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HEMT "Info" Rack for calibration control

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Change Record

REVISION	DATE	AUTHOR	AFFECTED SECTION/PAGE	REMARKS

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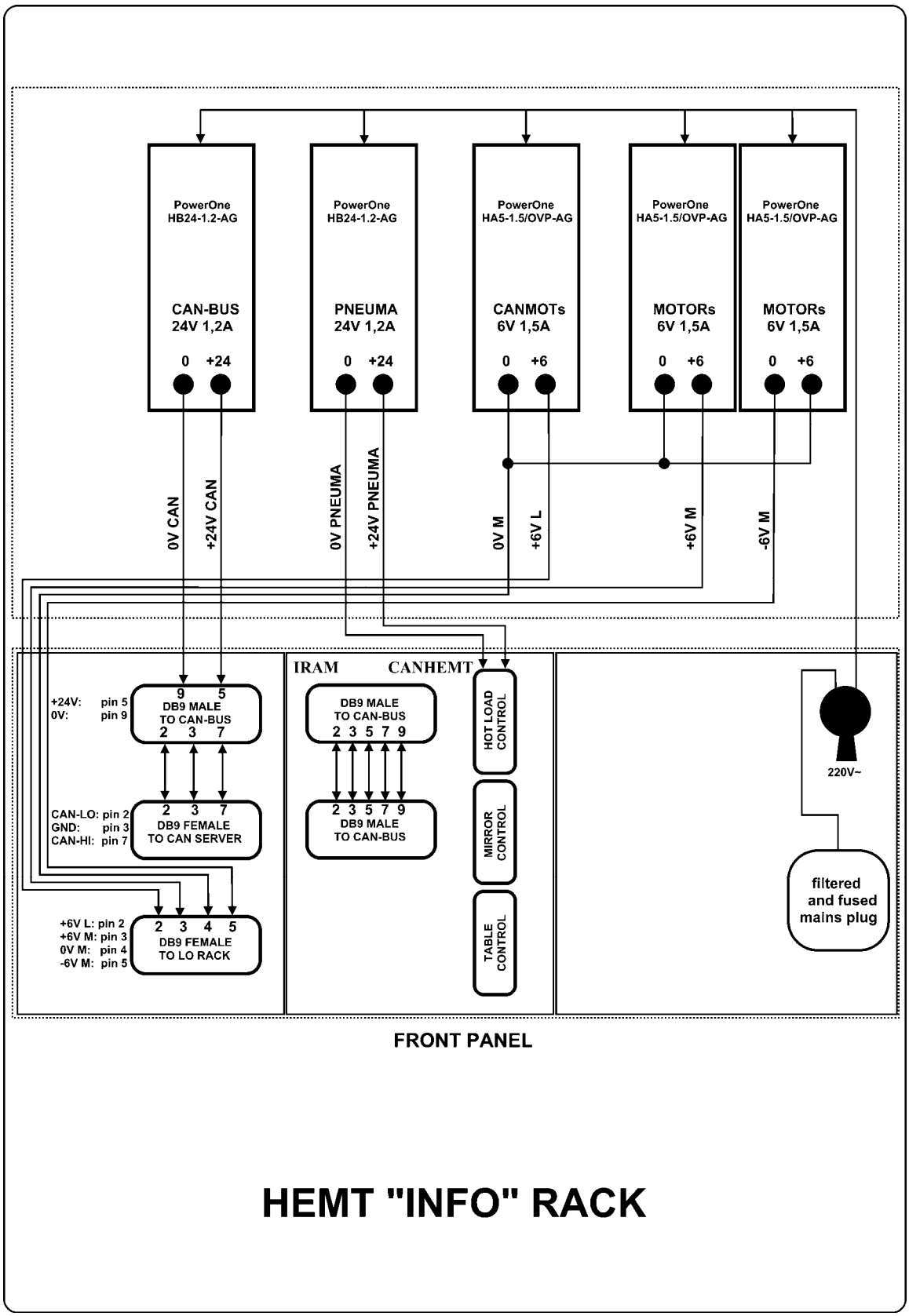
1 Brief description of the Calibration system

Three devices are used for HEMT receiver calibration. They have 2 positions, and can be moved in/out the beam under CAN control:
-A hot load, moved with a rotary jack.
-A cold load, moved with a translation table.
-A mirror (MH5), also moved with a rotary jack.
The hot load is moved with a rotary solenoid.
The translation table and the mirror are actuated through pneumatic motors driven by 24V DC electrovanes.
All (end) positions are detected with 24 Volt proximity limit switches.

