3. ELECTRICAL INTERFACE DESIGN

SECTION 3 CONTENTS

3.1 POWER SUPPLY INTERFACE

3.1.1 General interface description

The general request of the Wave Experiment is:

- One redundant power line connected to the WEC/PWR device which is the single point interface with the spacecraft for the power needed in operational phase.
- One redundant power line distributed to the 4 deployment unit of the electric booms.
- No keep alive line is requested.

FUNCTION	Number of Main Lines Required	Number of Redundant Lines Required	LCL class
+28 V MAIN BUS (Switched and Current limited)	1	1	C 25 W /0.93 A
	1	1	E 63 W /2.30 A
EXPERIMENT KEEP ALIVE LINE	0		

Table 3.1/1 Power Supply Interface Requirements

3.1.2 Power distribution block diagram

a/ Power distribution

The power distribution concept of the WEC is shown in Fig. 3.1/1.1 for the main experiment and Fig. 3.1/1.2 for the details of the deployment units.

For the WEC Power Supply, a general principle of redundancy has been adopted: no single point failure shall cause failure of more than one of the wave consortium instruments.

- Two fully redundant +5 volts supplies operating from separate spacecraft +28 volts lines are provided for the DWP.
- Separate power supplies that can operate from both spacecraft +28 volts lines are provided for the instruments: STAFF/mwf, STAFF/spa, WHISPER.
- One +28 volts line, being the addition of both spacecraft lines

is delivered to each of the experiments EFW and WBD that have their own converter and regulator circuits in their units.

- One separate +28 volts line is provided to the transmitter of WHISPER. This instrument which generates pulses at a middle voltage (200 volts) must be correctly isolated from the other power lines.

b/ Keep alive

n/a

c/ Switching concept

The ON/OFF switches for all the instruments, but the DWP, are included inside the WEC/PWR unit. The DWP may be switched ON or OFF by the general WEC ON/OFF command at the spacecraft level.

The main current in each of the two main bus lines will be measured in the Power Supply unit and monitored by the DWP. The current of the transmitter of WHISPER will be controlled inside this experiment.

d/ mechanism

The deployment phase is controlled by the micro processor of the EFW experiment with a possibility for the spacecraft to stop the procedure in case of problem.
The control is shown on fig 3.1/1.3.

Fig 3.1/1.1 WEC power distribution concept

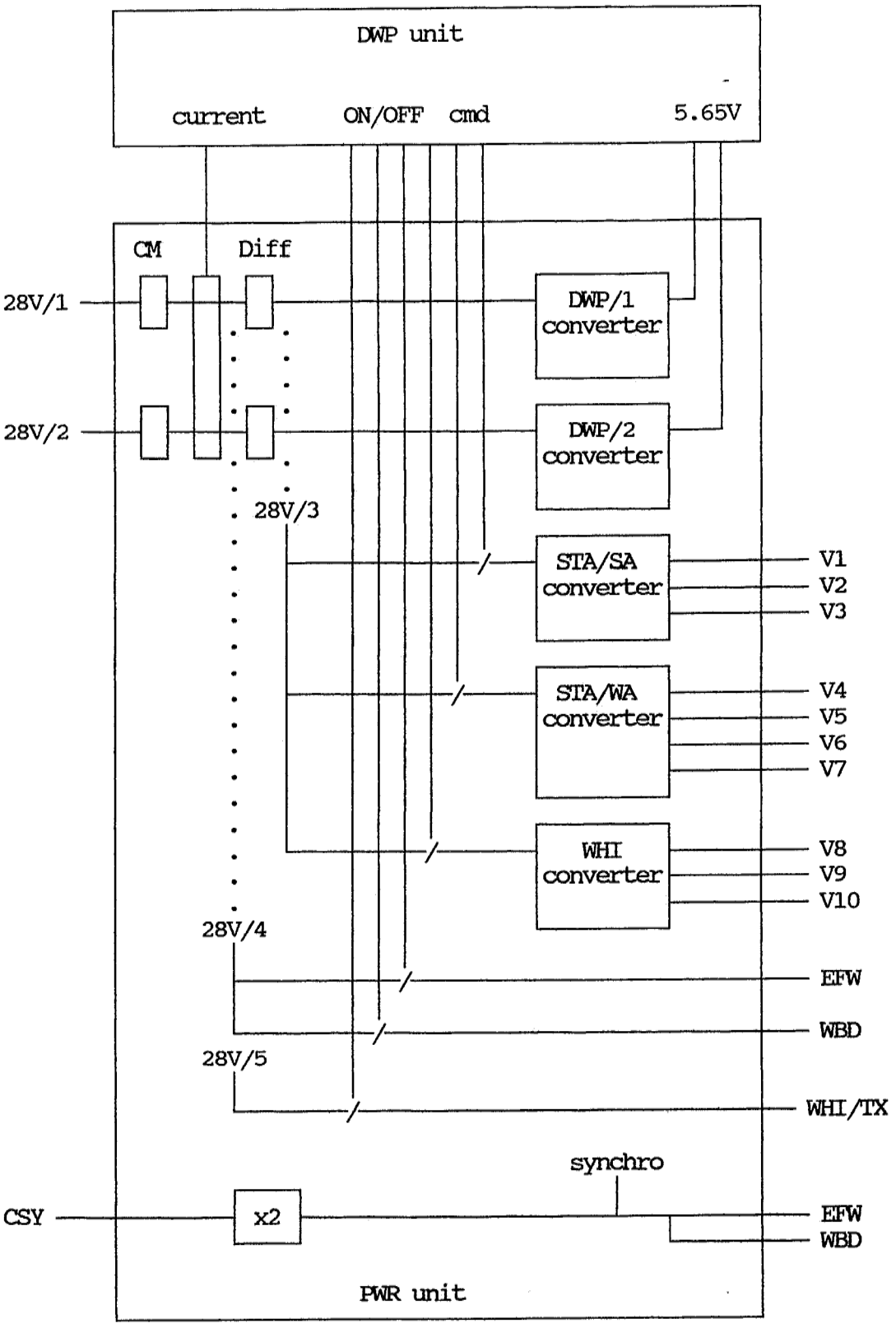


Fig 3.1/1.2 Power distribution of the deployment units

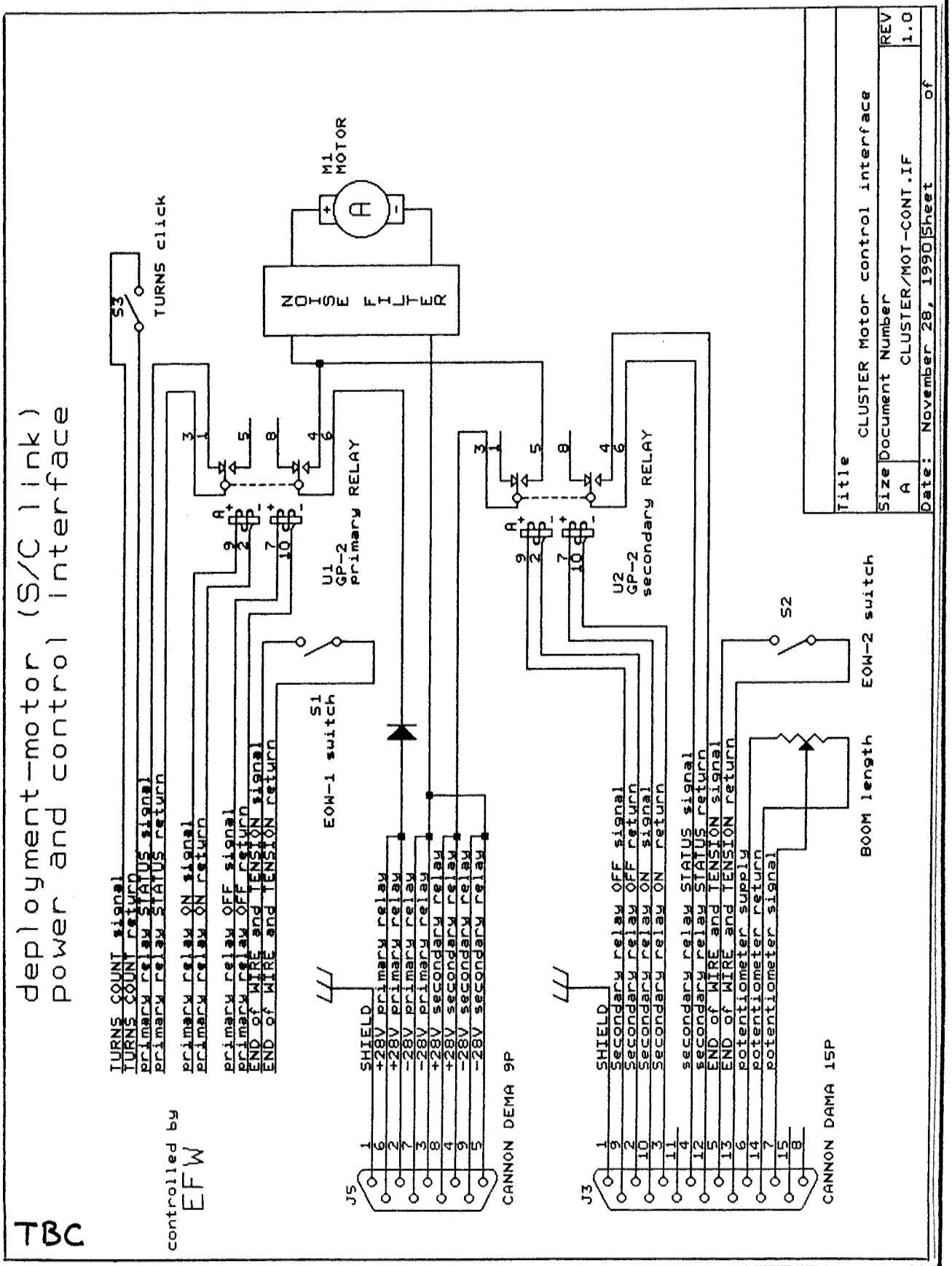
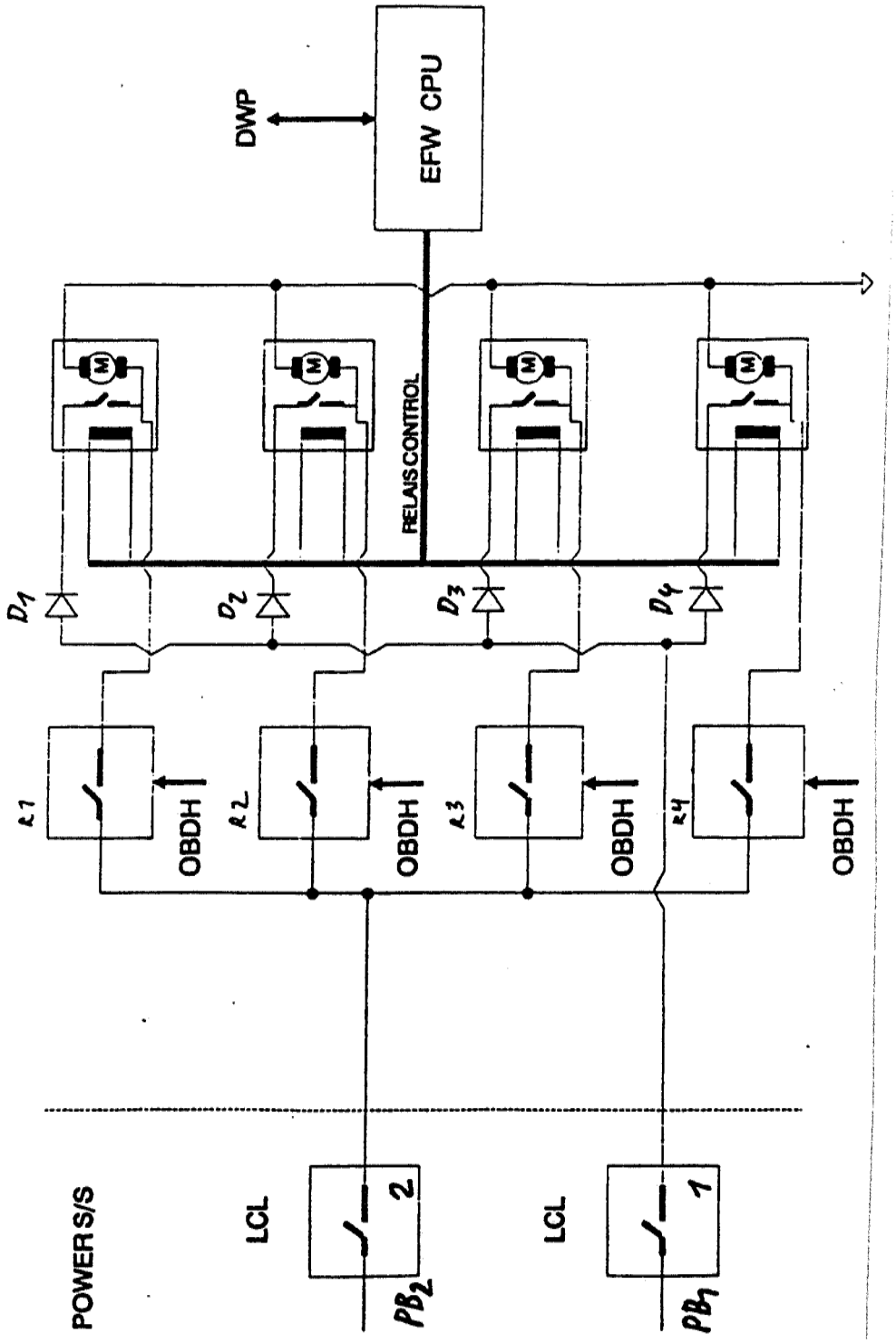


Fig 3.1/1.3 Deployment control of the deployment units



3.1.3 **Power requirements**

a) Power budget

The total WEC mean power consumption is 13.8 Watts if all the instruments are in their nominal mode, see table 3.1/2.a.
The allocation affected to WEC is 12.0 W
The WEC will work with a mean operational power consumption which is mode dependent (see tab 3.1/2.c) and can vary in the range 10.6 to 11.9 Watts.
Depending on the power available, WEC may operate between 12 and 13.8 W.

The total WEC maximum power is estimated to 17.5 Watts.
This figure is obtained with the assumption that all the WEC instruments are running simultaneously in their maximum individual power consumption. This is not foreseen during nominal operations.

Individual mean power per unit is given in table 3.1/2.

b) Power Profil

An estimated power profiles is given on figure 3.1/2.1

WHISPER Power Profile (fig 3.1/2.2)

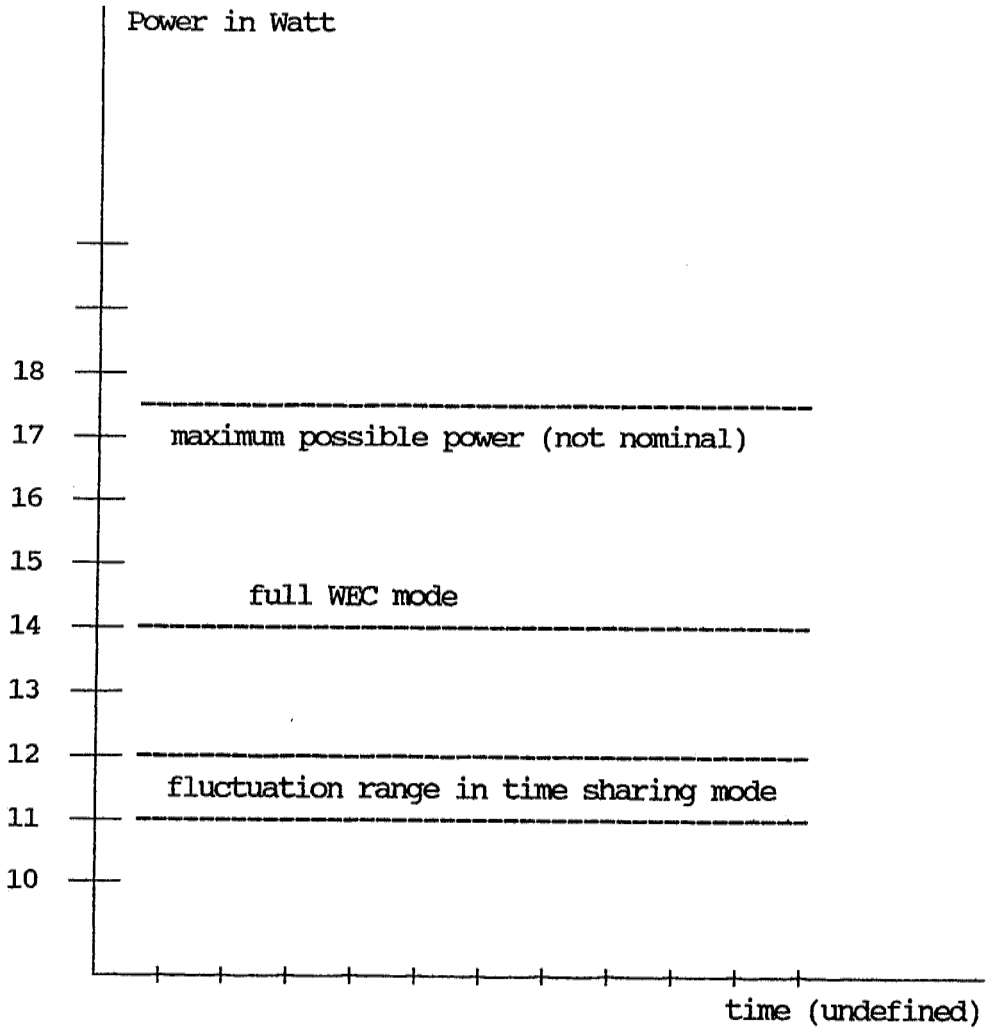
- Power profile in Natural wave mode :
  Constant power at 1.75 Watt (2.4 primary power)

- Power profile in sounding mode with a 1ms pulse at 100V and 80 kHz :

  Constant power at 1.75 Watt (2.4 primary power)
  plus a mean power of 0.45 W (standard rate), slightly modulated at the repetition rate of the transmission (fig 3.1/2.1).

- Fig 3.1/2.2 shows a typical power profile of the WHISPER transmitted pulse. Due to the filtering at the input of the transmitter, the current pulse is largely reduced in the 27 V input line.

