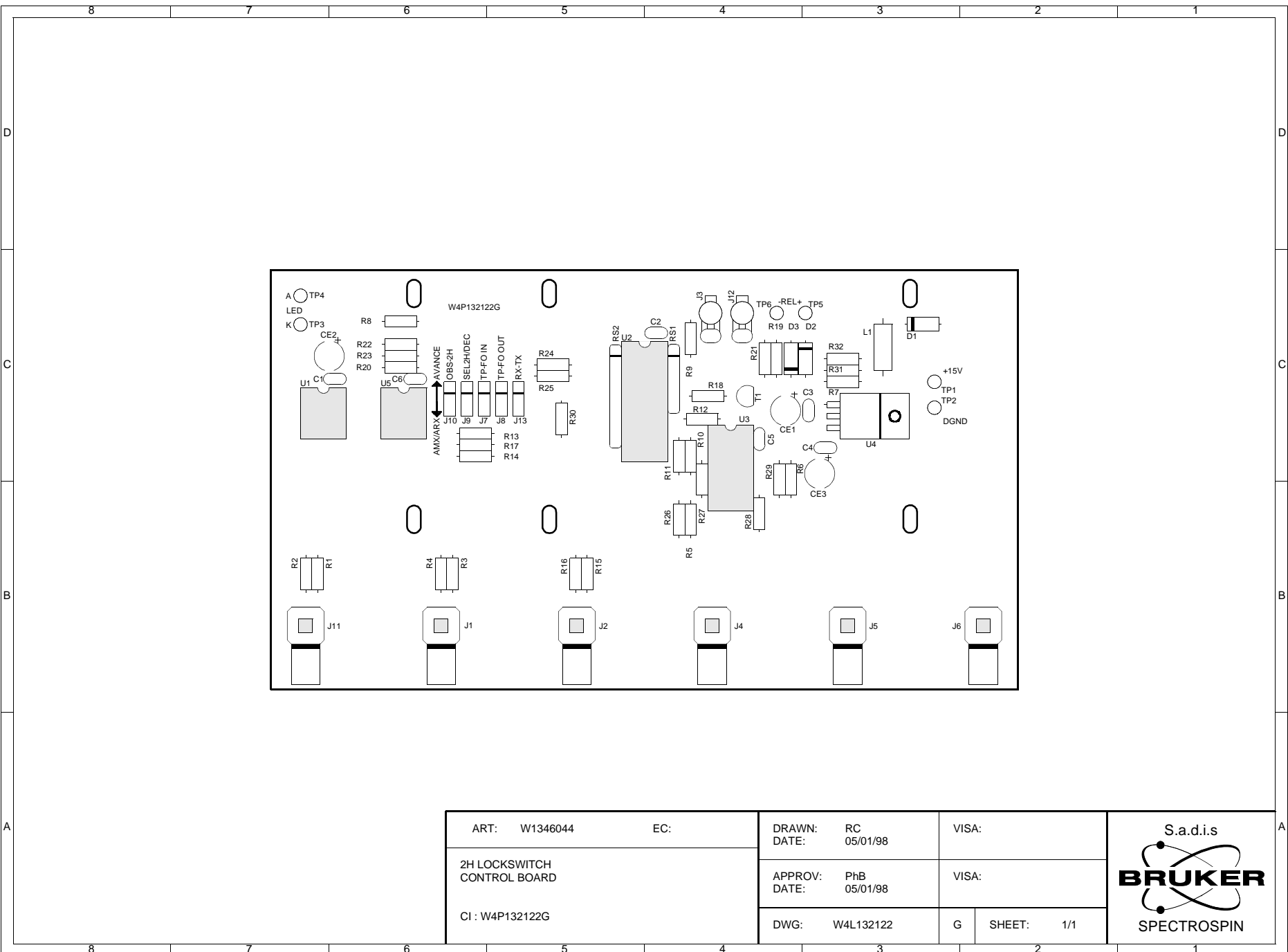


Figure 5.1. Control Board Schematic

ART: W1346044	EC: 09	DRAWN: DW DATE: 12/11/97	VISA:
2H LOCKSWITCH CONTROL BOARD		APPROV: PHB DATE: 13/11/97	VISA:
		DWG: W4S132122	G SHEET: 1/1