1.1 HEMT-INFO Rack

This rack was developed for calibration control using a CAN Bus. It includes:
a)5 linear power supplies necessary to drive:
-CAN Bus power (+24V) for all devices on the CAN bus.
-"Pneumatics power" (+24V) for all electrovanes.
-+6V Logic, +6V Motors, -6V Motors required by all CAN backshort motors inside the LO Rack.
These 6V power supplies were originally 5 Volt models, modified in order to increase the output voltage. Their current limitation resistor also had to be modified (0.22 Ohm instead of 0.39) in order to reach the nominal current of 1.5 Ampere @ 6 Volt. Their overvoltage protection (crowbar + thyristor) was suppressed.
N.B: Normally, no current from the motors'supply should flow in the "0V Motor" conductor.
b)A CAN-HEMT module, composed of 1 CANIO board and 1 interface board for electrovanes and limit switches. The 2 boards are enclosed in a RFI-proof box.
All connections to/from the HEMT-INFO rack are located on the front-panel.
The mains switch and the mains fuse are also located on the front-panel.

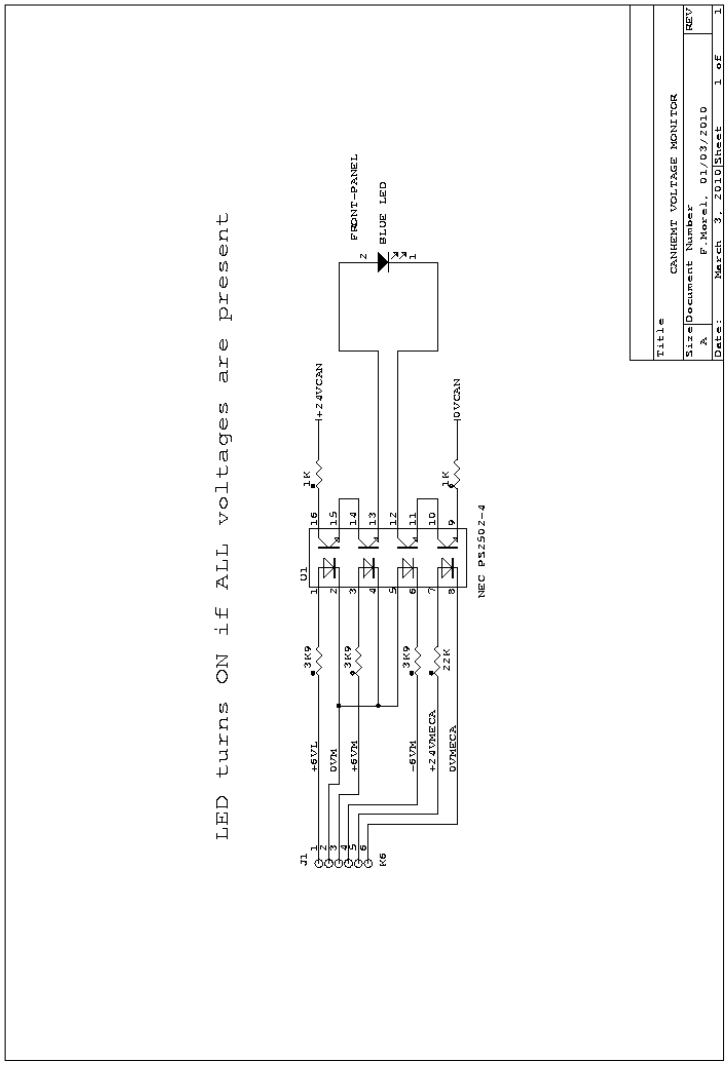
1.2 HEMT-INFO Rack block-diagram



2 Hardware

2.1 Power check

A front-panel blue LED turns on ONLY if **ALL** supply voltages are present, thanks to a small voltage monitor located inside the rack.



2.2 Left side Panel

There are 3 connectors on the (fixed) most-left part of the front-panel.
From top to bottom:

-CAN connector 1 (Sub-D 9 MALE) conforms to IRAM standard. This connector is also the power supply source for all CAN devices on the CAN Bus.

