NEW TUBE PROTECTION

OPERATING TECHNICAL MANUAL

Telecom Rimini by R.V.R. elettronica

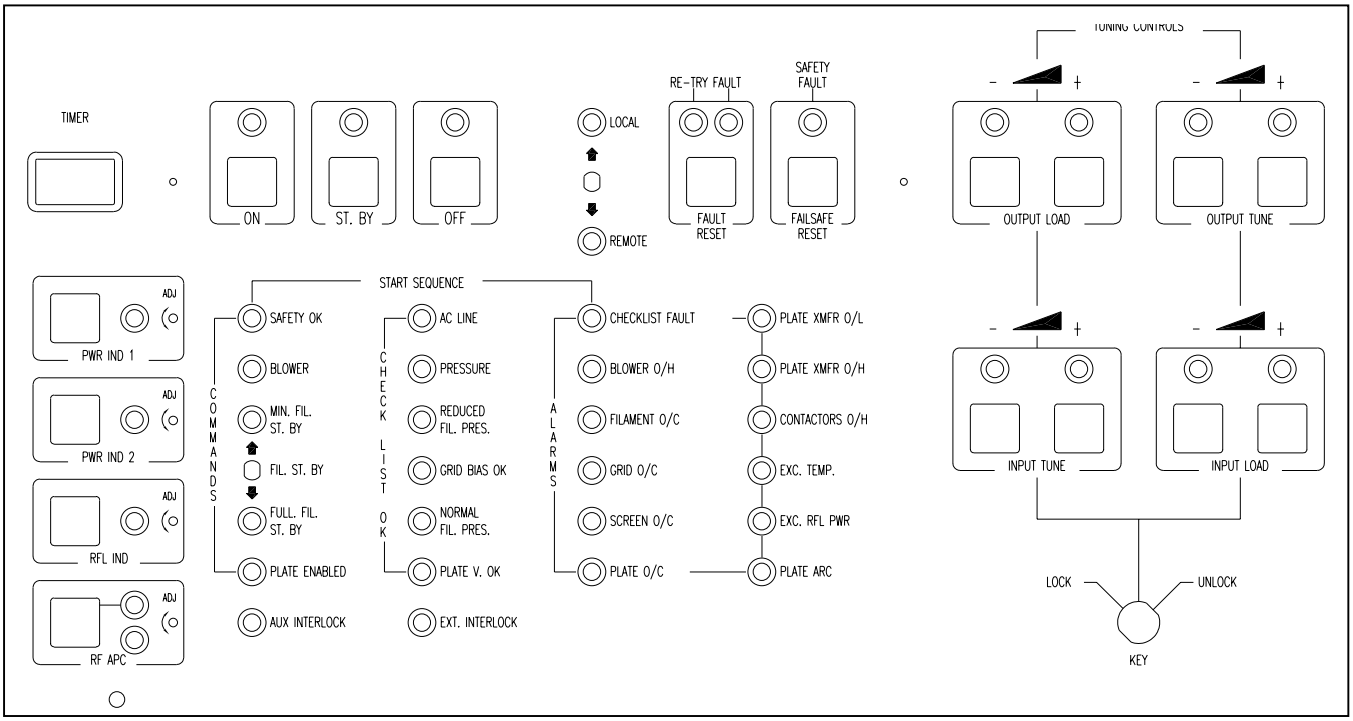
Tube protection technical manual

Introduction

With new microprocessor protection we wanted to realize a product that collects all know-how developed during these years. All working aspects are been taken care in detail with a particularly attention to service personnel requires.

New working ways are been inserted in this equipment, implemented only inside of high technology equipment such as half power stand-by, the local/remote way and the telemetry with LCD display (optional) with the faulty acquisition in real time. All electromechanical parts that are subject to faulty or maintenance is been inserted inside of removable box with wheels. The tube cavity is been completely re-projected improving the quality factor and the radio-electrical screening, then is been facilitated the access to the parts that is subject to the wear and tear decreasing drastically the intervention time inside of the cavity.

In the following chapters we explain the description of the commands and the signaling led placed on the main front panel.



1 COMMANDS

1.1_Operative selectors

LOCAL/REMOTE, PREHEAT/FULL

LOCAL/REMOTE

This selector establishes the coming of the commands. When it's set on the **Remote** position the operative push buttons placed on the front panel aren't enabled. Otherwise, on the **Local** position the commands coming from LCD Telemetry or electromechanical interface card (csintlprotvj) aren't accepted. The LOCAL/REMOTE way is selectable only from the front panel.

PREHEAT/FULL

This selector is active only when the equipment is in ST.BY. way. On the PREHEAT position the filament is supplied at low power. This allows to increase the tube working hours when the equipment is used as reserve. On the FULL position the filament is supplied at full power. During the ST.BY phase it's possible to chose the most appropriate way.

The PREHAT/FULL way is selectable only from the front panel, therefore the ST.BY phase from remote control will follow this setting.

1.2_Local operative push buttons

Local operative push buttons are the following: **OFF, ST.BY, ON , PWR LOWER, FAULT RESET.**

OFF- pushing this push button is stopped the equipment working and it can be pushed in every time. The green led shows that the command is been accepted.

ST.BY- pushing this push button the equipment is placed in standby way working and it can be pushed in every time. The yellow led shows that the command is been accepted. The ST.BY phase will follow the way sets by PREHEAT/FULL selector.

ON- pushing this push button the equipment is placed in operative way and it can be pushed in every time**.** The green led shows that the command is been accepted.

RF APC- pushing this push button the equipment is switched on at low power and the power reduction is adjustable through the trimmer placed near this key. This push button can be pushed in every time. The green led shows that the command is been accepted. A second led placed under this green led shows that the reduction level is active. It's light on when the operative parameter is set in foldback and has exceeded the intervention threshold too. To obtain this working way is necessary to connect output CN8 to exciter feedback input.

FAULT RESET- this push button is active only when one of two RETRY or FAULT led is lighted on, and allows to reset an eventual alarm.

1.3_Remote operative push buttons

Remote operative push buttons are the following: **OFF, ST.BY, ON , PWR LOWER, FAULT RESET.**

When the LOCAL/REMOTE selector is placed on the REMOTE position all commands placed on the front control panel aren't enabled. Remote commands coming from telemetry system, or from the apposite interface card (CSINTLOROTVJ). All commands are of impulsive type, the minimum closing time is 100 ms. The RF APC commands is of TOGGLE type, the commands ON ST.BY OFF **cannot** be pushed contemporaneously, all commands resist without any damage in presence of protracted closing time too. The AUX INTERLOCK signal put the equipment in ST.BY way for all time that is set close.

Pay attention: When you connect (for the first time) the equipment to internal telemetry system, check that the output relays aren't all enabled because any relay placed in ON position can stop the correct working of the electromechanical interface card or to maintain the equipment on EXT INTERLOCK state. Relays can remain in ON state switch off the telemetry system too, to resolve this problem you must disconnect the connector CN15. If on of three commands ON, STBY, OFF remains close, the equipment doesn't accept any other input until the opening of the overwritten commands.

1.4_Service push buttons

Service push buttons are the following: **PWR IND 1, PWR IND 2, RFL IND, TUNNING CONTROLS.**

PWR IND 1- pushing this push button is displayed on the power instrument the power good1 relay commutation level. This level is adjustable through the trimmer placed near to this key and can be set when the equipment is switch off too. Pay attention to the selector in middle to the small instruments, must be placed on the forward power position. When the relay is excited the led placed on the side light up.

PWR IND 2- as like as **PWR IND 1**.

Note:
The **PWR IND** function allows to have a signaling through a contact N.O. or N.C. when the forward power decrease under the operator pre-adjusted threshold. When the relay is excited the led placed on the side light up.

RFL IND - pushing this push button is displayed on the power instrument the RFL IND relay commutation level. This level is adjustable through the trimmer placed near to this key and can be set when the equipment is switch off too. Pay attention to the selector in middle to the small instruments, must be placed on the reflected power position. This last allows to have an alarm signaling through a contact N.O. or N.C. when the reflected power increase over the operator pre-adjusted threshold. When the relay is excited the led placed on the side light up.

Note:
The RFL IND. warning function allows to have a signaling through a contact N.O. or N.C. when the reflected power increase over the operator pre-adjusted threshold. When the relay is excited the led placed on the side light up.

TUNNING CONTROLS- these 8 push buttons allow to tune the input and output circuits. **These push buttons are inhibited if RF APC key led is light on**, an ulterior block is realized with key selector placed on the front panel. The led placed over each key shows that the servomotor is power supplied, and it light down when the gear come up with the end-line position relative to selected movement.

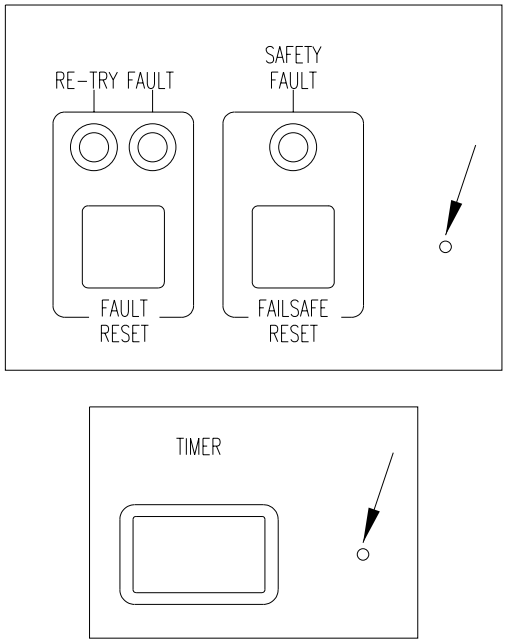
1.5_Special push buttons

The special push buttons are the following: **FAIL SAFE RESET, TIMER ACC, BYPASS PROT.**

FAILSAFE RESET - this push buttons allows to reset any safety protection memorized from equipment. All times that a safety device is removed, the equipment stops all command outputs storing this state. A led shows the overwritten condition. To increase the personnel safety in addition to electronic control is been inserted an electromechanical type control too.

TIMER ACC- this push button isn't directly accessible. Pushing it for a time of 3 seconds the filament heating cycle is accelerated of 10 once.
The push button can be pushed during the heating time too and when it released the remaining time indicated on the display is accelerated of a factor 10. This push button can be pushed in any time, the command is stored and executed at successive cycle.

BYPASS PROT- this push button isn't directly accessible. Pushing it for a time of 3 seconds the protection subjected to RETRY is ignored, the by bass is active for a time of 30 seconds.
This push button can be pushed in any time, the command is stored and executed immediately if the equipment is in ON state otherwise at successive cycle if is in OFF state.



(Regolare con un cacciavite dove indicato dalla freccia: timer e fail safe)

2 SIGNALING LED

Display-on the display is showed the filament timer. The presence on the display of three hyphens indicates that the filament heater time isn't been executed. When the timer starts on the display light on the seconds that decrease until zero; during the normal working the timer indicates zero.

2.1_COMMANDS SIGNALING LED

SAFETY OK- this led when is light on shows that the safety devices are correctly inserted (doors and cavity micro-switches).
Signal type :digital input.

