

**Broadgate**®

**VOYAGE EVENT RECORDER**®

**VER4000/VER4000-S**®

**OPERATION AND  
MAINTENANCE  
MANUAL**

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## Index

1.	Introductory Notes.....	6
1.1.	Quality Standards .....	6
1.2.	Environmental Specification .....	6
1.3.	Glossary of Terms.....	6
1.4.	Date of Manufacture .....	7
2.	Operation .....	8
2.1.	Controls and Indications .....	8
2.1.1.	Power Switch.....	8
2.1.2.	LCD Screen .....	8
2.1.3.	Dimmer Control.....	8
2.1.4.	Buzzer.....	8
2.1.5.	Alarm Accept Button .....	9
2.1.6.	Alarm LED (Red).....	9
2.1.7.	Power LED (Green) .....	9
2.2.	Initialisation.....	10
2.3.	Closing Down.....	12
3.	Security of Recorded Data.....	13
4.	Action In Case of Emergency or Incident .....	13
4.1.	Compact Flash.....	13
5.	Action in the event of an alarm during operation.....	15
6.	Maintenance .....	17
6.1.	Technical Description .....	17
6.1.1.	Main Electronics Enclosure.....	17
6.1.2.	Crash Protected Memory.....	18
6.1.3.	Optional Interfaces .....	19
7.	Maintenance Checks.....	20
7.1.	Alarm Test.....	20
8.	Supplementary Information .....	21
8.1.	Type Approval Certificates .....	21
8.1.1.	VER4000 QinetiQ Type Approval Certificate .....	21
8.1.2.	VER4000-S QinetiQ Type Approval Certificate.....	24
9.	MEE Connections.....	27
9.1.	Internal Connections .....	27
9.2.	External Connections .....	27
9.2.1.	Microphone Cables. ....	27
9.2.2.	VHF Communications Audio.....	28
9.2.3.	Crash Protected Memory.....	29
9.2.4.	IEC 61162 Data Channels .....	30
9.2.5.	External Ships Alarm .....	31
9.2.6.	Remote Alarm Unit (500.06).....	32
9.2.7.	Video Cables.....	33
9.3.	Crash Protected Memory .....	34
9.3.1.	Cable Terminations .....	34
10.	TIU LED Indicators.....	35
11.	Fuse Location and Value .....	35
12.	Broadgate Proprietary Sentence Format .....	36
12.1.1.	Helm Command - \$PBRO AA .....	37
12.1.2.	Rudder sensor angle - \$PBRO BA.....	38

12.1.3.	Engine Command - \$PBRO CA.....	39
12.1.4.	Thruster Demand/Achieved - \$PBRO DA.....	40
12.1.5.	Main alarms, Hull openings, Watertight/Firedoors - \$PBRO EA.....	41
12.1.6.	Engine Response - \$PBRO GA.....	42
12.1.7.	Steering Mode - \$PBRO HA.....	43
13.	Appendix 1 – Initialisation Alarms.....	44
14.	Appendix 2 – Alarms In Operation.....	47
15.	Drawings.....	49



## **Preface**

The Broadgate Voyage Event Recorder (VER) is designed to provide a recording of various operational events in a ship over the previous 12 hours. These include voice, radar information and other such data. The purpose of these recordings is to be able to analyse the events leading up to a casualty or near miss situation involving the vessel in which the equipment is fitted. In order to facilitate the analysis of the recorded information a Playback Suite is provided at a location ashore.

The following manual outlines the operation of the VER 4000/VER 4000-S and describes the various controls and indicators on the front panel of the Main Electronics Enclosure (MEE).

The MEE contains the electronics required to process the data required by IEC specification 61996. The data sources include nine audio channels, sixteen data channels and a video source.

Eight of the audio sources come from Microphones and the ninth channel from the ship's VHF. The 16 data channels must conform to IEC 61162 and be RS422 in nature. The Radar video input consists of three colours (Red, Green and Blue) and each must be 1V peak positive going signal. The Sync signal can be either a 1V peak negative going composite sync or separate horizontal and vertical negative going TTL level sync. The MEE must be connected to a CPM otherwise an alarm will sound.

The Crash Protected Memory (CPM) is the only part of the VER4000/VER4000-S designed to survive a major incident. The CPM contains enough memory to store more than twelve hours of VER4000/VER4000-S data. The CPM communicates with the MEE via an Ethernet link and also receives power from the MEE.

# 1. Introductory Notes

## 1.1. Quality Standards

All assembly must meet standards set out in the SELEX Communications Ltd Procedures and Work Instructions Manual and the outline criteria in the SELEX Communications Ltd Quality Manual.

## 1.2. Environmental Specification

The equipment supplied will meet all the applicable requirements of IEC Specification 60945.

Performance requirements are complied with in meeting IEC Specification 61996.

## 1.3. Glossary of Terms

AIS	Automatic Identification System
ARPA	Automatic Radar Plotting Aid
CPM	Crash Protected Memory (Also known as Protective Capsule)
EMC	Electromagnetic Compatibility
FRM	Final Recording Medium (Also known as CPM)
HSM	Hull Stress Monitoring
IDC	Inline Dual Connector
IEC	International Electronic Commission
IMO	International Maritime Organisation
MEE	Main Electronic Enclosure
PC	Protective Capsule (Also known as Crash Protected Memory)
PCB	Printed Circuit Board
PSU	Power Supply Unit
SPU	Signal Processing Unit
TIU	Transition Interface Unit (PCB)
VDR	Voyage Data Recorder
S-VDR	Simplified Voyage Data Recorder
VER	Voyage Event Recorder

#### **1.4. Date of Manufacture**

To ascertain the date of manufacture of each component of the VER4000/VER4000-S system, examine the serial number. The first and second digits of the serial number identify the year of manufacture, the third and fourth the week of manufacture and the last three digits are sequential system numbers.

Hence 0601-100 indicates

Year of manufacture **2006**

Week of manufacture **01**

Sequential serial number **100**

## 2. Operation

### 2.1. Controls and Indications

The following controls and indications are all sited on the Main Electronics Enclosure (MEE) control panel. See photo 2.1.1.



Photo 2.1.1.

#### 2.1.1. Power Switch

This keyswitch, when placed in the 'ON' position applies 24 volts DC to the PSU and automatically starts recording.

Recording is terminated when key is turned to the 'OFF' position.

#### 2.1.2. LCD Screen

The LCD Screen displays the status of the unit and the cause of any alarm condition

#### 2.1.3. Dimmer Control

This controls the brightness of the LED's. It will extinguish the Green Power LED and the LCD Screen, the Alarm LED can be dimmed but not switched off, i.e. it remains illuminated should an alarm condition exist.

#### 2.1.4. Buzzer

This will sound when an alarm condition occurs.

### **2.1.5. Alarm Accept Button**

This button has two functions. When pressed in alarm condition, it silences the Buzzer. The Red Alarm LED will change from flashing to constant. If pressed when not in alarm, for more than four seconds, the Buzzer will sound, the Red Alarm LED will flash and the Alarm Contact Output Relay will switch into alarm position and then reset.

### **2.1.6. Alarm LED (Red)**

OFF - No alarm condition exists.

Flashing - There are one or more alarms that have not been accepted.

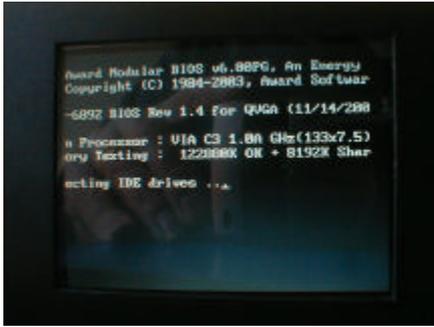
ON - One or more alarms have been accepted and no alarm has occurred since the last time the accept button was pressed.

### **2.1.7. Power LED (Green)**

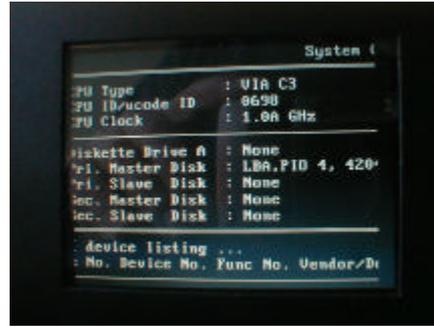
The Green Power LED Illuminates when the Power Off/On switch is in the On position.

## 2.2. Initialisation

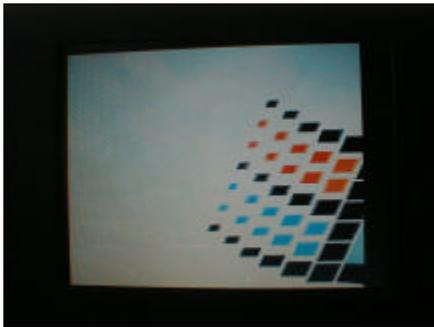
1. To switch the VER4000 on, turn 'ON-OFF' keyswitch to 'ON'.
2. The LCD will go through a series of displays and sound the Buzzer, as follows (Note Screen 4 is intentionally blank) :-
3. Screen 6 shows the fully running mode.



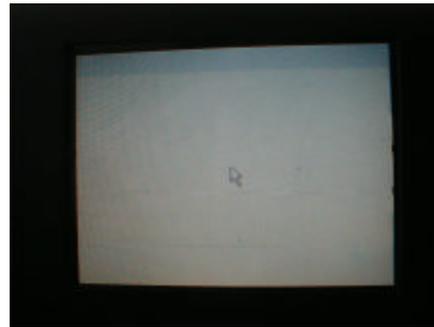
Screen 2.2.1.



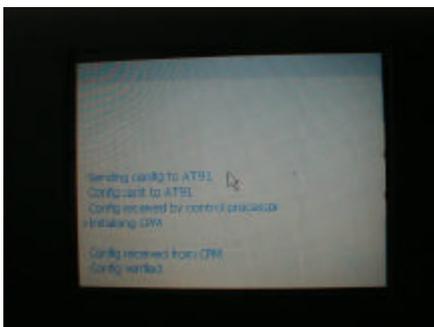
Screen 2.2.2.



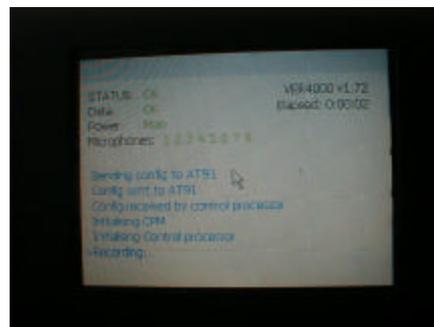
Screen 2.2.3.



Screen 2.2.4.



Screen 2.2.5.



Screen 2.2.6.

4. The normal running mode is indicated by the LCD Screen, showing the following :-

```
STATUS:   OK                VER4000 v1.73
Data:     OK                Elapsed: 0:00:02
Power:    Main
Microphones:1 2 3 4 5 6 7 8

Sending config to AT91
Config sent to AT91
Config received by control processor
Initialising CPM
Initialising Control Processor
>Recording
```

Screen 2.2.7.

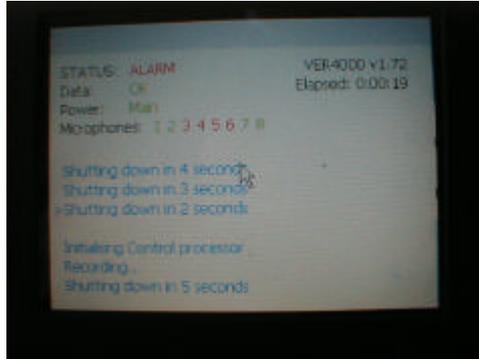
Notes :

- a) STATUS: **OK** or **ALARM** – for normal running this must show **OK**. For **ALARM** condition, see Appendix 1.
  - b) Data: **OK** or **ERROR** – for normal running this must show **OK**. For **ERROR** condition, see Appendix 1.
  - c) Power: **Main** or **UPS**. **Main** indicates that the unit is running on the main 24 V d.c. supply. **UPS** indicates that the VER is running on the internal UPS, this will be accompanied by other alarms and should not happen on start up.
  - d) Text in **Blue** is a scrolling screen, the above information is only an example. However the ‘>’ indicates the current message, in the example above ‘>Recording’, indicates that the VER4000/VER4000-S is recording correctly.
5. For Initialisation Failure messages and recommended actions, refer to Appendix 1. In general, if an alarm occurs at Switch On, switch the VER4000/VER4000-S Off (using the on/off key switch), check all cables and correct insertion of Compact Flash. If all is OK, switch the VER4000/VER4000-S On again. In case of repeated failures switch the VER4000/VER4000-S Off. Advice from SELEX Communications Ltd, should be then obtained. See front cover of this manual, for contact details.

### 2.3. Closing Down

To switch the VER4000 Off, turn the 'ON-OFF' keyswitch to 'OFF'.

The LCD Screen will now go through a close down sequence, as per screen 2.3.1. The VER4000 will switch off at the end of this close down sequence.



Screen 2.3.1.

### **3. Security of Recorded Data**

All keys should be removed from the MEE once the system has been switched on and initialisation is complete.

The keys should be held by the Master or Captain of the vessel and only issued to authorised personnel when it is necessary to terminate recording after an incident or for maintenance purposes.

### **4. Action In Case of Emergency or Incident**

The actions taken in case of Emergency or Incident are dependent upon the circumstances, the following should be taken as guidance only. The safety of all personnel is paramount, the recovery of the internal Compact Flash memory should only be carried out, if time and circumstances permit.

If time and circumstances permit, the Compact Flash should be removed from the VDR and kept safe, pending future investigation. The Compact Flash will hold twenty-four hours of recording. If the vessel is continuing to operate then another Compact Flash must be fitted. See section 4.1 below, for information regarding removal of the Compact Flash.

If time and circumstances do not permit and it is not possible to remove the Compact Flash, then the external Crash Protected Memory will record twelve hours of information. The Crash Protected Memory will then have to be recovered, to be able to extract the recorded data.

#### **4.1. Compact Flash**

The Compact Flash contains all the files necessary for the VDR to run. It also contains a record of the last twenty-four hours of recording. This recording can be used for performance checks, annual inspections and incident analysis. To remove or change the Compact Flash, proceed as follows :-

- a) Switch the VDR off, using the front panel On/Off switch.
- b) Remove the Orange inset front panel or open the MEE door, to gain access to the Compact Flash, which is located behind the inset Orange front panel.
- c) Pull the Compact Flash out, see photo 4.1.1. below :-

Compact  
Flash

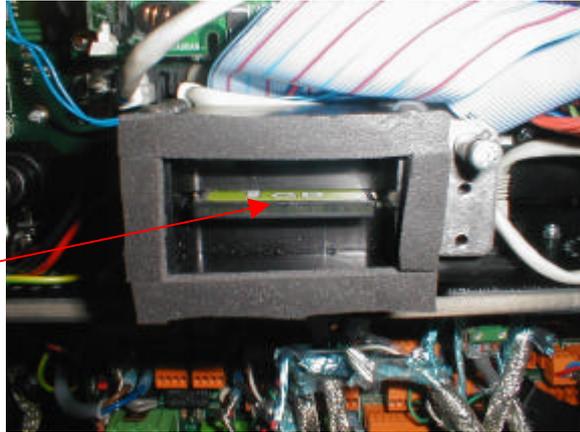


Photo 4.1.1



Photo 4.1.2.