1	Shield and PE
2	CAN Low
3	CAN GND
4	unused
5	CAN + 24V Power Supply
6	unused
7	CAN High
8	unused
9	CAN 0V Power Supply

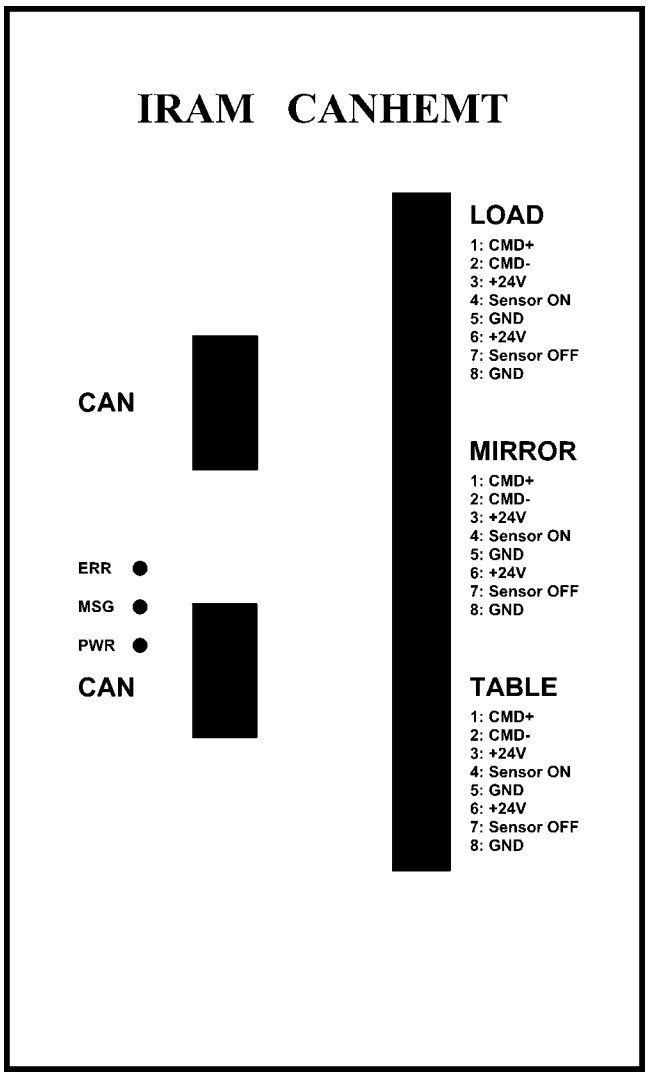
-CAN connector 2 (Sub-D 9 FEMALE): This is the **ONLY** female connector used for CAN Bus. It is used to connect the 3 lines of CAN Bus to the CAN master (CAN Board inside server PC)

1	No Connection
2	CAN Low
3	CAN GND
4	No Connection
5	No Connection
6	No Connection
7	CAN High
8	No Connection
9	No Connection

-CAN Motors Power connector (Sub-D 9 Female) carries the power supplies of all CAN Motors.