BLOWER- this led when is light on shows that the power relay of the blower is excited. This command is delayed of two minutes during the releasing phase to allow to discharge the heat stored during the working.
Signal type :digital output.

MIN. FIL. ST. BY - this led when is light on shows that the power relay of the filament transformer is excited and the limitation resistors are inserted.
Signal type :digital output.

MAX. FIL. ST. BY - this led when is light on shows that the power relay of the filament transformer is excited and the limitation resistors are short-circuited.
Signal type :digital output.

PLATE ENABLED this led when is light on shows that the power relay of the anode transformer is excited and the limitation resistors aren't disabled.
Signal type :digital output.

2.2_CHECK LIST OK SIGNALING LED

AC LINE- this led when is light on shows that the mains power supplying is correctly present, the signal is delayed of about seven seconds. This signal if not present doesn't enable the equipment start.
During the normal working an unexpected main voltage break stops completely the equipment, and when the mains voltage come back on the equipment restarts automatically, in this case the starting sequence can be of two different type: standard or quick. The standard restart respects the pre-fixed heating time, the quick restart is long only eight seconds and it can happen only the mains voltage break isn't longer than 4 or 5 seconds.
Signal type :digital input.

PRESSURE - this led when is light on shows that the main blower has reach the necessary air flow for a correct working.
This signal if not present stops the starting sequence of equipment and after 4 seconds is light on the check list fault led.
Signal type :digital input.

MIN. FIL. ST. BY - this led when is light on shows that the minimum value of the filament current is been reached. If the tube isn't correctly inserted on the socket or if the tube filament is broken, the current minimum value isn't reached. This signal if isn't present stops the starting sequence of equipment and after 2 seconds is light on check list fault led.
Signal type: complex analog input.

GRID BIAS - this led when is light on shows that the Bias signal is correctly present (always lighted on in triode equipment). This signal if isn't present stops the starting sequence of equipment and after 2 seconds is light on check list fault led.
Signal type: digital input.

FULL FIL. ST. BY- this led when is light on shows that the minimum value of the filament voltage current is been reached. This signal if isn't present stops the starting sequence of equipment and after 2 seconds is light on check list fault led.
MIN. FIL. ST. BY and FULL FIL. ST. BY signals are of analog type and indicate respectively filament current and voltage.
On MIN. FIL. ST. BY and FULL FIL. ST. BY signals are inserted two tripping thresholds, for eventual adjustment (see as reference adjustments section).

PLATE V.- this led when is light on shows that the voltage minimum threshold of the anode circuit is been reached. This signal if isn't present stops definitively the starting sequence of equipment and after 2 seconds is light on the FAULT led.
Signal type: digital input.

2.3_INTERLOCK SIGNALING LED

AUX INTERLOCK-(N.O.) the lighting on of this led shows that the equipment is kept necessarily in stand by condition. This signal is operative when is close. The AUX INTERLOCK is active in both ways of local or remote command, and can come both from telemetry and from interface card. The closing of this signal during the working put automatically the equipment in stand by state.

EXT INTERLOCK-(N.C.) the lighting on of this led shows that the equipment is kept necessarily in stand by condition. This signal is operative when is open. The EXT INTERLOCK is active in both ways of local or remote command, and can come both from main terminal board. The opening of this signal during the working put automatically the equipment in stand by state. This signal is normally used to block the transmitter through the coaxial relay protection contact.

Note:

if during a break time, caused to an alarm, comes in Interlock command, timers continue to advance until the end of the programmed time, the signaling led remain until the interlock command removing.

The interlock command opening and closing during the working put the equipment in stand-by state, the filament power in this state will follow that set on the command front panel.

2.4_COMMAND OUTPUTS SIGNALING LED

BLOWER- the lighting on of this led shows that the blower power relay is excited. When the equipment is placed on the OFF state this relay switches off itself after two minutes. This shrewdness is adopted to avoid temperature peaks inside of the tube; in all conditions of voluntary break or alarm is always executed a post-ventilation.

MIN. FIL. ST. BY - **-** the lighting on of this led shows that the middle filament section power relay is been excited.

Note:

every time that MIN. FIL. ST. BY relay is excited, the alarm on the filament current is disabled for a time of 4 seconds; This shrewdness is adopted to guarantee the starting of the equipment in presence of very low temperatures.

FULL FIL. ST. BY - the lighting on of this led shows that the entire filament section power relay is been excited.

PLATE ENABLED - the lighting on of this led shows that the second power relay of anode transformer is been excited..

Note :

every time that relays dedicated to the supplying of anodic circuit are released, the following alarms allarmi PLATE CURR., GRID CURR., SCREEN CURR., EXC. RFL PWR, PLATE ARC are disabled for a period of 300 milliseconds.

2.5_FIRST LEVEL ALARMS SIGNALLING LED

The equipment is supplied of three different alarms level.

In the first level are inserted those signals (check list ok) that during the switching on of the equipment are enables and allow to accede to the next phase. The absence of one of them within the prefixed time, causes the lighting on of the check list fault led; the restoration of the absence signal allows to accede to the next phase completing the starting sequence. The absence of the PRESSURE signal after the arrive of the MIN. FIL. ST. BY signal put automatically the equipment in FAULT state. The absence of the AC LINE signal causes the reset of the command outputs and the freezing of the synoptic led, the return of the signal allows the synoptic updating and the starting of the start up sequence.

If during the working fail one or more signals of the CHECK LIST OK, the system switches off the anodic supplying; if within a maximum period of 10 seconds the signal comes back, the system returns automatically in function. This shrewdness allows to not stop the equipment in presence of mains voltage micro-breaks. When a signal of the check list ok intervenes putting the

equipment in Fault, is possible to identify the signal that has caused the anomaly: the check list ok led switched off is the cause of the event.
The starting sequence signals are those identified as check list ok : AC LINE, PRESSURE, MIN. FIL. ST. BY, GRID O/C, FULL FIL. ST. BY, PLATE V.

CHECK LIST FAULT- the lighting on of this led shows the absence of one or more consents listed in the check list ok, the switching on sequence is temporary suspended or definitively interrupted if Fault led is lighted on.
Signal type: virtual signal.

PLATE XMFR O/H - the lighting on of this led shows that the thermal sensor placed inside of laminar section is intervened This alarm type causes a temporary working block, and when the transformer will be cool down, the equipment will come back in working automatically. **The FAULT RESET push button doesn't intervene on this alarm type**.
Signal type: digital input.

RETRY- the lighting on of this led shows that the equipment is momentarily blocked until the waiting time is passed, expired that the system come back in working automatically.
FAULT- the lighting on of this led shows that an anomaly of fatal type is occurred or are just executed all RETRY attempts relative to a specific alarm.

2.6_ SECOND LEVEL ALARMS SIGNALLING LED

The second level alarms are safety thresholds beyond that the working is blocked definitively, and the alarm threshold overcoming from a parameter put the equipment in RETRY way. In this state is taken away the mains voltage to anode circuit for a period of 16 seconds, passed that the equipment starts again automatically. Each parameter is equipped with an events counter, after four consecutive events until 30 minutes from the last event is introduced a waiting time of others 30 minutes. Ended this long waiting time the equipment starts again automatically, if others four events happened, at 8th event the system goes in FAULT state. After a period of 35 minutes from the last alarm occurred all events counters are reset.

GRID O/C - the lighting on of this led shows an excessive Grid 1 current. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately. In the ST-BY state is been foreseen a protection that safeguards Grid 1 from eventual current excesses caused to an erroneous presence of driver power. During the ST.BY phase if the Grid 1 current is present, exceeding the protection threshold for a period of 4 seconds, the equipment safeguards itself removing the power supplying to filament and put in FAULT state the equipment.
SCREEN O/G.- the lighting on of this led shows an excessive Grid 2 current. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately.

PLATE O/C.- the lighting on of this led shows an excessive Anode current. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately.

EXC. RFL PWR- the lighting on of this led shows the presence of a reflected power level higher than the programmed threshold level. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately. Is possible to intervene on this alarm threshold through the trimmer TR8 (see as reference adjustments section). This alarm is active when the equipment is in ST.BY state too; this function allows to protect the system if is connected to a combiner and this last has lost the isolation between the different inputs. The alarm intervention logic in this condition too is the same of the alarms second level.

EXT. TEMP - the lighting on of this led shows the presence of a temperature higher than the programmed threshold level for the internal part of the tube cavity. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately. Is possible to intervene on this alarm threshold through the trimmer TR1 (see as reference adjustments section).

The second level alarm signals are those identified as "ALARMS" and more exactly : GRID O/C., SCREEN O/C., PLATE O/C., EXCIT. TEMP, EXC. RFL PWR, PLATE ARC.

PLATE ARC- the lighting on of this led shows that is happened a spark inside of the tube cavity. This alarm type put the equipment in RETRY state, passed the waiting period of 16 seconds, the equipped will take again the working automatically. Pushing the FAULT RESET the equipment restarts immediately. This alarm is different from others for tentative numbers that is been reduced at two plus two.

Note:
all second level alarms subjected to RETRY can become to the third level simply removing a jumper on the control card. To enable this working type remove the jumper **JP11 (**see as reference adjustments section)**.**

Note:
through the jumper **JP13** is possible to remove the waiting time of 30 minutes so that all attempts are consecutive **(**see as reference adjustments section)**.**

Alarms recapitulatory table subjected to retry

	Retry 1	**Retry 2**	**Retry 3**	**Retry 4**		**Retry 5**	**Retry 6**	**Retry 7**	**Retry 8**	
PLATE O/C.	16”	16”	16”	16”	30’/16”	16”	16”	16”	16”	Fault
GRID O/C.	16”	16”	16”	16”	30’/16”	16”	16”	16”	16”	Fault
SCREEN O/C.	16”	16”	16”	16”	30’/16”	16”	16”	16”	16”	Fault
Temp°C	16”	16”	16”	16”	30’/16”	16”	16”	16”	16”	Fault
PLATE ARC	16”	16”	-	-	30’/16”	16”	16”	-	-	Fault
PLATE XMFR O/H	Retry									

2.7_THIRD LEVEL ALARMS SIGNALLING LED

The third level alarms are safety thresholds or signal levels that put the equipment in FAULT state without the execution of any attempt of restoring. Some of these are intervenes of mechanical type that have the necessity of the operator presence to can restart the equipment.

The third level alarm signals are those identified as “ALARMS” and more exactly: BLOWER O/H, **CONTACTORS O/H, PLATE XMFR O/L, FILAMENT O/C.**

BLOWER O/H - the lighting on of this led shows that is intervened the protection thermal contact of the blower motor. This alarm type put the equipment in FAULT state. To restore the working is necessary to reset the thermal contact and then push the FAULT RESET.
Signal type: digital input.

PLATE XMFR O/L - the lighting on of this led shows that is intervened the protection thermal contact of the anode transformer. This alarm type put the equipment in FAULT state. To restore the working is necessary to reset the thermal contact and then push the FAULT RESET.
Signal type: digital input.

CONTACTORS O/H - the lighting on of this led shows that is intervened the protection thermal sensor placed on the contacts (optional) of the anode transformer contactor because these are too hot. This alarm type put the equipment in FAULT state. To restore the working is necessary to replace the power contactors group and then push the FAULT RESET.
Signal type: digital input.