- d) To refit the Compact Flash, ensure that the Compact Flash is the correct way up and gently push it into the Compact Flash socket.

## 5. Action in the event of an alarm during operation

The following steps should be followed if an audible alarm sounds at the MEE or Remote Alarm Unit: -

1. Press the ALARM ACCEPT BUTTON on MEE control panel or optional Remote Alarm Unit to silence the audible alarm.
2. Examine the LCD Screen on the front of the MEE and note all the messages in blue, green and red text.
3. The Status: message will indicate **ALARM**. This must be interpreted with the other messages on the LCD Screen.

If the Power: indicates **UPS**, then the VDR has switched over to its own internal supply. In this case the VDR will record Audio and IEC 61162 data only, for two hours. After this it will stop recording. No action is required in this instance. If the 24 V d.c. external power is re-applied within two hours, then the VDR will change back to this supply, the alarm will clear and the VDR will return to the normal running mode. If the 24 V d.c. external power is not re-applied within two hours, then the VDR will shut down. The VDR will then have to be switched off and back on, after the external supply is available, to return to the normal running condition.

If the **TAMPER** message is visible below the Elapsed: time message, then the door of the MEE has been opened. This alarm can only be cleared by switching the VDR off and then back on, using the key switch. Note: See section 3, of this manual.

In normal running the enabled microphone inputs, 1 to 8, are indicated in the Microphone: line of the LCD Screen. Only the enabled microphones are displayed. Hence, if **1 2 4 5 6** is indicated, this shows that microphone inputs 1,2,4,5 and 6 are in use, inputs 3,7 and 8 are not in use. If the number changes to red, i.e. **1 2 4 5 6**, this would indicate that microphone input 4 had failed a microphone test.

The microphone test occurs at switch on and then every twelve hours thereafter. Failure of a test can be caused, as follows :-

- e) Due to a failure in the microphone, associated cabling or inside the VDR MEE.
- f) Due to a loud noise at the same time as the microphone test occurs.

In case a) the failure would normally occur on every microphone test, in case b) this would probably be a one off failure. The action taken should be appropriate to the consistency of the alarm.

4. In other alarm conditions, switch the VDR Off, using the front panel On/Off switch.
5. If the VDR fails to initialise, repeat step 3 above before referring to Appendix 1 definition of Initialisation fault codes and remedial action to be taken.
6. If system initialises successfully but then indicates an alarm condition, refer to Appendix 2 for definition of fault codes and remedial action to be taken.
7. If the cause of alarm cannot be cleared, report the defect, including details of all fault messages, displayed in blue on the LCD Screen, directly to SELEX Communications Ltd.

## **6. Maintenance**

### **6.1. Technical Description**

The VER4000 consists of two main units, one to process the signals called the Main Electronics Enclosure (MEE) and the other to store the recorded data, called the Crash Protected Memory (CPM). In addition there are a number of microphones, up to eight, above the normal conning positions on the Bridge of the ship.

Additionally there may be a number of optional interfaces fitted. These include the ARPA Isolation Unit, VHF Interface, Signal Interface or the Remote Alarm Unit.

#### **6.1.1. Main Electronics Enclosure**

Inside the MEE there are the Transition Interface Unit (TIU), the pcb Frame, Flash Memory Card, Batteries, Fans and Front Panel Controls.

The pcb Frame consist of the main printed circuit boards, for Video, Audio/Data, Control AT91 processor and SBC Interface.

The PSU takes in the 24 volts d.c. and provides all the necessary voltage supplies for the system. It also provides 12 volts d.c. for the microphone supply. The Power Supply Unit is mounted directly behind the Front Panel Controls in the upper section of the MEE. It also controls the Battery supply.

24 V d.c. is available on the TIU board, to supply external equipment. These five outputs are controlled by a relay on the TIU board, the total load must not exceed 2 A.

The TIU also has the 'Crowbar' circuit fitted, to protect the VER4000 in case of excessive input voltage. If this circuit operates it will blow the incoming 24 V d.c. fuse F1. See table 11.1

The TIU provides isolation and buffering for all incoming data signals. LED's on the TIU indicate the presence of DC supplies.

The pcb frame processes all the data, video, audio signals and sends them to the SBC and to the CPM. It also provides the control signals to the external indicators. The SBC controls the front panel LCD Screen.

### **6.1.2. Crash Protected Memory**

The Crash Protected Memory (CPM) contains a suitable amount of flash memory to record all the data for 12 hours. Inside the CPM is a Control Board and memory card. There is an Ethernet link between the MEE and the CPM.

### **6.1.3. Optional Interfaces**

#### **Remote Alarm Unit**

This optional unit is fitted when the MEE is to be mounted away from the wheelhouse area and the possibility of any alarm being overlooked. It replicates the functions of the alarm buzzer and LED with a cancel button.

#### **ARPA Isolation Unit**

The optional ARPA Isolation Buffer is fitted when the host radar video signals are not at the required level of 1 volt peak to peak. It will also be fitted if the host radar provides the sync pulse combined with the green video. The unit will provide suitable buffering between the host radar and the MEE and can be fitted in line to the radar display if required. It can accept separate horizontal and vertical sync pulses or a combined sync.

#### **VHF Interface**

The VHF Interface provides the required signal level to the MEE regardless of the level of input from the host VHF. It will work across a frequency range of up to 6 kHz and a voltage input range of 50 mV to 2 V and give a constant 0.75 V RMS signal level out.

#### **Signal Interface**

This unit converts analogue signals such as rudder signals, bow thruster signals to IEC 61162 sentences (NMEA format). The unit can convert a small number of digital volt free contacts or signals from 3.5 V to 50 volts d.c., to the same format. The unit has a total of 16 channels available. Which can accept up to 4 analogue inputs per board, when analogue isolation PCB's are fitted. It can accept up to 16 digital inputs per channel, when a digital isolation PCB's are fitted.

## 7. Maintenance Checks

There is very little user intervention required with the VER4000<sup>®</sup> and servicing depends on the level of expertise and test equipment available.

Front line repair is limited to fuse replacement and advising SELEX Communications Ltd, of the fault symptoms and the initial error messages, as displayed on the LCD Screen, with reference to Appendix 1 and Appendix 2.

### 7.1. Alarm Test

With the system fully operational and no alarms showing the LED Screen, the test function is carried out as follows: -

- 1) Press and hold down the **“Alarm Accept”** button for more than four seconds.
- 2) The Buzzer will sound
- 3) ‘Alarm’ LED will change state from off to on
- 4) The external alarm relay will change state and indicate an alarm on any connected equipment, i.e. ships monitoring systems, bridge or engine.

If an alarm condition is detected during the period of testing, the test function will be aborted and the ‘Alarm’ LED will flash and the buzzer will sound until accepted.

## 8. Supplementary Information

### 8.1. Type Approval Certificates

#### 8.1.1. VER4000 QinetiQ Type Approval Certificate





**CERTIFICATE OF TYPE APPROVAL**  
(EC Certificate of Type Examination - Module B)  
(Marine Equipment Directive - 96/98/EC, as amended<sup>\*1</sup>)

**Applicant:-**  
Selex Communications Ltd (Marine Division)  
Building 20/A1-2, PO Box 5,  
Filton  
Bristol, BS34 7QW  
United Kingdom

**Manufacturer:-**  
Selex Communications Ltd  
Marconi House  
New Street  
CHELMSFORD CM1 1PL  
United Kingdom

This is to certify that the applicant has submitted details of a:-

**SHIPBORNE VOYAGE DATA RECORDER (VDR) EQUIPMENT**  
(COMMISSION DIRECTIVE 2002/75/EC – ITEM A.1/4.29)

Of system type known and designated as:-

**Broadgate VER 4000 - Voyage Data Recorder System**  
(Comprising component parts and having technical characteristics shown in shedule 1)  
and that these have been assessed, tested and when used in a combination of component parts as described in the attached schedules, is **CERTIFIED** as complying with the relevant parts of:  
**BS EN 61996:2001, "Shipborne voyage data recorder (VDR)"**  
**BS EN 60945 : 2002 "General Requirements for Marine Navigation Equipment"**  
(being specifications for Technical Characteristics and Methods of measurements equivalent to IEC 61996 and IEC 60945, and published by the British Standards Institute).  
It is also **RECOGNISED** that the equipment conforms to performance standards not inferior to those adopted by the International Maritime Organisation, and which are contained in Resolution A861(20) and Resolution A694(17).

**SIGNED:**   
P J Goddard    **Authorised Signatory**

**DATE of ISSUE:**            10<sup>th</sup> May 2006  
**DATE of EXPIRY :**            9<sup>th</sup> May 2011  
**Certificate Number:**        QQ-MED-07/06-01  
**USCG Approval Number:**    165.150/EC0191/0706-01

*EU/USCG Mutual Recognition Agreement  
Council Decision 2004/425/EC*

This Certificate is Valid until expiry date shown, subject to the standard conditions of issue printed on the attached schedule  
Selex Communications Ltd are Module D registered with QinetiQ in accord with standard condition 3, ref Certificate DQAS-09/02-BG1001R

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX  
Under the terms of the United Kingdom Statutory Instrument, No 1957 : 1999, the QinetiQ Group PLC (formerly known as DERA) has been Notified to the European Commission by the Maritime and Coastguard Agency as a Body authorised to conduct Conformity Assessment procedures under the provisions of the European Council Directive 96/98/EC on Marine Equipment and issue Certificates of Type Approval.



**mca**  
Maritime and Coastguard Agency  
The MCA is an Executive Agency of the Department for Transport

QinetiQ/SPS/FRG/MTA/MED/002/L1  
Sheet 1 of 2

\*1 Commission Directives 2002/75/EC & 2002/84/EC

## Certificate of Type Approval - Schedule 1

### Broadgate VER 4000 - Voyage Data Recorder System

The applicant declared that the following units when combined form an operational Marine Shipborne Voyage Data Recording equipment. The units below have been assessed & tested and satisfactory details of these units were included in the technical file.. These units form systems consistent with the Item Description A1/4.29, given in Annex A1 of Directive 2002/75/EC .

MAIN UNITS Comprising:-			
Main Electronics Enclosure		<b>500.01</b>	
Protective Capsule		<b>500.04</b>	
Microphone Enclosure - Internal		<b>500.02</b>	*1
And which may include:-			
Microphone Enclosure - External		<b>500.03</b>	*1, 2
SOFTWARE:-			
Main Electronics Unit	<b>Version</b>	<b>v1.72</b>	<b>*4</b>
----- End of List -----			

**NOTES:-**

1. Up to 8 microphones may be fitted, .
2. Microphone unit is for external bridge wings
3. The SELEX Playback Software needed to replay data is not part of this approval but a satisfactory system was demonstrated.
4. This approval is valid for equipment including minor software revisions where written details of any modifications have been submitted to and accepted by QinetiQ.

**Technical Characteristics**

PARAMETER	PROVISION	COMMENT
IEC 61162-1 SERIAL PORTS	<b>16</b>	Electrical Conformity to IEC 61162-1:2000. All data recorded, no sentence conformity or presence check carried out on messages
ANALOGUE SIGNAL PORTS	--	An External A/D unit can accept analogue signals. Not assessed as IEC 61996 does not detail criteria.
RADAR VIDEO PORT	<b>1</b>	Red/Green/Blue analogue plus H/V Sync. VESA DMTS standards to 1240 x 1024@ 60Hz, covered Presence check and alarm
BRIDGE AUDIO CHANNELS	<b>8 microphones</b>	Proprietary recording format Acoustic integrity check every 12 hrs
RADIO COMMS AUDIO CHANNELS	<b>1</b>	600m/0dBm
FLOAT FREE	<b>No</b>	Protective capsule used is for fixed deck installation only.
RECORDING DURATION	<b>&gt;12 Hours</b>	Parallel recording onto removable Flash memory card, Protective capsule memory can be downloaded via Ethernet
RESERVE POWER	<b>2 Hours</b>	From internal batteries. Bridge audio only recorded during reserve power operation
POWER SOURCE	<b>24V DC</b>	Power supply input via Main Electronics Enclosure.
Temperature Range - Exposed & IEC 945 Class	<b>-25°C to +55°C</b> <b>+70°C (Storage)</b>	— Protective Capsule, Waterproof Micro-phone Unit.
- Protected	<b>-15°C to +55°C.</b>	— All other units

**Conditions of Issue of this certificate are printed the reverse of this sheet.**

QinetiQ  
Cody Technology Park  
Ively Road, Farnborough  
Hampshire. GU14 0LX

Certificate Number **QQ-MED-07/06-01**

QinetiQ/SPS/FRG/MTA/MED/002/1.1  
Sheet 2 of 2



**Certificates of Type Approval**  
**Conditions of Issue**

1. Each Certificate will be used in its entirety and not reproduced in part.
2. This certificate remains valid until the date shown (normally 5 years) unless cancelled or revoked, provided:-
  - i) the design and manufacture remain unmodified from the specimen tested and recorded in the Technical Construction File;
  - ii) any conditions contained in the schedule are complied with;
  - iii) the equipment remains satisfactory in service and the regulations and standards cited in the appropriate Directives do not change.
3. The mark of conformity may only be affixed to the equipment listed on this certificate and a manufacturer's Declaration of Conformity issued when the production Quality Assurance requirements laid down in Annex B, of the Directive (96/98/EC) is fully complied with and controlled by a written inspection agreement with a Notified Body. The use of the QinetiQ Notified Body Number (0191) in combination with the Wheelmark implies that the manufacturer is Registered with the QinetiQ Quality Assurance Scheme. A Certificate of Registration is issued to the manufacturer and should be made available on request. The manufacturer is responsible for ensuring that annual renewal and surveillance are maintained.
4. This certificate does not confer any approval status to this equipment other than defined by, and tested according to the specifications listed on sheet 1.
5. The labeling requirements of IMO Resolution A694(17) shall be met. Descriptions of each unit of apparatus forming part of the equipment will be as given on this Certificate. Each unit of equipment will be marked with the minimum safe distance at which it should be mounted from a standard and steering magnetic compass.
6. No unit of apparatus shall be advertised or labeled as "approved" or "certified" on behalf of the Maritime and Coastguard Agency, the Department of Transport or the QinetiQ Group in any sense other than that it is a type that has been assessed as satisfactory against the specification;
7. The manufacturer must advise QinetiQ of any intended changes to the design or production of the equipment which might affect the equipment performance.
8. Minor Modifications to the equipment will be considered on a case-by-case basis. QinetiQ will review any factory test results, in consultation if necessary, with the test facility that conducted the original Type Approval testing on the equipment. QinetiQ will advise the manufacturer if any further testing is required to maintain valid certification.
9. If an equipment manufacturer wishes to have the type approved equipment designated under alternative names (e.g. agent/distributor's name and model number), a separate application should be completed and sent to QinetiQ.