1	No Connection
2	+6VL
3	+6VM
4	0VM
5	-6VM
6	No Connection
7	No Connection
8	No Connection
9	No Connection

2.3 HEMT module

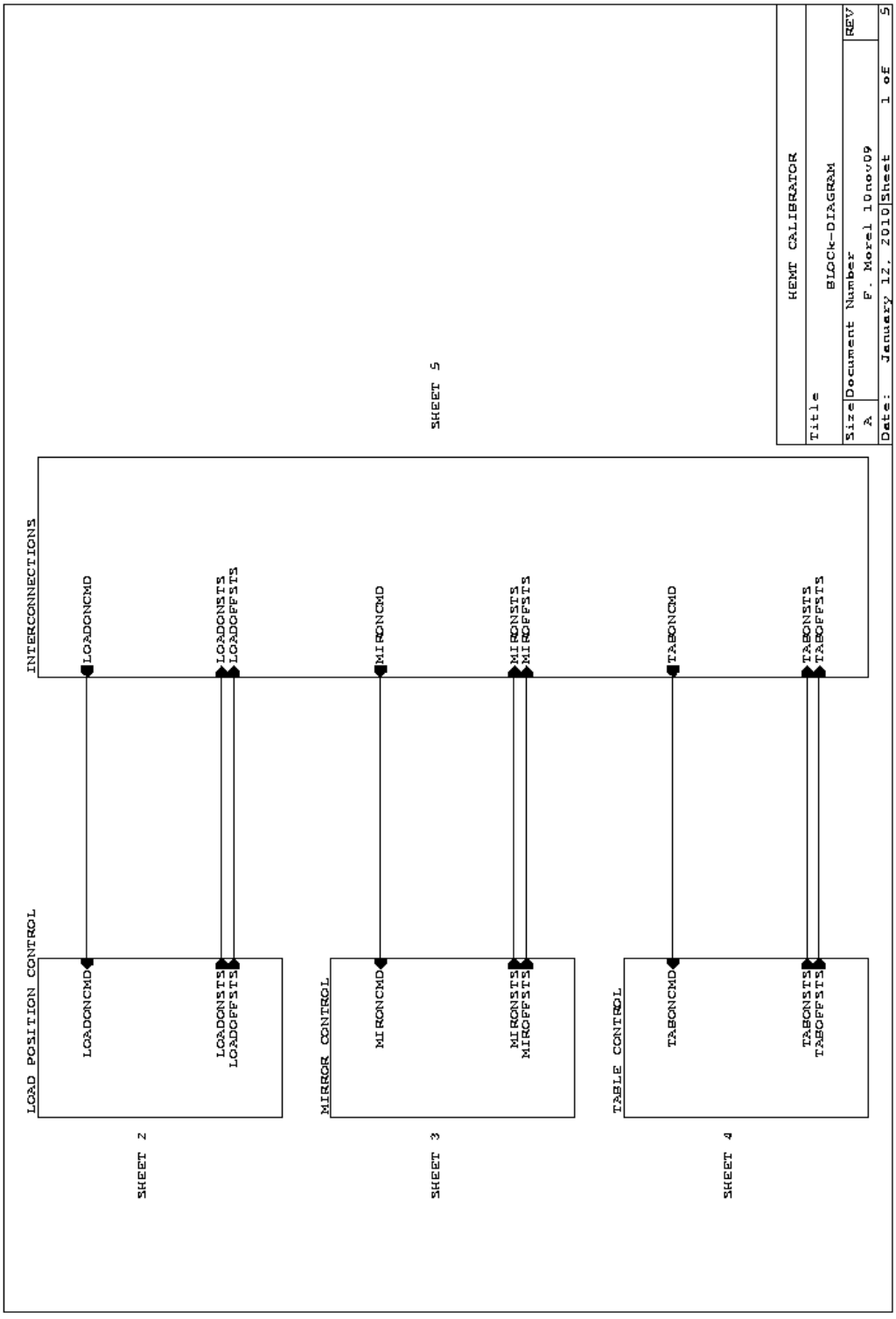


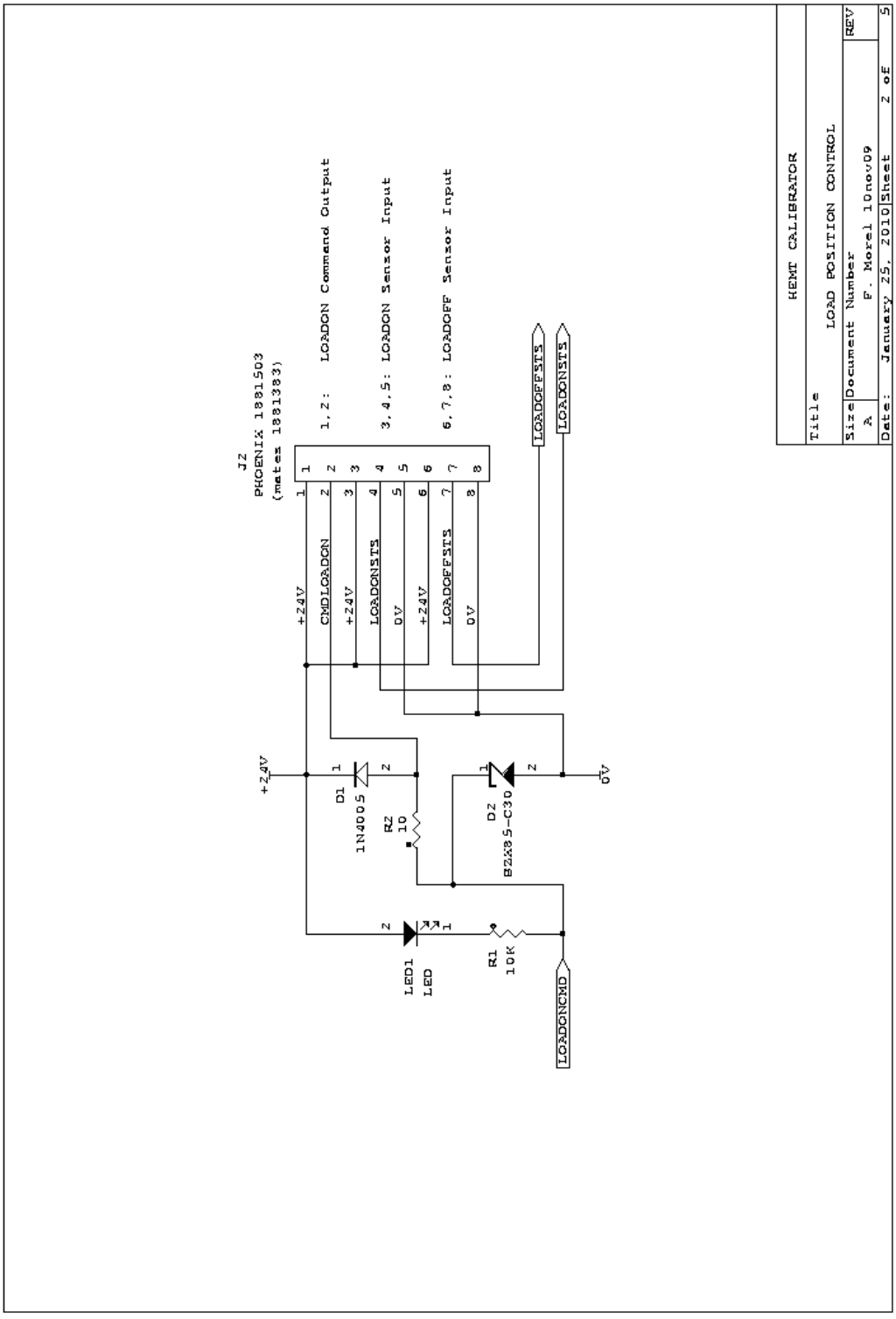
This module can be extracted from the rack and has no backplane connections. It needs 2 power supplies isolated from each other:
-The CAN +24V, fed trom CAN Bus.
-The “pneumatics” +24V, fed from a plastic Lemo connector (located on the rear side of the module) and an extensible cable.
2 boards are installed inside the HEMT module box: A CANIO Board and an Interface Board. Both boards are galvanically isolated from each other. The 2 boards are interconnected (inside the module box) through a 64-pos flat cable and opto-couplers.
The 0V of the “pneumatics” power supply is connected to the box housing, and thus to Earth.