Figure 5.2: Control Board Location



Control Board

Value Table

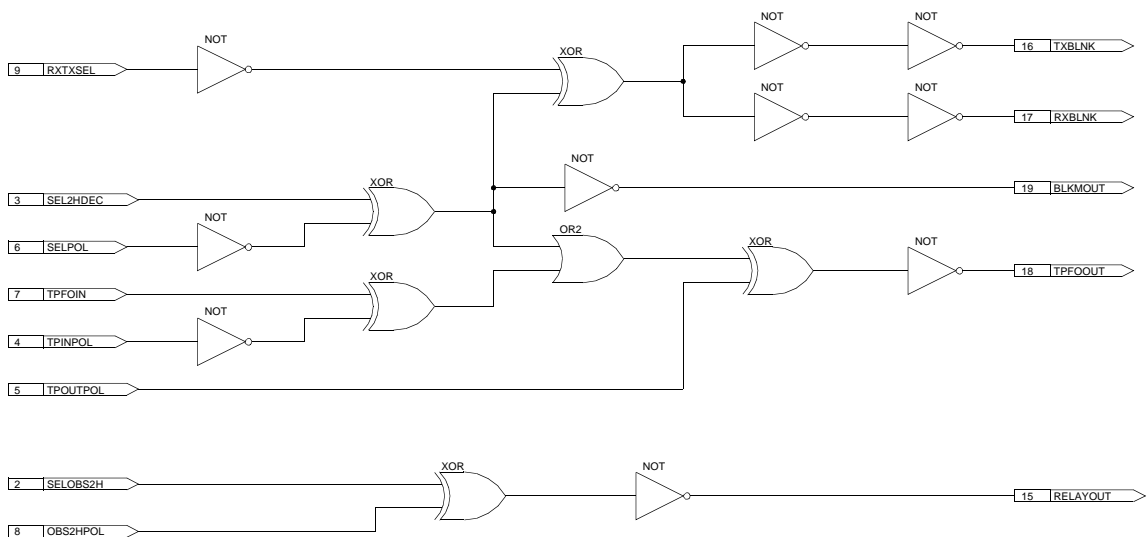
Pos.	Component	Local Description
C01	37167	COND CERM 100N 100V 10% X7R
C02	37167	COND CERM 100N 100V 10% X7R
C03	37167	COND CERM 100N 100V 10% X7R
C04	37167	COND CERM 100N 100V 10% X7R
C05	37167	COND CERM 100N 100V 10% X7R
C06	37167	COND CERM 100N 100V 10% X7R
CE01	10017	COND CHIMI RAD 22U 35V 6.3X7
CE02	10017	COND CHIMI RAD 22U 35V 6.3X7
CE03	10017	COND CHIMI RAD 22U 35V 6.3X7
CI01	W1356617	CI CONTROL 2H LOCKSWITCH
D01	355	DIODE 1N4007
D02	355	DIODE 1N4007
D03	355	DIODE 1N4007
ICSU01	4285	IC SUPPORT DIL8 TULIPE
ICSU02	9276	IC SUPPORT DIL20 TULIPE
ICSU03	4284	IC SUPPORT DIL14 TULIPE
ICSU05	4285	IC SUPPORT DIL8 TULIPE
J01	22656	CN COAX SMA F C PRT L=29.5MM
J02	22656	CN COAX SMA F C PRT L=29.5MM
J03	8747	ACCBL PICOT FOURCHE D1.3MM
J03'	59995	ACCBL PICOT FOURCHE D1.1MM
J04	22656	CN COAX SMA F C PRT L=29.5MM
J05	22656	CN COAX SMA F C PRT L=29.5MM
J06	22656	CN COAX SMA F C PRT L=29.5MM
J07	W1204337	CN M 3 D PRT BARSIL R2.54 H8
J07'	3033	ACCBL CAVALIER F 2.54MM
J08	W1204337	CN M 3 D PRT BARSIL R2.54 H8
J08'	3033	ACCBL CAVALIER F 2.54MM
J09	W1204337	CN M 3 D PRT BARSIL R2.54 H8
J09'	3033	ACCBL CAVALIER F 2.54MM
J10	W1204337	CN M 3 D PRT BARSIL R2.54 H8
J10'	3033	ACCBL CAVALIER F 2.54MM
J11	22656	CN COAX SMA F C PRT L=29.5MM
J12	8747	ACCBL PICOT FOURCHE D1.3MM
J12'	59995	ACCBL PICOT FOURCHE D1.1MM
J13	W1204337	CN M 3 D PRT BARSIL R2.54 H8
J13'	3033	ACCBL CAVALIER F 2.54MM
L01	30609	SELF 10UH 0.33A
R01	2741	RES MET 470 1% 0.6W 50PPM
R02	1016	RES MET 3.32K 1% 0.6W 50PPM
R03	2741	RES MET 470 1% 0.6W 50PPM
R04	1016	RES MET 3.32K 1% 0.6W 50PPM
R05	998	RES MET 100 1% 0.6W 50PPM
R06	998	RES MET 100 1% 0.6W 50PPM
R07	999	RES MET 121 1% 0.6W 50PPM
R08	2741	RES MET 470 1% 0.6W 50PPM
R09	994	RES MET 47.5 1% 0.6W 50PPM
R10	994	RES MET 47.5 1% 0.6W 50PPM
R11	994	RES MET 47.5 1% 0.6W 50PPM
R12	994	RES MET 47.5 1% 0.6W 50PPM
R13	998	RES MET 100 1% 0.6W 50PPM
R14	998	RES MET 100 1% 0.6W 50PPM
R15	1004	RES MET 332 1% 0.6W 50PPM
R16	1010	RES MET 1K 1% 0.6W 50PPM