FILAMENT O/C. - the lighting on of this led shows an excessive filament current. This alarm type put the equipment in FAULT state. To restore the working is necessary to push the FAULT RESET., if the alarm comes back, execute the opportune technical controls.

Note:

all three types alarms are endowed with memory. When one or more alarms intervene putting the equipment in RETRY or FAULT state, the relative led are maintained lighted on, until the waiting period ending for the RETRY state and permanently in FAULT state.

The pushing of the FAULT RESET key, or the absence and the return of the MAINS signal resets alarm led memory.

The signals FILAMENT O/C., GRID O/C., SCREEN O/C., PLATE O/C., are of analog type, the intervention alarm thresholds aren't adjustable and the intervention point value is fixed in 3,9V. The signals EXC. TEMP, EXC. RFL PWR are of analog type, the intervention thresholds are adjustable by a trimmer; The upper intervention point is always fixed at 3,9V.

Alarms recapitulatory table subjected to Fault

BLOWER O / H	Fault
PLATE XMFR O/L	Fault
FILAMENT O/C.	Fault
CLAMP O-HEATt	Fault

3 WORKING OPERATIONS

When is pushed ON or ST.BY key begins the start sequence, a series of signals and enables must happen in succession. All signals and enables are been group in the following table. The equipment working can be divided in three state: ON, STBY, OFF. At each state is associated a working push button, pushing the desired push button the equipment executes all procedures to go in the selected state. These three push buttons can be pushed in any moment. All start and stop sequences are totally automatic.

ON State: this is operative working state and the anode circuit is supplied.

ST.BY State: in this state the tube is hot and for this reason will be able to pass to ON state in any moment will be request; the anode circuit isn't supplied.

OFF State: in this state the equipment is completely switched off.

Recapitulatory table of the sequences signals and enables for the ON working state

Push Button	**Safety**	**Mains**	**Aux interlock**	**Ext interlock**	**STATUS**		**Fail safe**	**Retry**	**Fault**	**Check list OK**	
ON	-	-	-	-	-		-	-	-	-	
Steep 1	●	●	-	-	Blower	●	○	○	○	PRESSURE	●
Steep 2	●	●	-	-	MIN. FIL. ST. BY	●	○	○	○	MIN. FIL. ST. BY GRID O/C	●●
Steep 3	●	●	-	-	MAX. FIL. ST. BY	●	○	○	○	MAX. FIL. ST. BY	●
Steep 4	Filament Timer										
Steep 5	●	●	○	○	PLATE XMFR O/H	●	○	○	○	VA	●
OPERATIVE ON STATE											
○ = Led off ● = Led on - = Indifferent											

Recapitulatory table of the sequences signals and enables for the ST.BY PRE HEAT working state

Push Button	**Safety**	**AC LINE**	**Aux interlock**	**Ext interlock**	**STATUS**		**Fail safe**	**Retry**	**Fault**	**Check list OK**	
ST.BY	-	-	-	-	-		-	-	-	-	
Steep 1	●	●	-	-	Blower	●	○	○	○	PRESSURE	●
Steep 2	●	●	-	-	MIN. FIL. ST. BY	●	○	○	○	MIN. FIL. ST. BY GRID O/C	●●
PRE HEAT	STAND BY PRE HEAT STATE										
○ = Led off ● = Led on - = Indifferent											

Recapitulatory table of the sequences signals and enables for the ST.BY FULL state

Pulsante	**Safety**	**AC LINE**	**Aux interlock**	**Ext interlock**	**STATUS**		**Fail safe**	**Retry**	**Fault**	**Check list OK**	
ST.BY	-	-	-	-	-		-	-	-	-	
Steep 1	●	●	-	-	Blower	●	○	○	○	PRESSURE	●
Steep 2	●	●	-	-	MIN. FIL. ST. BY	●	○	○	○	MIN. FIL. ST. BY GRID O / C	●●
Steep 3	●	●	-	-	MAX. FIL. ST. BY	●	○	○	○	MAX. FIL. ST. BY	●
FULL	Filament Timer										
STAND BY FULL STATE											
○ = Led off ● = Led on - = Indifferent											

Note: in tiode equipment version the signal marked G1 Bias is always present with equipment in OFF state too.

Recapitulatory table of the enables and commands state during ON and ST-BY state

Signals	ON state led	Contact or level state	FIL. ST. BY state led	Contact or level state	FULL FIL. ST. BY state led	Contact or level state
COMMANDS						
BLOWER	●	-	●	-	●	-
MIN. FIL. ST. BY	●	-	●	-	●	-
FULL FIL. ST. BY	●	-	○	-	●	-
PLATE ENABLED	●	-	○	-	○	-
CHECK LIST OK						
SAFETY	●	**N.C.**	●	**N.C.**	●	**N.C.**
AC LINE	●	**N.C.**	●	**N.C.**	●	**N.C.**
PRESSURE	●	**N.C.**	●	**N.C.**	●	**N.C.**
MIN. FIL. ST. BY	●	**H**	●	**N.C.**	●	**N.C.**
GRID O/C	●	**N.C.**	●	**N.C.**	●	**N.C.**
FULL FIL. ST. BY	●	**H**	○	**-**	●	**H**
PLATE XMFR O/L.	●	**N.C.**	○	**-**	○	**-**
AUX INTERLOCK	○	**N.O.**	=	=	=	=
EXT INTERLOCK	○	**N.C.**	=	=	=	=
ALARMS						
CHECK LIST FAULT	○	**L**	○	**L**	○	**L**
BLOWER O/H	○	**N.O.**	○	**N.O.**	○	**N.O**
FILAMENT O/C..	○	<3.9V	○	<3.9V	○	<3.9V
GRID O/C.	○	<3.9V	○	<3.9V	○	<3.9V
SCREEN O/C.	○	<3.9V	○	<3.9V	○	<3.9V
PLATE O / C	○	<3.9V	○	<3.9V	○	<3.9V
PLATE XMFR O/L	○	**N.O.**	○	**N.O.**	○	**N.O**
ANDODE TRF O-HEAT	○	**N.O.**	○	**N.O.**	○	**N.O**
CONTACTORS O/H	○	**N.C.**	○	**N.C.**	○	**N.O**
EXCT. TEMP	○	<3.4V	○	<3.4V	○	<3.4V
EXC. RFL PWR	○	<3.8V	○	<3.8V	○	<3.8V
PLATE ARC	○	**L**	○	**L**	○	**L**

○ = Led off ● = Led on - = Indifferent N.C.= contact normally close N.O.= contact normally open H = high level L = low level - = not considered x.xV = alarm voltage level

3.1_Special functions

This function is been realized to facilitate the troubleshootting; when the equipment is put in OFF state all input signals of the control card is displayed on the synoptic without to generate alarms and to active command outputs. The operator can so proceed to insert and disconnect all electromechanical enables such as end line position, thermal contacts, etc. checking their correct working. Disconnecting CN11 connector and inserting in the same position the analog checking tools is possible to verify completely all signals of the control card. This device allows to change and to simulate analog signals relative to the tube. Through this device is possible to verify the adjusting and the displaying on the meters placed on the equipment front panel too.

TLC3000/V Telemetry System

The equipment control circuit is been projected so that to support a rather refined telemetry system, the two control logic are completely indipendent, an eventual anomaly caused by the telemetry system doesn't cause a transmitter working anomaly.

Power supply voltages

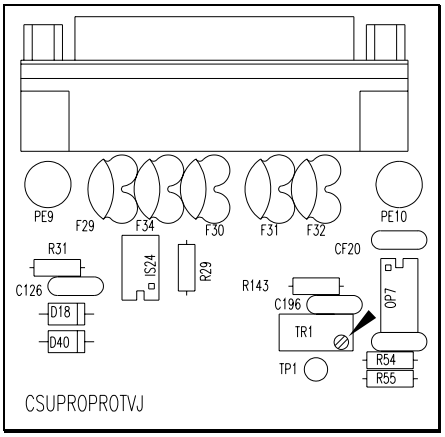
The control card (CSUPROPROTVJ) furnishes to all cards connected to itself tthe relative power supply voltages, all connectors except CN3 are protected by grounded protracted short-circuit, the negative pole of the mains voltage is connected to the chassis ground.

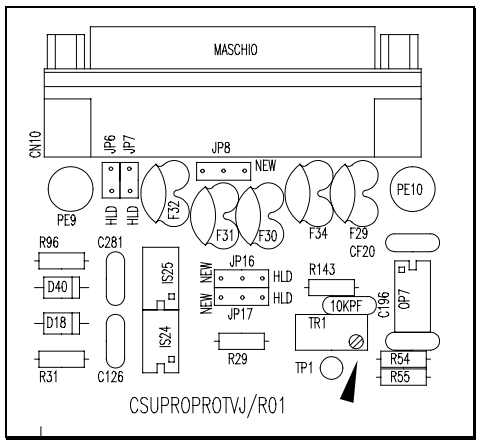
4 ADJUSTMENT AND SETTING OPERATIONS

All alarm levels of analog type have as maximum intervention threshold the limit of 3,9V. This voltage is supplied to control card from measures card (VALVMEASVJ). Some signals can be adjusted to have maximum intervention threshold lower than the limit over described.

4.1_Working temperature maximum value adjustment

The default setting of this alarm is of 80°C equal to 3,4V; through the test point TP1 is possible to read the preset level. To set a new value turn the trimmer TR1.
The temperature and voltage value are correlated in according to the following equation:
$V_{alarm} = \left[\left(10_{mV}/°c * T_{emp}\right) + 500_{mV}\right] * 2{,}6$

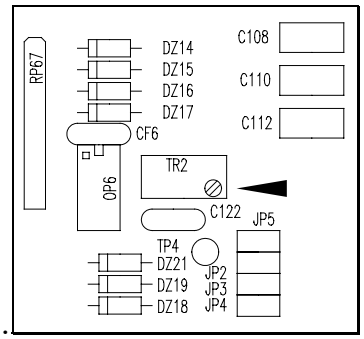




Note: When the equipment is in folder temperature working way is necessary to set the alarm threshold at 90°C equal to 3.7V of threshold. This operation is necessary because the folder intervention threshold is about 80°C.

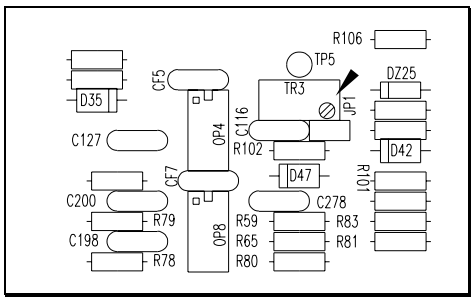
4.2_ Filament current minimum value adjustment

To MIN. FIL. ST. BY adjustment place the tester on TP4 and then turn the trimmer TR2 to obtain a value of 1,95V.
See as reference the following drawing.