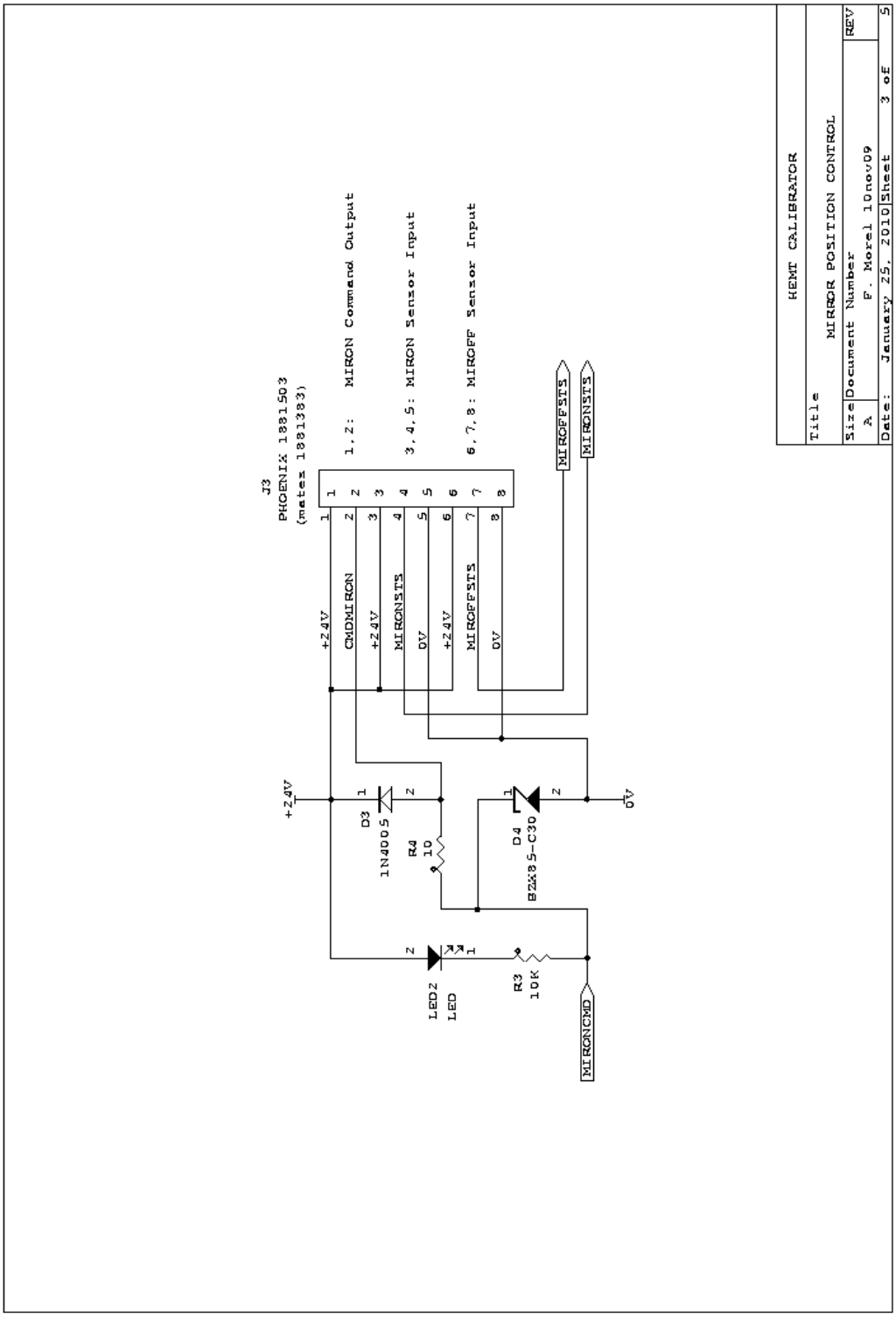
2.3.1 CANIO Board

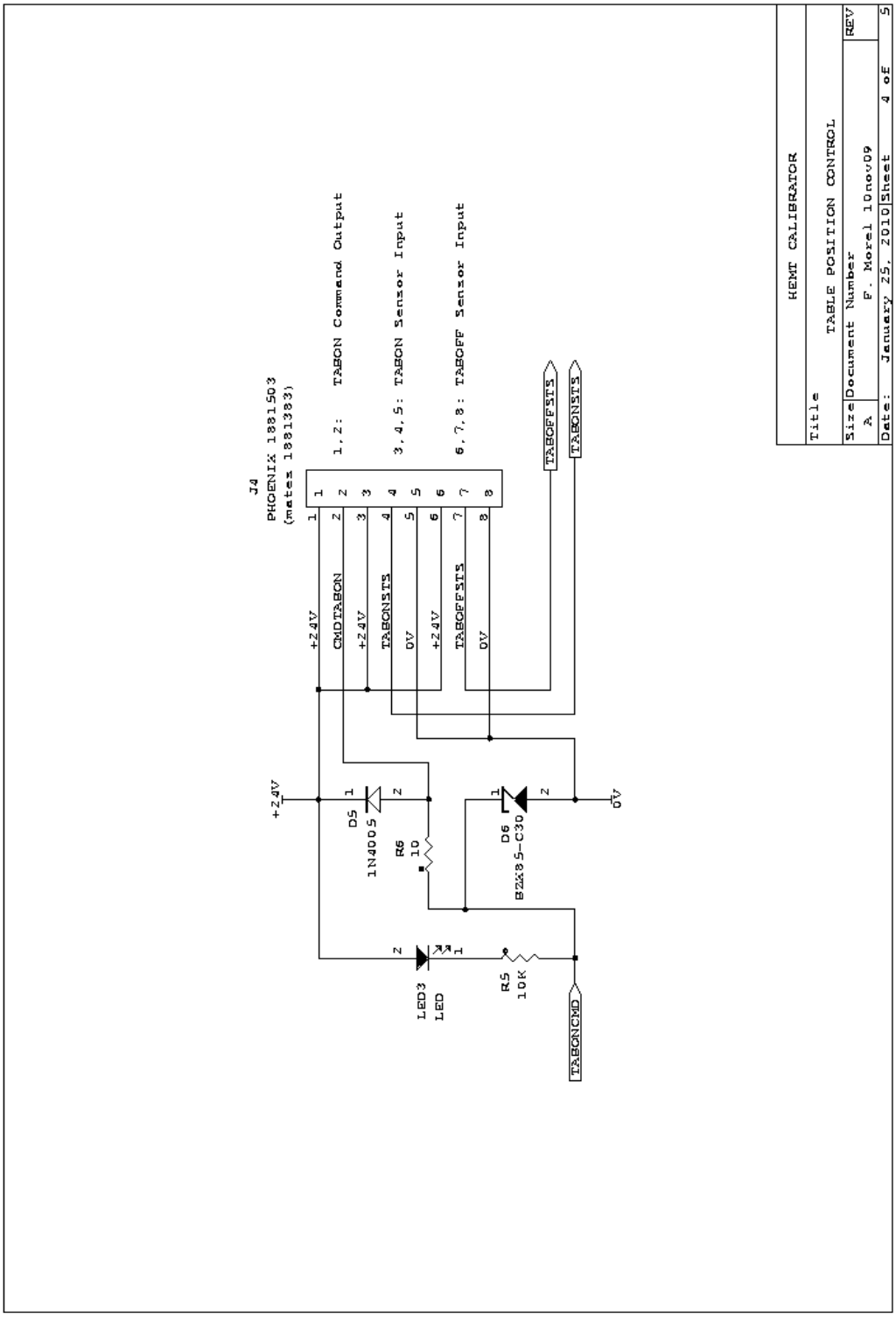
See doc of the CANIO board in ~/computer/doc/can/canIO/canIO.pdf.