Fig. 3.1/2.1 : WEC power profiles



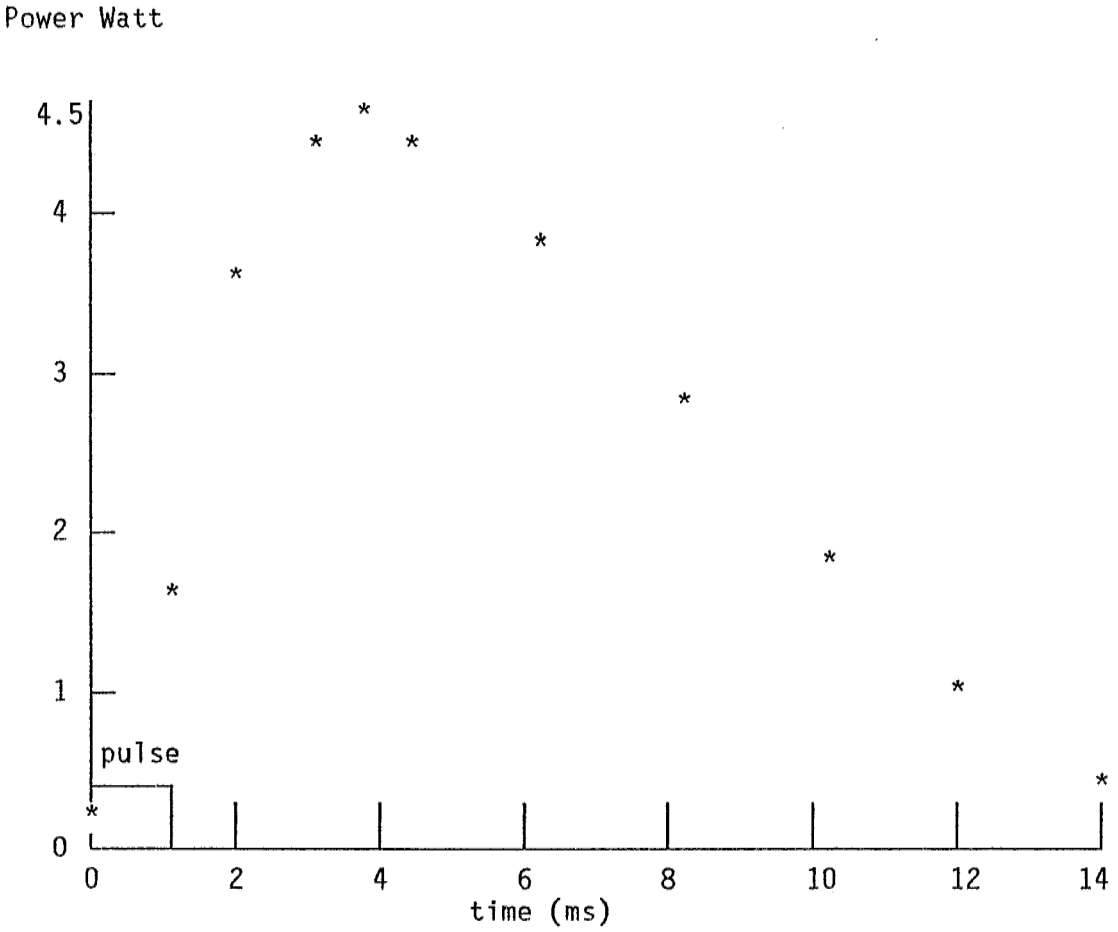


Fig 3.1/2.2 Whisper power profile

c) Turn on current

A typical turn-on current characteristic is shown on figure 3.1/3

d) Kal current

N/A

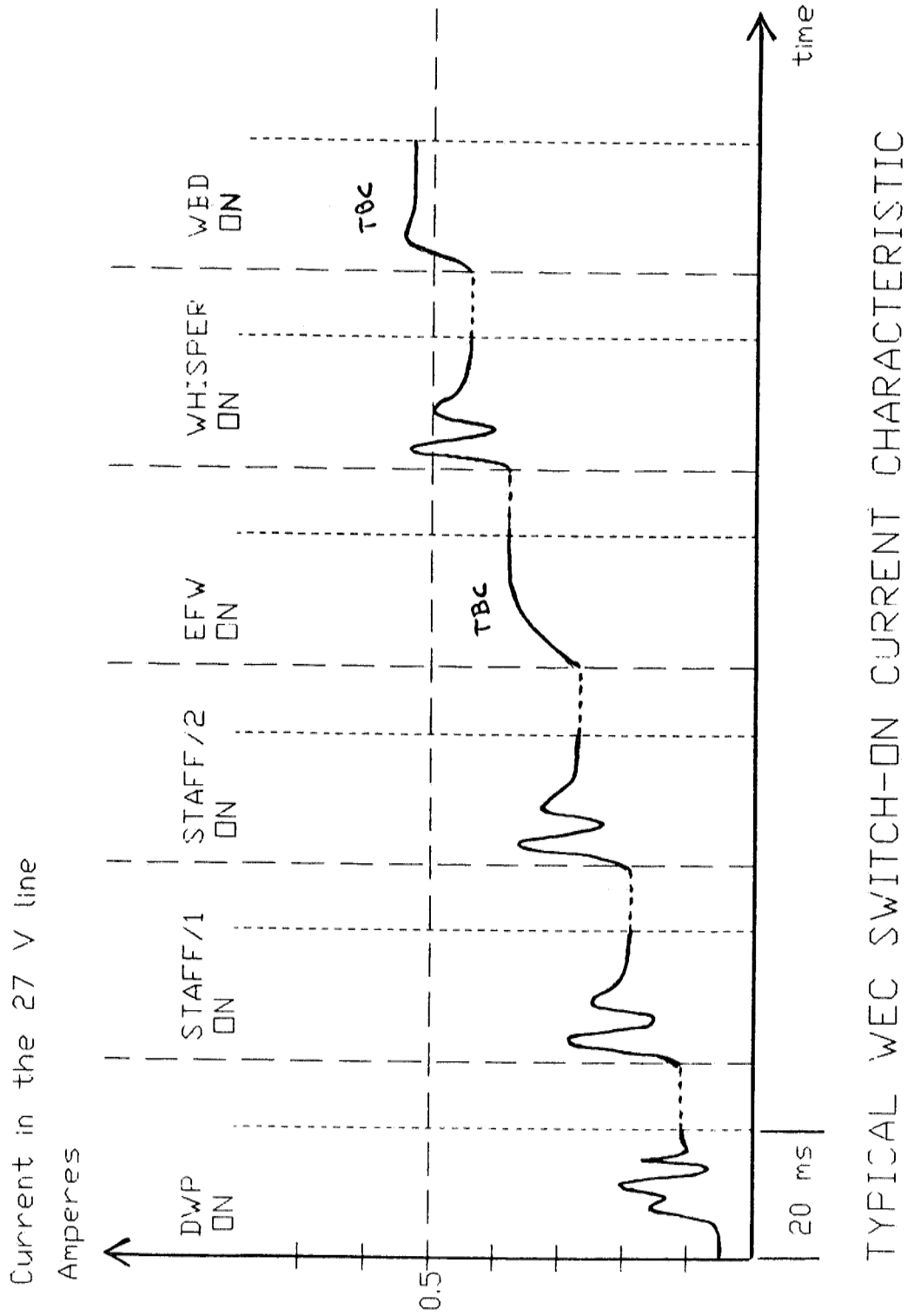
e) Unit average power

Typical examples of power dissipation versus operational modes are shown in table 3.1/3.

f) Mechanism

Power consumption during deployment phase is about 14 Watts when two motors are activated (see table 3.1/2.b). Each deployment unit will require power only when deploying the 50 meter boom. The current required to operate each motor is 100 - 150 mA. The motor startup spike (due to the lack of back EMF) is 1 amp with a decay time constant of .05 second at room temperature. This decay time constant can increase to about 10 seconds when the mechanism is very cold (-20 to -30 C) due to gearhead lubricant viscosity increase. In addition, there is a 2.6 Amp 0.8 A/microsec TBC spike decaying with a tbd microsecond time constant, caused by motor EMI filters.
The deployment will be performed by pair of opposite units, but the second units will start with a certain delay (@ .1 s) after the first one.
During deployment the WEC Power must be turned on. DWP will turn on EFW to allow EFW to control the deployment motors.

Fig. 3.1/3 Typical WEC turn-ON characteristic



WEC POWER TABLE mW					
sub/unit	minimum	nominal	maximum	nominal per unit	
Probe 1 /EFW	50	90	100	90	P.1
Probe 2	50	90	100	90	P.2
Probe 3	50	90	100	90	P.3
Probe 5	50	90	100	90	P.4
WEC. 1 /EFW	130	160	200	160	WEC. 1
WEC. 2	130	160	200	160	WEC. 2
WEC. 3	130	160	200	160	WEC. 3
WEC. 4	130	160	200	160	WEC. 4
WEC. 5 /EFW	2000 (*)	2150 (*)	2400 (*)	2150	WEC. 5
sub/unit	reduced	nominal	maximum	nominal per unit	
WEC. 7 /STA		70	100	70	WEC. 7
WEC. 8				2720	WEC. 8
WEC. 8/1/STA		670	970		
WEC. 8/2/STA	1900	2050	2200		
WEC. 9				3700	WEC. 9
WEC. 9/1/WHI		1750	2000		
WEC. 9/2/DWP		1500	5200		
WHISPER / TX		450	1500		
WEC.10 /WBD		1700	1950	1700	WEC.10
WEC.11 /PWR				2480	WEC.11
for 8/1		350			
for 8/2		750			
for 9/1		650			
for 9/2		600			
for EFW		80			
for WBD		50			
Total WEC Power with all exp in nominal mode :				13 820	mW
Power allocated to WEC at selection :				11 750	mW

Tab 3.1/2.a Unit power requirement

(*) the power consumption of EFW is extremely dependent of the level of the signal. The minimum or nominal values are expected the most part of the time, and the maximum value a few % of an orbit

WEC POWER TABLE mW					
sub/unit	minimum	nominal	maximum	nominal per unit	
Probe 1 /EFW	50	90	100	90	P.1
Probe 2	50	90	100	90	P.2
Probe 3	50	90	100	90	P.3
Probe 5	50	90	100	90	P.4
WEC. 1 /EFW	100	120	200	120	WEC. 1
WEC. 2	100	120	200	120	WEC. 2
WEC. 3	100	120	200	120	WEC. 3
WEC. 4	100	120	200	120	WEC. 4
WEC. 5 /EFW	1800 (*)	1950 (*)	2400 (*)	1950	WEC. 5
sub/unit	reduced	nominal	maximum	nominal per unit	
WEC. 7 /STA		70	100	70	WEC. 7
WEC. 8				2600	WEC. 8
WEC. 8/1/STA		850	970		
WEC. 8/2/STA	1450	1750	2200		
WEC. 9				3730	WEC. 9
WEC. 9/1/WHI	1200	1590	2000		
WEC. 9/2/DWP		1740	5200		
WHISPER / TX		400	1500		
WEC.10 /WBD		2130	2150	2130	WEC.10
WEC.11 /PWR				2460	WEC.11
for 8/1		400			
for 8/2		680			
for 9/1		570			
for 9/2		810			
Total WEC Power with all exp in nominal mode :				13 780	mW
Power allocated to WEC at selection :				11 750	mW

Tab 3.1/2.a Unit power requirement

(*) the power consumption of EFW is extremely dependent of the level of the signal. The minimum or nominal values are expected the most part of the time, and the maximum value a few % of an orbit

WEC POWER TABLE mW		
DEPLOYMENT CONFIGURATION		
WEC. 5 /EFW	1950	
WEC. 9/2/DWP	1740	
WEC.11 /PWR	810	
WEC. a /motor (a = 1 or 3)	4200	
WEC. b /motor (b = 2 or 4)	4200	
Total Power in deployment phase :	12900	mW

Tab 3.1/2.b Power requirement during deployment

UNIT \ MODE	A	PWR(mW)	B	PWR(mW)	C	PWR(mW)	D	PWR(mW)
WEC 7 WEC 8/1 STAFF/mwf	nominal	740	nominal	740	nominal	740	nominal	740
WEC 8/2 STAFF/spa	nominal	2050	reduced	1900	nominal	2050	OFF	
WEC 9/1 WHISPER	OFF		active	1750	passive	1750	passive	1750
WEC 9/2 DWP	nominal	1500	nominal	1500	nominal	1500	nominal	1500
WEC 1 to 5 EFW	nominal	3150	nominal	3150	nominal	3150	nominal	3150
WEC 10 WBD	nominal	1700	OFF		OFF		nominal	1700
WEC 11 PWR	ON	1830	ON	2430	ON	2430	ON	1730
WHISPER/tx	OFF		ON	400	OFF		OFF	
expected Power (mW)		10 970		11 920		10 620		10 570

Tab 3.1/2.c Examples of working modes of the Wave Consortium

3.1.4 **Interface circuits**

3.1.4.1 With main bus :

a) For WEC 11 (WEC power unit)

see Fig 3.1/4.1

b) For WEC 1/4 (EFW)

see Fig 3.1/4.2

c) For WEC 5 (EFW)

see Fig 3.1/4.3

d) For WEC 10 (WBD)

see Fig 3.1/4.4

3.1.4.2 With keep alive line :

N/A

3.1.5 **Converter Synchronisation Interface**

WEC11 receives the 131.072 kHz CSY clock from OBDH on one non redundant line.

This frequency is multiplied by two and the 262.144 kHz is used to synchronise the five DC/DC converters of WEC11.

The 262.144 kHz is also re-distributed to EFW and WBD to synchronise their own power supplies.

Since the synchronisation frequency is divided by two inside the PWR integrated circuits, all the DC/DC converters of WEC, EFW, WBD operate at 131.072 kHz.

Free running frequencies will be kept in a range of $\pm$ 5% w.r.t. the nominal frequency.

Interface circuits: Ref. to Fig. 3.1/5

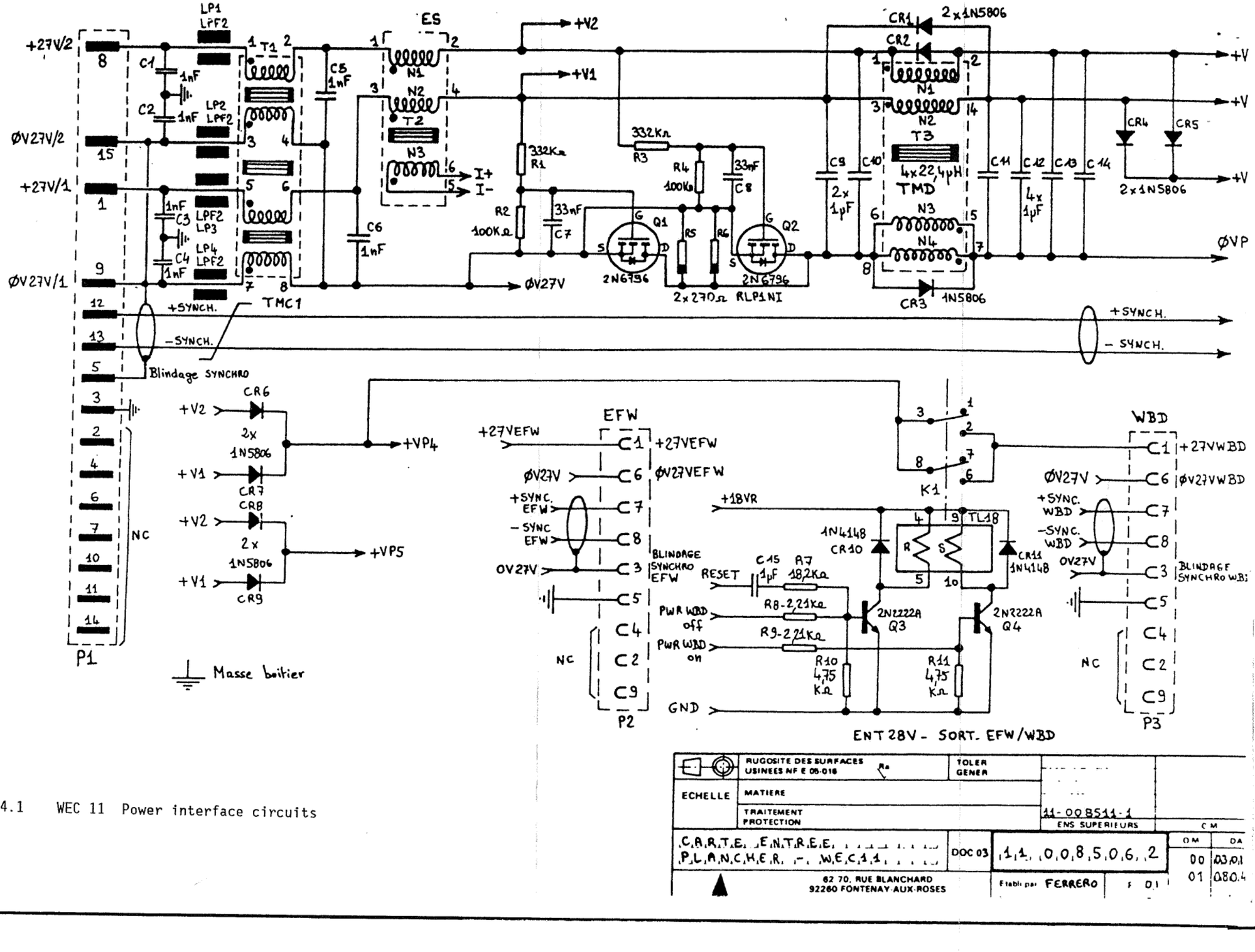


Fig 3.1/4.1 WEC 11 Power interface circuits

RUGOSITE DES SURFACES USINEES NF E 05-016 Ra	TOLER GENER		
ECHELLE	MATIERE		
	TRAITEMENT PROTECTION	11-008511-1 ENS SUPERIEURS	
CARTE ENTREE PLANCHER - WEC11	DOC 03	11,008,506,2	OM 00 01 / DA 03.01 080.4
62 70, RUE BLANCHARD 92260 FONTENAY-AUX-ROSES	Etabli par FERRERO	F 01	