Part:W1346044 Drawing:W4S132122G		Copy In Part:	Draw:
Desc:2H LOCKSWITCH CIRCUIT CONTROL ECL:9		Modified:03/12/98	By:DW
Value	Tab		
Pos.	Component	Local Description	
R17	998	RES MET 100 1% 0.6W 50PPM	
R18	998	RES MET 100 1% 0.6W 50PPM	
R19	992	RES MET 33.2 1% 0.6W 50PPM	
R20	1010	RES MET 1K 1% 0.6W 50PPM	
R21	994	RES MET 47.5 1% 0.6W 50PPM	
R22	998	RES MET 100 1% 0.6W 50PPM	
R23	998	RES MET 100 1% 0.6W 50PPM	
R24	998	RES MET 100 1% 0.6W 50PPM	
R25	998	RES MET 100 1% 0.6W 50PPM	
R26	998	RES MET 100 1% 0.6W 50PPM	
R27	998	RES MET 100 1% 0.6W 50PPM	
R28	998	RES MET 100 1% 0.6W 50PPM	
R29	998	RES MET 100 1% 0.6W 50PPM	
R30	998	RES MET 100 1% 0.6W 50PPM	
R31	999	RES MET 121 1% 0.6W 50PPM	
R32	999	RES MET 121 1% 0.6W 50PPM	
RS01	9818	RES RES 4.7KX5 2% SIL6	
RS02	7223	RES RES 4.7KX8 2% SIL9	
T01	34607	TRANS BS170 N VMOS TO92	
TP01	59995	ACCBL PICOT FOURCHE D1.1MM	
TP02	59995	ACCBL PICOT FOURCHE D1.1MM	
TP03	59995	ACCBL PICOT FOURCHE D1.1MM	
TP04	59995	ACCBL PICOT FOURCHE D1.1MM	
TP05	59995	ACCBL PICOT FOURCHE D1.1MM	
TP06	59995	ACCBL PICOT FOURCHE D1.1MM	
U01	14820	OPTO COUP HCPL-2731 DIL8 2-FOI	
U02	W1356676	IC 220/2H LOCKSWITCH CONTROL	
U03	10812	IC 7404/MM74HC04N PDIP 14	
U04	446	IC 7805/VREG MC7805CT TO220	
U05	5941	IC HCPL 2630	

Figure 5.3. Pal HLS01/01 Schematic

HLS04/01
11/09/96

EP330PC-12									
GND	1	IN1	VCC	20	VCC				
SELOBS2H	2	IN2	I/O8	19	BLKMOUT				
SEL2HDEC	3	IN3	I/O7	18	TPFOOUT				
TPINPOL	4	IN4	I/O6	17	RXBLNK				
TPOUTPOL	5	IN5	I/O5	16	TXBLNK				
SELPOL	6	IN6	I/O4	15	RELAYOUT				
TPFOIN	7	IN7	I/O3	14	RESERVED				
OBS2HPOL	8	IN8	I/O2	13	RESERVED				
RXTXSEL	9	IN9	I/O1	12	RESERVED				
GND	10	GND	IN10	11	GND				



ART: W1356676	EC:	DRAWN: DW DATE: 11/09/96	VISA:
HLS04/01 PAL 2H LOCKSWITCH		APPROV: PHB DATE: 11/09/96	VISA:
		DWG: W4D132510	A SHEET: 1/1