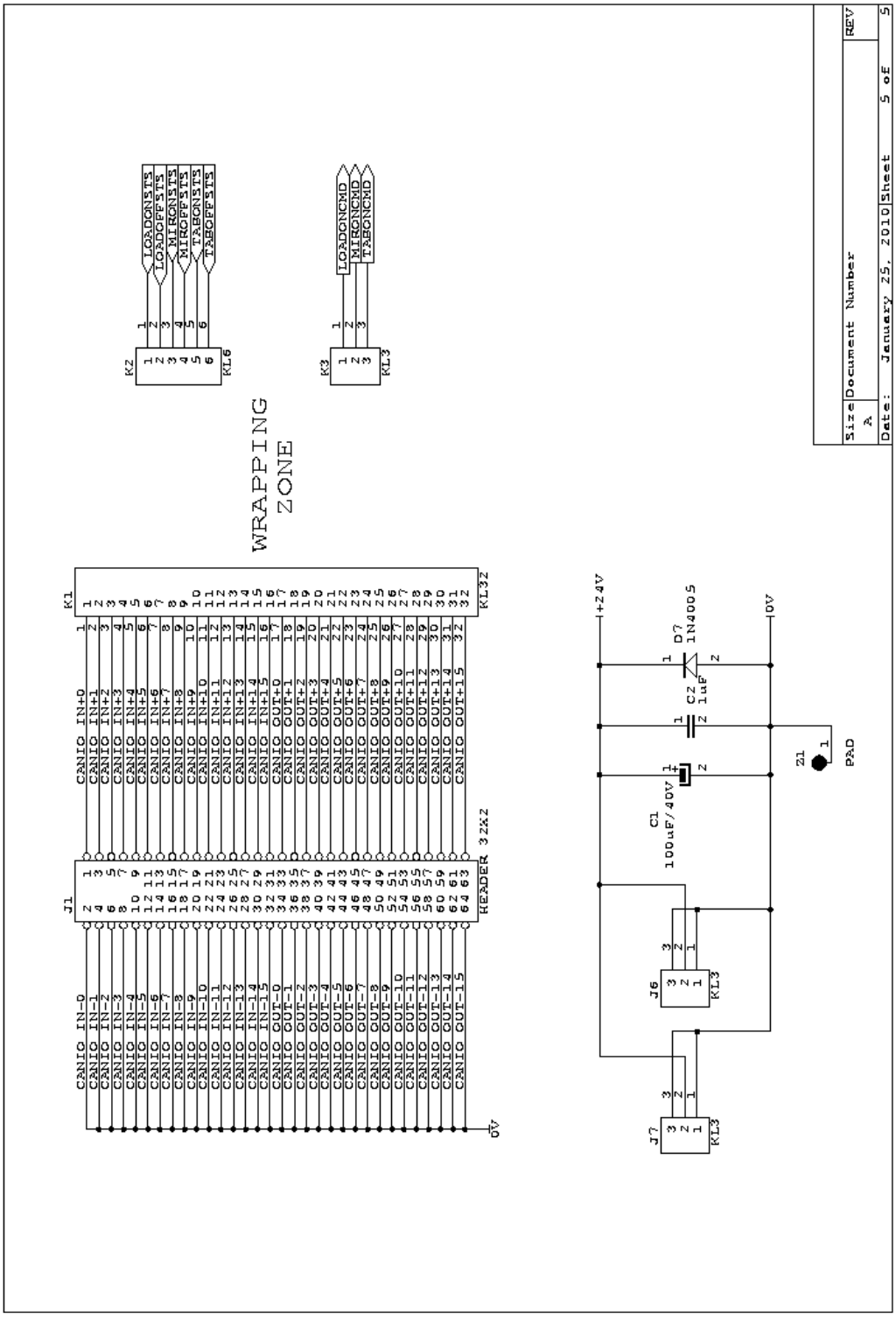
2.3.2 Interface Board schematics


HEMT CALIBRATOR
Title
BLOCK-DIAGRAM
Size
A
Document Number
F. Morel 10nov09
REV
Date: January 12, 2010 Sheet 1 of 5
SHEET 5
INTERCONNECTIONS
LOADONCMD
LOADONSTS
LOADOFFSTS
MIRONCMD
MIRONSTS
MIROFFSTS
TABONCMD
TABONSTS
TABOFFSTS
LOAD POSITION CONTROL
LOADONCMD
LOADONSTS
LOADOFFSTS
SHEET 2
MIRROR CONTROL
MIRONCMD
MIRONSTS
MIROFFSTS
SHEET 3
TABLE CONTROL
TABONCMD
TABONSTS
TABOFFSTS
SHEET 4


HEMT CALIBRATOR
Title
LOAD POSITION CONTROL
Size
A
Document Number
F. Morel 10nov09
REV
Date: January 25, 2010 Sheet 2 of 5
J2
PHOENIX 1881503
(mates 1881383)
1,2: LOADON Command Output
3,4,5: LOADON Sensor Input
6,7,8: LOADOFF Sensor Input
+24V
CMDLOADON
+24V
LOADONSTS
0V
+24V
LOADOFFSTS
0V
LOADOFFSTS
LOADONSTS
+24V
D1
1N4005
R2
10
D2
BZX85-C30
0V
LED1
LED
R1
10K
LOADONCMD


HEMT CALIBRATOR
Title
MIRROR POSITION CONTROL
Size
A
Document Number
F. Morel 10nov09
REV
Date: January 25, 2010 Sheet 3 of 5
J3
PHOENIX 1881503
(mates 1881383)
1,2: MIRON Command Output
3,4,5: MIRON Sensor Input
6,7,8: MIROFF Sensor Input
+24V
CMDMIRON
+24V
MIRONSTS
0V
+24V
MIROFFSTS
0V
MIROFFSTS
MIRONSTS
+24V
D3
1N4005
R4
10
D4
BZX85-C30
0V
LED2
LED
R3
10K
MIRONCMD


HEMT CALIBRATOR
Title
TABLE POSITION CONTROL
Size
A
Document Number
F. Morel 10nov09
REV
Date: January 25, 2010 Sheet 4 of 5
J4
PHOENIX 1881503
(mates 1881383)
1,2: TABON Command Output
3,4,5: TABON Sensor Input
6,7,8: TABOFF Sensor Input
+24V
CMDTABON
+24V
TABONSTS
0V
+24V
TABOFFSTS
0V
TABOFFSTS
TABONSTS
+24V
D5
1N4005
R6
10
D6
BZX85-C30
0V
LED3
LED
R5
10K
TABONCMD