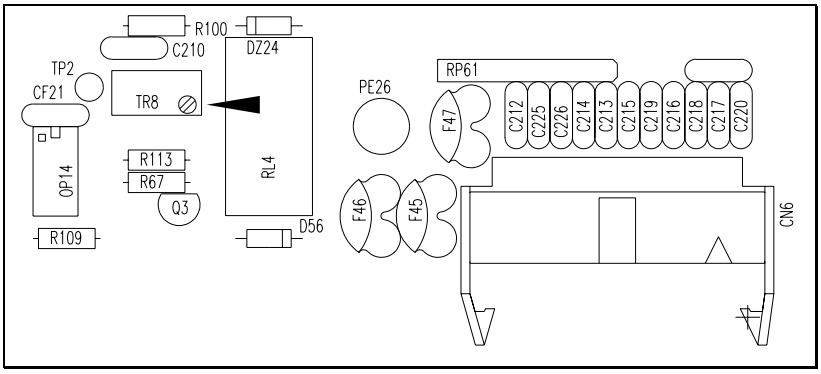
4.3_ Filament voltage minimum value adjustment

To MAX. FIL. ST. BY adjustment place the tester on TP5 and then turn the trimmer TR3 to obtain a value of 3,10V.
See as reference the following drawing.



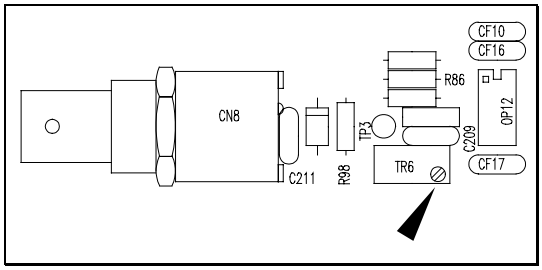
4.4_ Reflected power alarm value adjustment

The default setting of this alarm is 3,8V; through the test point TP2 is possible to read the preset level. To set a new value turn the trimmer TR8.



4.5_ Output static offset voltage value adjustment

The default setting of this alarm is 2V. To set a new value turn the trimmer TR6. This adjustment is necessary when the equipment is put in folder with the exciter; this value is very good so that it's advisable to operate on the exciter input level.

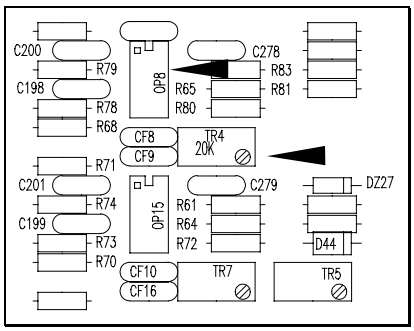


4.6_ Loop gain value adjustment during folder working

Through the trimmer TR7 is set the loop gain when the equipment works in folder; the trimmer during the adjusting is set to gain minimum value, turn it in clockwise to increase the value.
PAY ATTENTION: a high gain can generate instability and huntings!

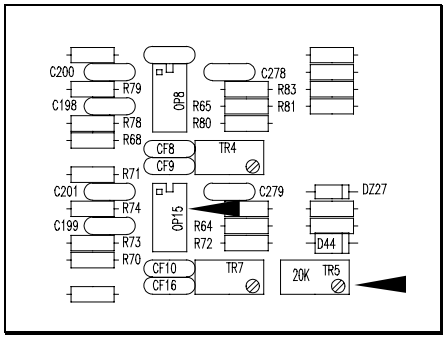
4.7_ Forward power amplification chain offset adjustment

Connect to ground the input (+) and (-) (pin 6 and 7 of CN7); measure with the multi-meter (mV scale) on pin 7 of OP8, work on TR4 to have 0V on output of the over described operational amplifier.



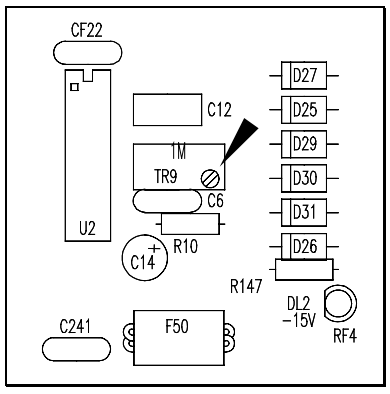
4.8_ Reflected power amplification chain offset adjustment

Connect to ground the input (+) and (-) (pin 8 and 9 of CN7); measure with the multi-meter (mV scale) on pin 7 of OP15, work on TR5 to have 0V on output of the over described operational amplifier.



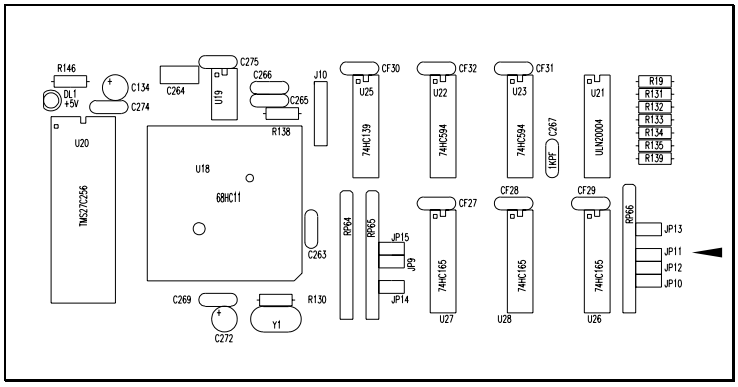
4.9_ Black out time adjustment

To increase the black out time to have a quick restarting turn clockwise TR9, this time is prefixed at about 4/5 seconds.

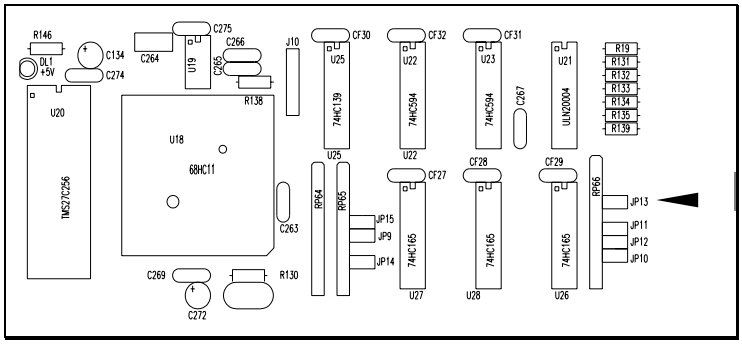


4.10_ Waiting time setting

Removing jumper **JP11** is possible to put the equipment in fault state without to execute any retry attempts.



Inserting jumper **JP13** the waiting time of 30 minutes it set to 16 seconds.



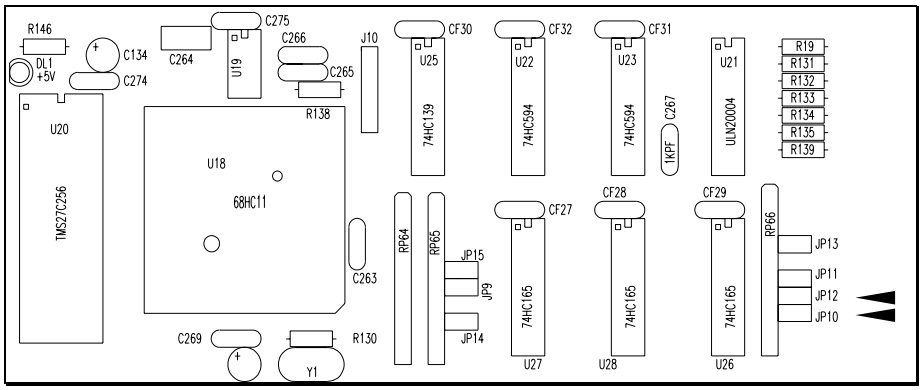
4.11_ Filament heating time setting

Through jumpers JP12 and JP10 is possible to set the filament heating time as indicated in the following table.

Time in seconds	JP10	JP12
30	●	●
60	○	●
120	●	○
180*	○	○
○ = jumper no inserted ● = jumper inserted		

Note:

***Release of 29-04-02 V1.30 The filament time, of 180 seconds, was substituted by 5 seconds.**

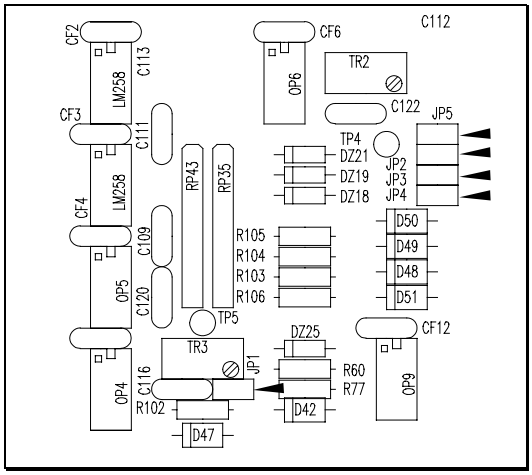


4.12_Folder parameters setting

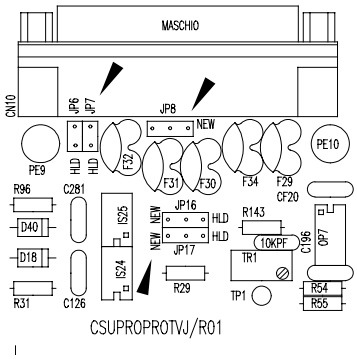
Through a series of jumpers is possible to put in folder main electrical parameters that check the tube. As default isn't inserted any parameter, is available the contemporary insertion of all parameters. When the jumpers are inserted the relative parameter goes in folder loop and reaches about 3.5V; to execute an eventual measure, connect a tester pole to ground and the other to the jumper used as test point.

For the temperature folder see as reference the note in the adjustments section.

Electrical Parameters	Jumper	Folder
Temperature	JP5 ●	YES
Grid 1 Current	JP2 ●	YES
Grid 2 Current	JP3 ●	YES
Anode Current	JP4 ●	YES
Reflected Power	JP1 ●	YES
○ = jumper no inserted ● = jumper inserted folder active		



Input configuration for the driver gate CN10



With version CSUPROPROTVJ/R01 results compatible the driver telemetry input fo the CN10 driver with new mosfet protection. To select the new or old version moving the jumpers as indicated in the following table.

Driver protection	JP6	JP7	JP8	JP16	JP17
New version	-	-	● New	● New	● New
Old version	● Hld	● Hld	● Hld	● Hld	● Hld
Insert jumpers in according to serigraphy ●= jumper -=no jumper					

5 OUTPUT INTERFACES

All output signals of the control card are interfaced through a power relay and a signal relay. On the tripping coils of the relays is present a signaling led that indicates control unit command state, all power contacts are equipped with noise-limiter. Relays' power supply is obtained through a power line protected from short-circuit by automatic resetting circuit breakers.