Fig 3.1/4.2 WEC 1/4 Power interface circuits

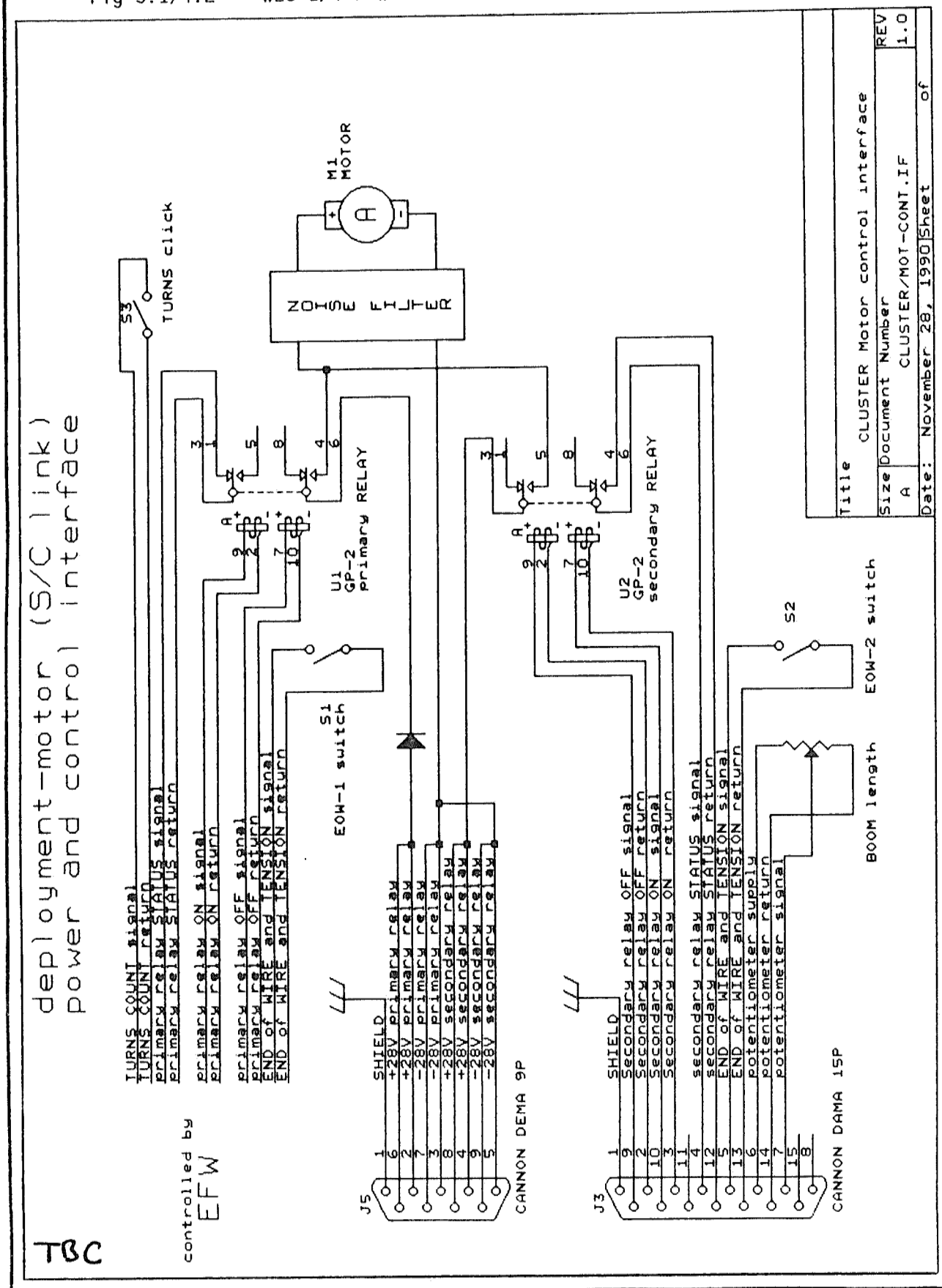
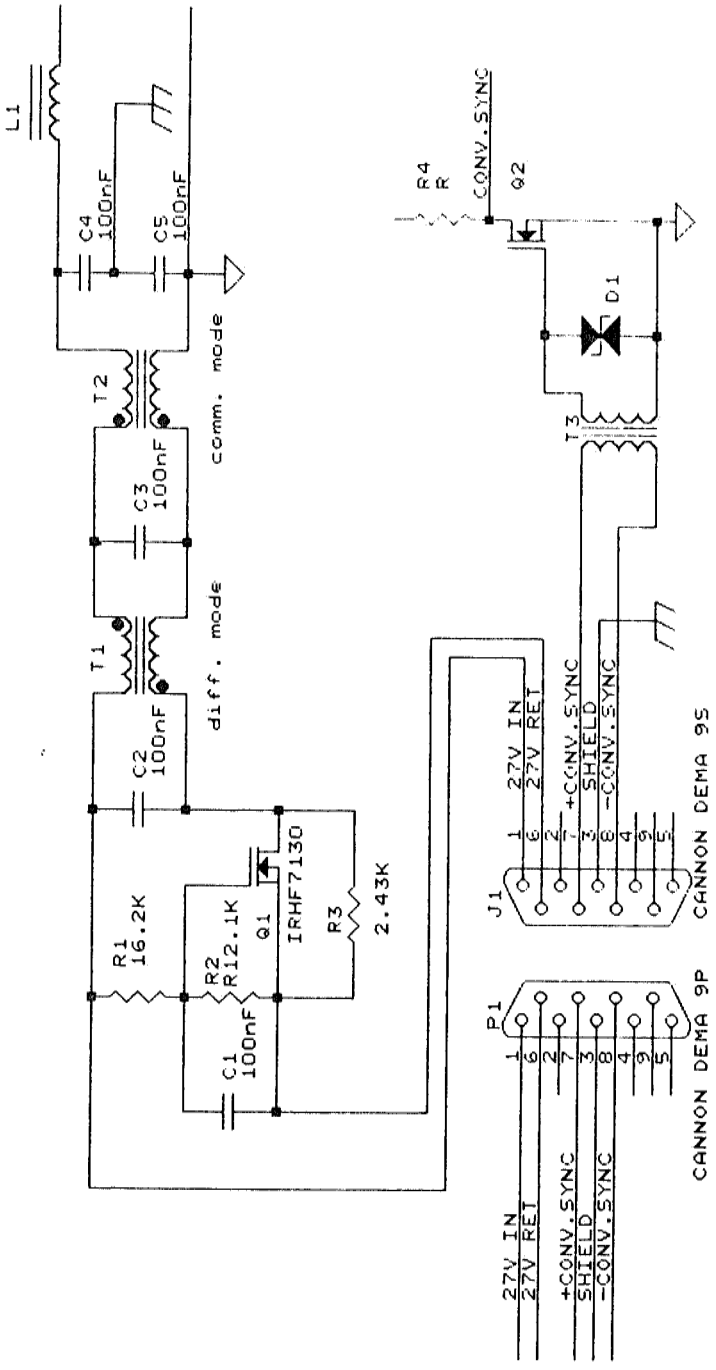


Fig 3.1/4.3 WEC 5 Power interface circuits



DC/DC converter interface (WEC-5 to WEC11)
WEC internal interface

TBC

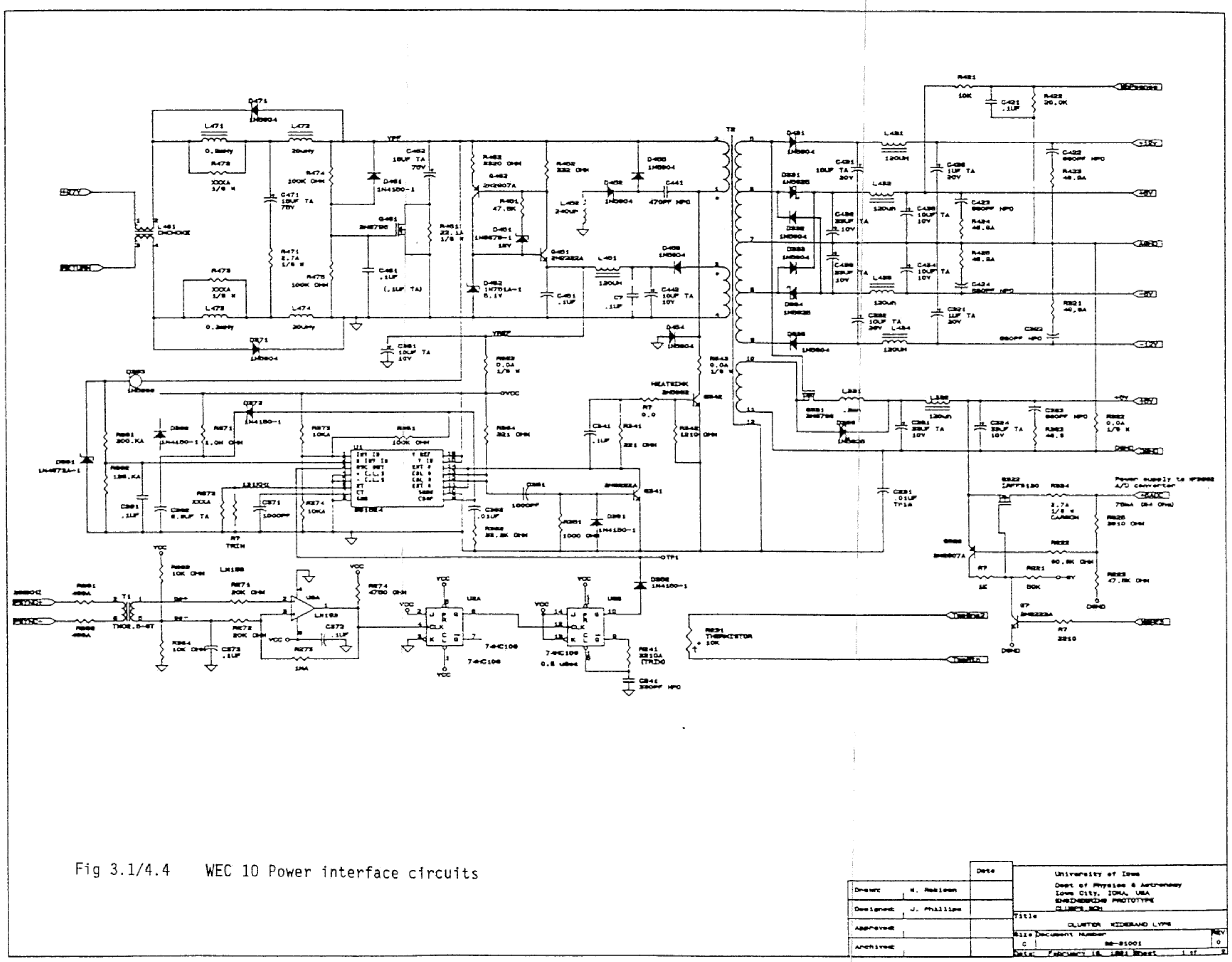


Fig 3.1/4.4 WEC 10 Power interface circuits

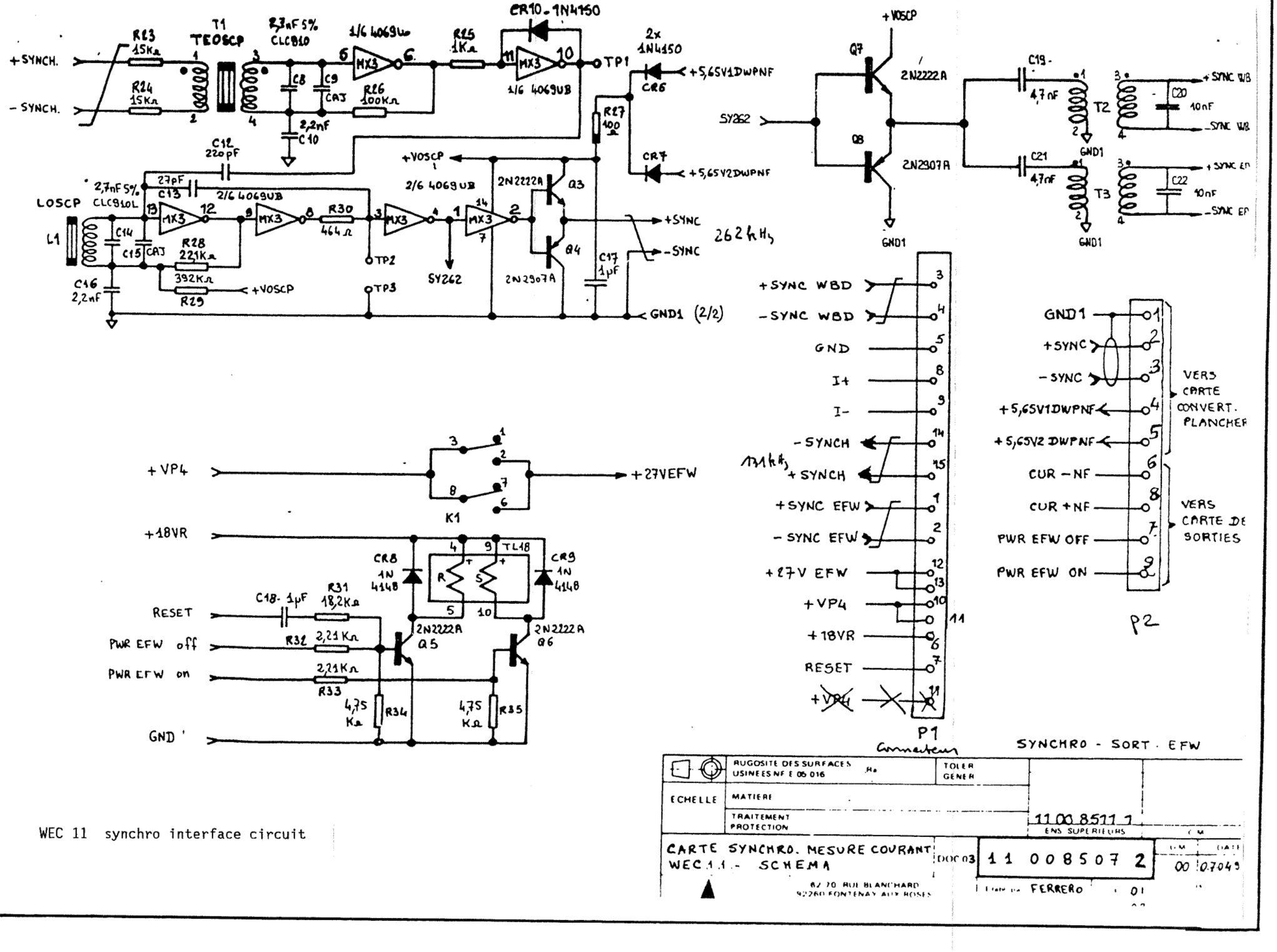


Fig 3.1/5 WEC 11 synchro interface circuit

RUGOSITE DES SURFACES USINEES NF E 05 016		TOLER GENER	
ECHELLE	MATIERE		
	TRAITEMENT PROTECTION		

11 00 8511 1 ENS SUPERIEURS

CARTE SYNCHRO. MESURE COURANT
WEC 11 - SCHEMA

DOC 03 | 11 008507 2 | 00 07049

SYNCHRO - SORT · EFW

62 70 RUE BLANCHARD 92260 FONTENAY AUX ROSES

Dessin FERRERO 01

3.2 PYROTECHNIC INTERFACE

This section concerns only the boom deployment mechanisms.

3.2.1 Electro Explosive devices

As defined by the tables 3.2/1 and 3.2/2.

FUNCTION	Number of Main Lines Required	Number of Redundant Lines Required
Pyro firing line	4	4

Table 3.2/1 Pyro interface requirement

3.2.2 Alternative to EED's :

None

3.2.3 Safety

The EEDs will comply with the safety request of EID Part A Section 11.

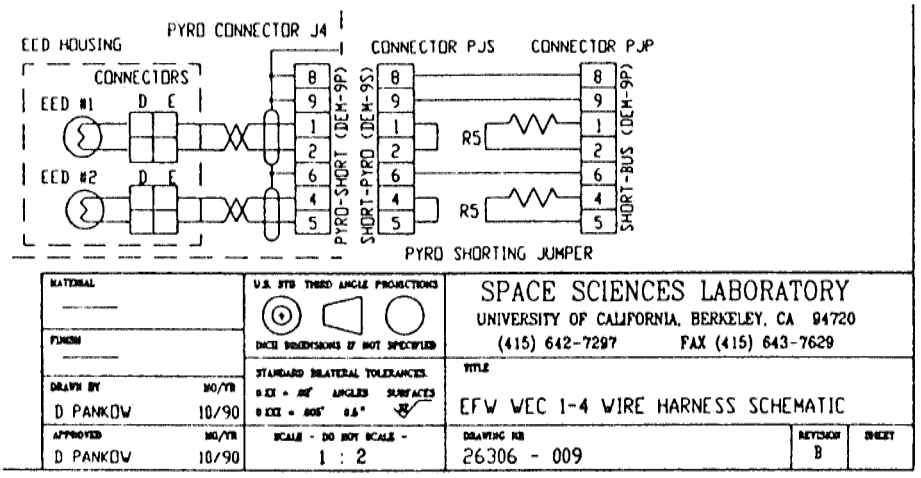
3.2.4 Pyrotechnic Interface circuit

See Fig 3.2/1

Pyro type Procurement specification	ICI Americas ISE192 wire cutters MIL-STD 1512
Qualification status	previously flown on GEOS, ISEE, ISPM waivered for use on CRRES
Number of EED's Number of squibs per EED's	2 per deployment unit 1 (integral)
Electrical characteristics Max All-Fire Min No-Fire Bridge Resistance Insulation Resistance between shorted Kads and case Electrostatic discharge from a 500 pF through a 5KΩ from leads to case Operating temperature Storage temperature	 5,0 A - 10 ms 1,0 A - 5 minutes 1 Ω ± 0.1 Ω 100 MΩ at 500 V 50 KV - 40 C + 66 C - 54 C + 71 C
Mechanical Characteristics Weight Maximum pyrotechnic Weight Dimensions	 2,250 g 0,025 g 19,05 mm L x 4,699 mm diam
Storage Life	10 years

Table 3.2/2 Pyrotechnic data

Fig 3.2/1 WEC1/4 Pyrotechnic interface circuit



MATERIAL ——	U.S. STD THIRD ANGLE PROJECTIONS	SPACE SCIENCES LABORATORY UNIVERSITY OF CALIFORNIA, BERKELEY, CA 94720 (415) 642-7297 FAX (415) 643-7629	
FINISH ——	INCH DIMENSIONS IF NOT SPECIFIED		
DRAWN BY D PANKOW 10/90	STANDARD BILATERAL TOLERANCES 0 XX = .02" ANGLES ±0.5° 0 XXX = .005"	TITLE EFW WEC 1-4 WIRE HARNESS SCHEMATIC	
APPROVED D PANKOW 10/90	SCALE - DO NOT SCALE - 1 : 2	DRAWING NO 26306 - 009	REVISION B / SHEET

3.3 ON-BOARD DATA HANDLING INTERFACE

3.3.1 Channel Allocation

Interface Parameter	Signal Type or functions		Number of main Channels	Number redundant Channels
Telecommand Channels	Memory Load Command (16 bit) Switch closure on/off command	WEC 9.2	1 0	1 0
Telemetry Channels	Serial 16 bit (Science) Serial 16 bit (Science) Serial 16 bit (Housekeeping)	WEC 9.2 WEC 10 WEC 9.2	1 1 1	1 1 1
Timing Channels	Reset Pulse Reset Pulse High Frequency clock	WEC 9.2 WEC 10	1 1 0	1 1 0
Service Channels	Sun Reference Pulse Spin Segment Clock Experiment Converter Synch.	WEC 9.2 WEC 9.2 WEC 11	1 1 1	1 1 n/a
Thermistor Channels	S/C Powered		0	n/a

Table 3.3/1 Experiment OBDH Interfaces : WEC

Functional Descriptions :

a) Telecommand channels :

16 bit serial, active high data, most significant bit first, as described in TTC-B-01.
Redundancy implementation TBD.

b) Telemetry channels :

16 bit serial, active high data, most significant bit first, as described in TTC-B-01.
Redundancy implementation TBD.

c) Timing channels :

Exact frequency and timing TBD.

d) Service channels.

CSY synchro frequency is at 131 kHz.

3.3.2 **Electrical Interface Circuits**

Compliant with ESA document TTC-01.

Exact implementation of redundancy TBD. The following circuits implement separate circuits for the normal and redundant channels, it is understood that this is not the most desirable solution.