QinetiQ Ltd  
Marine Approval and Testing Service  
Cody Technology Park, Room 1005/A5  
Ively Road, Farnborough  
Hants, GU14 0LX  
United Kingdom

## 8.1.2. VER4000-S QinetiQ Type Approval Certificate

**QinetiQ**

**UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND  
CERTIFICATE OF TYPE APPROVAL**

<b>Applicant:-</b> Selex Communications Ltd (Marine Division) Building 20/A1-2, PO Box 5, Filton Bristol, BS34 7QW United Kingdom	<b>Manufacturer:-</b> Selex Communications Ltd Marconi House New Street CHELMSFORD CM1 1PL United Kingdom
--	--

This is to certify that the applicant has submitted details of a:-  
**Shipborne Simplified Voyage Data Recorder (S-VDR)**

Of a type known and designated as:-  
**Broadgate VER 4000-S - -- Simplified Voyage Data Recorder**  
(Comprising component parts as described in schedule attached )

and that this has been assessed and tested, and is CERTIFIED as complying with:-  
**IEC 61996-2: 2006 "Part 2:- Simplified voyage data recorder (S-VDR)"**  
**IEC 60945:2002 "General Requirements for Marine Navigational Equipment"**  
(being Operational requirements - Methods of testing and test results, performance specification), published by the International Electrotechnical Commission and by the British Standards Institution as BS EN60945 :2002.

It is also CERTIFIED that the equipment conforms to performance standards not inferior to those adopted by the International Maritime Organisation, and which are contained in Resolution MSC 163(78) and Resolution A694(17).

<b>SIGNED:</b>		<b>DATE of ISSUE:</b>	<b>10<sup>th</sup> May 2006</b>
		<b>DATE of EXPIRY :</b>	<b>9<sup>th</sup> May 2011</b>
<b>P J Goddard</b>	<b>Authorised Signatory</b>	<b>Certificate Number:</b>	<b>QQ-TAN-04/06-01</b>

**This Certificate is Valid until expiry date shown, subject to the standard conditions of issue printed on the attached schedule**

<b>QinetiQ</b> Cody Technology Park Ively Road, Farnborough Hampshire. GU14 0LX	 <b>mca</b> Maritime and Coastguard Agency The MCA is an Executive Agency of the Department of Transport
--	---

The QinetiQ Group PLC (formerly known as DERA) is specified as a "person" under the terms of The Merchant Shipping (Delegation of Equipment Approval) Regulations 1996, and this certificate is issued under the authority given in Merchant Shipping Notice No MSN1735.

QinetiQ/SPSFRG/MTA/UKTA/001/1.0  
Sheet 1 of 2

**Certificate of Type Approval - Schedule 1**  
**Broadgate VER 4000-S – Simplified Voyage Data Recorder**

The applicant declared that the following units when combined form an operational Marine Shipborne Voyage Data Recording system. The units below have been assessed & tested and satisfactory details of these units were included in the technical file.

MAIN UNITS Comprising:-

Main Electronics Enclosure	<b>500.01</b>	
Protective Capsule	<b>500.04</b>	
Microphone Enclosure - Internal	<b>500.02</b>	*1

And which may include:-

Microphone Enclosure - External	<b>500.03</b>	*1, 2
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SOFTWARE:-

Main Electronics Unit	<b>Version</b>	<b>v1.72</b>	<b>*4</b>
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----- End of List -----

NOTES:-

- Up to 8 microphones may be fitted.
- Microphone unit is for external bridge wings
- The SELEX Playback Software needed to replay data is not part of this approval but a satisfactory system was demonstrated.
- This approval is valid for equipment including minor software revisions where written details of any modifications have been submitted to and accepted by QinetiQ.

**Technical Characteristics**

PARAMETER	PROVISION	COMMENT
IEC 61162-1 SERIAL PORTS	<b>16</b>	Electrical Conformity to IEC 61162-1:2000. All data recorded, no sentence conformity or presence check carried out on messages
ANALOGUE SIGNAL PORTS	--	An External A/D unit can accept analogue signals. Not assessed as IEC 61996 does not detail criteria.
RADAR VIDEO PORT	<b>1</b>	Red/Green/Blue analogue plus H/V Sync. VESA DMTS standards to 1240 x 1024@ 60Hz, covered Presence check and alarm
BRIDGE AUDIO CHANNELS	<b>8 microphones</b>	Proprietary recording format Acoustic integrity check every 12 hrs
RADIO COMMS AUDIO CHANNELS	<b>1</b>	600m/0dBm
FLOAT FREE	<b>No</b>	Protective capsule used is for fixed deck installation only.
RECORDING DURATION	<b>&gt;12 Hours</b>	Parallel recording onto removable Flash memory card, Protective capsule memory can be downloaded via Ethernet
RESERVE POWER	<b>2 Hours</b>	From internal batteries. Bridge audio only recorded during reserve power operation
POWER SOURCE	<b>24V DC</b>	Power supply input via Main Electronics Enclosure.
Temperature Range - Exposed & IEC 945 Class	<b>-25°C to +55°C +70°C (Storage)</b>	— Protective Capsule, Waterproof Micro-phone Unit.
- Protected	<b>-15°C to +55°C.</b>	— All other units

**Conditions of Issue of this certificate are printed the reverse of this sheet.**

QinetiQ  
 Cody Technology Park  
 Ively Road, Farnborough  
 Hampshire. GU14 0LX

Certificate Number **QQ-TAN-04/06-01**

QinetiQ/SPSRG/MTA/UKTA/001/1.0  
 Sheet 2 of 2



**Certificates of Type Approval**  
**Conditions of Issue**

1. Each Certificate will be used in its entirety and not reproduced in part.
2. This certificate is not valid for equipment, the design or manufacture of which has been varied or modified from the specimen tested.
3. This certificate remains valid for a period of 5 years unless cancelled or revoked, provided any conditions contained in the schedule are complied with and the equipment remains satisfactory in service.
4. The approval status conferred by each certificate will apply only to the aspects of the equipment's performance defined by, and tested to, the specifications printed on that certificate.
5. Each unit of apparatus forming part of an equipment will have prominently marked on it the description given to it in the Certificate.
6. Each unit of an equipment will be marked with the minimum safe distance at which it should be mounted from a standard magnetic compass.
7. No unit of apparatus shall be advertised or labelled as "approved" or "certified" on behalf of the Maritime and Coastguard Agency (MCA), Department of Transport, DERA or QinetiQ in any sense other than that it is a type that has been assessed as satisfactory against the specification;

The manufacturer must advise QinetiQ of any future changes to the design or production of the equipment which might affect the equipment performance.

For minor modifications to the equipment, factory test results provided to QinetiQ by the manufacturer can be considered on a case-by-case basis. These test results will be reviewed by the QinetiQ, in consultation with the test facility which conducted the original Type Approval tests on the equipment.

QinetiQ will advise the manufacturer if there is a need for further testing.

If an equipment manufacturer wishes to have the type approved equipment designated under alternative names (e.g. agent/distributor's name and model number), a separate application should be completed and sent to QinetiQ.

## 9. MEE Connections

### 9.1. Internal Connections

The internal connections are pre-made, as per drawing GA.500.01.00.005.

### 9.2. External Connections

#### 9.2.1. Microphone Cables.

Terminate microphone cables in accordance with Table 9.2.1.1., using Plug In Connectors Orange 6 way.

Connect plugs into TIU sockets CON 17-24.

<b>Cores</b>	<b>Pin</b>	<b>Use</b>
<b>White/Black</b>	1	Audio Out (+)
<b>Black/White</b>	2	Audio Out (-)
<b>Green/Black</b>	3	Audio In (+)
<b>Black/Green</b>	4	Audio In (-)
<b>Black/Red</b>	5	0 V
<b>Red/Black</b>	6	+ 12 V
Screen		SPA 6 to 13

Table 9.2.1.1. Microphone cable TIU terminations.

Note: First colour indicates colour to connect, second colour indicates pair, and for example **Black/White** indicates that the Black wire is connected of the Black and White pair.

### 9.2.2. VHF Communications Audio.

Terminate VHF Communication audio cable in accordance with Table 9.2.2.1., using Plug In Connectors CON26 Orange 8 way and Table 9.2.2.2 Plug In Connector CON34 Green 2 way.

**Note:** CON26 Pins 3 and 4 have a higher gain level (12dB) than CON26 pins 5 and 6.

CON26	
Pin	Use
1	Not connected
2	Not connected
3	Audio In Low Level (+)
4	Audio In Low Level (-)
5	Audio In High Level (+)
6	Audio In High Level (-)
7	Not Connected
8	Not Connected
Screen	SPA 14

Table 9.2.2.1. VHF Communications audio TIU terminations - Audio.

CON34	
Pin	Use
1	+24 V
2	0 V

Table 9.2.2.2. VHF Communications audio TIU terminations - Power

### 9.2.3. Crash Protected Memory

Terminate Crash Protected Memory data cable with Plug In RJ45 Connector, as in Table 9.2.3.1. and Figure 1. The screens of the cable are to be connected to earth on the Cable Bridge and are to be run up to the RJ45 CPM connector

CPM		
Cable	Pins	Use
Green/White	1	Tx Data +
Green	2	Tx Data -
Orange/White	3	Rx Data +
Blue	4	0 V
Blue/White	5	0 V
Orange	6	Rx Data -
Brown/White	7	+ 12 V
Brown	8	+ 12 V

Table 9.2.3.1. Crash Protected Memory data cable terminations.

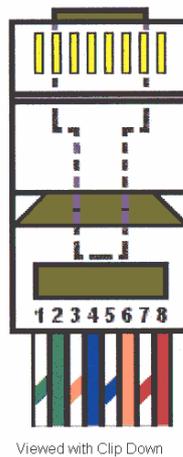


Figure 9.2.3.1.

## 9.2.4. IEC 61162 Data Channels

AIS Data is to be connected to CON1.

Repeated IEC 61162 Header Data is to be connected to CON2, for example, Alarm Data.

Other data can be connected to any of the remaining 14 IEC 61162 Data In channels CON3-CON16, however to ensure consistency of installation it is recommended that signals are connected as per table 9.2.4.2. Terminate data input cables using Plug In Connectors Orange 3 way in accordance with Table 9.2.4.1. Terminate the screen on the appropriate connector, pin 3 only.

Pins CON1-16	Use
1	Data In (A) +
2	Data In (B) -
3	Screen

Table 9.2.4.1. 61162 Data input connections.

Channel	VDR	S-VDR
1	AIS *	AIS **
2	Repeated Data	Repeated Data
3	GPS	GPS
4	Gyro	Gyro
5	Speed Log	Speed Log
6	Echo Sounder	Echo Sounder ***
7	Wind ****	Wind ***
8	Signal Interface	As Required
9	As Required	As Required
10	As Required	As Required
11	As Required	As Required
12	As Required	As Required
13	As Required	As Required
14	As Required	As Required
15	As Required	As Required
16	As Required	As Required

Table 9.2.4.2. IEC 61162 Data recommended input connections.

\* = AIS Optional

\*\* = AIS Mandatory if radar cannot be recorded by an 'off-the-shelf interface'.

\*\*\* = Items to be recorded only if IEC 61162 Signal are available.

\*\*\*\* = Item to be recorded if Anemometer is fitted to vessel.

As Required = Inputs required as per IEC 61996-2 VDR/S-VDR Specification.

### 9.2.5. External Ships Alarm

An external ships alarm can be connected to the VER4000/VER4000-S. This will allow other ships monitoring systems to be connected to the VDR, to monitor when the VDR is in normal operation or abnormal operation.

Connections are to be made as per table 9.2.5.1.

CON29	Use
1	Normally Open
2	Common
3	Normally Closed

Table 9.2.5.1. External Alarm Connections

### 9.2.6. Remote Alarm Unit (500.06)

The remote alarm is required when the MEE unit is located away from the wheelhouse in an unpopulated or concealed position. The unit indicates when there is an alarm on the main unit. Consequently, the remote alarm needs to be positioned in a highly visible place on the bridge.

Refer to drawing MAN.500.06.01.00.001 – equipment weight 1 Kg.

Once a suitable location has been selected, make off a suitable length 16/2/12C cable, ensuring screen or braid is terminated correctly.

Cut the cores to length and connect in accordance with Table 9.2.6.1.

Terminal	Core	Use
1	Red	Ext. Cancel button (-)
2	Blue	Ext. Cancel button (+)
3	Green	Ext. Alarm LED (-)
4	Yellow	Ext. Alarm LED (+)
5	White	Ext. Alarm buzzer (+)
6	Black	Ext. Alarm buzzer (-)
7	Brown	Ext. Dimmer (+)
8	Violet	Ext. Dimmer (wiper)
9	Orange	Ext. Dimmer (-)
10	Pink	Power LED 0 V
11	Turquoise	Power LED + V
12	Grey	Not Connected

Table 9.2.6.1. Remote Alarm Unit connections

At the Main Electronics Enclosure, make off the 16/2/12C, cut cores to length and terminate in accordance with Table 9.2.6.2.

CON28	Core	Use
1	Red	Ext. Cancel button (-)
2	Blue	Ext. Cancel button (+)
3	Green	Ext. Alarm LED (-)
4	Yellow	Ext. Alarm LED (+)
5	White	Ext. Alarm buzzer (+)
6	Black	Ext. Alarm buzzer (-)
7	Brown	Ext. Dimmer (+)
8	Violet	Ext. Dimmer (wiper)
9	Orange	Ext. Dimmer (-)
10	Pink	Power LED 0 V
11	Turquoise	Power LED + V
12	Grey	Not Connected

Table 9.2.6.2. Remote Alarm connections at the TIU.

### 9.2.7. Video Cables.

Terminate the URM70 Video cables with BNC Plugs, 75Ω in accordance with Instructions supplied with connectors.

Connect Video cables to MEE central bulkhead sockets ensuring that the signal lines are connected to the appropriate socket, as labelled (i.e. Red to “R”, Green to “G”, Blue to “B”, H-Sync or Combined Sync to “H/C” and V-Sync to “V”, as required), paying particular attention to the Sync inputs.

When the Video input has a ‘Combined’ sync signal, this is connected to the ‘H/C’ input. The connector on the top side of the ‘H/C’ input is to be disconnected and the spare BNC to BNC lead is connected between the top of the ‘H/C’ bulkhead BNC connector and the ‘C1’ input on the Video Processor pcb.

### 9.3. Crash Protected Memory

#### 9.3.1. Cable Terminations

Terminate the data and power cables in accordance with Table 9.3.1.1. below.

On completion fit the lid, ensuring that it sits squarely onto the Crash Protected Memory seal. Line up the screw hole in the end of the tube. Insert and tighten 4 x M4 bolts.