5.1_CSRLYCPROTVJ CARD

This interface card allows to drive the tripping coils of the power contacts. The signals coming from control card are of NPN type and are active when are connected to ground. All relays are equipped with signaling led; this led shows when is lighted on, that the coil is excited. The tripping coil of the relay RL7 marked as serigraphy SAF, is dedicated to an ulterior personnel safety, this relay is excited only when all safety micro switches are close. This relay contact acts on common pole of the power supplying of the power contacts. At protection of the card is been placed a fuse FS1 of the type 30x38 - 10A. The lighting on of the led DL8 indicates the breaking of the fuse FS1.
This interface is connected to control panel through the connector CN18 and is directly under the control of the microprocessor.
PAY ATTENTION: connect always the ground wire on the turret PE1.
Signals present on the card:

Serigraphy	Function	Led	Output Socket	Command
FAN-RL1	Fan Blower	DL1	JP3/7	CN18/9
FIL1-RL2	Filament 1 level	DL2	JP3/3	CN18/8
FIL2-RL3	Filament 2 level	DL3	JP3/4	CN18/3
HV1-RL4	HV 1 level	DL4	JP3/5	CN18/1
HV2-RL5	HV 2 level	DL5	JP3/6	CN18/4
AUS-RL6	Reserve	DL6	JP3/8-9	CN18/2
SAF-RL7	Safety	DL7	JP2/1-2/3-4	

See as reference the electrical drawings.

5.2_CSRLYPROTVJ CARD

This interface card allows to drive the four servomotors that are used for tuning, each motor output is equipped with the relative end line switch normally close, if this last isn't used, it's necessary insert a jumper wire. All relays are equipped with signaling led that is lighted on when the push buttons on the control panel are pushed. The intervention of the end line switch doesn't switch off the command led but acts directly on the power. When relay aren't excited, both poles of the servomotors are short-circuited to ground. The led DL9 indicates the presence of the power supplying +12Vdc. To protection of the card is been placed a fuse FS1 of the type 30x38 - 10A.
The card is stopped and the key selector is in lock position otherwise if the folder key is pushed.
This interface is connected to control panel through the connector CN20 and is independent from the control system (apart RL5).
Note:
Led placed on the control panel indicate the exact servomotor power supplying. Once is been decided the verse of the rotation for tuning operation, the relative led switches off when the mechanical device reaches the end line position.
PAY ATTENTION: connect always the ground wire on the turret PE1.
See as reference the electrical drawings.

5.3_CSINTLPROTVJ CARD

This interface card is optional and is been realized to connect to external telemetry. In this card are inserted all main signals that indicates the working state. From this card is possible to drive completely the equipment. The state output signals are of electromechanical type, by jumpers JP1….JP14 is possible to select the polarity of the NO or NC contact. All relays contacts are connected to clamp 1 of the socket JP12. The total current on the contacts mustn't exceed 2A. It's very important that the output contacts are clean.
The input commands of the card must be executed by clean contacts. The pole common of the power supplying is kept from JP12/14; these commands works only if commands ways selector is on the remote position.
This interface is connected to control panel through the connector CN14 and is directly under the control of the microprocessor.
All relays are equipped with signaling led; led lighted on shows that the coil is excited.
Connecting the connector CN1 to measure card (vlavemeasvj) all analog variables normalized at 3,9V are available on the connector CN2.
In connector CN3 are present the same commands present on the socket JP13. In connector CN4 are present out relay contacts but the common is connected to ground.
The connectors CN2, CN3, CN4 are directly compatible with the telemetry system TLC3000.
PAY ATTENTION: connect always the ground wire on the turret PE1.
See as reference the electrical drawings.

Commands socket

Function	Terminal
Command ON	JP13/1
Command stby	JP13/2
Command off	JP13/3
Command reset retry fault	JP13/4
Command power lower	JP13/5
Commands power supplying	JP12/14

Output socket

Function	Terminal
Relay common pole	JP12/1
Output contact – confirmation command ON	JP12/2
Output contact – confirmation command ST-BY	JP12/3
Output contact – confirmation command OFF	JP12/4
Output contact – confirmation command POWER LOWER	JP12/5
Output contact – confirmation command RETRY state or FAULT or Check list not OK	JP12/6
Output contact - WARNING SWR	JP12/7
Output contact - POWER GOOD 1	JP12/8
Output contact - POWER GOOD 2	JP12/9
Output contact – LOCAL/REMOTE state	JP12/10
Output contact – DRIVER FAULT	JP12/11
Output contact – confirmation command ON DRIVER	JP12/12
Output contact – confirmation command SWR DRIVER	JP12/13
Commands power supplying output	JP12/14

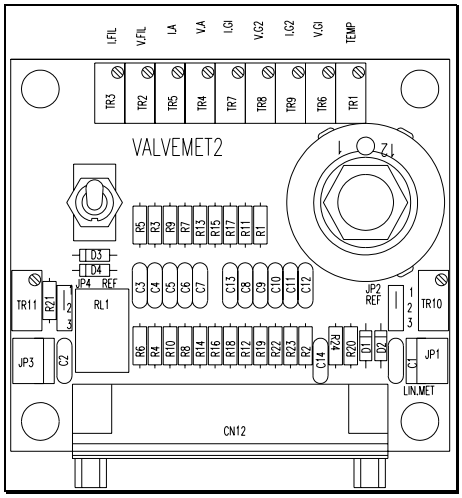
5.4_VALVEMET2 CARD

This interface card valvemet2 allows to display by two index instruments all analog electrical parameters. An instrument will display all linear type parameters and the other of quadratic type. All values are normalized for a full scale of 3,9 V.

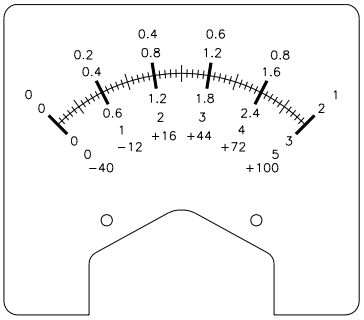
To execute the setting, execute the following operations: place jumpers JP2 and JP4 both on the positions **2-3;** acts on TR10 to bring the instruments index of the analog parameters on the full scale, repeat this operation with TR11 to adjust the quadratic parameters. Remember to restore both jumpers on the position **1-2**. Select the interesting parameter by rotary commutator, turn the relative trimmer to adapt the value to instrument scale.

Note:

The relay RL1, in absence of the mains voltage, provides to short-circuit all instrument's inputs to avoid damages during the shipment.



5.5_ANALOG VALUES AND PARAMETERS FOR THE VERSION FROM 5-8-10-15-20 KW



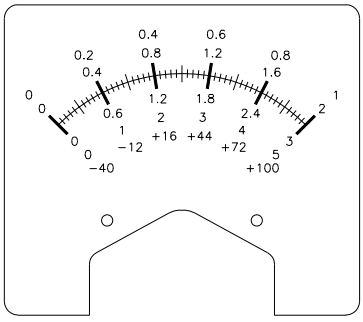
Operative parameters nominal values

Amplif/tube	°C	V.FIL	I:FIL	VA	IA	V.G1	I.G1	V.G2	I.G2	RFL
VJ5000TR 3CX3000	70°C	7.5V	51A	4800V	1.5A	-47V	280mA	-	-	500W
VJ5000TEV1 4CX5000	70°C	7.5V	75A	6000V	1.5A	-140V	50mA	650V	70mA	500W
VJ5000TEV2 4CX3500	70°C	5V	90A	5500V	1.5A	-140V	50mA	650V	70mA	500W
VJ8000 YV148	70°C	7V	78A	6000V	2A	-55V	350mA	-	-	800
VJ10000TR 3CX15000	70°C	6.3V	160A	7000V	2A	±60V	350mA	-	-	1000W
VJ12000TR 3CX15000	70°C	6.3V	160A	7000V	2.2A	±60V	350mA	-	-	1000W
VJ10000TE 4CX75000	70°C	7V	110A	7000V	2A	-150V	40mA	700V	80mA	1000W
VJ10000TE 4CX10000	70°C	7.5V	75A	7000V	2A	-200V	40mA	800V	100mA	1000W
VJ15000TR 3CX15000	70°C	6.3V	160A	7000V	2.5A	-60V	400mA	-	-	1000W
VJ20000TR 3CX15000	70°C	6.3V	160A	7000V	3A	-60V	460mA	-	-	1000W
VJ25000TE 4CX20000	70°C	10V	140A	12000V	3A	-250V	50mA	750V	180mA	1000W
VJ30000TE 4CX20000	70°C	10V	140A	12000V	3.5A	-250V	50mA	750V	200mA	1000W

Analog parameters at full scale

DESCRIPTION	FS	REFERENCE SCALE
Temp. °C	100°C	−40 ... +100 (x 1)
Fil. V.	10 V	0 ... 1 (x 10)
Fil. Curr.	100 A	0 ... 1 (x 100)
Plate V.	10 kV	0 ... 1 (x 10000)
Plate Curr.	3 A	0 ... 3 (x 1)
Grid V.	−100 V	0 ... 1 (x −100)
Grid Curr.	500 mA	0 ... 5 (x 100)
Screen V.	/	/
Screen Curr.	/	/

Quadratic Values and parameters for version from 5-8-10-15-20kW



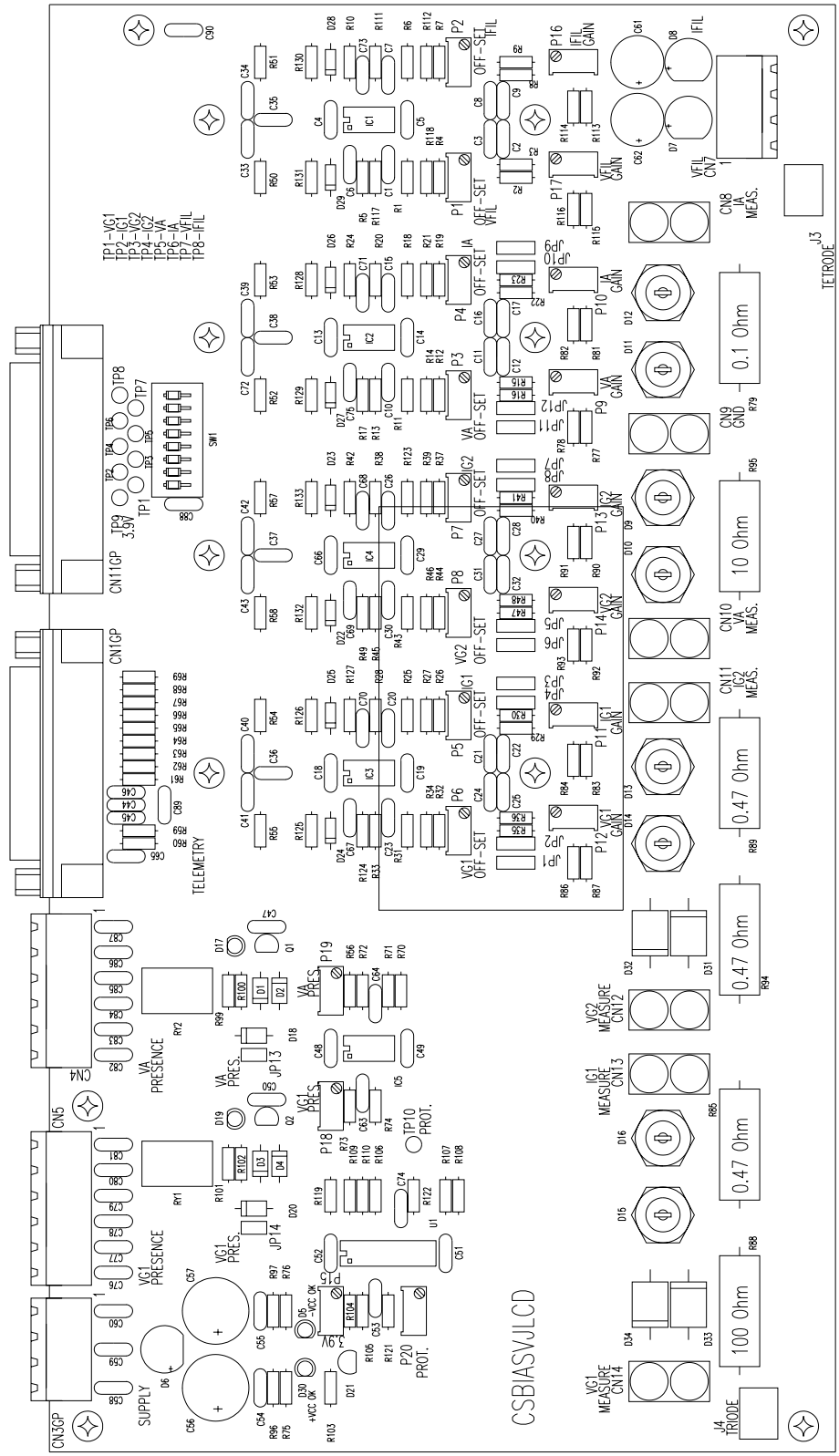
Quadratic parameters full scale

DESCRIPTION	FS	REFERENCE SCALE
FOR PWR	50	0 ... 50 (x100)
RFL PWR	50	0 ... 50 (x10)