3.3.2.1 Telecommand circuit

WEC 9.2 see Fig 3.3/1

3.3.2.2 Telemetry circuit

a) WEC 9.2

see Fig 3.3/2.1

b) WEC 10

see Fig 3.3/2.2

3.3.2.3 Timing circuit

a) WEC 9.2

see Fig 3.3/3.1

b) WEC 10

see Fig 3.3/3.2

3.3.2.4 Service Interface circuit

a) WEC 9.2

see Fig 3.3/4.1

B) WEC 11

see Fig 3.3/4.2

Fig 3.3/1 WEC 9.2 Telecommand Data Interface Circuit

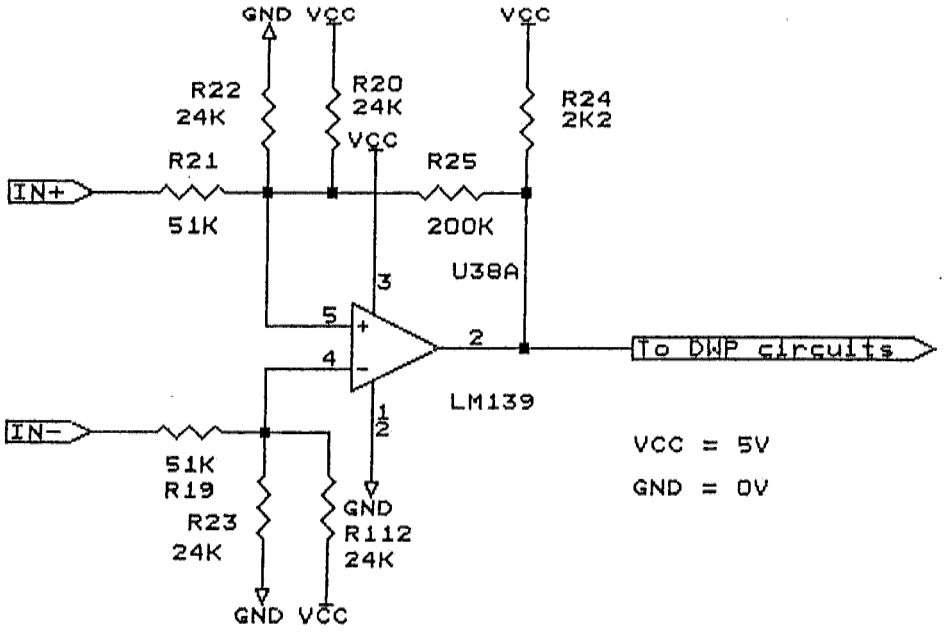


Fig 3.3/2.1 WEC 9.2 Telemetry Data Interface Circuit

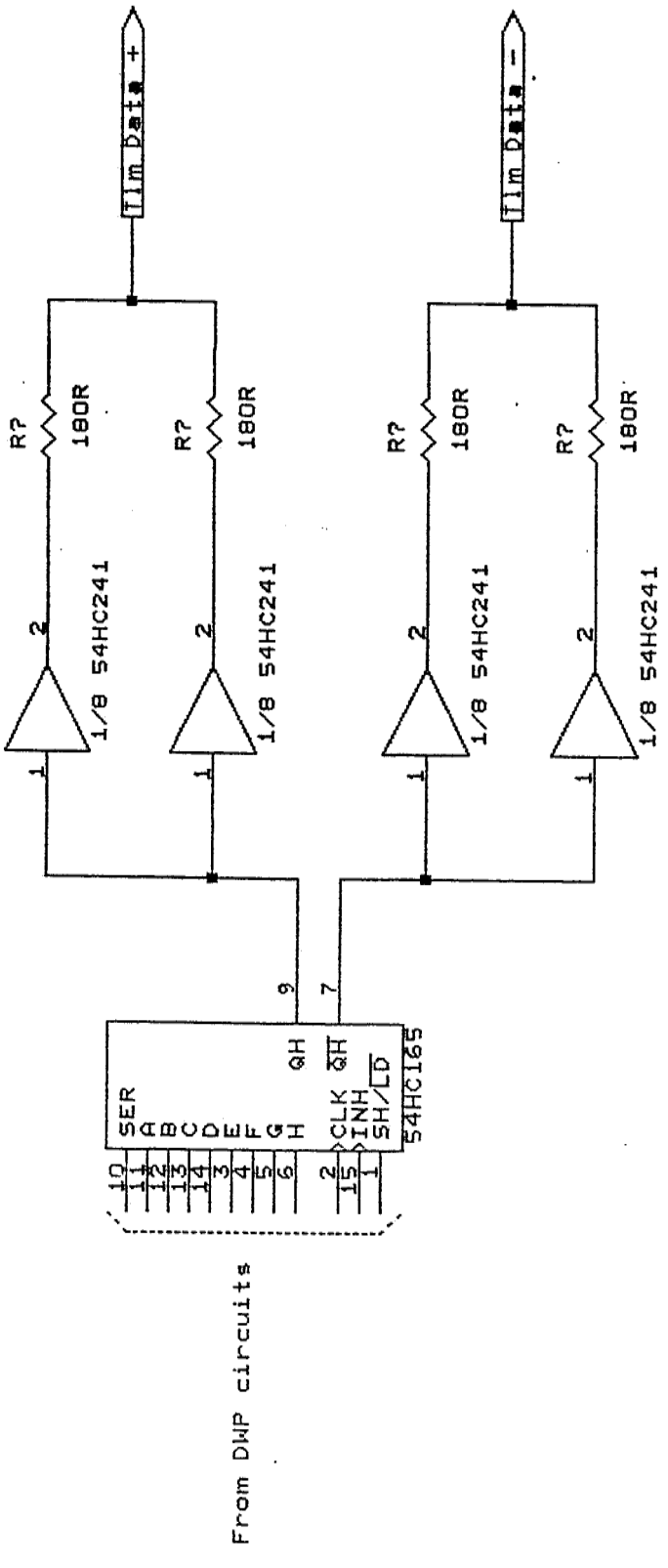


Fig 3.3/2.2 WEC 10 telemetry interface circuit

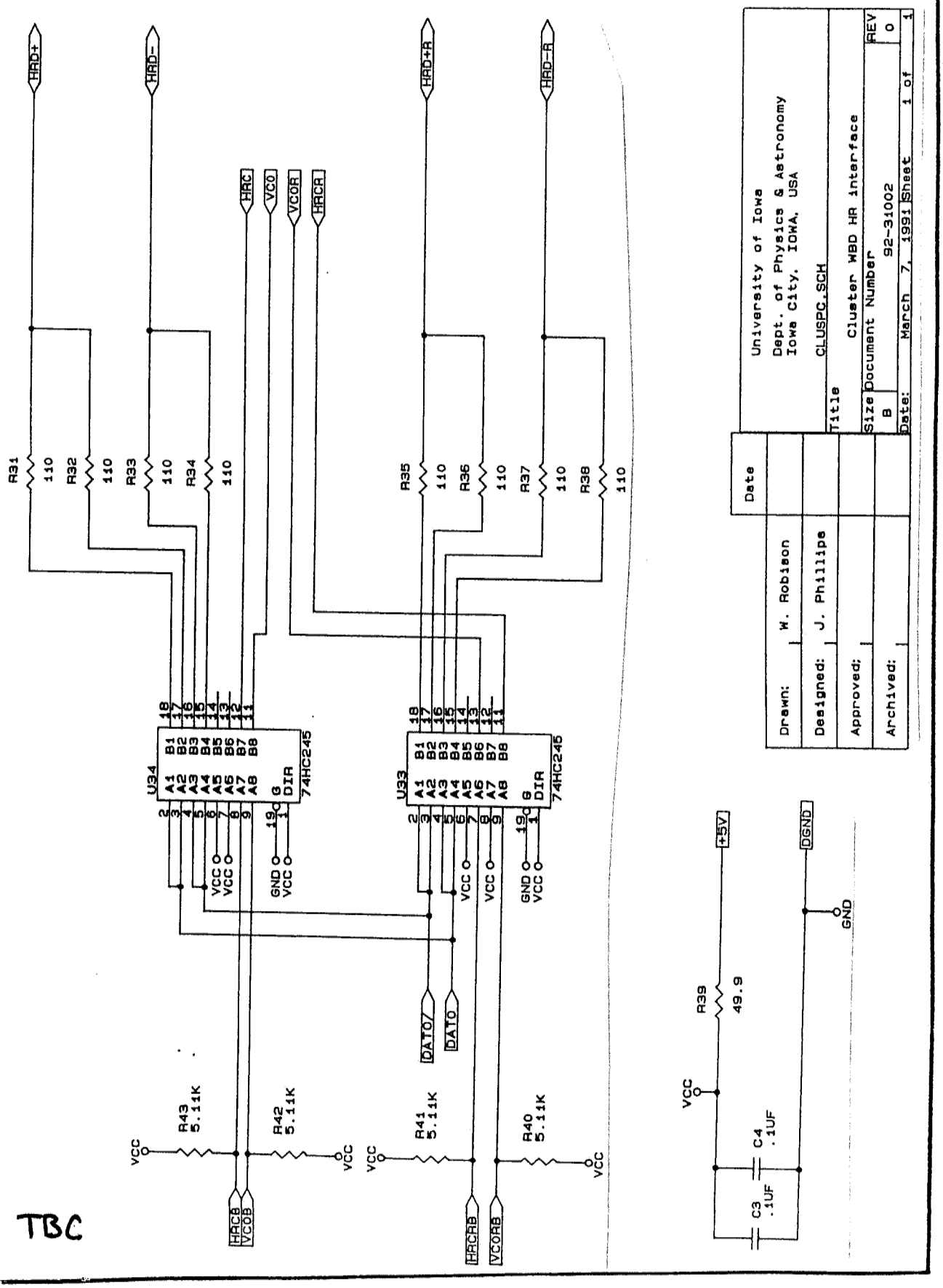


Fig 3.3/3.1 WEC 9.2 Timing (Clock and Sample) Interface Circuit

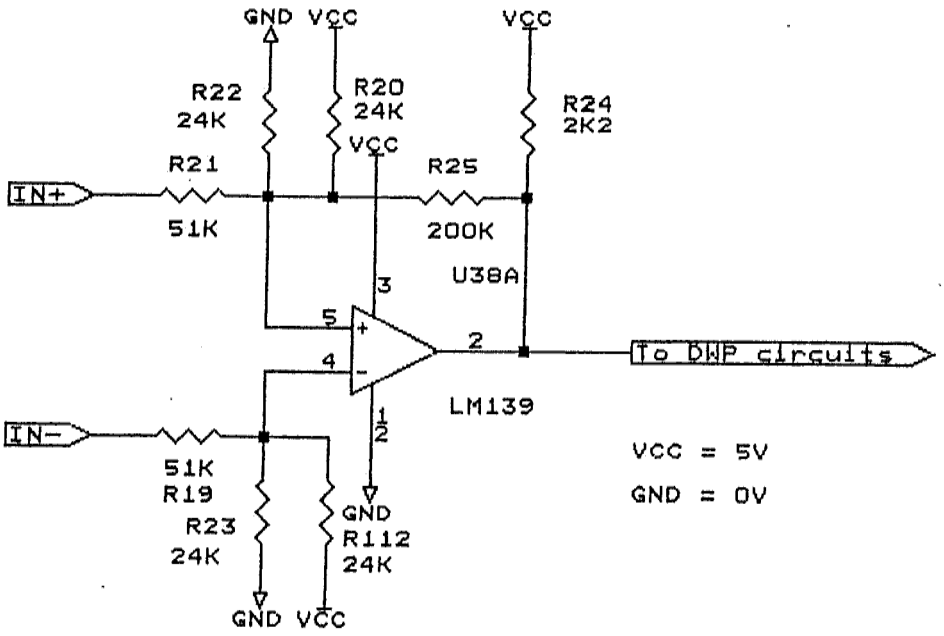
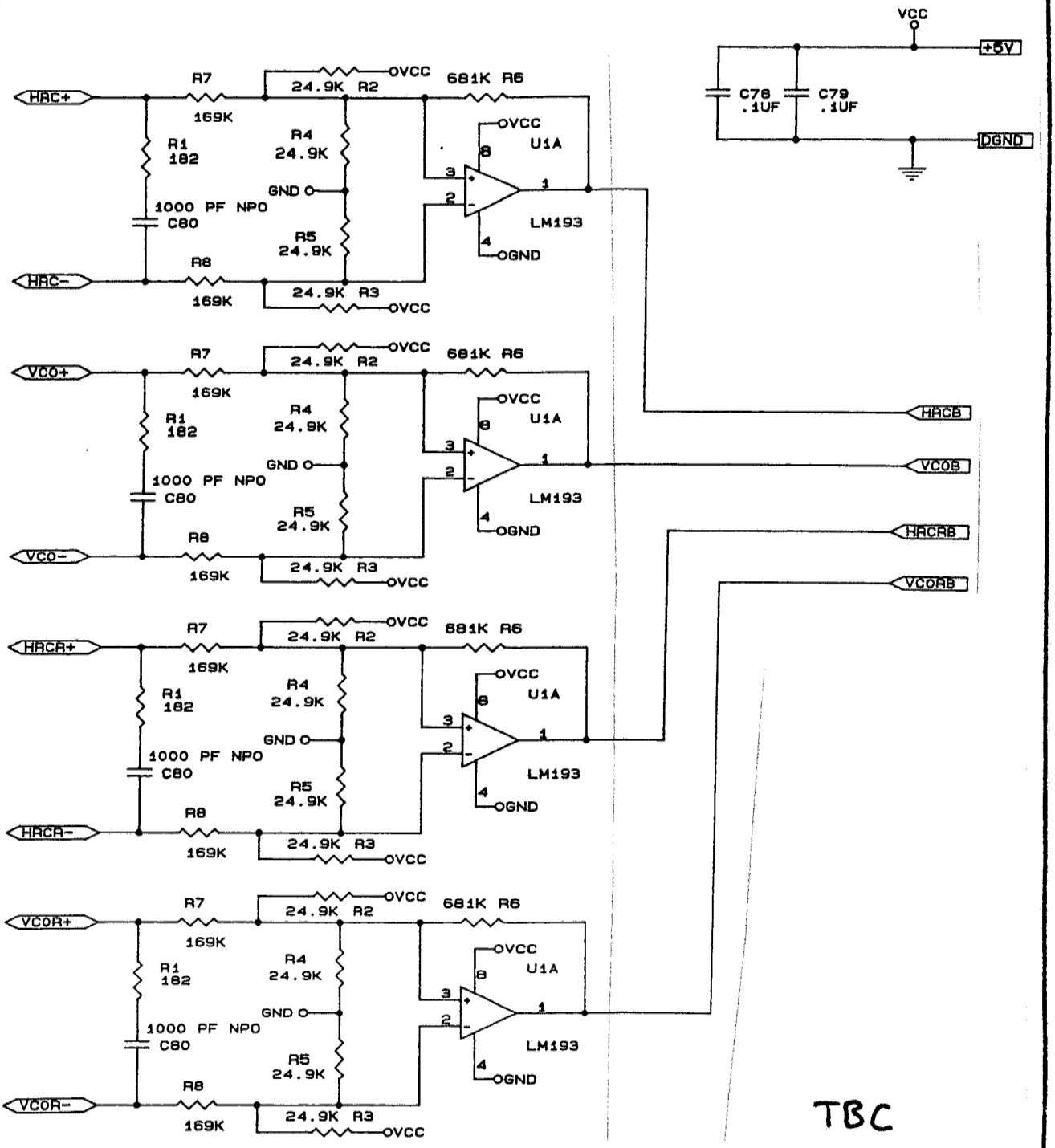


Fig 3.3/3.2 WEC 10 timing interface circuit



		Date
Drawn:	W. Robison	
Designed:	J. Phillips	
Approved:		
Archived:		

University of Iowa
Dept. of Physics & Astronomy
Iowa City, IOWA, USA

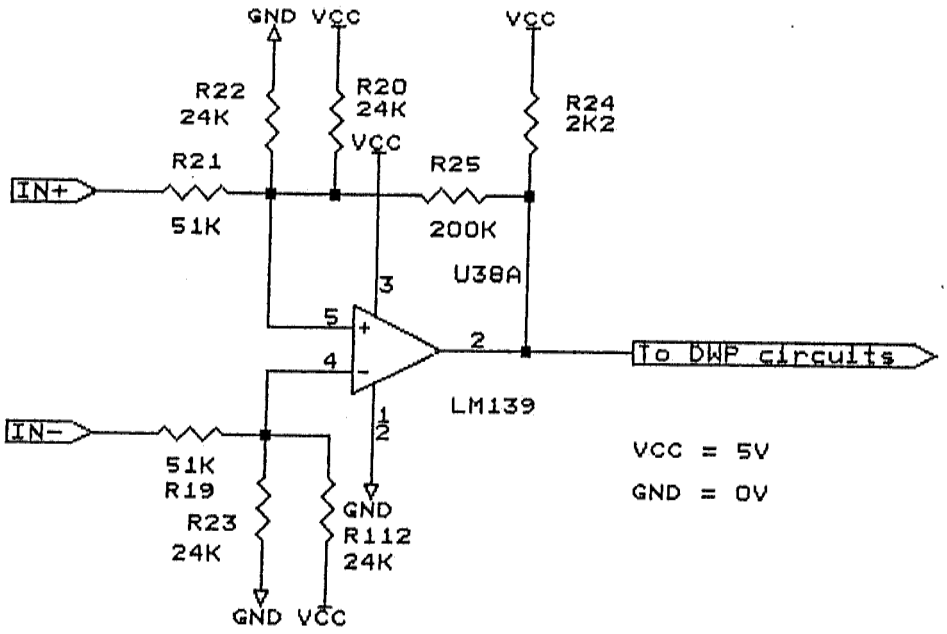
CLUSPB.SCH

Title: Cluster WBD HR interface

Size	Document Number	REV
B	92-31002	0

Date: March 7, 1991 Sheet 1 of 1

Fig 3.3/4.1 WEC 9.2 Service Signals Interface Circuit



3.3.3 Timing

Timing information will be included within the data field of telemetry packets - exact format TBD.

Timing information will be derived from the Reset Pulse and from clocks generated internally within DWP. Typical resolution of 128 micro-second. Note that the OBDH High Frequency Clock is NOT required.

3.3.4 Bit Rate Requirement

	allocation	block size	exact bite rate
NM 1	5.2 Kbps	336	5217.17 bps
NM 2	5.2 Kbps	336	5217.17 bps
NM 3	5.2 Kbps	336	5217.17 bps
BM 1	43.8 Kbps	456	43898.73 bps
BM 2	91.5 Kbps	950	91455.69 bps
BM 3	tbd	tbd	tbd
WBD M	220.0 Kbps	n/a	220752.00 bps
HK	250 bps	192	298.12 bps

Table 3.3/2 Bit Rate Requirements

3.3.5 Monitoring

a/ Concept

DWP will maintain at all times during the operation of WEC a "housekeeping block" within the "kernel processor module" memory.

The housekeeping block is continuously updated by DWP, and a "housekeeping snapshot" taken on the first transistion of the DWP "master clock" that occurs after an OBDH reset pulse. This housekeeping snapshot can be read by the spacecraft OBDH by transitions on the RTU housekeeping TM sampling line.

The Spacecraft RTU serial digital telemetry (SDT) interface to DWP will be configured to be 16 bits.

The current size of the Housekeeping block is 96 words.

b/ Housekeeping telemetry contents

THe correct reception and execution of all telecommands will be reported in the housekeeping telemetry. The correct and safe functionning of the experiment will also be verifiable htrough the housekeeping telemetry.

a summary list of the housekeeping parameters is given on table 3.3/3. A complete description of each parameters , as required for entry into the AIT data base, will be provided as a dedicated document.