<b>Cable</b>	<b>Terminal</b>	<b>Use</b>
Brown/White	1	+12 V
Brown	1	+12 V
Blue/White	2	0 V
Blue	2	0 V
Orange/White	3	Tx Data +
Orange	4	Tx Data -
Green/White	5	Rx Data +
Green	6	Rx Data -

Table 9.3.1.1. Crash Protected Memory Terminations SK6

## 10. TIU LED Indicators

The 2 LED's on the TIU indicate the presence of voltages. Table 10.1 shows which voltage each LED represents.

LED	Voltage Level	Supply
1	24 V d.c.	External 24 V Out
2	24 V d.c.	External Supply Connected

Table 10.1 TIU LED Indications

## 11. Fuse Location and Value

MEE Fuses:

Description	Location	Identity	Value
24 V d.c. Supply	TIU	F1	5 Amp T1 ant surger
Audio 1	TIU	F2	100 mA T1 ant surger
Audio 2	TIU	F3	100 mA T1 ant surger
Audio 3	TIU	F4	100 mA T1 ant surger
Audio 4	TIU	F5	100 mA T1 ant surger
Audio 5	TIU	F6	100 mA T1 ant surger
Audio 6	TIU	F7	100 mA T1 ant surger
Audio 7	TIU	F8	100 mA T1 ant surger
Audio 8	TIU	F9	100 mA T1 ant surger
VHF 1	TIU	F10	100 mA T1 ant surger
VHF 2 (Not Used)	TIU	F11	100 mA T1 ant surger
24 V d.c. External Equipment Supply	TIU	F12	2 Amp T1 ant surger
Remote Alarm Fuse	Control	F1	1 A T1 ant surger
Control, CPM and overall Audio	Control	F2	2 A T1 ant surger
Auxiliary 24 V	Control	F3	1 A T1 ant surger
Battery Fuse (Battery Pack)	Battery Pack		20 A Blade
Battery Fuse (Power Supply)	PSU		15 A Blade

Table 11.1 Fuse Location and Value

## 12. Broadgate Proprietary Sentence Format

All serial data inputs to the VER4000/VER4000-S Main Electronics Equipment are in IEC 61162 format. This format is also known as NMEA.

There are no published 61162 sentences available for some of the data items that must be recorded on a VDR. Broadgate has designed 'proprietary sentences' to record these data items. The sentences are prefixed by the manufacturer's proprietary code '\$PBRO', and this has been registered with the NMEA.

The proprietary sentences used are shown below.

Sentences will be in the form:-

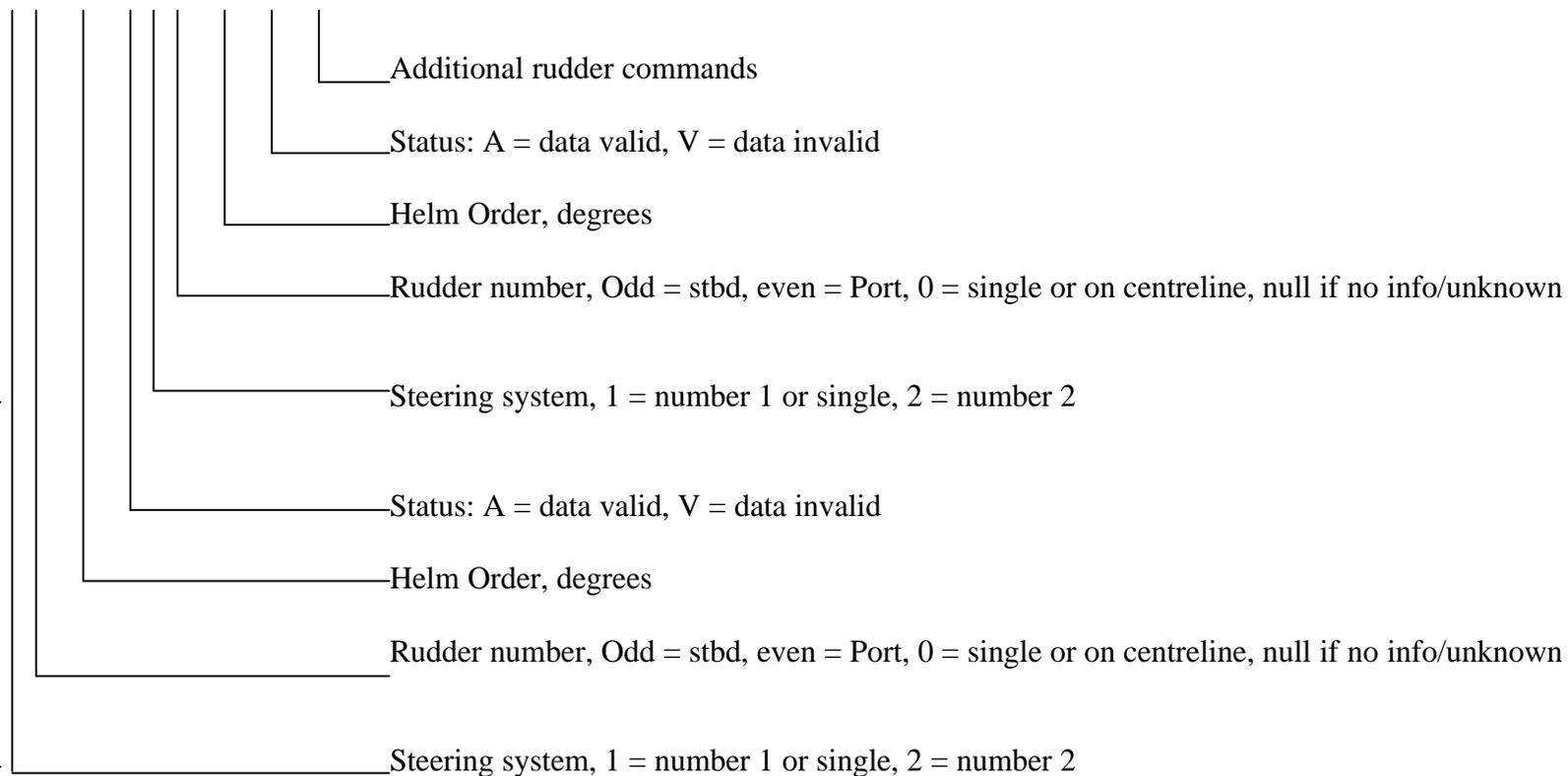
\$PBRO AA ..... Data.

|

Broadgate sentence identifier

### 12.1.1. Helm Command - \$PBRO AA

\$PBRO, AA, x, x, x.x, A, x, x, x.x, A,.....\*hh<CR><LF>

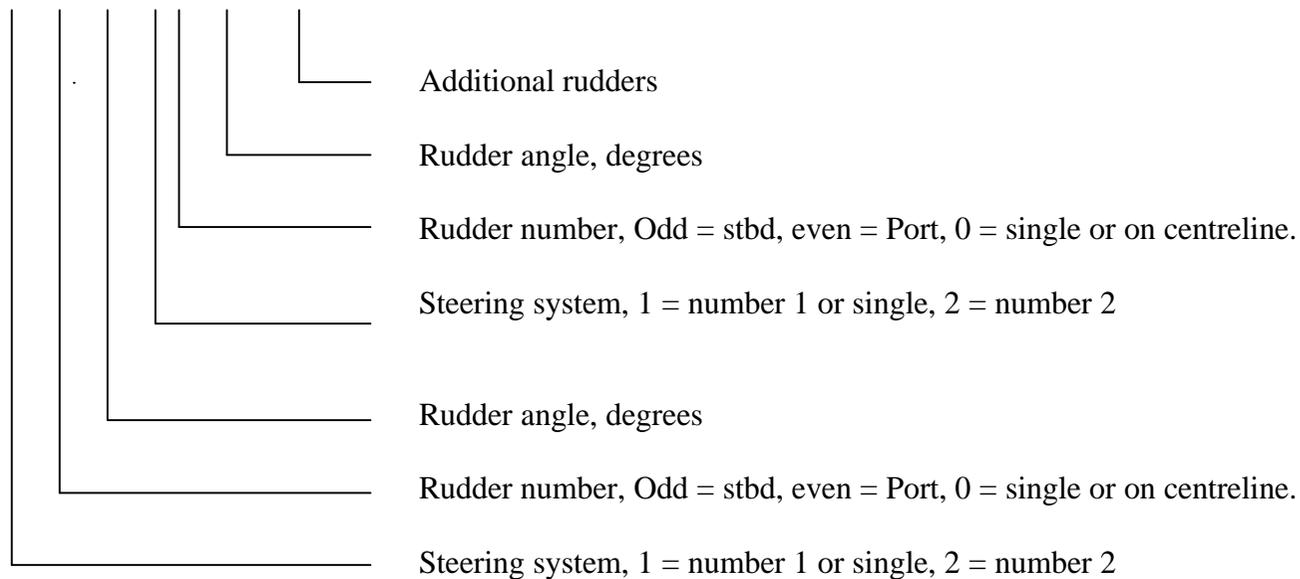


Use \$PBRO AB if additional sentence required

### 12.1.2. Rudder sensor angle - \$PBRO BA

(used if more than one steering systems or rudder are used)

\$PBRO, BA, x, x, x.x, x, x, x.x, .....\*hh<CR><LF>

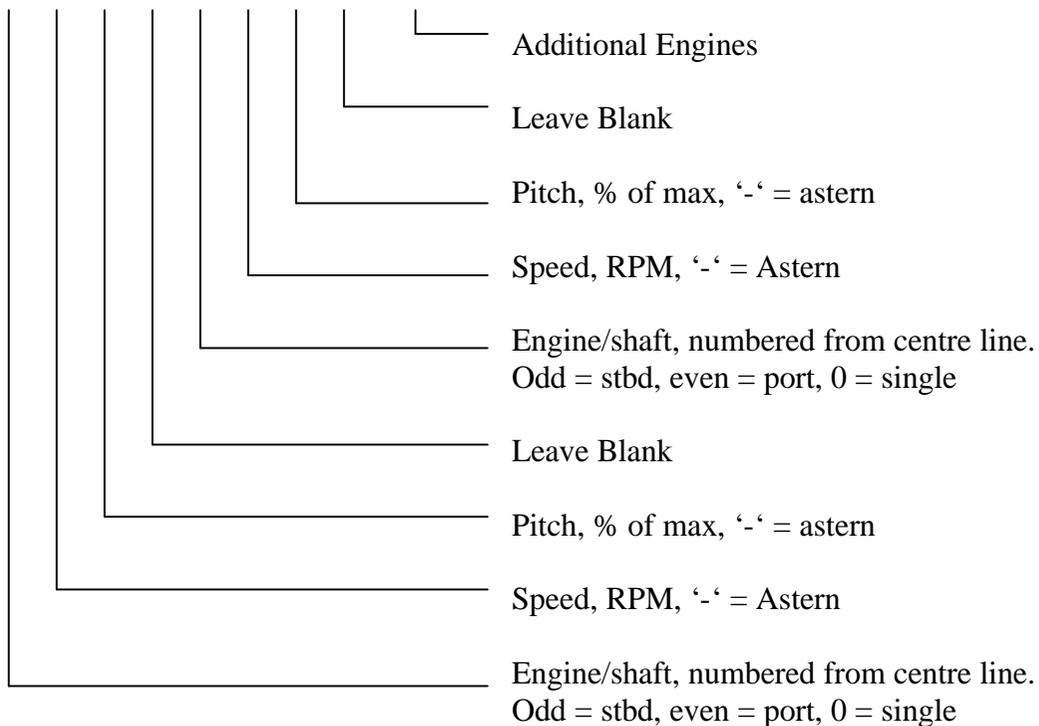


Use \$PBRO BB if additional sentence required

### 12.1.3. Engine Command - \$PBRO CA

Note – IMO require either ‘*engine telegraphs or direct engine/propeller controls*’ to be recorded. Not both.

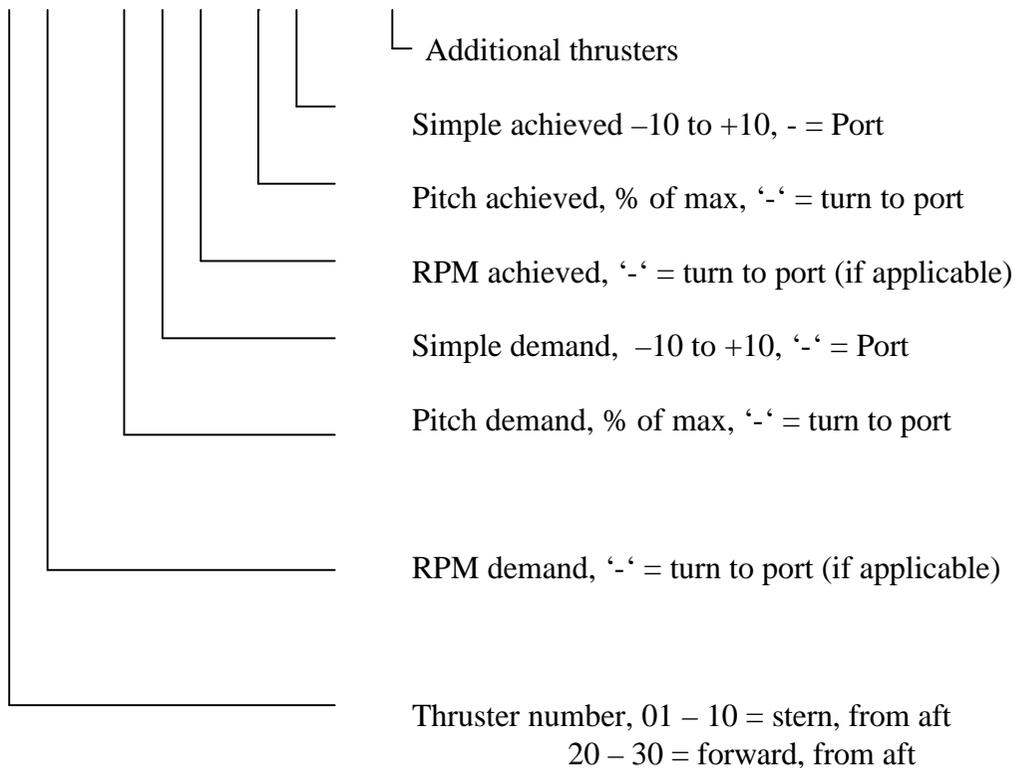
\$PBRO, CA, x, x.x, x.x, a, x, x.x, x.x, a,.....\*hh<CR><LF>



Note if an additional sentence required then use \$PBRO CB

### 12.1.4. Thruster Demand/Achieved - \$PBRO DA

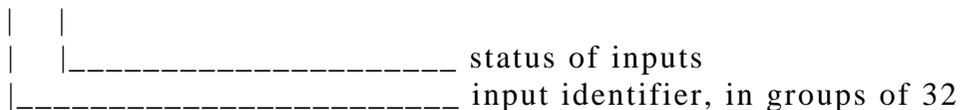
\$PBRO, DA, x, x.x, x.x, a, x.x, x.x, x, .....\*hh<CR><LF>