Valvemet card adjustment

5.6 Measure card setting levels

The measure card “Valvemet” allows to interface the tube operative parameters with the main section of the protection. To set these parameters is necessary to equipe itself of a continuos current and voltage generator; each value set as input to the card must corresponds an exact value normalized in output. Through the following two tables is possible to verify or adjust the operative values referred to each single equipment.



Measure card

6 OUTPUT CONNECTORS

Description CN1 Female	Pin DB25
Digital Input cabin door / Oil Reserve	1
Digital Input CONTACTORS O/H	2
Digital Input PLATE XMFR O/H	3
Digital Input PLATE XMFR O/L	4
Digital Input BLOWER O / H	5
Digital Input AUX INTERLOCK	6
Digital Input EXT. INTERLOCK	7
Digital Input PLATE V.	8
Digital Input GRID O / C	9
Digital Input AC LINE	10
Digital Input PRESSURE	11
Digital Input SAFETY	12
Power supplying +15Vdc max 300Ma	13
Digital Input starting generating set	14
Ground	15
N.C.	16
N.C	17
N.C.	18
N.C.	19
N.C	20
Ground	21
Ground	22
Ground	23
Ground	24
Power supplying +15Vdc max 300mA	25

Description Flat CN2	Pin flat 16
Power supplying -15Vdc	1
Power supplying -15Vdc	2
Ground	3
Ground	4
Power supplying +15Vdc	5
Power supplying +15Vdc	6
Power supplying +15Vdc	7
Power supplying +15Vdc	8
Ground	9
Ground	10
Power supplying 5Vdc	11
Power supplying 5Vdc	12
Power supplying 5Vdc	13
Power supplying 5Vdc	14
Ground	15
Ground	16

Description CN3 male	Terminal 4 poles
Negative pole Power supplying –15Vdc	1
Ground	2
Ground	3
Positive Power supplying +15Vdc	4

Description CN4 male	Terminal 2 poles
Power supplying AC 21V	1
Power supplying AC 0V	2
Description CN5 male	Terminal 2 poles
Battery Power supplying +24V	1
Battery Ground	2

Description CN6	Pin flat 20
Common 1 Tuning enable	1
Common 2 Tuning enable (available)	2
N.C.1 Tuning enable	3
N.C. 2 Tuning enable (available)	4
N.O. 2 Tuning enable (available)	5
N.O. 1 Tuning enable	6
Ground	7
Ground	8
Ground	9
Ground	10
Slider trimmer PWR IND 2	11
Ground	12
Slider trimmer PWR IND 1	13
Ground	14
Slider trimmer RFL IND	15
Relay coil Command PWR IND 1	16
Slider trimmer RF APC	17
Relay coil Command RFL IND	18
V. ref.3.9V Trimmer	19
Relay coil Command PWR IND 2	20

Description 90° male CN7	DB9
Ground	1
Ground	2
Ground	3
Ground	4
Screening cable	5
Analog Input forward power differential –	6
Analog Input forward power differential +	7
Analog Input reflected power differential –	8
Analog Input reflected power differential +	9

Description 90° male CN8	Bnc
Screening power supplying Ground	External
Folder output for exciter	Internal

Description Flat 90° male CN9	Pin flat	Tlc input	Pin db25	Card
Ground	1			
Ground	2			
GRID BIAS OK bias Voltage measure	3	In0	2	1-Bil
GRID O / C bias Current measure	4	In1	15	1-Bil
Screen grid G2 Voltage measure	5	In2	3	1-Bil
Grid screen G2 Current measure	6	In3	16	1-Bil
SCREEN O / C Voltage measure	7	In4	4	1-Bil
Anode Current measure	8	In5	17	1-Bil
Filament Voltage measure	9	In6	5	1-Bil
Filament Current measure	10	In7	18	1-Bil
Ground	11			
Ground	12			
Ground	13			
Ground	14			
Ground	15			
Air temperature measure	16	In0	21	2-Bil
Forward power measure	17	In1	9	2-Bil
Reflected power measure	18	In2	22	2-Bil
Driver reflected power measure	19	In3	10	2-Bil
Driver forward power measure	20	In4	23	2-Bil
SWR driver protection	21	In5	11	2-Bil
ON Driver return	22	In6	24	2-Bil
FAULT Driver return	23	In7	12	2-Bil
Ground	24			
Ground	25			
N.C.	26			

The tube protection marked on the card CSUPROPROTVJ/R01 allows the connection by a direct standard cable with new protection system of the mosfet amplifier (see as reference adjustments section) and is adaptable through jumpers to old protection.

Description CN10 male	Pin DB25
N.C.	1
N.C.	2
Reflected power measure	3
Driver reflected power	4
N.C.	5
N.C.	6
Ground	7
Driver switching on (not included)	8
N.C.	9
Driver NC fault relay contact (not used)	10
Ground	11
Driver NC ON relay contact (not used)	12
Ground	13
N.C.	14
N.C.	15
Driver forward power	16
N.C. (old version) - Fault (new version)	17
SWR Driver protection	18
N.C.	19
Driver switching off (not included)	20
Ground	21
N.C.	22
Driver NO fault relay contact	23
N.C.	24
Driver NO ON relay contact	25

Description CN11 Male	Pin DB25
Short circuited	1-2
Short circuited	3-4
Reference voltage 3,9Vdc	5
Control grid G1 voltage measure	6
Control grid G1 current measure	7
Screen grid G2 voltage measure	8
Screen grid G2 current measure	9
Anode voltage measure	10
Anode current measure	11
Filament voltage measure	12
Filament current measure	13
Ground	14,15,16,17,18,19 20,21,22,23,24,25

Description CN12 female	Pin DB25
Filament current displaying	1
Filament voltage displaying	2
Anode current displaying	3
Anode voltage displaying	4
Control grid G1 current displaying	5
Screen grid G2 voltage displaying	6
Screen grid G2 current displaying	7
Control grid G1 voltage displaying	8
Reference voltage 3,9Vdc	9
Forward power displaying	10
Reflected power displaying	11
Air temperature displaying	12
Power Supplying +15V	13
Ground	14,15,16,17,18,19 20,21,22,23,24,25

Description flat 90° CN13	Pin flat	Tlc input	Pin db25	Card
Ground	1			
Ground	2			
Push button ON accepted	3	In0	2	1-Sbil
Vref (3,9V)	4	In1	15	1-Sbil
Timer on (0=timer on 1=timer off)	5	In2	3	1-Sbil
Push button STANDBY accepted	6	In3	16	1-Sbil
Hv2 output contact	7	In4	4	1-Sbil
Push button OFF accepted	8	In5	17	1-Sbil
Retry or fault	9	In6	5	1-Sbil
Safety hold	10	In7	18	1-Sbil
Ground	11			
Ground	12			
Ground	13			
Ground	14			
Ground	15			
Air temp. Alarm (with memory)	16	In8	21	1-Sbil
G1 current alarm (with memory)	17	In9	9	1-Sbil
Push button RF APC lower accepted	18	In10	22	1-Sbil
Anode current alarm (with memory)	19	In11	10	1-Sbil
G2 current alarm (with memory)	20	In12	23	1-Sbil
Filament current alarm (with memory)	21	In13	11	1-Sbil
Swr alarm (with memory)	22	In14	24	1-Sbil
Check list fault	23	In15	12	1-Sbil
Ground	24			
Ground	25			
N.C	26			

Description CN14 male	Type	Pin DB25
Accepted command output ON	OC	1
Accepted command output OFF	OC	2
PWR IND 2 output	OC	3
Driver Reflected power analog output	ANA	4
PROTECTION or FAULT output	ANA	5
Accepted command output POWER LOWER	OC	6
FAULT RESET command	INP	7
RF APC command	INP	8
STANDBY command	INP	9
Forward power analog output	ANA	10
Reflected power analog output	ANA	11
Air temperature analog output	ANA	12
AUX INTERLOCK input	INP	13
Accepted command output STANDBY	OC	14
PWR IND 1 output	OC	15
Driver Forward power analog output	ANA	16
RFL IND output	OC	17
Driver swr protection output	+15V	18
Ground	-	19
LOCAL / REMOTE state output	+15V	20
ON command	INP	21
OFF command	INP	22
Driver Fault output	OC	23
Power supplying +15Vdc max 200mA		24
Driver on output	OC	25

Description flat 26 CN15	Pin flat	Tlc out	Pin db25	Card
Output +15Vdc max 50mA	1			
N.C.	2			
Relay Input N.O. FAULT RESET command	3	Out0		1
Power supplying +15Vdc max 50mA	4			
N.C.	5			
Relay Input N.O. POWER LOWER command	6	Out1		1
Output +15Vdc max 50mA	7			
N.C.	8			
Relay Input N.O. ON command	9	Out2		1
Power supplying +15Vdc max 50mA	10			
N.C.	11			
Relay Input N.O. AUX INTERLOCK	12	Out3		1
Output +15Vdc max 50mA	13			
N.C.	14			
Relay Input N.O. OFF command	15	Out4		1
Output +15Vdc max 50mA	16			
N.C.	17			
Relay Input N.O. STANDBY command	18	Out5		1
Ground	19			
N.C.	20			
N.C.	21			
Ground	22			
N.C.	23			
N.C.	24			
N.C.	25			
N.C.	26			

Signals coming from the equipment to temperature Core

Description 90° CN16 female	DB9
Temperature analog input differential –	1
Temperature analog input differential +	2
Ground	3
Ground	4
Power supplying +9Vdc	5
Ground	6
Ground	7
Ground	8
Screening cable	9