WRAPPING
ZONE
K2
LOADONSTS
LOADOFFSTS
MIRONSTS
MIROFFSTS
T2BONSTS
T2BOFFSTS
KL6
K3
LOADONCMD
MIRONCMD
T2BONCMD
KL3
J1
HEADER 32X2
K1
KL32
CANIO IN-0
CANIO IN-1
CANIO IN-2
CANIO IN-3
CANIO IN-4
CANIO IN-5
CANIO IN-6
CANIO IN-7
CANIO IN-8
CANIO IN-9
CANIO IN-10
CANIO IN-11
CANIO IN-12
CANIO IN-13
CANIO IN-14
CANIO IN-15
CANIO OUT-0
CANIO OUT-1
CANIO OUT-2
CANIO OUT-3
CANIO OUT-4
CANIO OUT-5
CANIO OUT-6
CANIO OUT-7
CANIO OUT-8
CANIO OUT-9
CANIO OUT-10
CANIO OUT-11
CANIO OUT-12
CANIO OUT-13
CANIO OUT-14
CANIO OUT-15
0V
+24V
C1
100uF/40V
C2
1uF
D7
1N4005
Z1
PAD
J6
J7
KL3
Size
A
Document Number
REV
Date: January 25, 2010
Sheet 5 of 5

2.3.3 HEMT Module front-panel CAN Connectors

Both CAN connectors are internally connected pin-to-pin for daisy-chain purpose. Their pinout conforms to IRAM standard:

1	Shield and PE (optional)
2	CAN Low
3	CAN GND
4	unused
5	CAN + 24V Power Supply
6	unused
7	CAN High
8	unused
9	CAN 0V Power Supply

2.3.4 HEMT Module front-panel Calibration devices Connectors

The three connectors are similar:
-Command outputs are current-limited, and were designed to drive 24V/250mA (6 Watt) loads.
But they can drive 60V/3A if the interface board limitation resistor is removed.
-Status inputs will accept any voltage from +/- 5 Volt to +/- 24 Volt.
N.B: The 0V of the "pneumatics" power supply is connected to Earth.

HOT LOAD Connector:

Pin 1 (TOP)	Set Load ON+ Output	+24V
Pin 2	Set Load ON- Output	OFF = +24V, ON = 0V
Pin 3	+24V	Sensor power supply
Pin 4	Load ON Input	Sensor LOAD ON output
Pin 5	0V	Sensor GND
Pin 6	+24V	Sensor power supply
Pin 7	Load OFF Input	Sensor LOAD OFF output
Pin 8 (BOTTOM)	0V	Sensor GND

MIRROR Connector:

Pin 1 (TOP)	Set Mirror ON+ Output	+24V
Pin 2	Set Mirror ON- Output	OFF = +24V, ON = 0V
Pin 3	+24V	Sensor power supply
Pin 4	Mirror ON Input	Sensor MIRROR ON output
Pin 5	0V	Sensor GND
Pin 6	+24V	Sensor power supply
Pin 7	Mirror OFF Input	Sensor MIRROR OFF output
Pin 8 (BOTTOM)	0V	Sensor GND

TABLE Connector:

Pin 1 (TOP)	Set TABLE ON+ Output	+24V
Pin 2	Set TABLE ON- Output	OFF = +24V, ON = 0V
Pin 3	+24V	Sensor power supply
Pin 4	TABLE ON Input	Sensor TABLE ON output
Pin 5	0V	Sensor GND
Pin 6	+24V	Sensor power supply
Pin 7	TABLE OFF Input	Sensor TABLE OFF output
Pin 8 (BOTTOM)	0V	Sensor GND

3 Low-level software Interface

3.1 Commands

16 command bits are available as outputs from the CANIO board.3 bits (selectable through a wrapping zone on the interface board) are used to drive the hot load, the mirror and the table.
Upon startup or after reset, all command outputs are OFF.

Commands are writable at CAN-ID 0x01 0C 01 10

	1	**0**
Bit[2]	Set Table On	Set Table Off
Bit[1]	Set Mirror On	Set Mirror Off
Bit[0]	Set Load On	Set Load Off

3.2 Status

16 status bits are available as inputs to the CANIO board. 6 bits (selectable through a wrapping zone on the interface board) are used to read the limit switches.

Status are readable at CAN-ID 0x01 0C 01 00

	11	**10**	**01 (reset default)**	**00**
Bits[5-4]	Impossible	Table is ON	Table is OFF	Table is moving
Bits[3-2]	Impossible	Mirror is ON	Mirror is OFF	Mirror is moving
Bits[1-0]	Impossible	Load is ON	Load is OFF	Load is moving