Word	Description
0	DWP model tag
1	reset count
2	snapshot offset
3	DWP operation error word
4	WEC operation error word
5	current WEC mode (macro slot number)
6	current DWP configuration
7	processor module 0 health (links)
8	processor module 1 health (links)
9	processor module 2 health (links)
10	DWP clock status
11	current OBDH acquisition mode
12-14	WEC instrument power status
15	EFW processing control
16	STAFF/SA processing control
17	STAFF/WA processing control
18	WHISPER processing control
19	WBD processing control
20	DWP correlation control
21	DWP memory read address pointer
22	DWP memory write address pointer
23	external experiment status
24	last DWP configuration telecommand
25	initial WEC power on status
26	instrument/interface failure
27-42	memory load echo
43-50	analogue monitor values (16 bytes)
51-52	EFW H/K
53-65	STAFF H/K
66-74	WHISPER H/K and WBD gain
75-76	WBD H/K
77-78	EFW boom potential (V1-V2, V3-V4)
79-80	SPARE particle correlator)
81-96	additional H/K (EFW)

Tab 3.3/3 Housekeeping parameters list

3.4 INTERFACES TO OTHER EXPERIMENT

DWP -> EDI	
Data:	WHISPER blanking pulse
Requested by:	EDI
Interface type:	Digital serial link using differential drivers.
Cable requirements:	1 x twisted shielded pair cable TBC grounded at DWP.
Comments:	see 3.4.1

Table 3.4/1 : WEC/EDI IEL

DWP -> ASPOC	
Data:	EFW Spacecraft potential and WHISPER synchronisation
Requested by:	ASPOC
Interface type:	Digital serial link 1 clock and 1 data line using differential drivers.
Cable requirements:	2 x screened twisted pair cable grounded at DWP.
Comments:	see 3.4.2

Table 3.4/2 : WEC/ASPOC IEL

DWP -> CIS	
Data:	EFW Spacecraft potential and WHISPER synchronisation
Requested by:	CIS
Interface type:	Digital serial link 1 Clock and 1 data line using differential drivers.
Cable requirements:	2 x screened twisted pair cable grounded at DWP.
Comments:	see 3.4.2

Table 3.4/3 : WEC/CIS IEL

FGM -> DWP	
Data:	Magnetic Field
Requested by:	EFW
Interface type:	Digital serial link 1 Clock and 1 data line using differential receivers.
Cable requirements:	2 x screened twisted pair cable grounded at FGM.
Comments:	See 3.4.3

Table 3.4/4 : WEC/FGM IEL

DWP -> PEACE	
Data:	WHISPER synchronisation
Requested by:	PEACE
Interface type:	Digital serial link 1 Clock and 1 data line using differential drivers.
Cable requirements:	2 x screened twisted pair cable grounded at DWP.
Comments:	See 3.4.4

Table 3.4/5 : WEC/PEACE IEL

PEACE -> DWP	
Data:	Electron plate pulse
Requested by:	DWP
Interface type:	Digital serial link using differential receivers.
Cable requirements:	1 x screened twisted pair cable grounded at PEACE.
Comments:	DWP particle correlator See 3.4.4

Table 3.4/6 : PEACE/WEC IEL

STAFF -> EDI	
Data:	Magnetic wave components
Requested by:	EDI
Interface type:	3 analogic signals
Cable requirements:	3 tsp overall shielding grounded at STAFF
Comments:	See 3.4.5

Table 3.4/7 : STAFF/EDI IEL

3.4.1 Distribution of WHISPER blanking pulse

a/ Purpose

The WHISPER instrument in its investigation of plasma electron densities, employs the established technique of Resonance Sounding. This requires the transmission of a radio wave over a limited time period at a fixed frequency.

Eventually, natural resonances of the plasma in that frequency range will be triggered, and are detected by a radio receiver on WHISPER immediately after the wave transmission is complete.

The frequency is then increased by a constant step value, and the process is repeated. A succession of these steps constituting a sweep, allows the properties of the neighbouring plasma to be investigated throughout the range of interest.

b/ data transmission

DWP informs other CLUSTER instruments of an imminent WHISPER rf transmission in one of two ways. The simplest is the distribution of a Blanking Pulse covering the period of the rf transmission. The other method is for DWP to send special words across the spacecraft potential interface (see 3.4.2). Upon receipt of a DWP generated warning the other instruments may then inhibit sensitive sensors and/or suspend operation.

c/ Interface circuits

Differential driver i/f shown in fig 3.4/1.

The EDI experiment is recommended to use the differential receiver interface shown in Fig 3.4/2.

d/ Timing and synchronisation

The timing of the Blanking Pulse is shown in Fig 3.4/4.1.

The period between successive blanking pulses depends on the operation mode of the WHISPER instrument and is a minimum of 13.3 ms. Bursts of WHISPER activity will be synchronised to spacecraft spin in some WHISPER modes. WHISPER transmission and spin synchronisation is described in detail in section 3.4.2 and Fig 3.4/4.4.

3.4.2 Spacecraft potential and WHISPER synchronisation

a/ Purpose

Two instruments receive information on the spacecraft potential from the EFW instrument (ASPOC and CIS). This potential can be as high as +50 V for spacecraft in the magnetosphere, and can make some types of plasma measurement almost impossible.

ASPOC controls the CLUSTER spacecraft ion emitters in a feedback loop with the EFW instrument which measures the spacecraft potential. ASPOC holds the spacecraft potential at a point such that there is no net transfer of charge between the spacecraft and its environment.

DWP also encodes within the spacecraft potential word, information about WHISPER rf transmissions and synchronisation with spacecraft spin.

b/ data transmission

DWP transfers words across the serial interface by setting the PotData line to the MSB of the data word value, and then taking the PotClock line to logic low. The other 15 (TBC) bits of data should be latched by the receiving instruments on the falling edge of subsequent clock pulses.

Note that PotClock is low when the interface is inactive. A Gate pulse may be generated by the receiving instrument, by connecting PotClock to the input of a 4098 retriggerable monostable with a time constant of 1 ms (min)

c/ Interface circuits

Differential driver shown in fig 3.4/1.

d/ Timing and Synchronisation

The timing characteristics for the interface are shown in Fig 3.4/4.

The format of the word transmitted to ASPOC and CIS is shown in tab 3.4/2.2

Bits	Description
15	1 if new spacecraft potential
14 - 12	WHISPER transmission information
11 - 0	Spacecraft potential value

Tab 3.4/2.2

Spacecraft Potential value will be transmitted once per spacecraft spin by DWP (top bit of the word set to 1). The format of the potential value (12 bits) is TBD.

Before and after each burst of WHISPER rf transmission, a word will be transmitted across the interface. The WHISPER transmission information can be decoded as shown in tab 3.4/2.3.

Bits 14 13 12	WHISPER Command
0 0 0	No command
0 0 1	Start glide
0 1 0	Stop glide
0 1 1	Start synchronous
1 0 0	Stop synchronous
1 0 1	Start continuous
1 1 0	Stop continuous
1 1 1	undefined

Tab 3.4/2.3

The WHISPER instrument has three synchronisation modes. These are Gliding, Synchronous and Continuous. These methods of synchronisation are described below and in Fig 3.4/4.4.

The Gliding synchronisation mode divides the spin of the spacecraft into a number of equal period spin segments. Spin segment 0 starts at the Sun Reference pulse. Each spin of the spacecraft, WHISPER will only be allowed to transmit during one spin segment (the WHISPER segment). WHISPER may transmit more than

one rf pulse during the WHISPER segment. The first rf pulse will be preceded by the Start Glide command, and the last rf pulse will be followed by the Stop Glide command. On the next spin of the spacecraft, the new WHISPER segment will be the segment immediately following the WHISPER segment in the last spin.

The Synchronous mode synchronises the WHISPER rf transmissions to the voltage flyback period of the electron plate detectors. Voltage flyback occurs 16 or 32 times per spin of the spacecraft. WHISPER will only transmit a single rf pulse 16 or 32 times per spin, synchronised to the voltage flyback period. A Start Synchronous command is sent before the single rf pulse, and a Stop Synchronous command immediately after.

In the Continuous mode WHISPER is not synchronised with the spin of the spacecraft, and transmits rf pulses at intervals of multiples of 13.3 ms. A Start Continuous command is sent by DWP before every rf pulse, and a Stop Continuous command afterwards.

DWP will send the appropriate Start command for the mode at least 1.11 mS (TBC) before the start of the first rf pulse, and the Stop command for the mode no sooner than 1 ms (TBC) after the end of the last rf pulse.

DWP will ensure that there is an interval of at least 2 ms between the transmission of any two words to allow the receiving instrument time to recognise and read the first word.

3.4.3 Supply of FGM Data to EFW

a/ Purpose

EFW requires FGM data so that Electric field phenomena can be related to the ambient magnetic field (Eg polarisation). DWP will interface to FGM, and transmit received FGM vectors across the DWP to EFW control interface.

b/ Data exchange

FGM data will be transmitted to DWP as a word of length 64 bits transmitted over a serial interface. FGM transfers its data by setting the FGMData line to the LSB (bit 0) of the FGM word, and then taking the FGMClock line to logic high. The other 63 bits of data are latched by DWP on the rising edge of subsequent clock pulses.

c/ Interface circuits

The differential receiver shown in fig 3.4/2.

d/ Timing and Synchronisation

The timing characteristics for the interface are shown in Fig 3.4/4.3.

FGM will provide magnetic field vectors 16 times per second, contained in 64 bit words. The structure of the word is shown in Tab 3.4/3.2

Synchronisation is provided by logical zeros and start bits.

Bits	Description
0	start bit (logical 1)
1 - 12	X component (12 bits) of B-field
13 - 24	Y component (12 bits) of B-field
25 - 36	Z component (12 bits) of B-field
37 - 39	range (3 bits)
40 - 63	logical 0

Tab 3.4/3.2

The FGM clock runs at a continuous rate of 1024 Hz, with no inactive periods between 64 bit words.

3.4.4 DWP to PEACE Interface

a/ Purpose

Electron Plate Pulses from the PEACE instrument are required by the DWP particle correlator. A signal from PEACE to DWP supplies a clock whose frequency varies with the number of electrons detected.

The PEACE plate sensor selection is controlled by DWP. Once per spacecraft spin DWP will send a plate selection command over a control interface.

In addition, DWP will send WHISPER transmission and spin synchronisation information across the control interface.

b/ data exchange

An 8-bit counter circuit will allow DWP to count the number of pulses in any specified time interval. Counter reset and register facilities will be provided.

The PEACE control byte is transmitted by DWP as an 8-bit serial signal. DWP transfers the control byte by setting the PCData line to the MSB (bit 7) of the control byte, and then taking the

PCclock line to logic low. The other bits of the byte are transferred on subsequent clock pulses.

Note that PCclock is low when DWP is not transmitting control bytes to PEACE. A Gate pulse may be generated by the receiving instrument by connecting PCclock to the input of a 4098 retriggerable monostable with a time constant of 1 ms (min).

c/ Interface circuits

The differential driver shown in Fig 3.4/1 will be used for the transmission of the signal to PEACE.

The differential receiver shown in Fig 3.4/2 will be used for the reception of pulses signal from PEACE.

d/ Timing and Synchronisation

Electron Plate Pulses at a frequency of up to 1 MHz are expected. Minimum pulse width should be 500 ns and the pulse counter will be incremented on the rising edge of the pulse.

PEACE will supply pulses from one of 16 electron detectors. DWP will select the detector to be used each spin by sending a control byte down the PEACE control interface (with bit 7 set to 1).

The format of this control byte is shown in Tab 3.4/4.2

Bits	Description
7	1 if correlator changed
6 - 4	WHISPER transmission information
3 - 0	Correlator channel select

Tab 3.4/4.2

Before and after each burst of WHISPER rf transmission, a word will be transmitted across the interface. The WHISPER transmission information can be decoded as shown in Tab 3.4/4.3

Bits 6	5	4	WHISPER Command
0	0	0	No command
0	0	1	Start glide
0	1	0	Stop glide
0	1	1	Start synchronous
1	0	0	Stop synchronous
1	0	1	Start continuous
1	1	0	Stop continuous
1	1	1	undefined

Tab 3.4/4.3

The WHISPER synchronisation protocol is described in section 2.4. DWP will ensure that there is an interval of at least 2 ms between the transmission of any two control bytes to allow PEACE to recognise and read the first control byte.

The timing diagram for the control interface is shown in Fig 3.4/4.5.

3.4.5 Supply of STAFF magnetic waves to EDI

a/ Purpose

On request from EDI, the STAFF experiment will transmit to EDI the 3 components of the magnetic wave forms. They are analog signals in a frequency range up to 4 kHz. The 3 components Bx, By, Bz are aligned with the WEC reference axis Ex, Ey, Ez defined as follows:

Ex is parallel to the S/C axis Xb (spin axis)
Ey is in the direction of the long boom V3
Ez is in the direction of the long boom V1

c/ Interface circuits

See Fig 3.4/3.

Fig 3.4/1 Differential driver

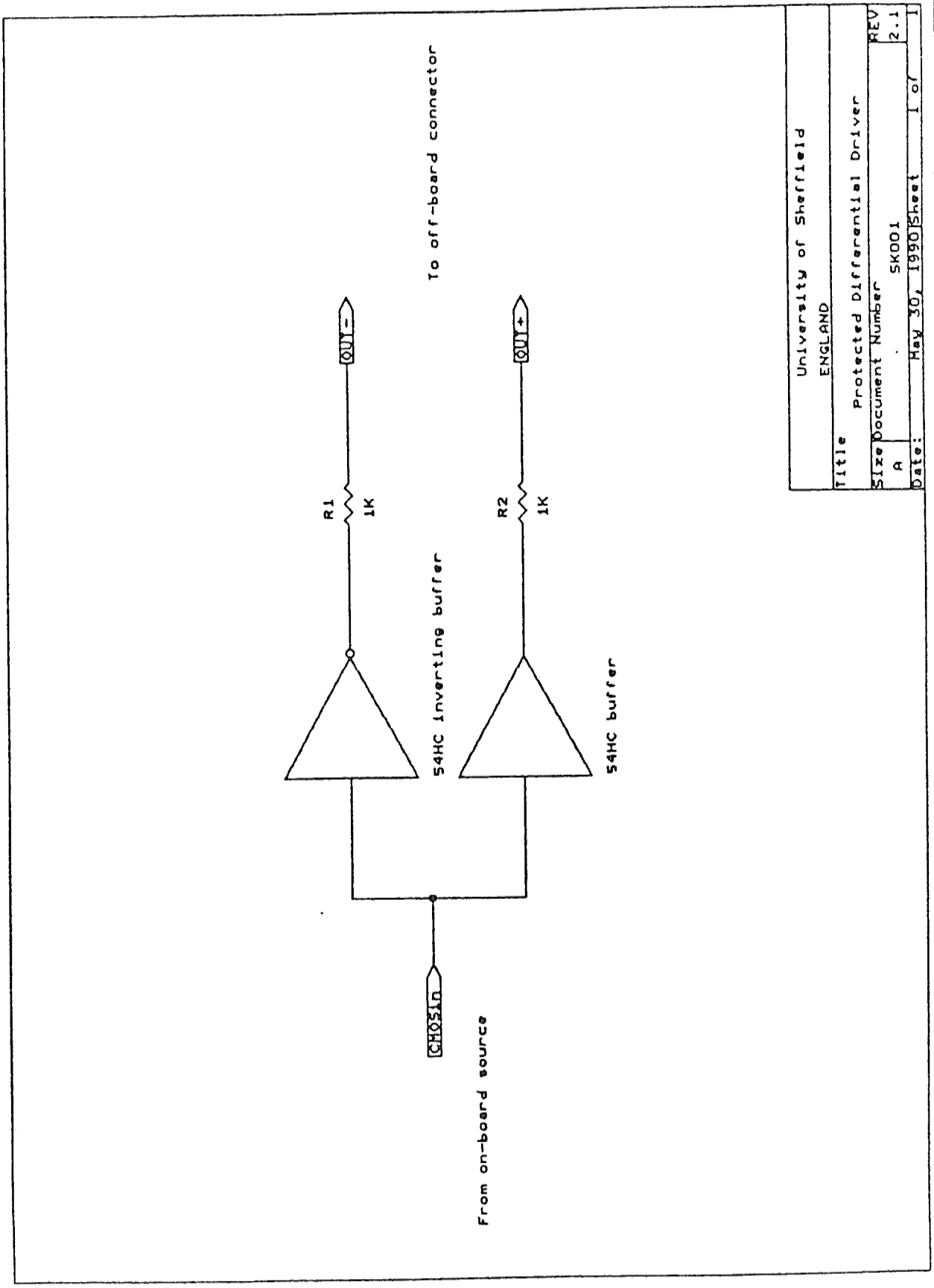
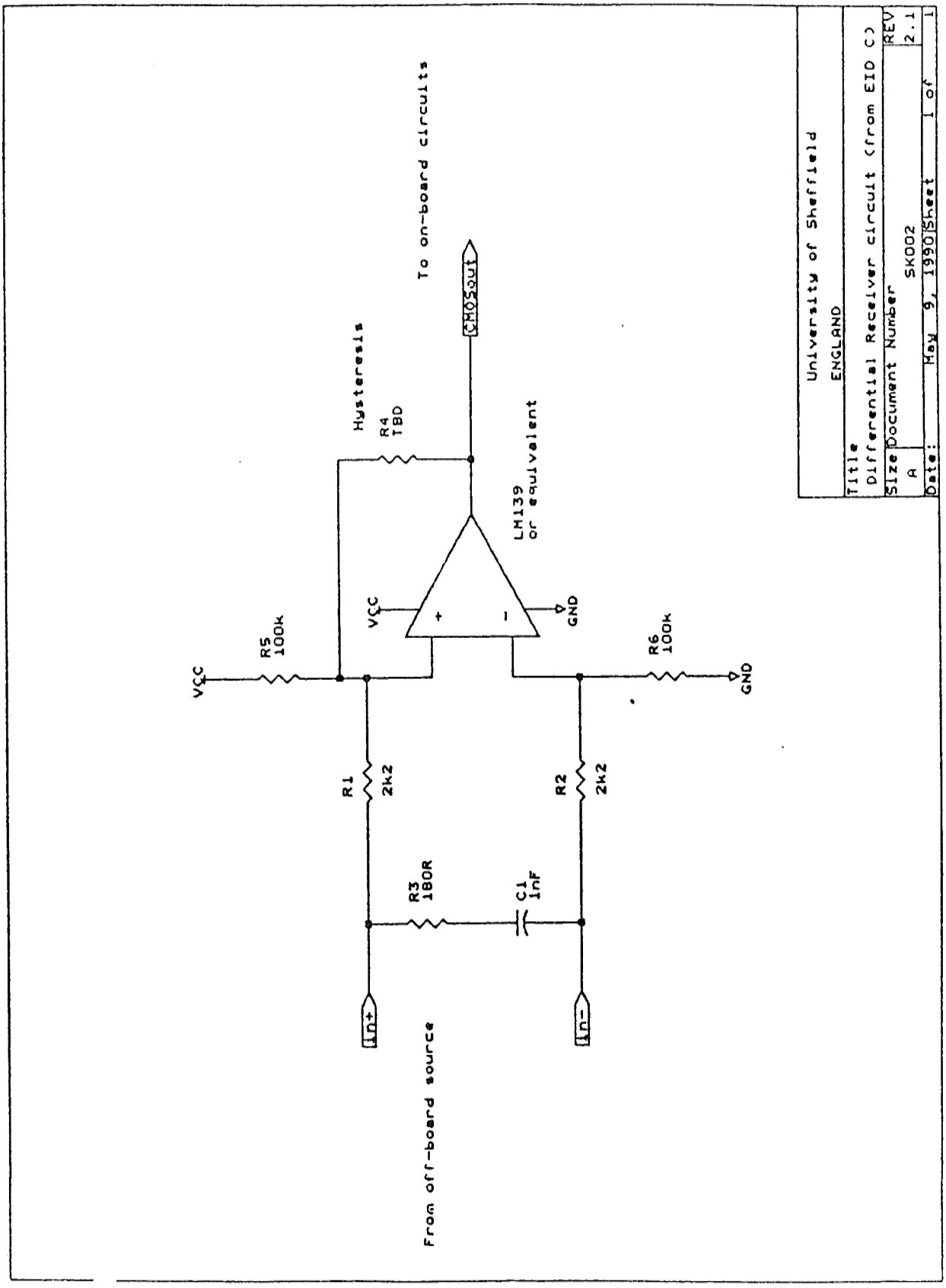