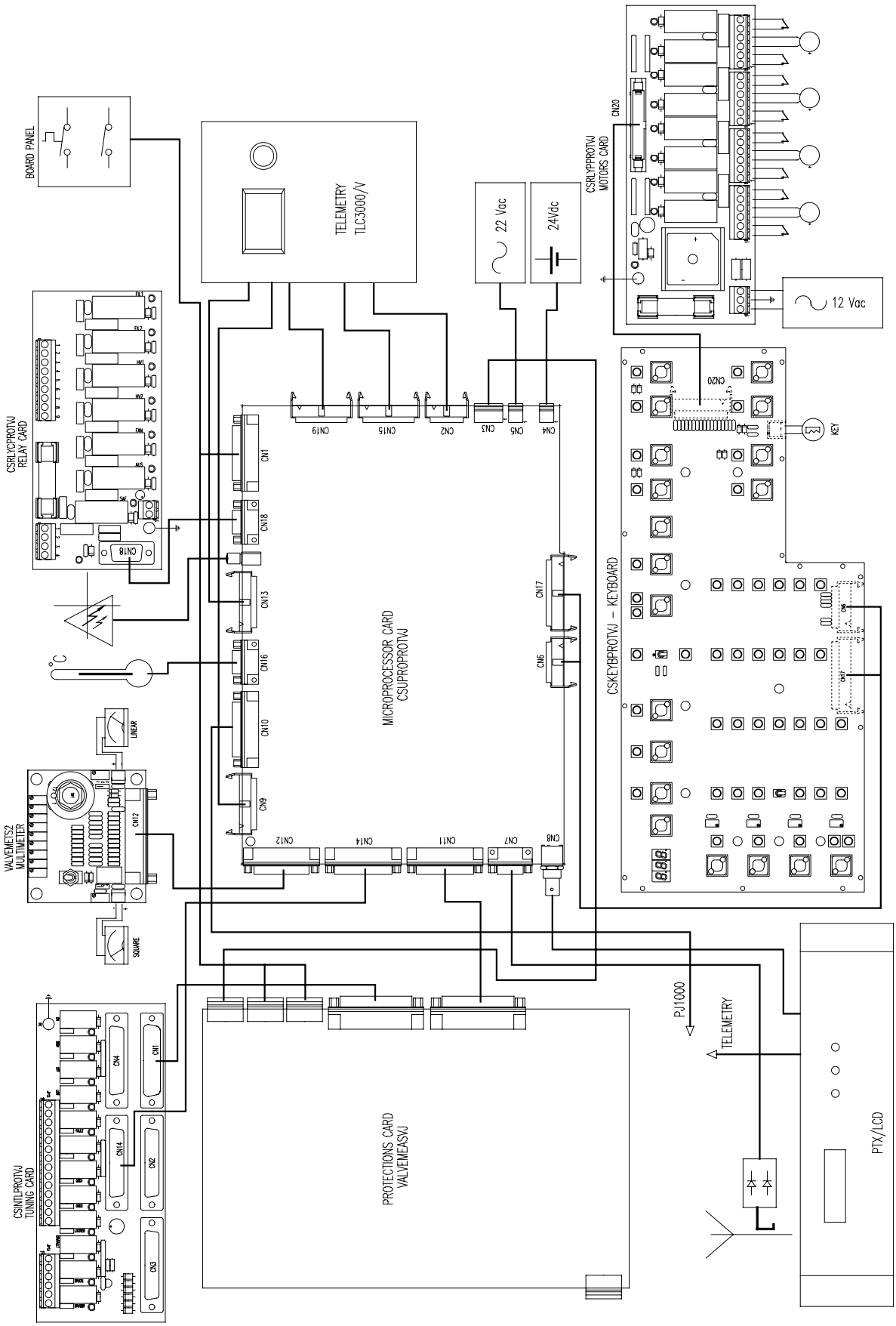
Signals present on the keyboard connector coming from Core

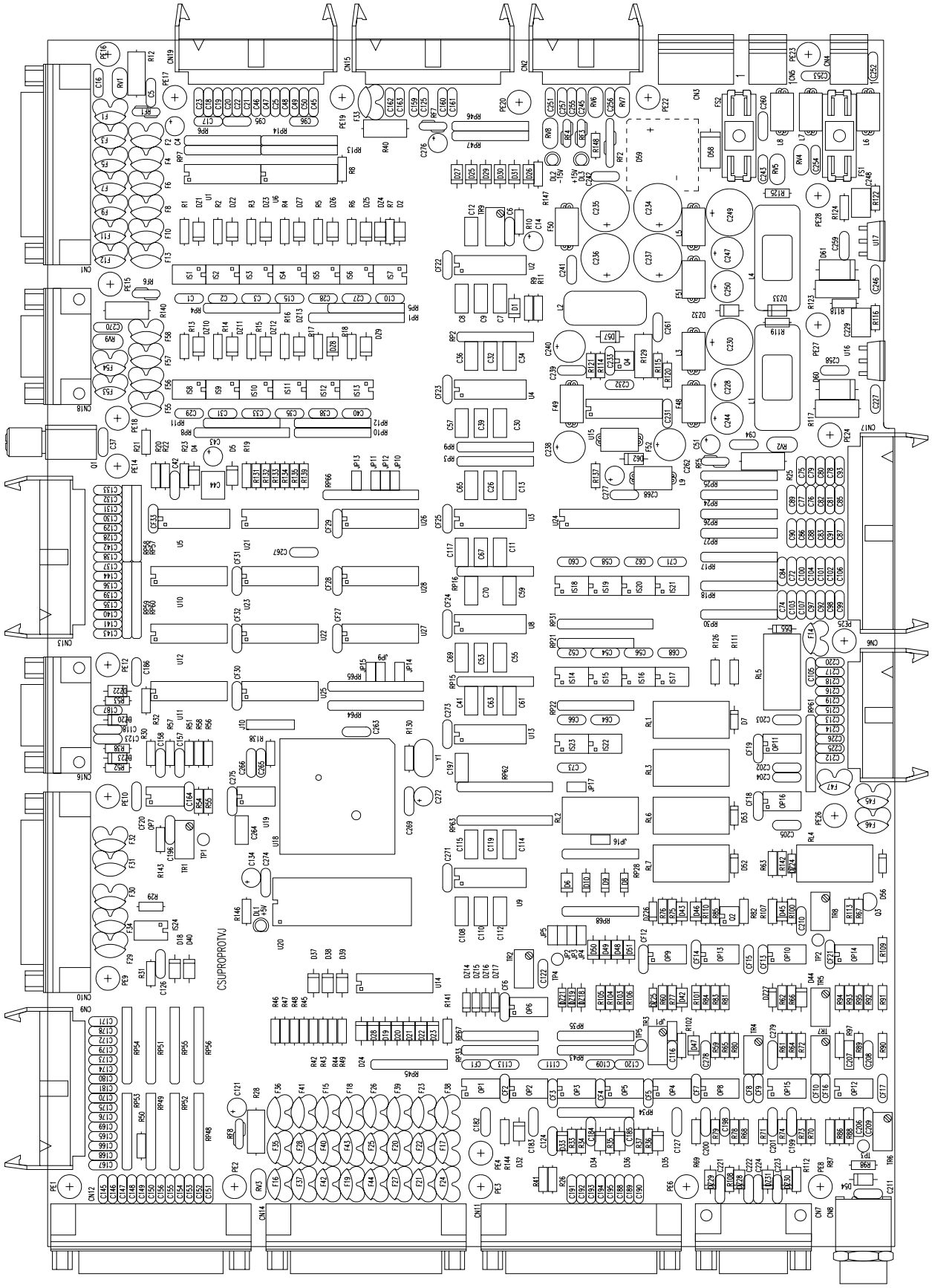
Description Flat 90° CN17	Pin flat 34
Power supplying +15Vdc max 200mA	1
Ld3	2
Ld7	3
Ld2	4
Ld4	5
Ld0	6
Ld5	7
Ld1	8
Ld6	9
Dg1	10
Dg5	11
Dg3	12
Dg7	13
Dg6	14
Dg2	15
Dg0	16
Dg4	17
Ground	18
Ground	19
Reserve 1	20
FULL FIL. ST. BY or MIN. FIL. ST. BY selector	21
ON push button	22
STANDBY push button	23
OFF push button	24
TMR ACC push button	25
Fault Reset push button	26
BYPASS push button	27
Safe Reset push button	28
POWER LOWER ON OFF push button	29
LOCAL / REMOTE selector	30
Led RFL IND	31
Led RF APC FOLD	32
Led PWR IND 2	33
Led PWR IND 1	34

Description 90° CN18 male	DB9
Relay Output HV1	1
Reserve Relay Output	2
Filament 2 Relay Output	3
HV2 Relay Output	4
Power supplying +15Vdc max 200mA	5
Ground	6
Ground	7
Filament 1 Relay Output	8
Blower Relay Output	9