Blanking Switch
BLMK 32-160MHZ

6

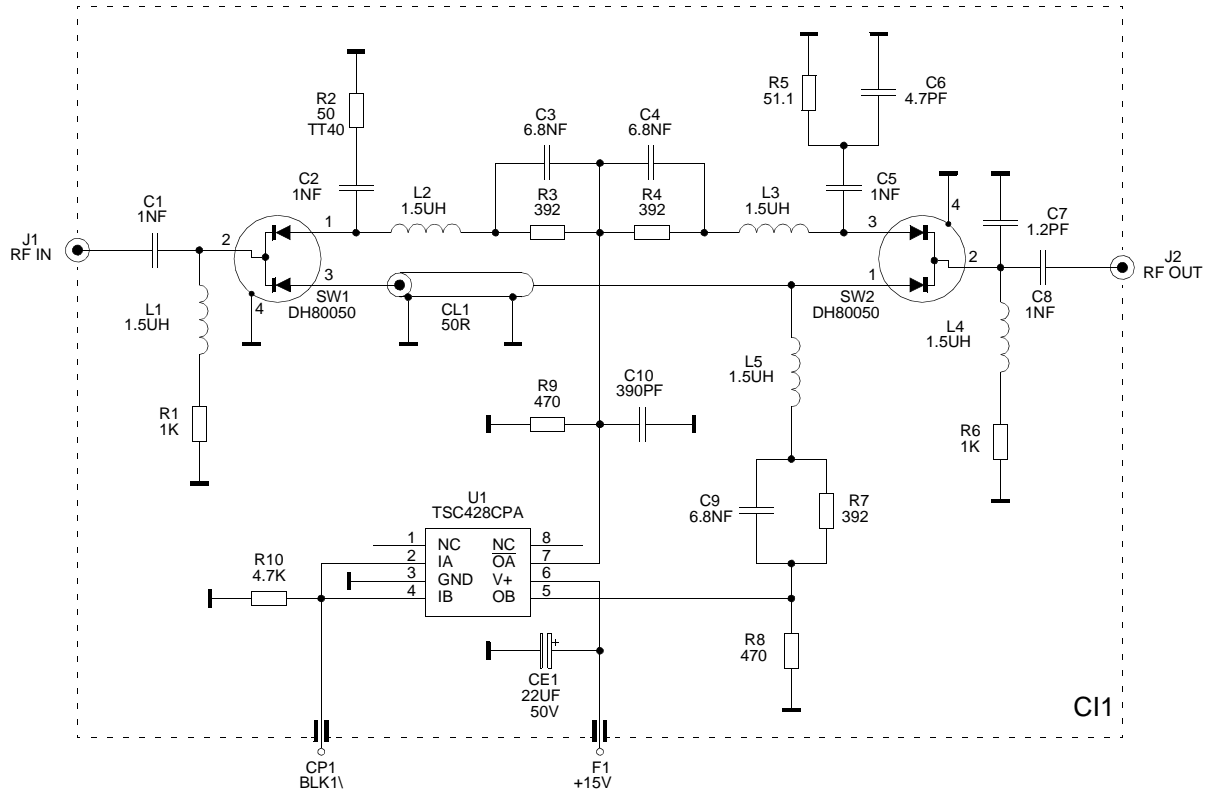
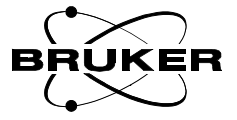


Figure 6. 1. Blanking Switch BLMK 32-160MHZ Schematic

ART: W1345135	EC: 01	DRAWN: DW	VISA:
2H LOCKSWITH BLANKING SWITH BLKM SWITCH 10W / 32-160MHZ		DATE: 06/11/98	VISA:
		APPROV: PHB	VISA:
		DATE: 15/12/98	
DWG: W4S132144	A	SHEET: 1/1	