Fig 3.4/2 Differential receiver



Distribution of WHISPER Blanking Pulse

Timing Characteristics

Parameter	Description	min	max
Tbrp	Pulse repetition rate	13.3 ms	
Tblh	Blanking Signal Active	3.33 ms	3.33 ms
Ttxd	Blanking start to Transmission Delay	1.11 ms	1.11 ms
Ttxp	RF Transmission Duration	Ø.5 ms	1 ms

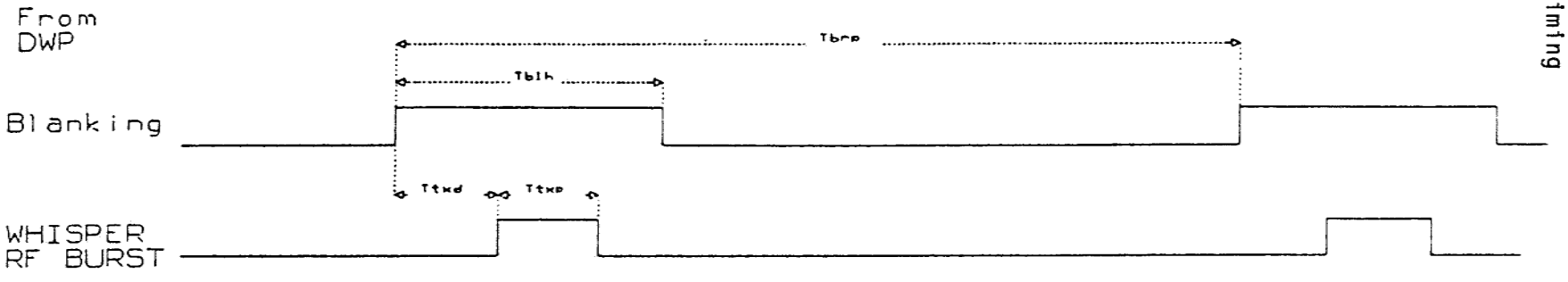


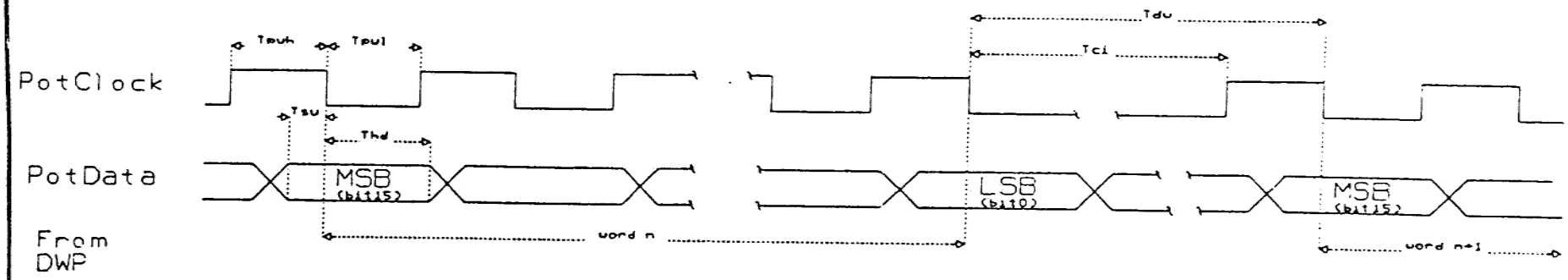
Fig 3.4/4.1 WHISPER Blanking pulse timing

University of Sheffield
ENGLAND
Title
WHISPER Blanking Pulse
Size B
Document Number
TMOOS
Rev
Date: May 1r, 1990 Sheet 1 of

esa estec CLUSTER

CL-EST-RS-0451/EID B Issue: 1
Date : 22.03.91 Rev : 0
Section: 3 Page : 48

Spacecraft Potential and WHISPER synchronisation (16 bit word)



Timing Characteristics

Parameter	Description	min	max
Tpwh	Clock high pulse width	1 uS	
Tpwl	Clock low pulse width	1 uS	
Tsu	Data setup time	1 uS	
Thd	Data hold time	1 uS	
Tci	Clock inactive period	1 mS	
Tdw	Delay between words	2 mS	

University Of Sheffield
ENGLAND
Title: Spacecraft Potential and WHISPER sync
Size: B | Document Number: TM006 | Rev:
Date: May 16, 1990 | Sheet 1 of

Fig 3.4/4 S/C potential and WHISPER synchronisation

Distribution of FGM Data (64 bit word)

Timing Characteristics

Parameter	Description	min	max
Tcp	Clock period (1024 Hz)	977 uS	977 uS
Tsu	Data setup time	30 nS	
Thd	Data hold time	0 ns	

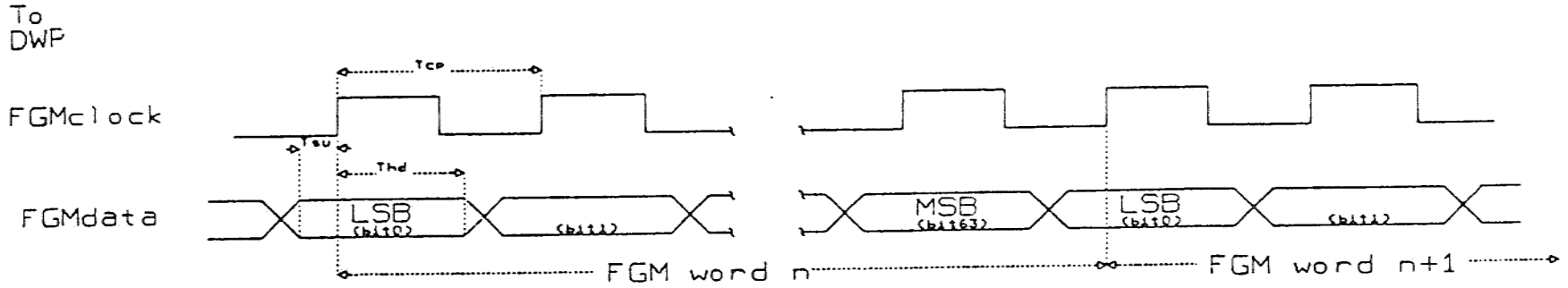
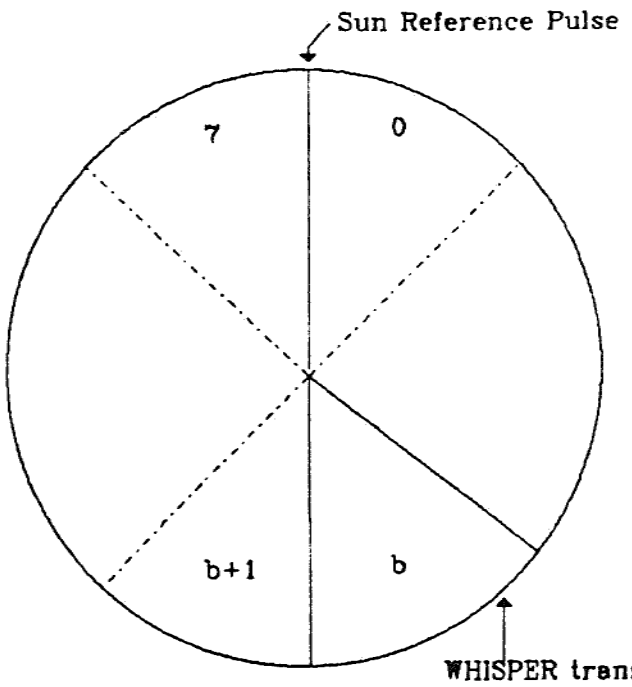


Fig 3.4/4.3 FGM data exchange

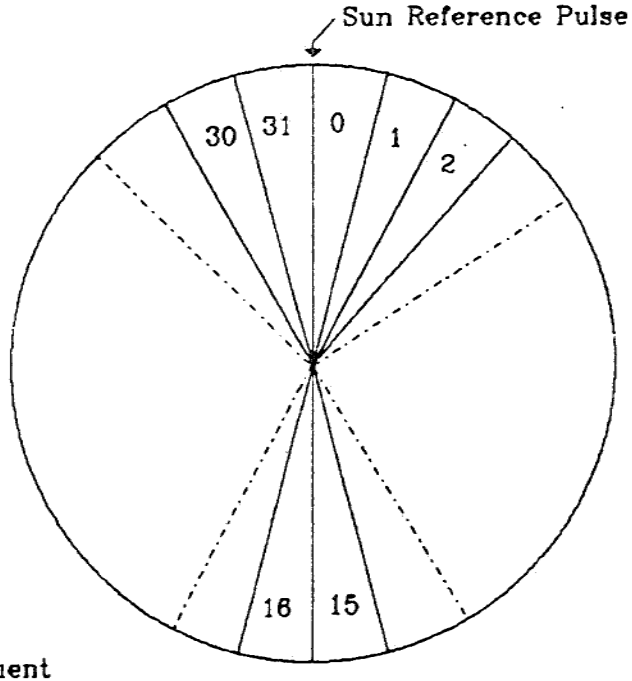
University of Sheffield ENGLAND		
Title: FGM interface timing		
Size: B	Document Number: TM010	Rev: 1.3
Date: May 16, 1990	Sheet 1 of 1	



Gliding Mode

If WHISPER transmits in segment b on spin S of the spacecraft. then on the next spin (S+1) WHISPER will transmit in segment b+1.

A spacecraft spin is divided into eight equal segments. Segment 0 is the segment starting at the Sun Reference Pulse.



Synchronous mode

WHISPER transmissions are synchronised to the voltage flyback period of the electron detection plates. Flyback occurs at the end of a spin segment. Transmissions occur either:

i/ 16 times per spin (segments 1.3.5. ... . 29.31)

ii/ 32 times per spin (segments 0.1.2. ... . 30.31)

Drawing TM011 Rev 3.1 Jan 9 1991

Fig 3.4/4.4 WHISPER transmission and spin synchronisation

3.5 CONNECTORS AND HARNESS (TBC)

3.5.1 Interconnecting block diagram

Ref to A4 condensed Fig 3.5/1 and Tab 3.5/3.1.
Drawing A0 detailled Fig 3.5/1 gives a complete definition of the harness.

The harness is classified in several categories:

- Unit harness provided by the relevant experiment
- Experiment harness (experiment mass budget)
- WEC common harness between experiment of the consortium (WEC harness mass budget)

The two last categories will be manufactured by the harness subcontractor. All harness except WEC7c are standard. WEC7c wires will be provided by STAFF for manufacturing by the harness subcontractor.

3.5.2 Interconnecting Harness Characteristics

Tab 3.5/3.1 and 3.5/3.2 give masses and densities relevant to each harness and estimated total mass for each one and the mass of the common wec harness.

3.5.3 Connectors Type

Tab 3.5/1.1 to 5 give the list of the connectors used per unit.
All connectors will be non magnetic, class B.

3.5.4 High Voltage Control

WHISPER has a dedicated disable connector for high voltage control.
It will be connected to the high voltage S/C panel control when mounted on the S/C. It is also used as a testing connector for the tests in the laboratory.

3.5.5 Pin Allocation

See Tables 3.5/2.1 to 3.5/2.30.

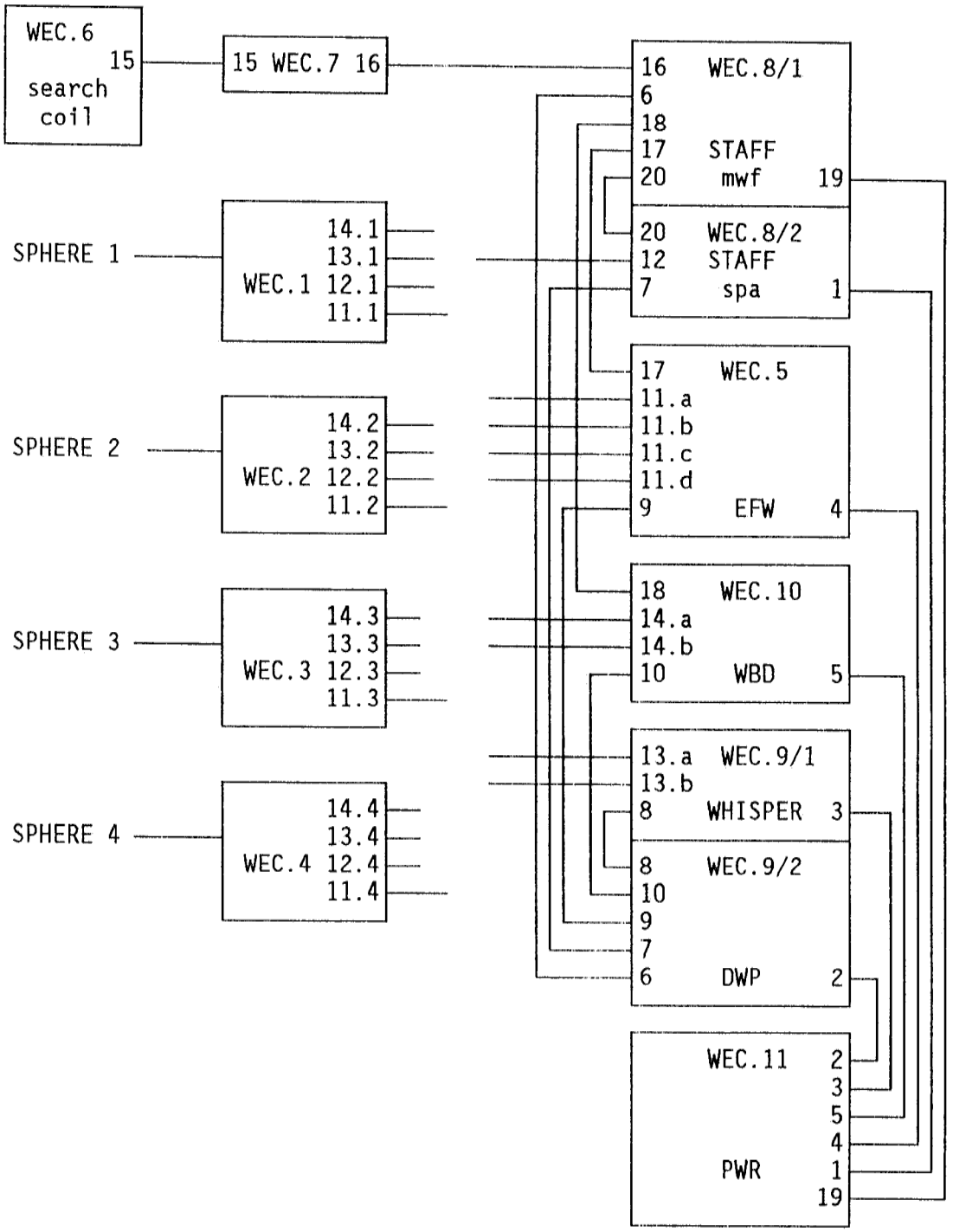


Fig. 3.5/1 WEC internal interconnections diagram

N°	from	to	type	function	conn	rem
19	WEC 11	WEC 8/1	4 tp AWG 24	power distr	9+15	
01	WEC 11	WEC 8/2	3 tp AWG 24	power distr	2* 9	
02	WEC 11	WEC 9/2	2 tp AWG 22	power distr	2*25	
			1 tp AWG 24	curr sensor		
			12 s AWG 24	on/off cmd		
03	WEC 11	WEC 9/1	4 tp AWG 24	power distr	2*15	
			1 tsp AWG 22	power distr TX		
04	WEC 11	WEC 5	1 tp AWG 22	power distr	2* 9	
			1 tsp AWG 24	synchro		
05	WEC 11	WEC 10	1 tp AWG 22	power distr	2* 9	
			1 tsp AWG 24	synchro		
06	WEC 8/1	WEC 9/2	37 s AWG 26	data exchange	2*50	
			3 ss AWG 26			
			3 overall shld			
07	WEC 8/2	WEC 9/2	17 s AWG 26	data exchange	2*25	
			1 tsp AWG 26			
			4 ss AWG 24			
			2 overall shld			
08	WEC 9/1	WEC 9/2	32 s AWG 26	data exchange	2*37	***
09	WEC 5	WEC 9/2	12 s AWG 26	data exchange	2*15	
10	WEC 10	WEC 9/2	18 s AWG 26	data exchange	2*25	
11.a	WEC 1	WEC 5	{	analog signals	2*25	*
11.b	WEC 2	WEC 5	{ 4*15 s AWG 26	analog signals	2*25	*
11.c	WEC 3	WEC 5	{ 4* 1 ss AWG 24	analog signals	2*25	*
11.d	WEC 4	WEC 5	{	analog signals	2*25	*
12	WEC 1-4	WEC 8/2	4 ss AWG 24	analog signals	5 *9	
13.a	WEC 1-2	WEC 9/1	2 ss AWG 24	analog signals	1* 9	
13.b	WEC 3-4	WEC 9/1	2 ss AWG 24	WHISP transmit	1* 9	
14.a	WEC 1-2	WEC 10	2 ss AWG 24	analog signals	1*15	
14.b	WEC 3-4	WEC 10	2 ss AWG 24	analog signals	1*15	
15	WEC 6	WEC 7	7 tsp spec cab	analog signals	2*25	**
16	WEC 7	WEC 8/1	3 tsp AWG 26	analog signals	2*25	
			6 s AWG 26			
			1 ss AWG 24	calibration		
17	WEC 8/1	WEC 5	3 tsp AWG 26	analog signals	15+9	
18	WEC 8/1	WEC 10	2 tsp AWG 26	analog signals	2* 9	
20	WEC 8/1	WEC 8/2	10 s AWG 26	analog signals	2*15	***