Note if an additional sentence required then use \$PBRO DB

### 12.1.5. Main alarms, Hull openings, Watertight/Firedoors - \$PBRO EA

\$PBRO,EA,1,xxxxxxxx,2,xxxxxxxx, ..... \*hh<CR><LF>

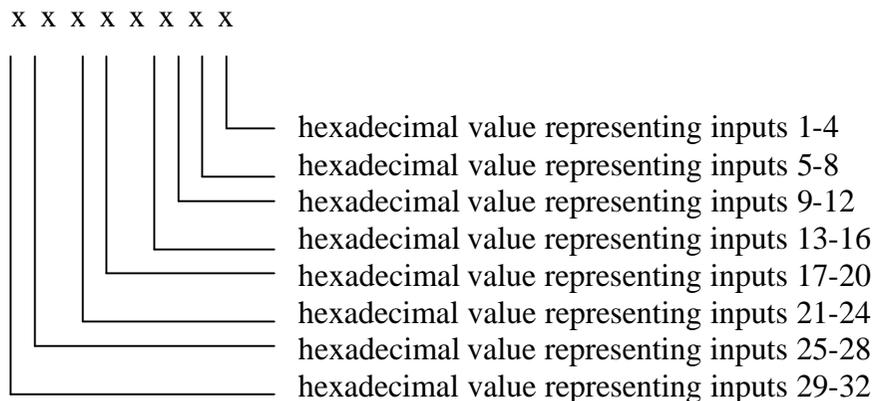


Use \$PBRO,EB... if additional sentences are required

Where 1, 2 is an input identifier which continues consecutively from sentence EA. For example, sentence EA could contain identifiers 1 to 3, and sentence EB identifiers 4 to 6.

where xxxxxxxx is a 32 bit hexadecimal number representing the status of 32 digital inputs

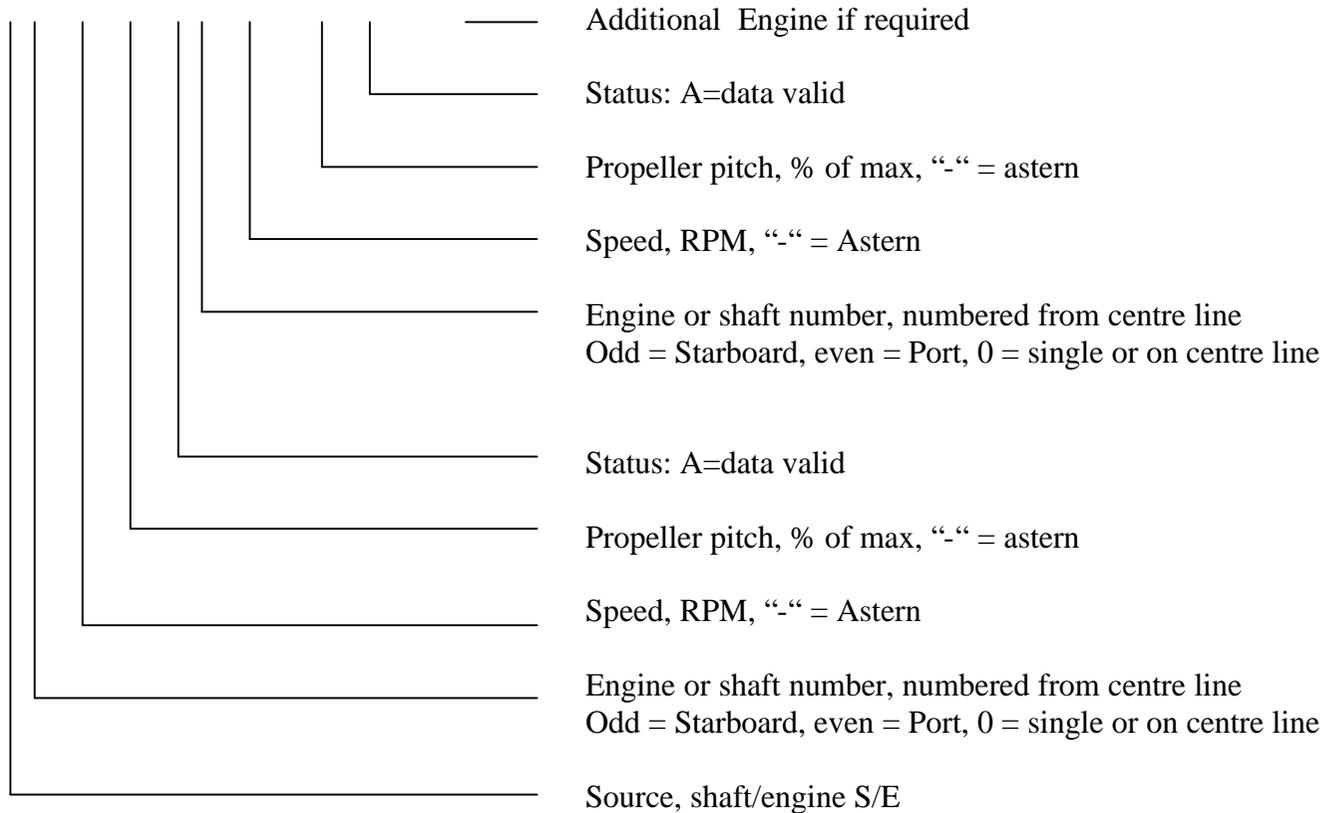
Example. For inputs 1-32



### 12.1.6. Engine Response - \$PBRO GA

(must always be used if more than one Engine is fitted)

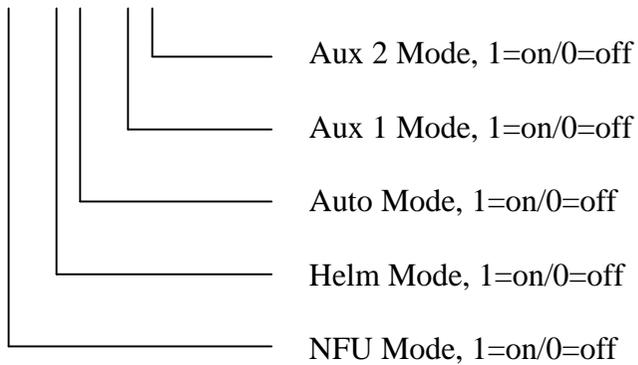
\$PBRO, GA, a, x, x.x, x.x, A, x, x.x, x.x, A,.....\*hh<CR><LF>



Note if an additional sentence required then use \$PBRO GB

### 12.1.7. Steering Mode - \$PBRO HA

\$PBRO, HA, x, y, z, v, w \*hh <CR><LF>



## **13. Appendix 1 – Initialisation Alarms**

**Following messages may occur during initialisation**

### **SBC Startup**

Failed to create Recorder Thread  
Failed to set Recorder thread priority  
QPF Failed - unable to continue  
Failed to initialise Control socket rc= (error code number)  
Failed to initialise CPM socket rc= (error code number)

#### **Possible solution:**

Replace all files on Compact Flash

### **SBC Compact Flash start up errors**

Cataloguing flash data directory...  
Catalogue complete  
Error: Could not establish free space on flash  
Error: Compact flash file deletion error  
Error: Could not create recording file on Flash  
Could not establish free space on flash  
Could not delete a recording file on flash  
Compact flash file deletion error  
Could not establish free space on flash  
Could not create recording file on Flash

#### **Possible solution:**

Replace SBC Compact Flash

### **SBC Communications**

Initialising CPM  
CPM failed to respond  
Initialising Control processor  
Socket error communicating with control processor

#### **Possible Solution:**

Check Ethernet cables

## **SBC & CPM/Control processor configuration transfer**

Socket Error on reply to Control processor  
Socket error on sending packet to CPM  
Socket failure on reply to control processor  
Socket error on communicating with CPM  
Socket failure on reply to control processor  
Searching for new config file...  
No new config file found  
Found more than one config file  
Could not close Config search handle  
Could not open Config file on Flash  
Error reading Config file  
New Config file found: (FileName)  
Processing new config file  
Config checksum invalid - Corrected  
Sending new config to CPM  
Failed to send config to CPM  
Sending packet %d (of 64)", current packet number (1-64)  
Receiving packet %d (of 64)", current packet number (1-64)  
Verifying new config in CPM  
Socket error on sending SCFG to CPM  
Socket error waiting for Config from CPM  
Verified config from CPM  
Error found in config from CPM  
Error: CPM failed to update config - using previous config  
Error writing Config file  
Could not open or create ver4000.dat  
Error writing ver4000.dat  
New config file saved  
No new config file found  
Loading config from CPM  
Socket error waiting for config from CPM  
Config received from CPM  
Config checksum invalid, retrying...  
Config verified  
Failed to receive valid config from CPM  
Sending config to AT91  
Socket error on sending RCFG to control processor  
Socket error on sending config to control processor  
Config sent to AT91  
Config received by control processor  
Control processor failed to receive config

### **Possible solution:**

- Check ethernet cables
- Check config in Config Editor
- Inspect/Replace Boards

### **Front-end Processors (Video, Audio and Data)**

Video processor not responding to INIT  
Video processor not responding to RCFG  
Audio processor not responding to INIT  
Audio processor not responding to RCFG  
Data processor not responding to INIT  
Data processor not responding to RCFG

#### **Possible Solution:**

Check and/or replace Video, Audio, Data boards

### **Last message on normal startup**

Recording...

#### **Possible Solution:**

Normal running of VDR, no action required.

### **Displayed on fatal error at startup**

Startup aborted

#### **Possible Solution:**

Refer to SELEX Communications Ltd, for advice.

## 14. Appendix 2 – Alarms In Operation

### Following messages may occur in running

#### SBC Compact Flash recording

Could not write to compact flash  
Could not read from compact flash  
Could not establish free space on compact flash  
Compact flash file deletion error  
Could not create recording file on compact flash  
Compact Flash file compare error

#### **Possible solution:**

Check/Replace Compact Flash

#### Normal Recording

Socket error waiting for STOK from CPM  
Video processor restarted  
Audio processor restarted  
Data processor restarted  
Video processor not responding, attempting restart  
Audio processor not responding, attempting restart  
Data processor not responding, attempting restart  
Video processor data error  
Audio processor data error  
Data processor data error  
CPM data error  
SBC data error

#### **Possible Solution:**

Check ethernet cables  
Check and/or replace Video, Audio, Data, CPM, SBC boards

### **Power failure UPS mode**

Main power failed - UPS mode

Initiating UPS shutdown

Main power restored - exit UPS mode

UPS Mode: Video processor powered down

Re-powering video processor

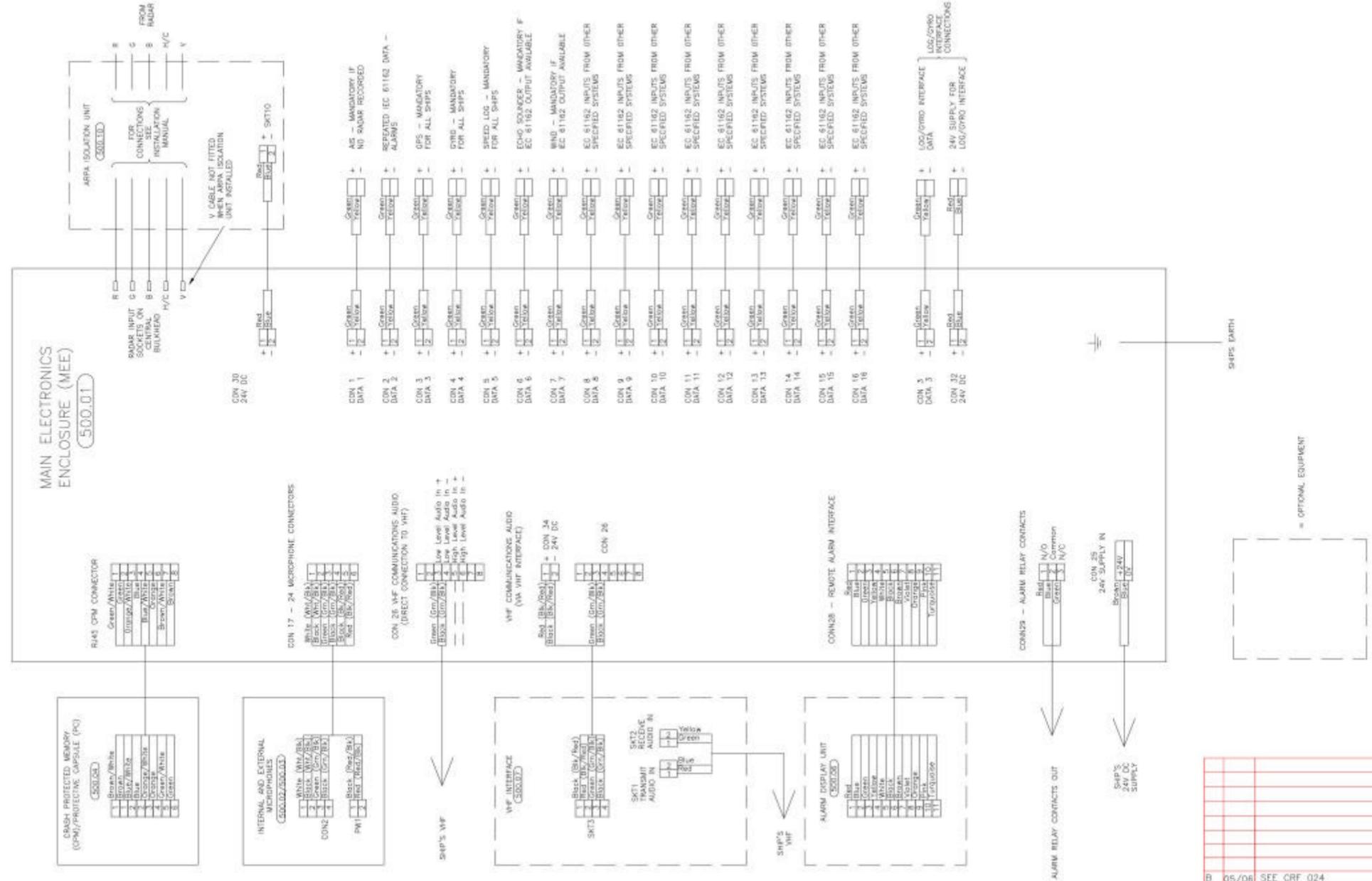
Video processor restarted

### **Possible solution:**

If persistent, check main power connections/voltage

## 15. Drawings

GA.500.00.00.00.000-5.6	Issue B	VER4000 Inter Unit Cable Terminations
GA.500.00.00.00.000-6.6 Terminations	Issue A	VER4000-S Inter Unit Cable
GA.500.01.00.002	Issue A	Microphone PCB Schematic
GA.500.01.00.005	Issue A	VER4000 MEE Block Diagram
GA.500.01.00.001	Issue A	VER4000 TIU Circuit Diagram Sheet 1
GA.500.01.00.001	Issue A	VER4000 TIU Circuit Diagram Sheet 2
GA.500.01.00.001	Issue A	VER4000 TIU Circuit Diagram Sheet 3
GA.500.01.00.003	Issue A Diagram	VER4000 Control Board Circuit Sheet 1
GA.500.01.00.003	Issue A Diagram	VER4000 Control Board Circuit Sheet 2
GA.500.01.00.004 Diagram	Issue A	VER4000 Video Input Schematic Sheet 1
GA.500.01.00.004 Diagram	Issue A	VER4000 Video Input Schematic Sheet 2
GA.500.01.00.004 Diagram	Issue A	VER4000 Video Input Schematic Sheet 3
GA.500.01.00.004 Diagram	Issue A	VER4000 Video Input Schematic Sheet 4
GA.500.04.00.001	Issue A	VER4000 CPM Input Circuit Diagram Sheet 1
GA.500.04.00.001	Issue A	VER4000 CPM Input Circuit Diagram Sheet 2
MAN.500.06.00.00.000	Issue B	Optional Alarm Internal Wiring