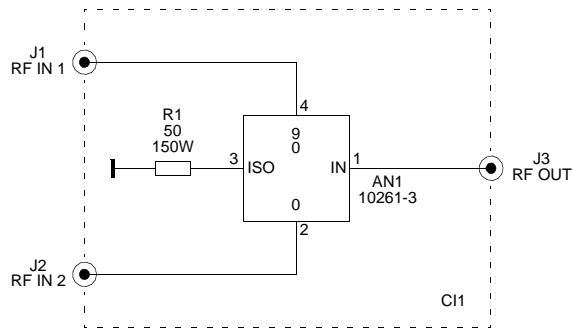
Value Table

Part:W1345135 Drawing:W4S132144A	Copy In Part:	Draw:
Desc:COMMUTATEUR BLKM 32-160MHZ	ECL:1	Modified:09/11/98 By:DW
Value Tab		
Pos.	Component	Local Description
C1	30424	COND CMS CDR14 1N 50V 20%
C2	30424	COND CMS CDR14 1N 50V 20%
C3	56276	COND CERM 6.8N 500V 5% X7R
C4	56276	COND CERM 6.8N 500V 5% X7R
C5	30424	COND CMS CDR14 1N 50V 20%
C6	30396	COND CMS CDR14 4.7P 500V 0.25P
C7	30389	COND CMS CDR14 1.2P 500V 0.25P
C8	30424	COND CMS CDR14 1N 50V 20%
C9	56276	COND CERM 6.8N 500V 5% X7R
C10	30419	COND CMS CDR14 390P 200V 20%
CE1	1983	COND CHIMI RAD 22U 50V 7X7
CI1	W1356240	CI B-LKM BLANKING SWITCH 10W
CP1	56154	COND PAS FILTRE 100P 100V 10A
ICSU1	4285	IC SUPPORT DIL8 TULIPE
J1	33011	CN COAX SMA F D EMB PLATINE
J2	33011	CN COAX SMA F D EMB PLATINE
L1	51528	SELF 1.5UH 0.56A
L2	51528	SELF 1.5UH 0.56A
L3	51528	SELF 1.5UH 0.56A
L4	51528	SELF 1.5UH 0.56A
L5	51528	SELF 1.5UH 0.56A
R1	20737	RES CMS 1K 1% 0.25W 1206
R2	30863	RES HF 50 40W
R3	20731	RES CMS 392 1% 0.25W 1206
R4	20731	RES CMS 392 1% 0.25W 1206
R5	20765	RES CMS 51.1 1% 0.25W 1206
R6	20737	RES CMS 1K 1% 0.25W 1206
R7	20731	RES CMS 392 1% 0.25W 1206
R8	51288	RES CMS 475 1% 0.25W 1206
R9	51288	RES CMS 475 1% 0.25W 1206
R10	20745	RES CMS 4.7K 1% 0.25W 1206
RAD1	W1305665	BLAH RADIAT BLANKING SWITCH
SW1	30636	DIODE PIN SW 10W
SW2	30636	DIODE PIN SW 10W
U1	56292	IC 428/DRV TSC428CPA DIP8