* = WEC 5c ** = WEC 7c *** = unit harness

Tab 3.5/3.1 - WEC harness description

H/N Nr	from	to	wire g/m	overal shield g/m	conn type	wire length m	wire g	overal shield g	conn g	total common g	unit harn g
19	11	08.1	20.0	10	2*9	0.7	14.00	7.00	36.00	57.00	
1	11	08.2	15.0	10	9+15	1.0	15.00	10.00	44.00	69.00	
2	11	09.2	48.2	12	2*25	0.2	9.64	2.40	66.00	78.04	
3	11	09.1	33.2	10	2*15	0.4	13.28	4.00	52.00	69.28	
4	11	05	15.4	10	2*9	2.7	41.58	27.00	36.00	104.58	
5	11	10	15.4	10	2*9	3.2	49.28	32.00	36.00	117.28	
6	08.1	09.2	79.8	50	2*50	0.7	55.86	35.00	114.00	204.86	
7	08.2	09.2	41.8	30	2*25	1.0	41.80	30.00	66.00	137.80	
8	09.1	09.2	60.8	15	2*37	0.2	12.16	3.00	92.00		107.16
9	05	09.2	22.8	10	2*15	3.1	70.68	31.00	52.00	153.68	
10	10	09.2	34.2	12	2*25	3.4	116.28	40.80	66.00	223.08	
11	1..4	05	35.5	12	8*25	9.8	347.90	117.60	264.00		729.50
12	1..4	08.2	4.7	10	1*15	11.6	54.52	116.00	26.00	196.52	
13	1..4	09.1	4.7	10	2*9	12.4	58.28	124.00	36.00	218.28	
14	1..4	10	12.0	10	2*15 4*15	10.0	120.00	100.00	52.00 104.00	272.00 104.00	
15	06	07	109.0	0	2*25	5.6	610.40	0.00	66.00		676.40
16	07	08.1	43.2	12	2*25	1.2	51.84	14.40	66.00	132.24	
17	08.1	05	23.6	10	15+9	2.6	61.36	26.00	44.00	131.36	
18	08.1	10	13.2	10	2*9	2.7	35.64	27.00	36.00	98.64	
20	08.1	08.2	24.5	10	2*15	0.1	2.45	1.00	52.00		55.45
total						72.60	1760	748	1406	2368	1569

Tab 3.5/3.2 - WEC harness characteristics and mass

EXP	CONNECTOR ID	TYPE MANUFACTURER	FUNCTION
WEC1/4	J01	tbd DBMA 25p NMB	EFW data link
	J02	tbd DAMA 15s NMB	STAFF, WBD, WHISPER i/f
	J03	Cannon DAMA 15p NMB	override control
	J04	tbd DEMA 9p NMB	pyro i/f
	J05	Cannon DEMA 9p NMB	S/C power i/f
WEC 5	J01	Cannon DEMA 9p NMB	PWR i/f
	J02	Cannon DBMA 25s NMB	wec 1 data link
	J03	Cannon DBMA 25s NMB	wec 2 data link
	J04	Cannon DBMA 25s NMB	wec 3 data link
	J05	Cannon DBMA 25s NMB	wec 4 data link
	J06	Cannon DAMA 15s NMB	DWP data link
	J07	Cannon DEMA 9s NMB	STAFF data link

Table 3.5/1.1 EFW connectors list

EXP	CONNECTOR ID	TYPE MANUFACTURER	FUNCTION
WEC6	J01	tbd DBMA 25s NMB	wec 7 data link
WEC7	J01	Cannon tbd 25s NMB	wec 6 data link
	J02	Cannon tbd 25p NMB	wec 8 i/f
WEC8	J01	Cannon DAMA 15p NMB	PWR i/f
	J02	Cannon DBMA 25s NMB	wec 7 i/f
	J03	Cannon DAMA 15p NMB	unit i/f
	J04	Cannon DEMA 9s NMB	WBD data link
	J05	Cannon DAMA 15s NMB	EFW data link
	J06	Cannon DAMA 15p NMB	EDI data link
	J07	Cannon DDMA 50s NMB	DWP data link
	J08	Cannon DAMA 15s NMB	unit i/f
	J09	Cannon DEMA 9p NMB	PWR i/f
	J10	Cannon DAMA 15s NMB	test
	J11	Cannon DAMA 15p NMB	EFW data link
	J12	Cannon DBMA 25s NMB	DWP data link

Table 3.5/1.2 STAFF connectors list

EXP	CONNECTOR ID	TYPE MANUFACTURER	FUNCTION
WEC9.1	J01	Souriau DAM 15p NMB	PWR i/f
	J02	Souriau DEMA 9s NMB	wec 3 & 4 data link
	J03	Souriau DEMA 9p NMB	wec 1 & 2 data link
	J04	Souriau DCMA 37p NMB	DWP data link
	J05	Souriau DEMA 9s NMB	test and HV control
WEC9.2	J06	Souriau DBMA 25s NMB	OBDH i/f
	J07	Souriau DBMA 25s NMB	OBDH i/f
	J08	Souriau DBMA 25p NMB	PWR i/f
	J09	Souriau DCMA 37p NMB	WHISPER data link
	J10	Souriau DBMA 25s NMB	WBD data link
	J11	Souriau DCMA 37s NMB	IEL i/f
	J12	Souriau DBMA 25p NMB	STAFF data link
	J13	Souriau DDMA 50p NMB	STAFF data link
	J14	Souriau DAMA 15p NMB	EFW data link

Table 3.5/1.3 WEC 9 connectors list

EXP	CONNECTOR ID	TYPE MANUFACTURER	FUNCTION
WEC10	J01	Cannon DBMA 25p NMB	obdh i/f
	J02	Cannon DAM7W2p	wec 3 & 4 data link
	J03	Cannon DAM7W2s	wec 1 & 2 data link
	J04	Cannon DEMA 9s NMB	STAFF data link
	J05	Cannon DBMA 25s NMB	DWP data link
	J06	Cannon DEMA 9p NMB	PWR i/f

Table 3.5/1.4 WBD connectors list

EXP	CONNECTOR ID	TYPE MANUFACTURER	FUNCTION
WEC11	J01	Souriau DAMA 15p NMB	S/C power i/f
	J02	Souriau DEMA 9s NMB	EFW power i/f
	J03	Souriau DEMA 9s NMB	WBD power i/f
	J04	Souriau DEMA 9s NMB	STAFF power i/f
	J05	Souriau DAMA 15s NMB	WHISPER power i/f
	J06	Souriau DBMA 25s NMB	DWP power i/f
	J07	Souriau DEMA 9s NMB	STAFF power i/f

Table 3.5/1.5 PWR connectors list

SOURCE WEC/EFW WEC1,2,3,4	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET WEC/EFW WEC 5 J02,03,04,05

J01	Signal Designation	EMC Cat	Wire	AWG	mΩ	
1	Structure ground		ov	shld		1
2	Sensor signal	2	ss	24		2
3	+ 100 V	2	s	26		3
4	+ 5 V	2	s	26		4
5	- 8 V	2	s	26		5
6	+ 12 V FLT	2	s	26		6
7	- 12 V FLT	2	s	26		7
8	AGND	2	s	26		8
9	BC1	2	s	26		9
10	BOOMENA	2	s	26		10
11	nc					
12	nc					
13	nc					
14	Sensor signal return	2	ss	shld		14
15	nc					
16	+ 8 V	2	s	26		16
17	AGND	2	s	26		17
18	- 100 V	2	s	26		18
19	FLT return	2	s	26		19
20	BIAS/STAT	2	s	26		20
21	BC0	2	s	26		21
22	BC2	2	s	26		22
23	nc					
24	nc					
25	nc					

Table 3.5/2.1 : WEC1,2,3,4 J01 to WEC 5 respectively J02,03,04,05 pin assignment

SOURCE WEC/EFW WEC 1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET a WEC 8.2 J11 b WEC 9.1 J03 c WEC 10 J03

J02	Signal Designation		EMC Cat	Cabl	Wire	AWG	mΩ	
1	Structure ground				ov	shld		15 a
1	Structure ground				ov	shld		1 b
1	Structure ground				ov	shld		4 c
2	nc							
3	nc							
4	+ Ez	return	2	2	ss	shld		7 b
5	nc							
6	+ Ez	signal	2	3	ss	24		A1 c
7	nc							
8	+ Ez	return	2	1	ss	shld		6 a
9	nc							
10	nc							
11	+ Ez	signal	2	2	ss	24		6 b
12	nc							
13	nc							
14	+ Ez	return	2	3	ss	shld		A1s c
15	+ Ez	signal	2	1	ss	24		5 a

Table 3.5/2.2 : WEC1 J02 to WEC 8.2 J11, WEC 9.1 J03, WEC 10 J03 pin assignment

SOURCE WEC/EFW WEC 2	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT						TARGET a WEC 8.2 J11 b WEC 9.1 J03 c WEC 10 J03
J02	Signal Designation		EMC Cat	Cabl	Wire	AWG mΩ	
1	Structure ground				ov	shld	15 a
1	Structure ground				ov	shld	1 b
1	Structure ground				ov	shld	4 c
2	nc						
3	nc						
4	- Ez	return	2	2	ss	shld	9 b
5	nc						
6	- Ez	signal	2	3	ss	24	A2 c
7	nc						
8	- Ez	return	2	1	ss	shld	8 a
9	nc						
10	nc						
11	- Ez	signal	2	2	ss	24	8 b
12	nc						
13	nc						
14	- Ez	return	2	3	ss	shld	A2s c
15	- Ez	signal	2	1	ss	24	7 a

Table 3.5/2.3 : WEC2 J02 to WEC 8.2 J11, WEC 9.1 J03, WEC 10 J03 pin assignment

SOURCE WEC/EFW WEC 3	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET a WEC 8.2 J11 b WEC 9.1 J02 c WEC 10 J02

J02	Signal Designation		EMC Cat	Cabl	Wire	AWG	mΩ	
1	Structure ground				ov	shld		15 a
1	Structure ground				ov	shld		1 b
1	Structure ground				ov	shld		4 c
2	WHISPER/TX true.	return	2	2	ss	shld		7 b
3	nc							
4	nc							
5	nc							
6	+ Ey	signal	2	3	ss	24		A1 c
7	nc							
8	+ Ey	return	2	1	ss	shld		2 a
9	WHISPER/TX true.	signal	2	2	ss	24		6 b
10	nc							
11	nc							
12	nc							
13	nc							
14	+ Ey	return	2	3	ss	shld		A1s c
15	+ Ey	signal	2	1	ss	24		1 a

Table 3.5/2.4 : WEC3 J02 to WEC 8.2 J11, WEC 9.1 J02, WEC 10 J02 pin assignment

SOURCE WEC/EFW WEC 4	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET a WEC 8.2 J11 b WEC 9.1 J02 c WEC 10 J02

J02	Signal Designation		EMC Cat	Cabl	Wire	AWG	mΩ	
1	Structure ground				ov	shld		15 a
1	Structure ground				ov	shld		1 b
1	Structure ground				ov	shld		4 c
2	WHISPER/TX comp.	return	2	2	ss	shld		9 b
3	nc							
4	nc							
5	nc							
6	- Ey	signal	2	3	ss	24		A2 c
7	nc							
8	- Ey	return	2	1	ss	shld		4 a
9	WHISPER/TX comp.	signal	2	2	ss	24		8 b
10	nc							
11	nc							
12	nc							
13	nc							
14	- Ey	return	2	3	ss	shld		A2s c
15	- Ey	signal	2	1	ss	24		3 a

Table 3.5/2.5 : WEC4 J02 to WEC 8.2 J11, WEC 9.1 J02, WEC 10 J02 pin assignment

SOURCE WEC/EFW WEC1,2,3,4	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET OBDH RTU

J03	Signal Designation		EMC Cat	Wire AWG mΩ
1	structure ground			
2	secondary relay off	return	2	
3	secondary relay on	return	2	
4	secondary relay status	signal	2	
5	end of wire & tension	signal	2	
6	potentiometre	supply	2	
7	potentiometre signal	signal	2	
8	nc			
9	secondary relay off	signal	2	
10	secondary relay on	signal	2	
11	nc			
12	secondary relay status	return	2	
13	end of wire & tension	return	2	
14	potentiometre	return	2	
15	nc			

Table 3.5/2.6 : WEC1,2,3,4 J03 (override) to RTU pin assignment

SOURCE WEC/EFW WEC1,2,3,4	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET PYRO PEU

J04	Signal Designation		EMC	cabl	Wire AWG mΩ
1	EED 1	.FIRE	3	1	tsp tbd
2	EED 1	.RTN	3	1	tsp tbd
3	structure gnd				
4	EED 2	.FIRE	3	2	tsp tbd
5	EED 2	.RTN	3	2	tsp tbd
6	structure gnd				
7	structure gnd				
8	structure gnd				
9	structure gnd				

Table 3.5/2.7 : WEC1,2,3,4 J04 (pyro) to PEU pin assignment

SOURCE WEC/EFW WEC1,2,3,4	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET POWER PDU

J05	Signal Designation	EMC	cabl	Wire	AWG	mΩ
1	structure gnd					
2	28 V primary relay .SUP	1	1			
3	28 V primary relay .RTN	1	1			
4	28 V secondary relay .SUP	1	3			
5	28 V secondary relay .RTN	1	3			
6	28 V primary relay .SUP	1	2			
7	28 V primary relay .RTN	1	2			
8	28 V secondary relay .SUP	1	4			
9	28 V secondary relay .RTN	1	4			

Table 3.5/2.8 : WEC1,2,3,4 J05 (power) to PDU pin assignment

SOURCE WEC/EFW WEC 5	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET WEC/PWR WEC 11

J01	Signal Designation	EMC Cat	Cabl	Wire	AWG	mΩ	J02
1	+ 27 V .SUP	1	1	tp	22		1
2	nc						2
3	nc CSY shld grounded at WEC11	2	2	tsp	shld		3
4	nc						4
5	structure ground			ov	shld		5
6	+ 27 V .RTN	1	1	tp	22		6
7	CSY .TRUE	2	2	tsp	24		7
8	CSY .COMP	2	2	tsp	24		8
9	nc						9

Table 3.5/2.9 : WEC5 J01 to WEC11 J02 pin assignment

SOURCE WEC/EFW WEC 5	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/DWP WEC 9.2
J06	Signal Designation	EMC Cat	Wire	AWG	mΩ	J14
1	signal ground	2	s	26		1
2	EFW data	2	s	26		2
3	Ready-to-send	2	s	26		3
4	EFW AD clock	2	s	26		4
5	EFWSampClock	2	s	26		5
6	Sun Ref Pulse	2	s	26		6
7	signal ground	2	s	26		7
8	structure ground	2	ov	shld		8
9	EFW Command	2	s	26		9
10	Clear-to-Send	2	s	26		10
11	signal ground tbc		s	26		11
12	nc					12
13	signal ground tbc		s	26		13
14	nc					14
15	blanking pulse	2	s	26		15

Table 3.5/2.10 : WEC5 J06 to WEC9.2 J14 pin assignment

SOURCE WEC/EFW WEC 5	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT				TARGET WEC/STAFF WEC 8.1
J07	Signal Designation	EMC	cabl	Wire AWG mΩ	J05
1	SCX+	2	1	tsp 26	1
2	nc				
3	SCY-	2	2	tsp 26	4
4	SCZ+	2	3	tsp 26	5
5	nc				
6	SCX-	2	1	tsp 26	2
7	SCY+	2	2	tsp 26	3
8	nc				
9	SCZ-	2	3	tsp 26	6
					7
					8
					9
	shld grounded at WEC8.1		1	tsp shld	10
					11
	shld grounded at WEC8.1		2	tsp shld	12
					13
	shld grounded at WEC8.1		3	tsp shld	14
	structure ground				15

Table 3.5/2.11 : WEC5 J07 to WEC8.1 J05 pin assignment

SOURCE WEC/STAFF WEC 6	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/STAFF WEC 7
J01	Signal Designation	EMC	Cable	Wire	AWG mΩ	J01
1	Bxe return	2	1	tspl	26	1
2	Bxe shld at signal gnd both end		1	tspl	shld	2
3	X feed back signal	2	4	tsp	26	3
4	nc					
5	shld at signal gnd both end		7	tsp	shld	5
6	Bye signal	2	2	tspl	26	6
7	Y feed back return	2	5	tsp	26	7
8	shld at signal gnd both end		5	tsp	shld	8
9	temp sensor true	2	7	tsp	26	9
10	Bze return	2	3	tspl	26	10
11	Bze shld at signal gnd both end		3	tspl	shld	11
12	Z feed back signal	2	6	tsp	26	12
13	nc					
14	Bxe signal	2	1	tspl	26	14
15	X feed back return	2	4	tsp	26	15
16	shld at signal gnd both end		4	tsp	shld	16
17	structure ground					17
18	Bye shld at signal gnd both end		2	tspl	shld	18
19	Bye return	2	2	tspl	26	19
20	Y feed back signal	2	5	tsp	26	20
21	nc					
22	temp sensor comp	2	7	tsp	26	22
23	Bze signal	2	3	tspl	26	23
24	Z feed back return	2	6	tsp	26	24
25	shld at signal gnd both end		6	tsp	shld	25

Table 3.5/2.12 : WEC6 J01 to WEC7 J01 pin assignment

SOURCE WEC/STAFF WEC 6	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/STAFF WEC 7
J01	Signal Designation	EMC	Cable	Wire	AWG mΩ	J01
1	Bxe signal	2	1	tsp	26	1
2	Bxe shld		1	tsp	shld	2
3	X feed back return	2	4	tsp	26	3
4	connected to 2					
5	nc sensor shld grounded at WEC7		7	tsp	shld	5
6	Bye signal	2	2	tsp	26	6
7	Y feed back return	2	5	tsp	26	7
8	nc Y shld grounded at WEC7		5	tsp	shld	8
9	temp sensor true	2	7	tsp	26	9
10	Bze signal	2	3	tsp	26	10
11	Bze shld		3	tsp	shld	11
12	Z feed back return	2	6	tsp	26	12
13	connected to 11					
14	Bxe return	2	1	tsp	26	14
15	X feed back signal	2	4	tsp	26	15
16	nc X shld grounded at WEC7		4	tsp	shld	16
17	structure ground					17
18	Bye shld		2	tsp	shld	18
19	Bye return	2	2	tsp	26	19
20	Y feed back signal	2	5	tsp	26	20
21	connected to 18					
22	temp sensor comp	2	7	tsp	26	22
23	Bze return	2	3	tsp	26	23
24	Z feed back signal	2	6	tsp	26	24
25	nc Z shld grounded at WEC7		6	tsp	shld	25

Table 3.5/2.12 : WEC6 J01 to WEC7 J01 pin assignment

SOURCE WEC/STAFF WEC 7	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT						TARGET WEC/STAFF WEC 8.1
J02	Signal Designation	EMC		Wire	AWG	mΩ	J02
1	Bxe in	2	1	tsp	26		1
2	nc Bxe shld grounded at WEC8.1		1	tsp	shld		2
3	nc						3
4	MagPApwr return	2		s	26		4
5	TempSO	2	g5	s	26		5
6	Temp return	2	g5	s	26		6
7	structure ground			ov	shld		7
8	nc Bye shld grounded at WEC8.1		2	tsp	shld		8
9	Bye return	2	2	tsp	26		9
10	CalSc	2	4	ss	24		10
11	nc Bze shld grounded at WEC8.1		3	tsp	shld		
12	Bze return	2	3	tsp	26		12
13	nc						13
14	Bxe return	2	1	tsp	26		14
15	nc						15
16	-V Mag PA	2		s	26		16
17	+V Mag PA	2		s	26		17
18	Temp S1	2	g5	s	26		18
19	Temp shld grounded at WEC7		g5	ov	shld		
20	nc						20
21	Bye in	2	2	tsp	26		21
22	CalSc return	2	4	ss	shld		22
23	nc						23
24	Bze in	2	3	tsp	26		24
25	nc						25

Table 3.5/2.13 : WEC7 J02 to WEC8.1 J02 pin assignment

SOURCE WEC/STAFF WEC 8.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET WEC/PWR WEC 11