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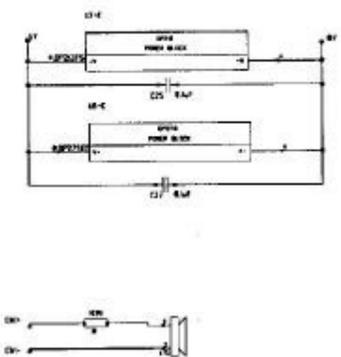
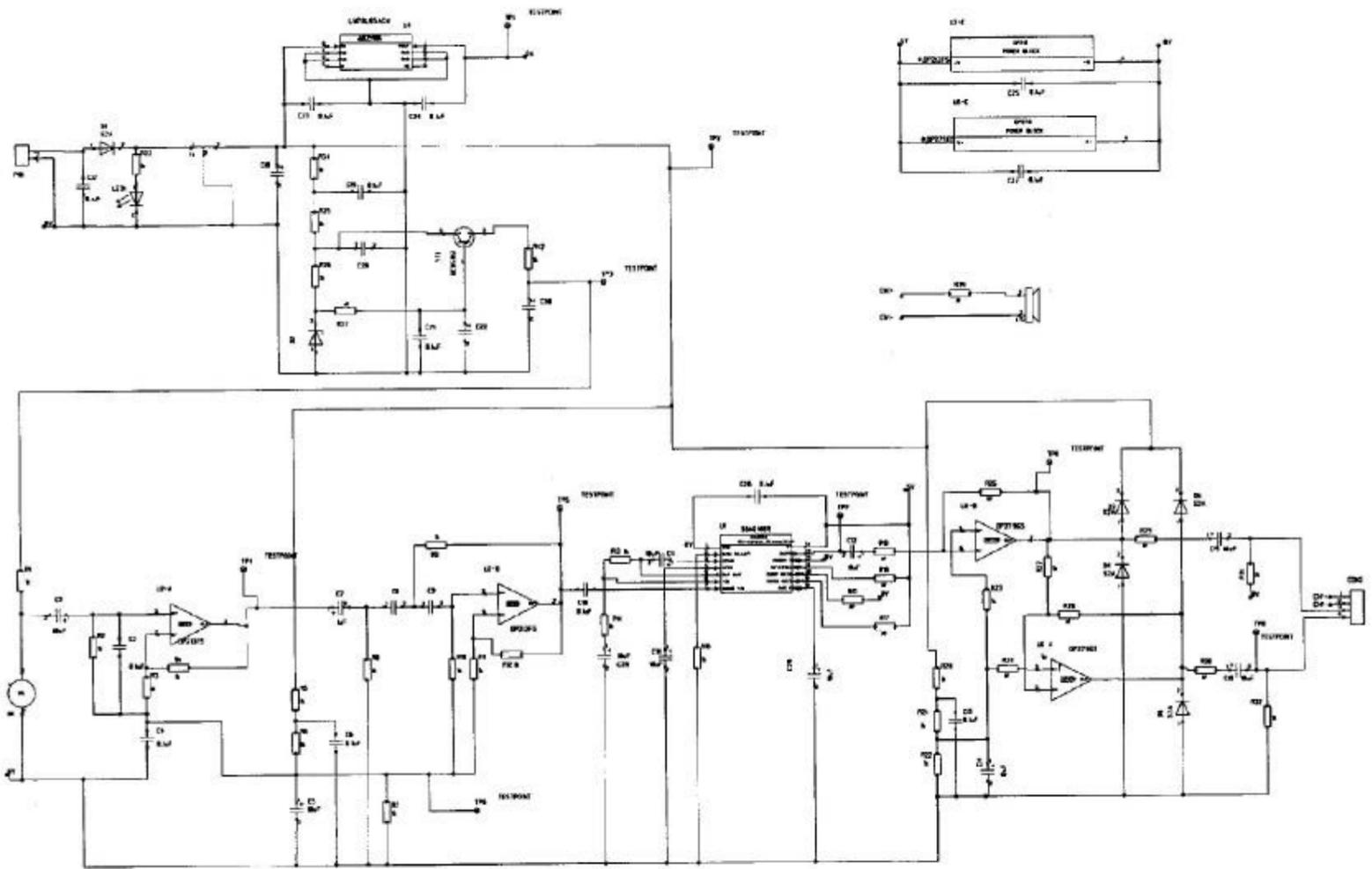
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 SH. 5 OF 6 SH. 3