HP Coupler 3dB 62,5- 125MHZ

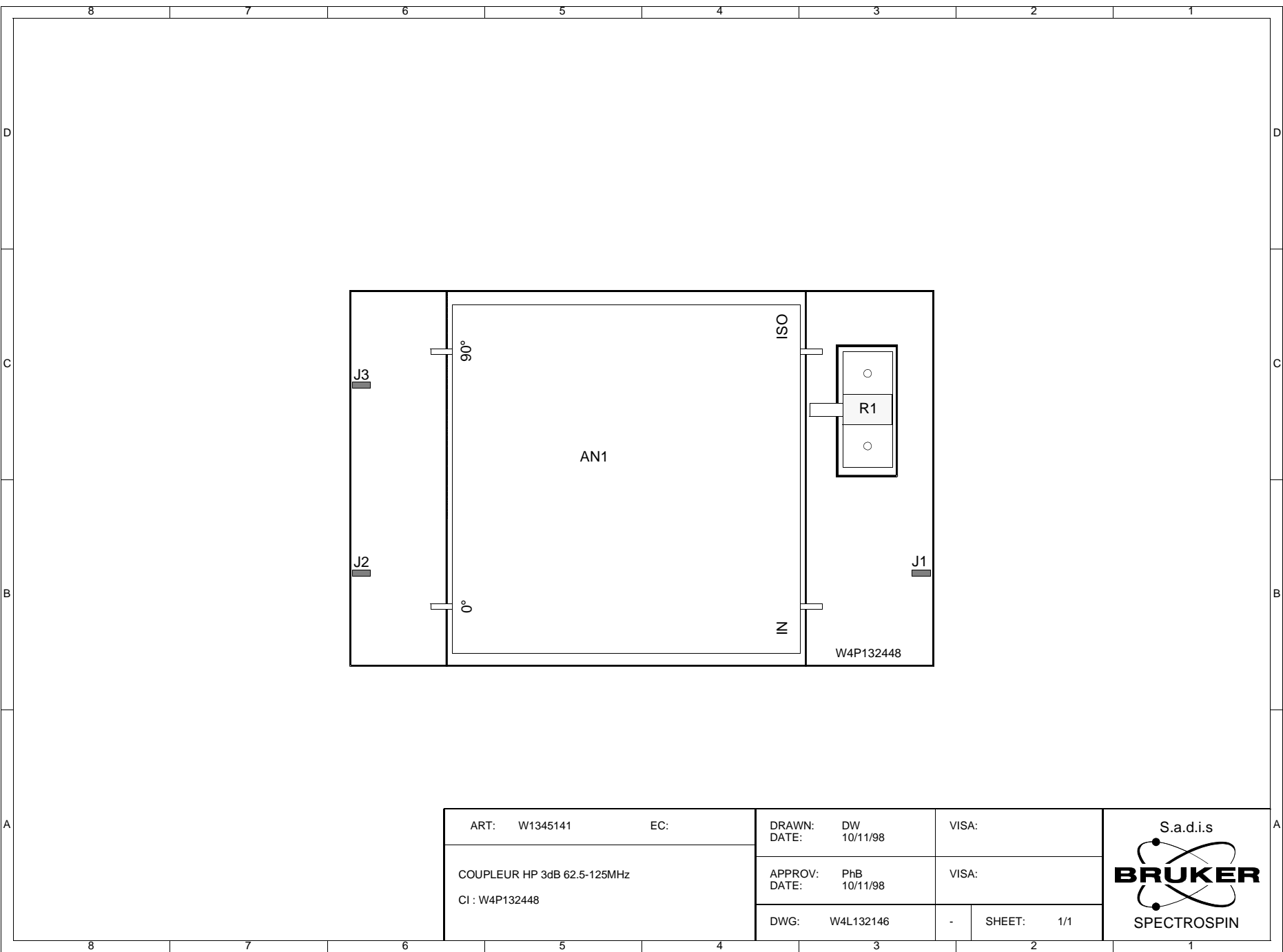
7

Figure 7.1. HP Coupler 3dB 62,5-125MHZ Schematic

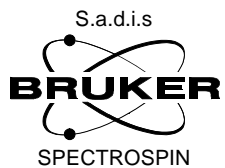


ART: W1345141	EC: 01	DRAWN: DW	VISA:	
2H LOCKSWITCH HP COUPLER 3dB 62.5-125MHZ		DATE: 31/05/95	DATE: 31/05/95	
		DWG: W4S132146	SHEET: 1/1	

Figure 7.2: HP Coupler 3dB 62,5-125MHZ Location



ART: W1345141	EC:	DRAWN: DW	VISA:
COUPLEUR HP 3dB 62,5-125MHz CI : W4P132448		DATE: 10/11/98	
		APPROV: PhB	VISA:
		DATE: 10/11/98	
		DWG: W4L132146	- SHEET: 1/1



HP Coupler 3dB 62,5-125MHZ

Value Table

Pos.	Component	Local Description
AN01	56522	IC 10261/COUPL.HF 62.5-125MHZ
CI01	W1340016	CI 3DB HP COUPLEUR 62.5-125MHZ
J01	6194	CN COAX N F D EMB PLATINE
J02	6194	CN COAX N F D EMB PLATINE
J03	6194	CN COAX N F D EMB PLATINE
R01	20138	RES HF CHARGE 50 OHMS 5% 150W

Specifications

8

2H Lockswitch 500 MHz specifications

8.1

Table 8.1. General requirements

Power requirements	220 V \pm 10%, 50/60 Hz
Power consumption	15 W
Weight	4 Kg
Dimensions	445 / 484 mm width (cabinet / front panel) 1 Unit height 280 mm depth
Software control	XWINNMR or UXNMR

Table 8.2. Insertion loss

Decoupling channel	4 dB \pm 1dB
Lock channel	4 dB \pm 1dB
BB channel	1dB maximum
BLK 2H isolation	50 dB Typical
DEC 2H IN / 2H TR IN directivity	20 dB Typical

Table 8.3. Switching time

SEL 2H/DEC	15 μ s typical (minimum current for level 1 INPUT : 0,5 mA)
SEL OBS 2H	15 μ s typical (minimum current for level 1 INPUT : 0,5 mA)
TP-FO IN	300 ns typical (minimum current for level 1 INPUT : 5 mA)
Polarity selection	DMX and AMX for all IN and OUT logical compatible

Table 8.4. Logic fan out

TP-FO OUT & RX BLNK / TX BLNK	Level 0 : 5 mA sink for 0,7 V out Level 1 : 10 mA source for 1,5 V out
"2H" Frequency range	70 to 80 MHz
DEC 2H IN power capability	600 W

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