J01	Signal Designation	EMC Cat		Wire	AWG	mΩ	J04
1	- 9 V	1	1	tp	24		1
2	- 5.75 V	1	2	tp	24		2
3	structure ground						
4	+ 5.75 V	1	3	tp	24		4
5	+ 9 V	1	4	tp	24		5
6	- 9 V return	1	1	tp	24		6
7	- 5.75 V return	1	2	tp	24		7
8	+ 5.75 V return	1	3	tp	24		8
9	+ 9 V return	1	4	tp	24		9
10	nc						
11	nc						
12	nc						
13	nc						
14	nc						
15	nc						

Table 3.5/2.14 : WEC8.1 J01 to WEC11 J04 pin assignment

SOURCE WEC/STAFF WEC 8.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/STAFF WEC 8.2
J03	Signal Designation	EMC Cat	Wire	AWG	mΩ	J08
1	Bxe signal	2	s	26		3
2	Bxe return	2	s	26		11
3	Bye signal	2	s	26		1
4	Bye return					9
5	Bze signal	2	s	26		2
6	Bze return					10
7	CAL signal	2	s	26		5
8	CAL return	2	s	26		12
9	CAL E cmd	2	s	26		7
10	signal ground		s	26		13
11	CAL B cmd	2	s	26		8
12	signal ground		s	26		14
13	nc					
14	nc					
15	structure ground		ov	shld		15

Table 3.5/2.15 : WEC8.1 J03 to WEC8.2 J08 pin assignment (unit harness)

SOURCE WEC/STAFF WEC 8.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/WBD WEC 10
J04	Signal Designation	EMC	Cable	Wire	AWG mΩ	J04
1	Bxe signal	2	1	tsp	26	1
2	Bxe return	2	1	tsp	26	6
3	Bye signal	2	2	tsp	26	3
4	Bye return	2	2	tsp	26	8
5	nc					
6	Bxe shld grounded at WEC8.1		1	tsp	shld	
7	nc					
8	Bye shld grounded at WEC8.1		2	tsp	shld	
9	structure ground					9

Table 3.5/2.16 : WEC8.1 J04 to WEC10 J04 pin assignment

SOURCE WEC/STAFF WEC 8.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET IEL EDI CONTROLL
J06	Signal Designation	EMC	Cable	Wire	AWG mΩ	
1	Bxe out		1	tsp	26	
2	Bxe rtn		1	tsp	26	
3	Bye out		2	tsp	26	
4	Bye rtn		2	tsp	26	
5	Bze out		3	tsp	26	
6	Bze rtn		3	tsp	26	
7	nc					
8	nc					
9	nc					
10	Bxe shld grounded at WEC8.1		1	tsp	shld	
11	nc					
12	Bye shld grounded at WEC8.1		2	tsp	shld	
13	nc					
14	Bze shld grounded at WEC8.1		3	tsp	shld	
15	Structure ground					

Table 3.5/2.17 : WEC8.1 J06 (IEL) to EDI pin assignment

SOURCE WEC/STAFF WEC 8.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/DWP WEC 9.2
J07	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	J13
1	Signal ground			s	26	1
2	SCTD1	2	g1	s	26	2
3	SCTD3	2	g1	s	26	3
4	SCTD5	2	g1	s	26	4
5	SCTD7	2	g1	s	26	5
6	SCTD9	2	g1	s	26	6
7	SCTD11	2	g1	s	26	7
8	SCTD13	2	g1	s	26	8
9	SCTD15	2	g1	s	26	9
10	SCCalop0	2	g2	s	26	10
11	SCCalMode0	2	g2	s	26	11
12	SCCalMode2	2	g2	s	26	12
13	SCCalLevel1	2	g2	s	26	13
14	SCBWcmd	2	g2	s	26	14
15	SCSaH	2	4	ss	26	15
16	SCBcmd1	2	g2	s	26	16
17	Shld grounded at WEC8.1		g2	"s"	shld	17
17	Shld grounded at WEC8.1		4,5	ss	shld	17
18	TempSense1	2	g3	s	26	18
19	Shld grounded at WEC8.1		g1	"s"	shld	19
19	Shld grounded at WEC8.1		g3	"s"	shld	19
19	Shield ground at WEC8.1		6	ss	shld	19
20	SCTD0	2	g1	s	26	20
21	SCTD2	2	g1	s	26	21
22	SCTD4	2	g1	s	26	22
23	SCTD6	2	g1	s	26	23
24	SCTD8	2	g1	s	26	24
25	SCTD10	2	g1	s	26	25
26	SCTD12	2	g1	s	26	26
27	SCTD14	2	g1	s	26	27
28	SCRESET	2	g2	s	26	28
29	SCCalop1	2	g2	s	26	29
30	SCCalMode1	2	g2	s	26	30
31	SCCLevel0	2	g2	s	26	31
32	SCCallevel2	2	g2	s	26	32
33	SCEOT	2	5	ss	26	33
34	SCBcmd0	2	g2	s	26	34
35	SCSOC	2	6	ss	26	35
36	TempSense0	2	g3	s	26	36
37	TempReturn	2	g3	s	26	37
38	nc					38
39	Volt monitoring V0	2		s	26	39
40	Volt " V1	2		s	26	40
41	Volt " V2	2		s	26	41
42	Volt " V3	2		s	26	42
43	nc					43
44	signal ground			s	26	44
45/49	nc					45/49
50	structure ground			ov	shld.	50

Table 3.5/2.18 : WEC8.1 J07 to WEC9.2 J13 pin assignment

SOURCE WEC/STAFF WEC 8.2	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/PWR WEC 11
J09	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	J07
1	+ 6 V	1	1	tp	24	5
2	- 6 V	1	2	tp	24	1
3	nc					
4	+ 5.25 V	1	3	tp	24	4
5	nc					
6	+ 6 V return	1	1	tp	24	9
7	- 6 V return	1	2	tp	24	6
8	+ 5.25 V return	1	3	tp	24	8
9	structure ground					3

Table 3.5/2.19 : WEC8.2 J09 to WEC11 J07 pin assignment

SOURCE WEC/STAFF WEC 8.2	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/DWP WEC 9.2
J12	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	J12
1	Structure ground			ov	shld	1
2	SATD1	2	g1	s	26	2
3	SATD3	2	g1	s	26	3
4	SATD5	2	g1	s	26	4
5	SATD7	2	g1	s	26	5
6	- 6V monitor	2		s	26	6
7	Signal ground			s	26	7
8	TempReturn	2	7	tsp	26	8
9	Signal ground			s	26	9
	nc shld grounded at WEC 9.2		7	tsp	shld	9
	nc shld grounded at WEC 9.2		4/6	ss	shld	9
	nc shld grounded at WEC 9.2		g2	"s"	shld	9
10	SAAck	2	g2	s	26	10
11	SAmdData	2	6	ss	24	11
12	SAReset	2	g2	s	26	12
13	SASunpulse	2	g2	s	26	13
14	SATD0	2	g1	s	26	14
15	SATD2	2	g1	s	26	15
16	SATD4	2	g1	s	26	16
17	SATD6	2	g1	s	26	17
18	+ 6V monitor	2		s	26	18
19	+ 5V monitor	2		s	26	19
20	Tempsense4	2	7	tsp	26	20
21	shld grounded at WEC 8.2		3	ss	shld	
21	shld grounded at WEC 8.2		g1	"s"	shld	
22	SAStrobe	2	3	ss	24	22
23	SACmdClock	2	4	ss	24	23
24	SACStrobe	2	5	ss	24	24
25	SASpinRef	2	g2	s	26	25

Table 3.5/2.20 : WEC8.2 J12 to WEC9.2 J12 pin assignment

SOURCE WEC/WHISPER WEC 9.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/PWR WEC 11
J01	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	J05
1	- 6 V	1	1	tp	24	1
2	+ 8 V	1	2	tp	24	2
3	nc					3
4	+ 27 V	1	5	tsp	22	4
5	nc + 27 V shld grounded at WEC11	1	5	tsp	shld	5
6	nc					6
7	+ 5.5 V	1	3	tp	24	7
8	+ 6 V	1	4	tp	24	8
9	- 6 V return	1	1	tp	24	9
10	+ 8 V return	1	2	tp	24	10
11	nc					11
12	+ 27 V return	1	5	tsp	22	12
13	structure ground					13
14	+ 5.5 V return	1	3	tp	24	14
15	+ 6 V return	1	4	tp	24	15

Table 3.5/2.21 : WEC9.1 J01 to WEC11 J05 pin assignment

SOURCE WEC/WHISPER WEC 9.1	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/DWP WEC 9.2
J04	Signal Designation	EMC Cat	Wire	AWG	mΩ	J09
1	Signal ground		s	26		1
2	WHTD1	2	s	26		2
3	WHTD3	2	s	26		3
4	WHTD5	2	s	26		4
5	WHTD7	2	s	26		5
6	WHTD9	2	s	26		6
7	WHTD11	2	s	26		7
8	WHTD13	2	s	26		8
9	WHTD15	2	s	26		9
10	WHFrameReady	2	s	26		10
11	WHTlmRead	2	s	26		11
12	WHCmdClock	2	s	26		12
13	WHCmdStrobe	2	s	26		13
14	WHReset	2	s	26		14
15	nc					15
16	WHSampleSync	2	s	26		16
17	TempSense3	2	s	26		17
18	nc					18
19	structure ground		ov	shld		19
20	WHTD0	2	s	26		20
21	WHTD2	2	s	26		21
22	WHTD4	2	s	26		22
23	WHTD6	2	s	26		23
24	WHTD8	2	s	26		24
25	WHTD10	2	s	26		25
26	WHTD12	2	s	26		26
27	WHTD14	2	s	26		27
28	Signal ground		s	26		28
29	WHRstCntr	2	s	26		29
30	nc					30
31	WHCmData	2	s	26		31
32	Signal ground		s	26		32
33	WHAlarm	2	s	26		33
34	WHblankP	2	s	26		34
35	Signal ground		s	26		35
36	TempReturn	2	s	26		36
37	nc					37

Table 3.5/2.22 : WEC9.1 J04 to WEC9.2 J09 pin assignment (unit harness)

SOURCE	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET
WEC/WHISPER WEC 9.1		HV panel

J05	Signal Designation	EMC Cat	Wire AWG mΩ	
1	HVCRTN			
* 2	WDPG/TXD			
* 3	RXD			
4	nc			
5	HVC			
6	nc			
* 7	Ground			
8	nc			
9	nc			

Table 3.5/2.23 : WEC9.1 J05 to HV control panel pin assignment

Pins with * are for WHISPER offline only

SOURCE WEC/DWP WEC 9.2 J06 J07	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT							TARGET OBDH RTU
	Signal Designation		EMC Cat	Cabl	Wire	AWG	mΩ	
1	Science sampling	TRUE		1	tsp	26		
2	House keeping sampling	TRUE		2	tsp	26		
3	Serial telemetry data	TRUE		3	tsp	26		
4	Signal ground			3	tsp	shld		
5	Transfer clock	TRUE		4	tsp	26		
6	Memory load sampling	TRUE		5	tsp	26		
7	Memory load data	TRUE		6	tsp	26		
8	nc							
9	Reset pulse	TRUE		7	tsp	26		
10	Spin segment clock	TRUE		8	tsp	26		
11	Sun reference pulse	TRUE		9	tsp	26		
12	Signal ground							
13	Structure ground							
14	Science sampling	COMP		1	tsp	26		
15	House keeping sampling	COMP		2	tsp	26		
16	Telemetry data	COMP		3	tsp	26		
17	nc							
18	Transfer clock	COMP		4	tsp	26		
19	Memory load sampling	COMP		5	tsp	26		
20	Memory load data	COMP		6	tsp	26		
21	nc							
22	Reset pulse	COMP		7	tsp	26		
23	Spin segment clock	COMP		8	tsp	26		
24	Sun reference pulse	COMP		9	tsp	26		
25	Signal ground							

Table 3.5/2.24 : WEC9.2 J06 & J07 to RTU pin assignment

SOURCE WEC/DWP WEC 9.2	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT						TARGET WEC/PWR WEC 11
J08	Signal Designation	EMC Cat	Cabl	Wire	AWG	mΩ	J06
1	nc						1
2	EFW - off	2		s	24		2
3	STAFF/wf - off	2		s	24		3
4	STAFF/sa - off	2		s	24		4
5	WHISPER - off	2		s	24		5
6	WHISPER/TX - off	2		s	24		6
7	WBD - off	2		s	24		7
8	- current sensor	2	3	tp	24		8
9	nc						9
10	nc						10
11	+ 5.65 V1 DWP return	1	1	tp	22		11
12	+ 5.65 V2 DWP return	1	2	tp	22		12
13	structure ground			ov	shld		13
14	EFW - on	2		s	24		14
15	STAFF/wf - on	2		s	24		15
16	STAFF/sa - on	2		s	24		16
17	WHISPER - on	2		s	24		17
18	WHISPER/TX - on	2		s	24		18
19	WBD - on	2		s	24		19
20	+ current sensor	2	3	tp	24		20
21	nc						21
22	nc						22
23	+ 5.65 V1 DWP	1	1	tp	22		23
24	+ 5.65 V2 DWP	1	2	tp	22		24
25	nc						25

Table 3.5/2.25 : WEC9.2 J08 to WEC11 J06 pin assignment

SOURCE WEC/DWP WEC 9.2	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/WBD WEC 10
J10	Signal Designation	EMC Cat	Wire	AWG	mΩ	J05
1	Signal ground		s	26		1
2	WBDStsData	2	s	26		2
3	nc					3
4	WBDTlmdata	2	s	26		4
5	nc					5
6	WBDCmdData	2	s	26		6
7	Signal ground		s	26		7
8	nc					8
9	nc					9
10	TempReturn	2	s	26		10
11	WBDPurSens	2	s	26		11
12	WBDSyncBlank	2	s	26		12
13	structure ground		ov	shld		13
14	WBDStsStrobe	2	s	26		14
15	WBDStsClock	2	s	26		15
16	WBDTlmStrobe	2	s	26		16
17	WBDTlmClock	2	s	26		17
18	WBDCmdClock	2	s	26		18
19	WBDCmdStrobe	2	s	26		19
20	WBDReset	2	s	26		20
21	WBDGainUpdate	2	s	26		21
22	TempSense2	2	s	26		22
23	nc					23
24	Signal ground		s	26		24
25	nc					25

Table 3.5/2.26 : WEC9.2 J10 to WEC10 J05 pin assignment

SOURCE	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET
WEC/DWP WEC 9.2		IEL a ASPOC b CIS c EDI d FGM e PEACE

J11	Signal Designation		EMC Cat	Cabl	Wire	AWG	mΩ	
1	Structure ground							
2	EFW & WHISP data	SPdataASP-		1	tsp	26		a
3	Clock shld grounded at	WEC9.2		2	tsp	shld		(a)
4	EFW & WHISP clock	SPclkASP-		2	tsp	26		a
5	nc							
6	EFW & WHISP data	SPdataCIS-		3	tsp	26		b
7	Clock shld grounded at	WEC9.2		4	tsp	shld		(b)
8	EFW & WHISP clock	SPclkCIS-		4	tsp	26		b
9	Signal shld grounded at	WEC9.2		5	tsp	shld		(c)
10	Whisp blanking pulse	EDIbp-		5	tsp	26		c
11	nc							
12	PEACE data	PCdata-		6	tsp	26		e
13	Clock shld grounded at	WEC9.2		7	tsp	shld		(e)
14	PEACE clock	PCclock-		7	tsp	26		e
15	Plate pulses	PCpulses-		8	tsp	26		e
16	nc							
17	FGM data	FGMdata-		9	tsp	26		d
18	nc							
19	FGM clock	FGMclock-		10	tsp	26		d
20	EFW & WHISP data	SPdataASP+		1	tsp	26		a
21	Data shld grounded at	WEC9.2		1	tsp	shld		(a)
22	EFW & WHISP clock	SPclkASP+		2	tsp	26		a
23	nc							
24	EFW & WHISP data	SPdataCIS+		3	tsp	26		b
25	Data shld grounded at	WEC9.2		3	tsp	shld		(b)
26	EFW & WHISP clock	SPclkCIS+		4	tsp	26		b
27	nc							
28	Whisp blanking pulse	EDIbp+		5	tsp	26		c
29	nc							
30	PEACE data	PCdata+		6	tsp	26		e
31	Data shld grounded at	WEC 9.2		6	tsp	shld		(e)
32	PEACE clock	PCclock+		7	tsp	26		e
33	Plate pulses	PCpulses+		8	tsp	26		e
34	nc							
35	FGM data	FGMdata+		9	tsp	26		d
36	nc							
37	FGM clock	FGMclock+		10	tsp	26		d

Table 3.5/2.27 : WEC9.2 J11 to IEL destination pin assignment

SOURCE WEC/WBD WEC 10	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT	TARGET OBDH RTU

J01	Signal Designation		EMC	Cabl	Wire	AWG	mΩ
1	nc						
2	VCO reset B	+	2	2	tsp	26	
3	VCO reset B	shld		2	tsp	shld	
4	VCO reset A	-	2	1	tsp	26	
5	high rate clock B	+ in	2	4	tsp	26	
6	high rate clock B	shld		4	tsp	shld	
7	high rate clock A	- in	2	3	tsp	26	
8	high rate data B	+	2	6	tsp	26	
9	high rate data B	shld		6	tsp	shld	
10	high rate data A	- out	2	5	tsp	26	
11	signal ground						
12	nc						
13	structure ground						
14	overall shld						
15	VCO reset B	-	2	2	tsp	26	
16	VCO reset A	+	2	1	tsp	26	
17	VCO reset A	shld		1	tsp	shld	
18	high rate clock B	-	2	4	tsp	26	
19	high rate clock A	+	2	3	tsp	26	
20	high rate clock A	shld		3	tsp	shld	
21	high rate data B	-	2	6	tsp	26	
22	high rate data A	+	2	5	tsp	26	
23	high rate data A	shld		5	tsp	26	
24	signal ground						
25	nc						

Table 3.5/2.28 : WEC10 J01 to RTU pin assignment

SOURCE WEC/WBD WEC 10	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET WEC/PWR WEC 11
J06	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	J03
1	+ 27 V	1	1	tp	22	1
2	nc					2
3	nc CSY shld grounded at WEC11		2	tsp	shld	3
4	nc					4
5	structure ground					5
6	+ 27 V return	1	1	tp	22	6
7	CSY TRUE.	2	2	tsp	24	7
8	CSY COMP.	2	2	tsp	24	8
9	nc					9

Table 3.5/2.29 : WEC10 J06 to WEC11 J03 pin assignment

SOURCE WEC/PWR WEC 11	HARNESS WIRING AND CONNECTOR PIN ASSIGNMENT					TARGET POWER PDU
J01	Signal Designation	EMC Cat	Cabl	Wire	AWG mΩ	
1	+ 28 V A .SUP	1	1	tp		
2	nc					
3	structure ground					
4	nc					
5	nc CSY shld grounded at PDU		3	tsp	26	
6	nc					
7	nc					
8	+ 28 V B .SUP	1	2	tp		
9	+ 28 V A .RTN	1	1	tp		
10	nc					
11	nc					
12	CSY .TRUE	2	3	tsp	26	
13	CSY .COMP	2	3	tsp	26	
14	nc					
15	+ 28 V B .RTN	1	2	tp		

Table 3.5/2.30 : WEC11 J01 to PDU pin assignment

Fig 3.5/2 HV Disable Schematic

TBD