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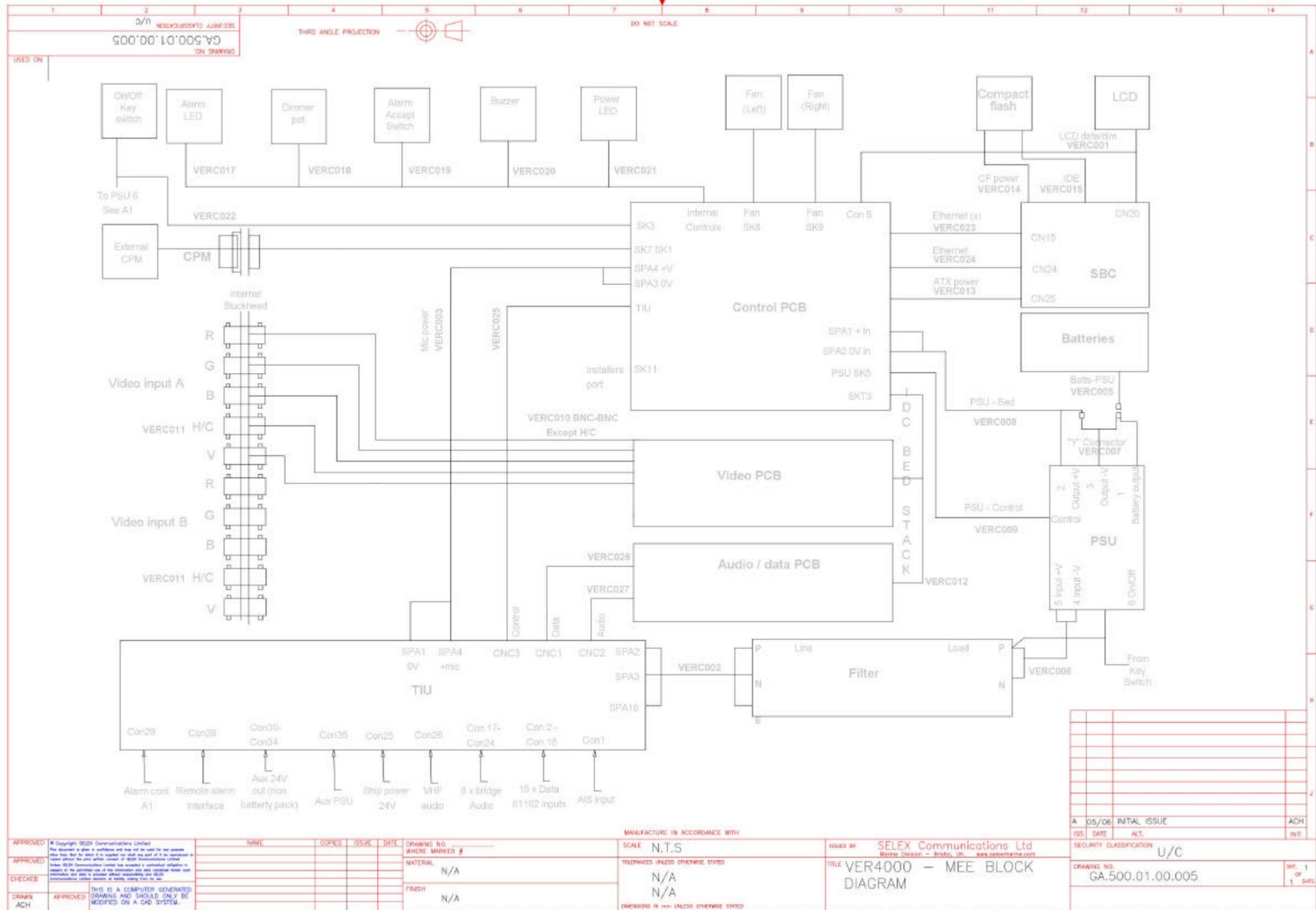
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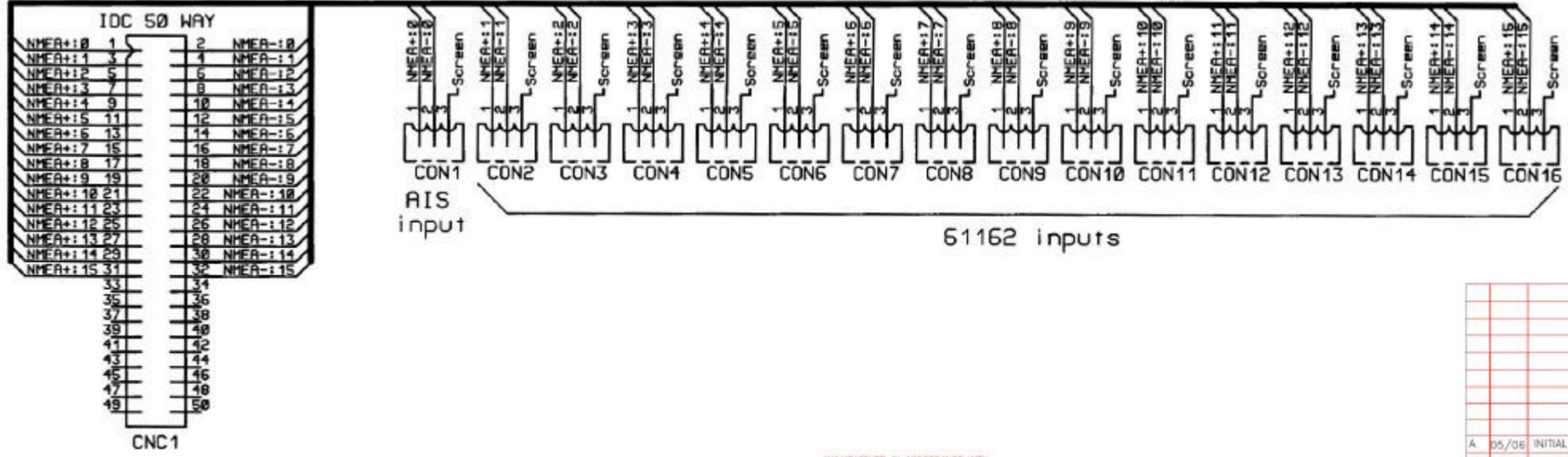
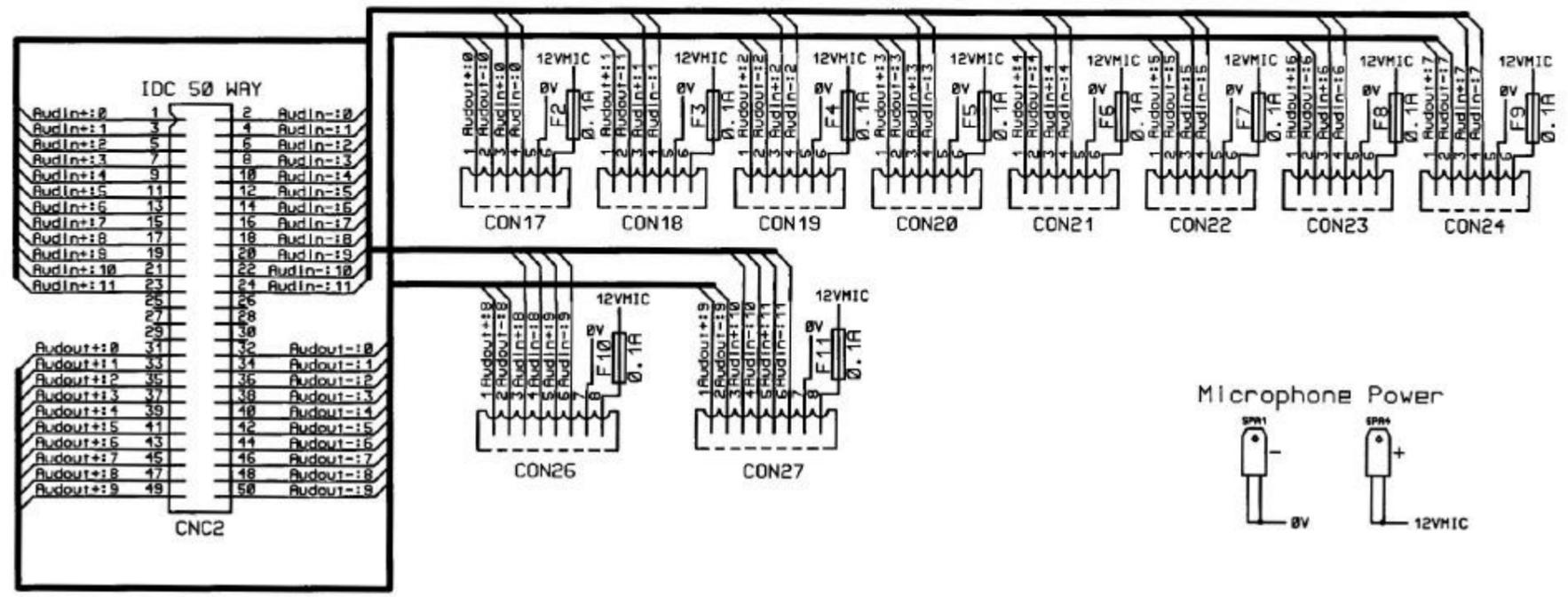
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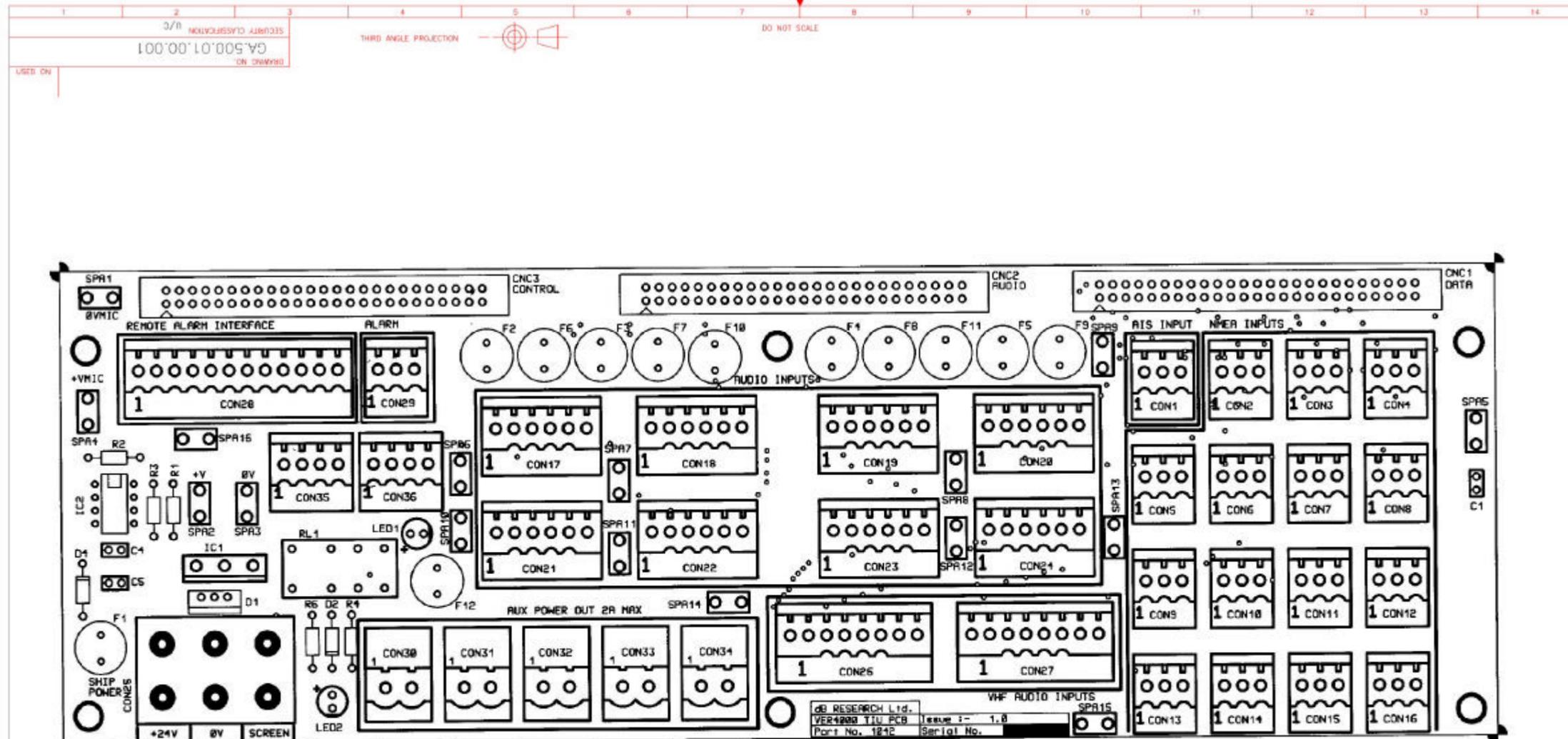
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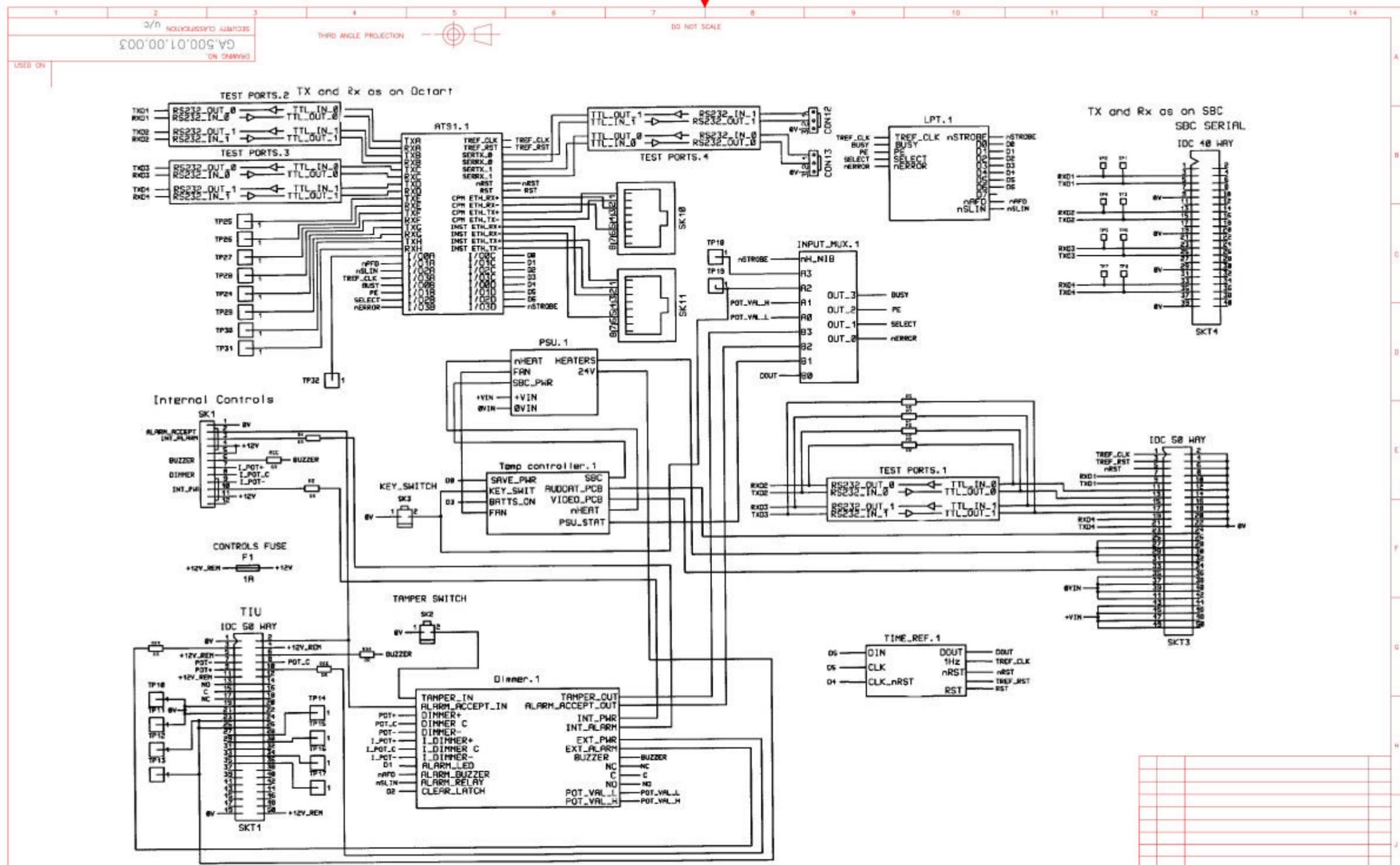
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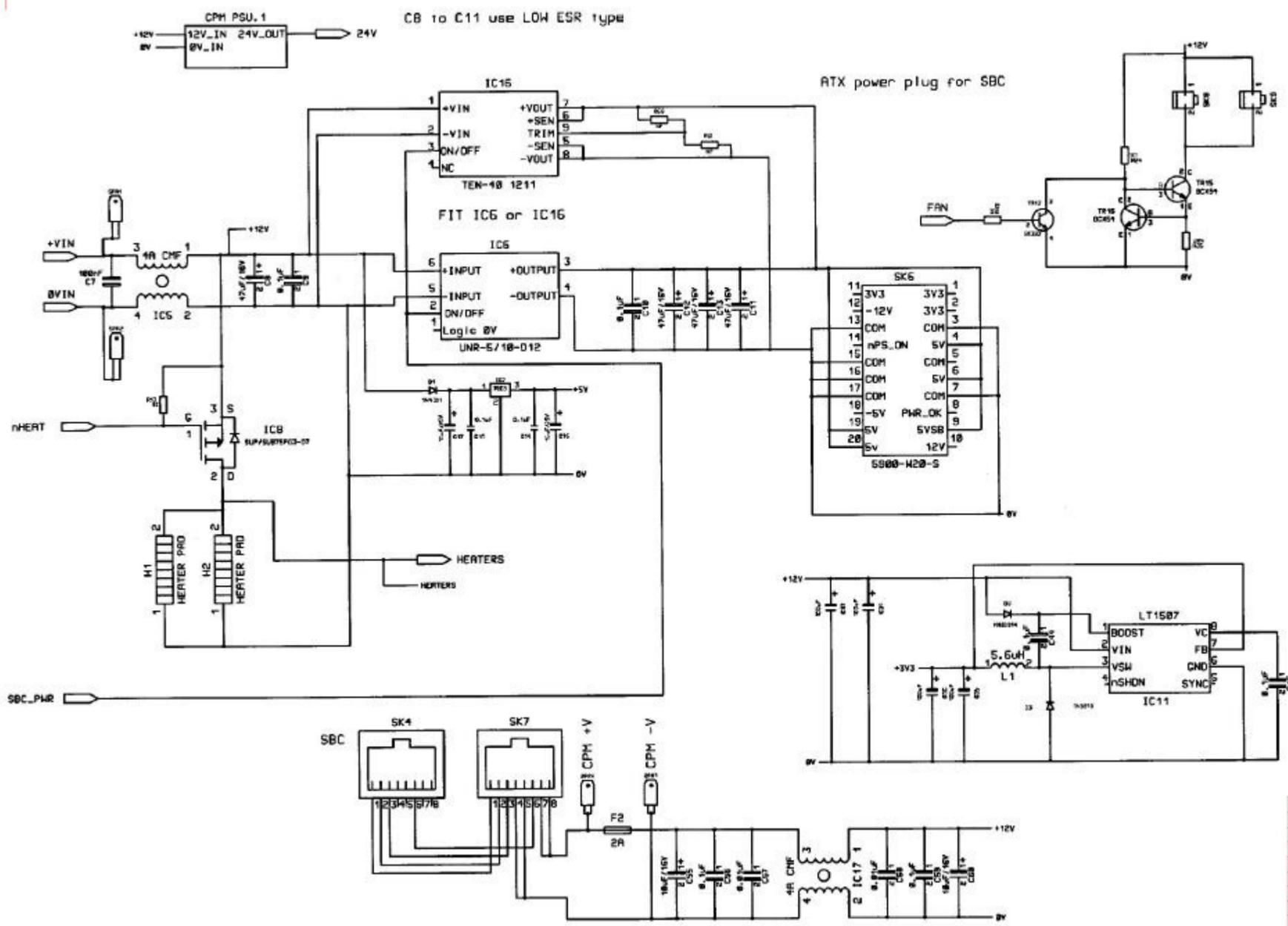
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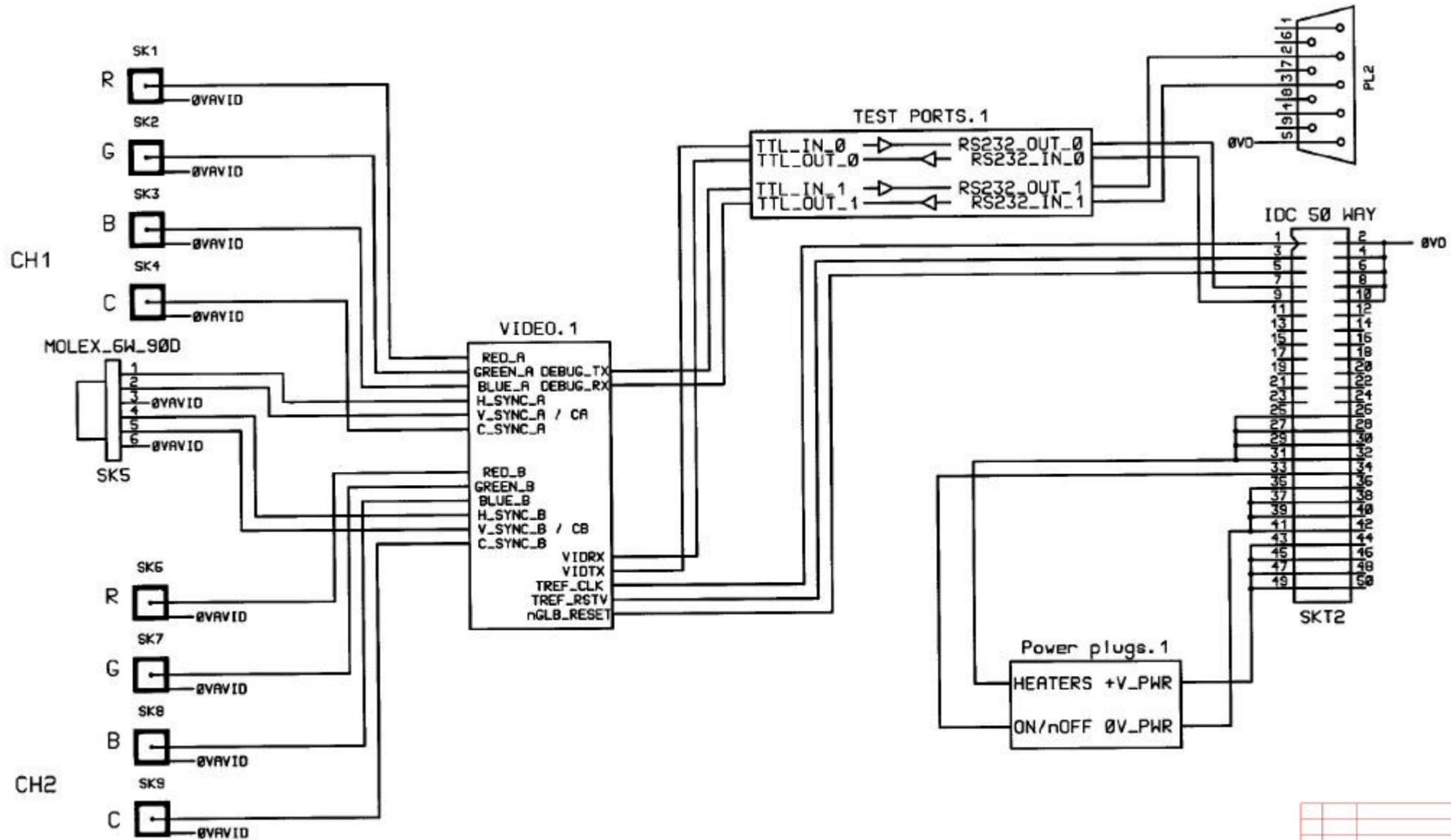
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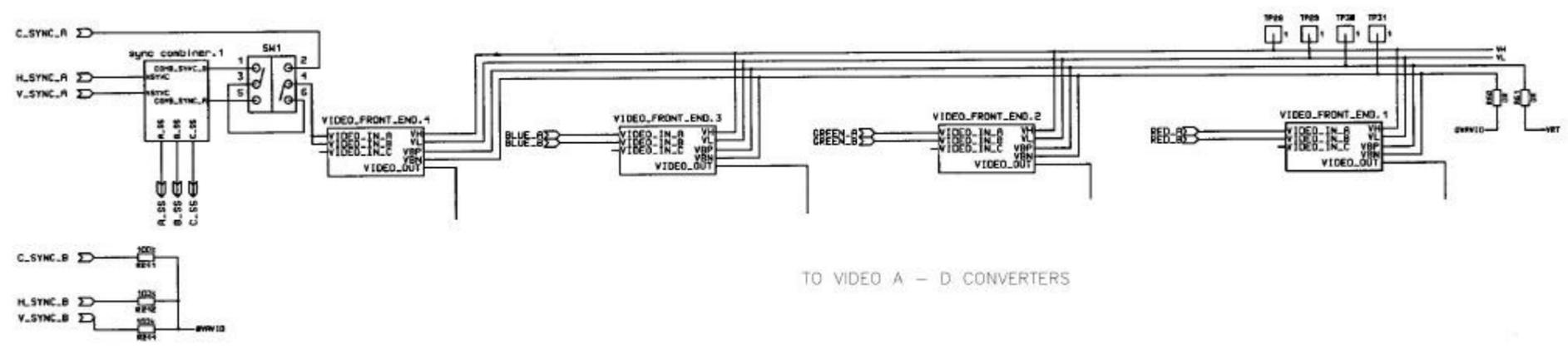
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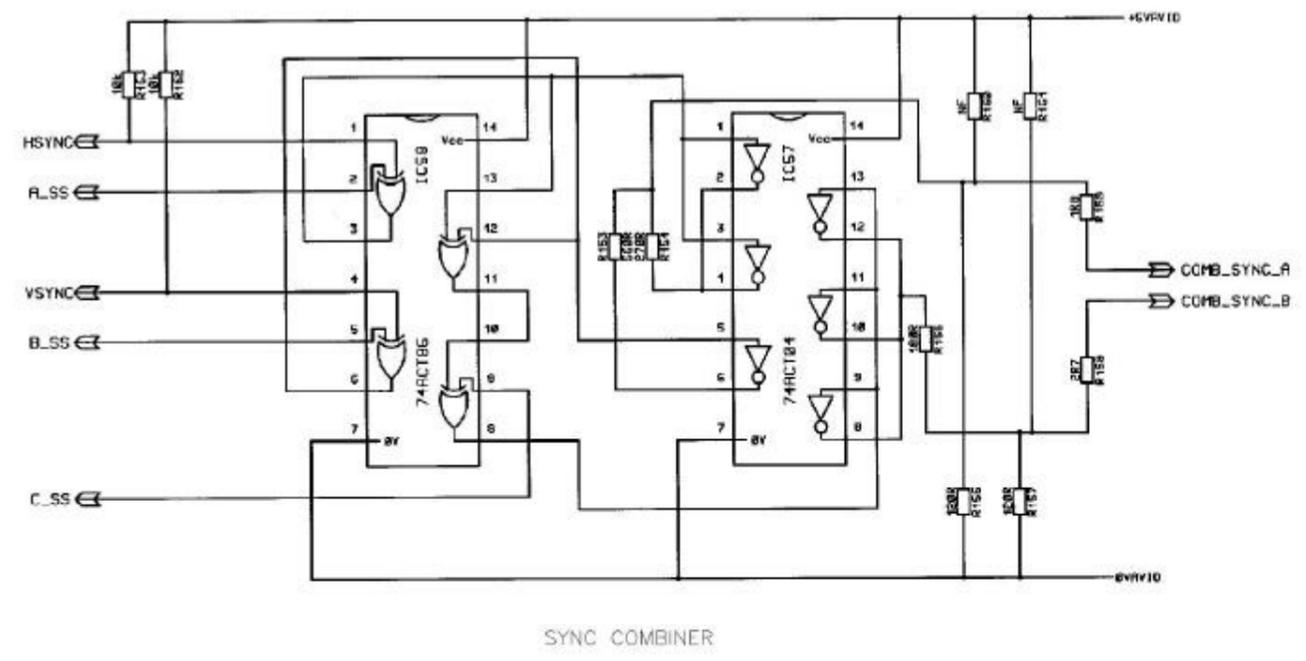
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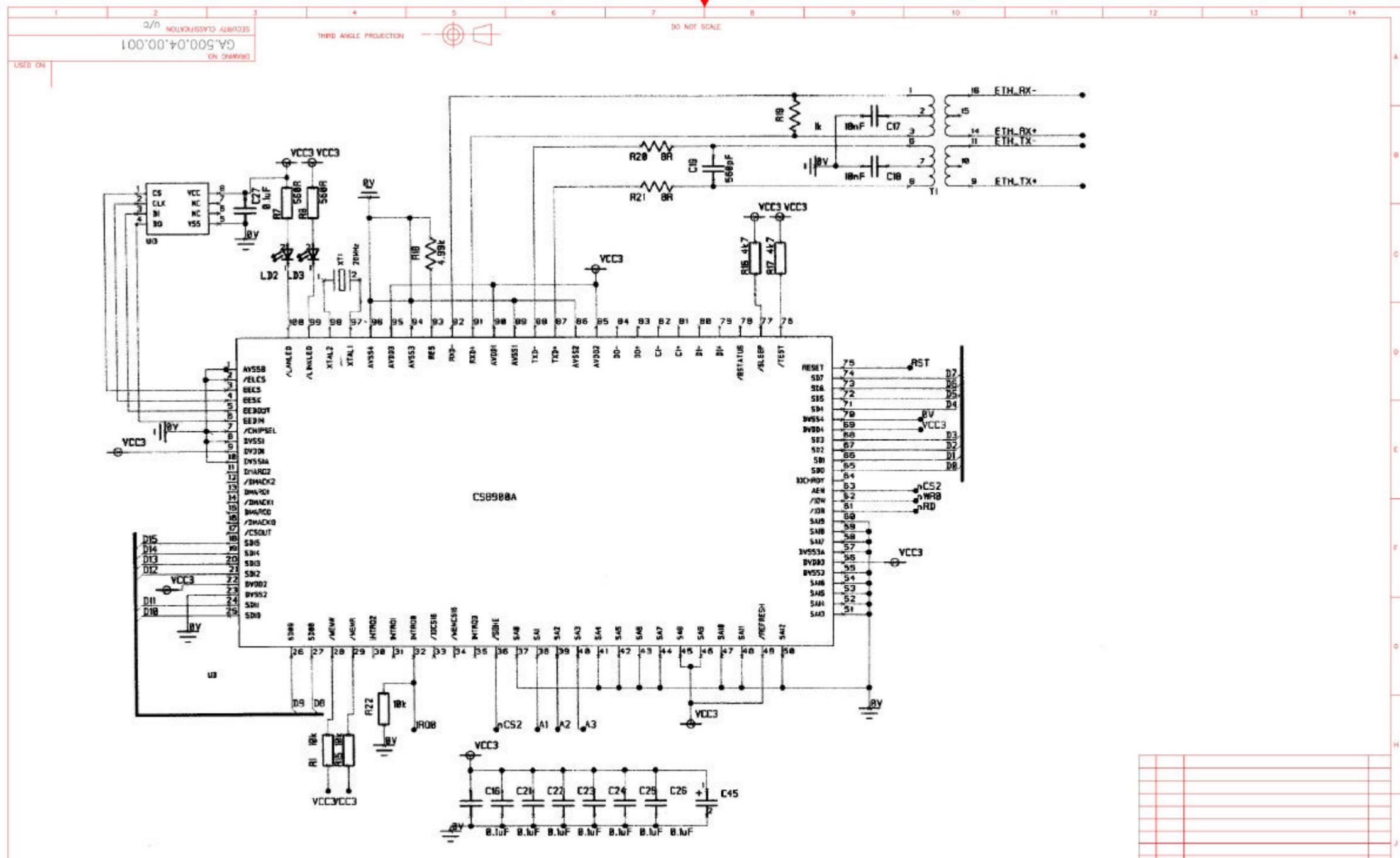


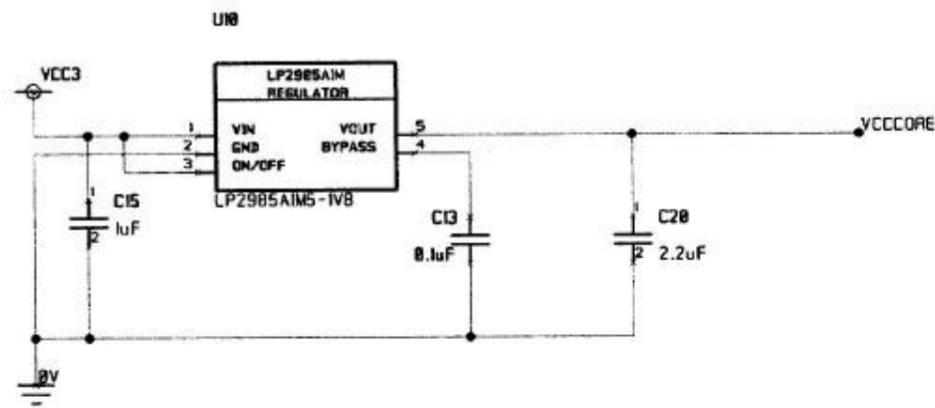
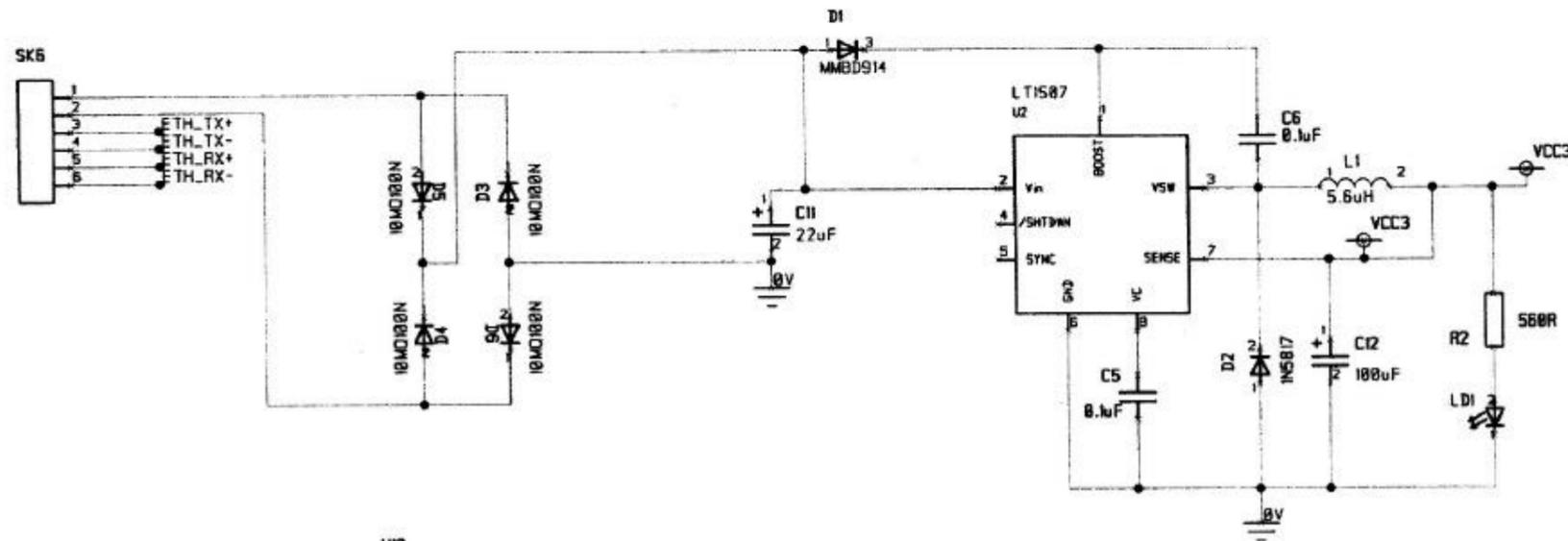
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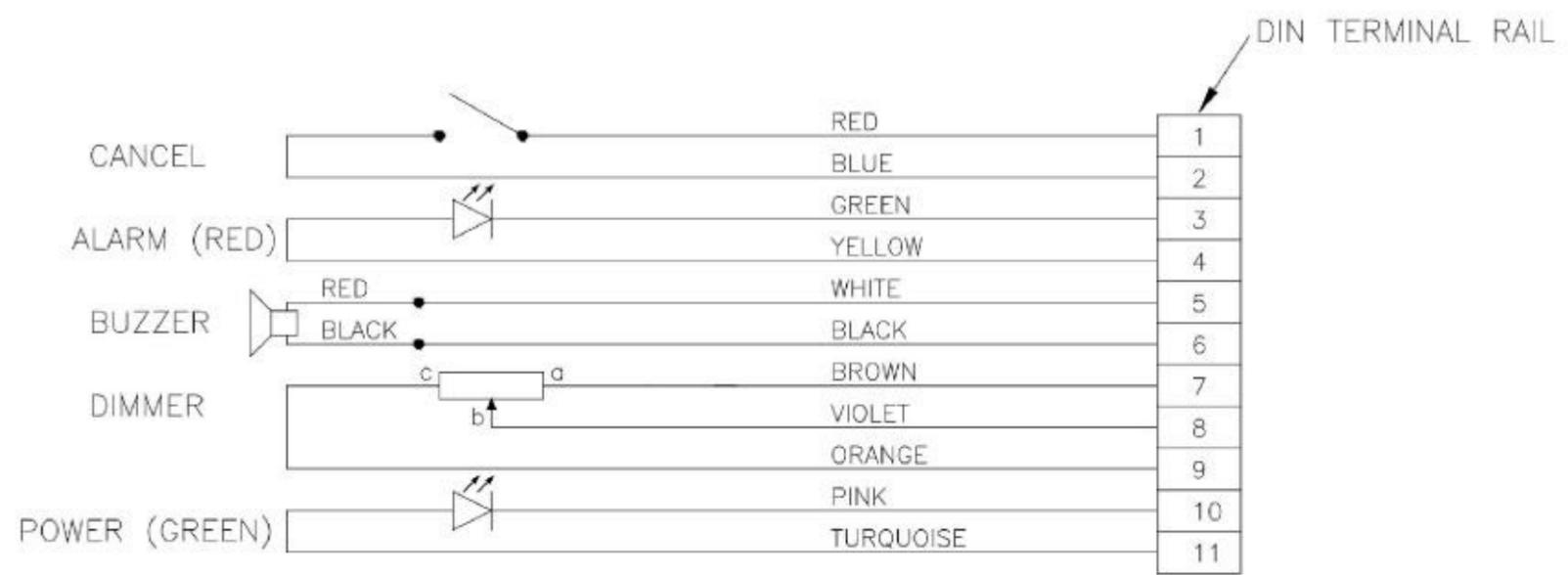
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  - MAN.500.06.00.00.000 VER4000 - OPTIONAL ALARM DISPLAY UNIT CIRCUIT
  - MAN.500.06.01.00.001 VER4000 - OPTIONAL ALARM DISPLAY UNIT COVER
  - MAN.500.06.01.00.002 VER4000 - OPTIONAL ALARM DISPLAY UNIT LABELS
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