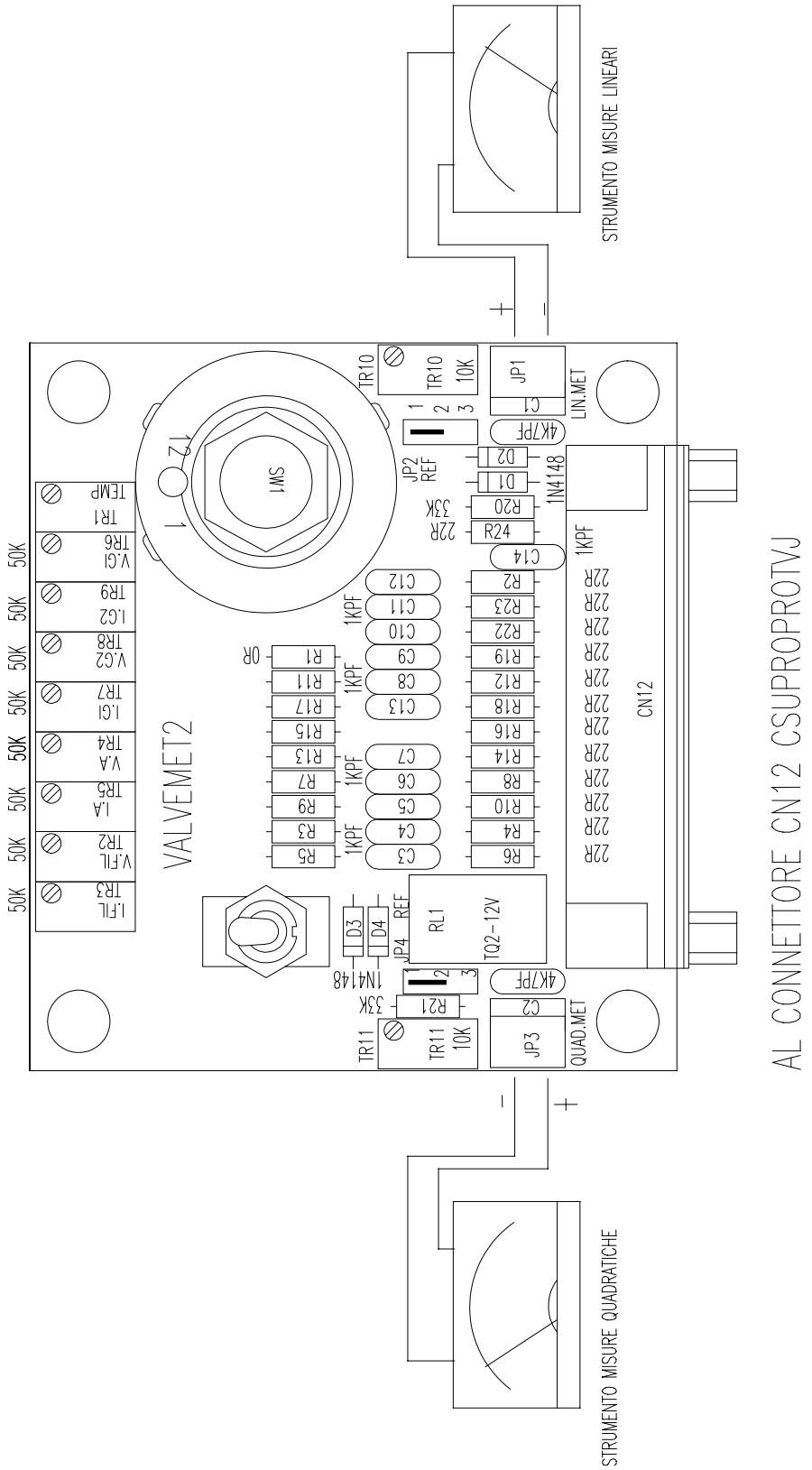
Description flat CN19	Pin flat	Tlc input	Pin db25	Card
Ground	1			
Ground	2			
Safety ok	3	In0	2	2-Sbil
Analog Fold level	4	In1	15	2-Sbil
AC LINE ok	5	In2	3	2-Sbil
Air press micro ok	6	In3	16	2-Sbil
Relay contact GRID BIAS OK	7	In4	4	2-Sbil
Ext. Interlock N.C.	8	In5	17	2-Sbil
Anode v.ok	9	In6	5	2-Sbil
MIN. FIL. ST. BY / FULL FIL. ST. BY	10	In7	18	2-Sbil
Ground	11			
Ground	12			
Ground	13			
Ground	14			
Ground	15			
PLATE XMFR O/L	16	In8	21	2-Sbil
PLATE ARC (memorized)	17	In9	9	2-Sbil
CONTACTORS O/H	18	In10	22	2-Sbil
Clamps overheat	19	In11	10	2-Sbil
Reserve 1	20	In12	23	2-Sbil
Reserve 2	21	In13	11	2-Sbil
BLOWER O / H thermal	22	In14	24	2-Sbil
Local / Remote selector	23	In15	12	2-Sbil
Ground	24			
Ground	25			
N.C.	26			

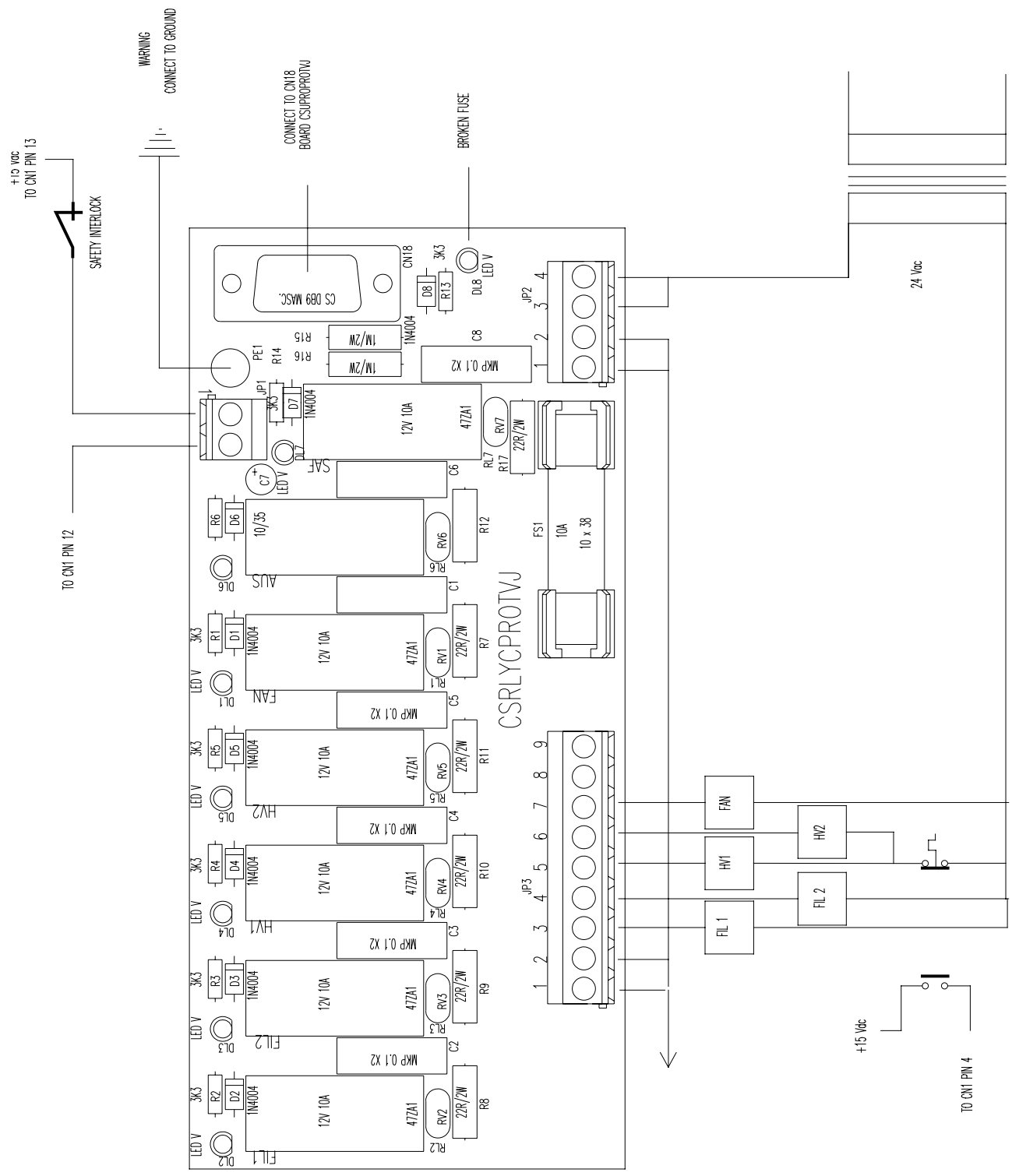
7 Equipment Lay out

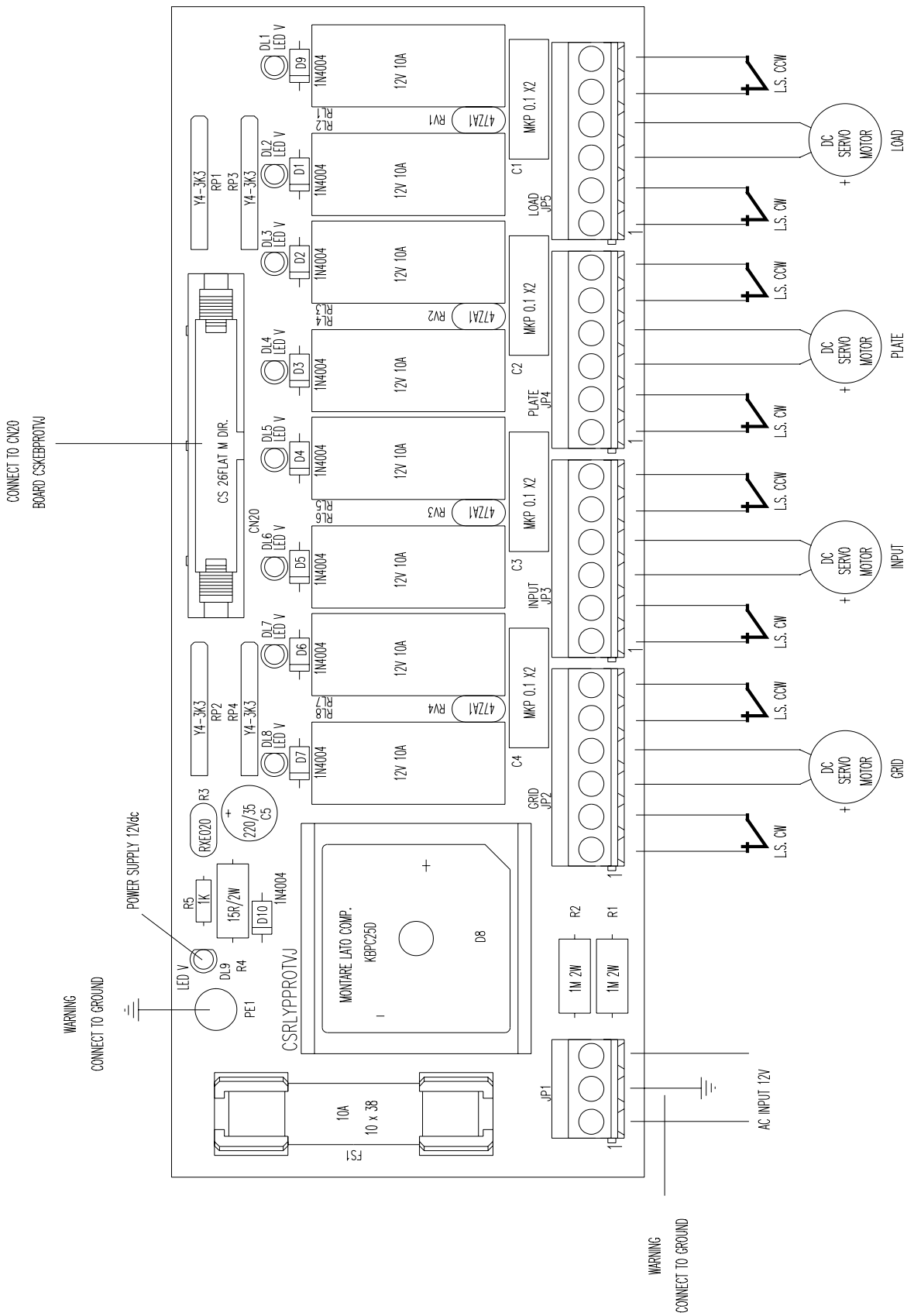

BOARD PANEL
TELEMETRY
TLC3000/V
22 Vac
24Vdc
CSRLYPPROTVJ
MOTORS CARD
CN20
12 Vac
CSRLYCPROTVJ
RELAY CARD
CN18
MICROPROCESSOR CARD
CSUPROPROTVJ
CN1
CN18
CN13
CN16
CN10
CN9
CN19
CN15
CN2
CN3
CN5
CN4
CN17
CN6
CN12
CN14
CN11
CN7
CN8
CSKEYBPROTVJ – KEYBOARD
CN20
KEY
CN6
CN7
VALVEMETS2
MULTIMETER
CN12
LINEAR
SQUARE
CSINTLPROTVJ
TUNING CARD
CN4
CN1
CN14
CN2
CN5
PROTECTIONS CARD
VALVEMEASVJ
PJ1000
TELEMETRY
PTX/LCD

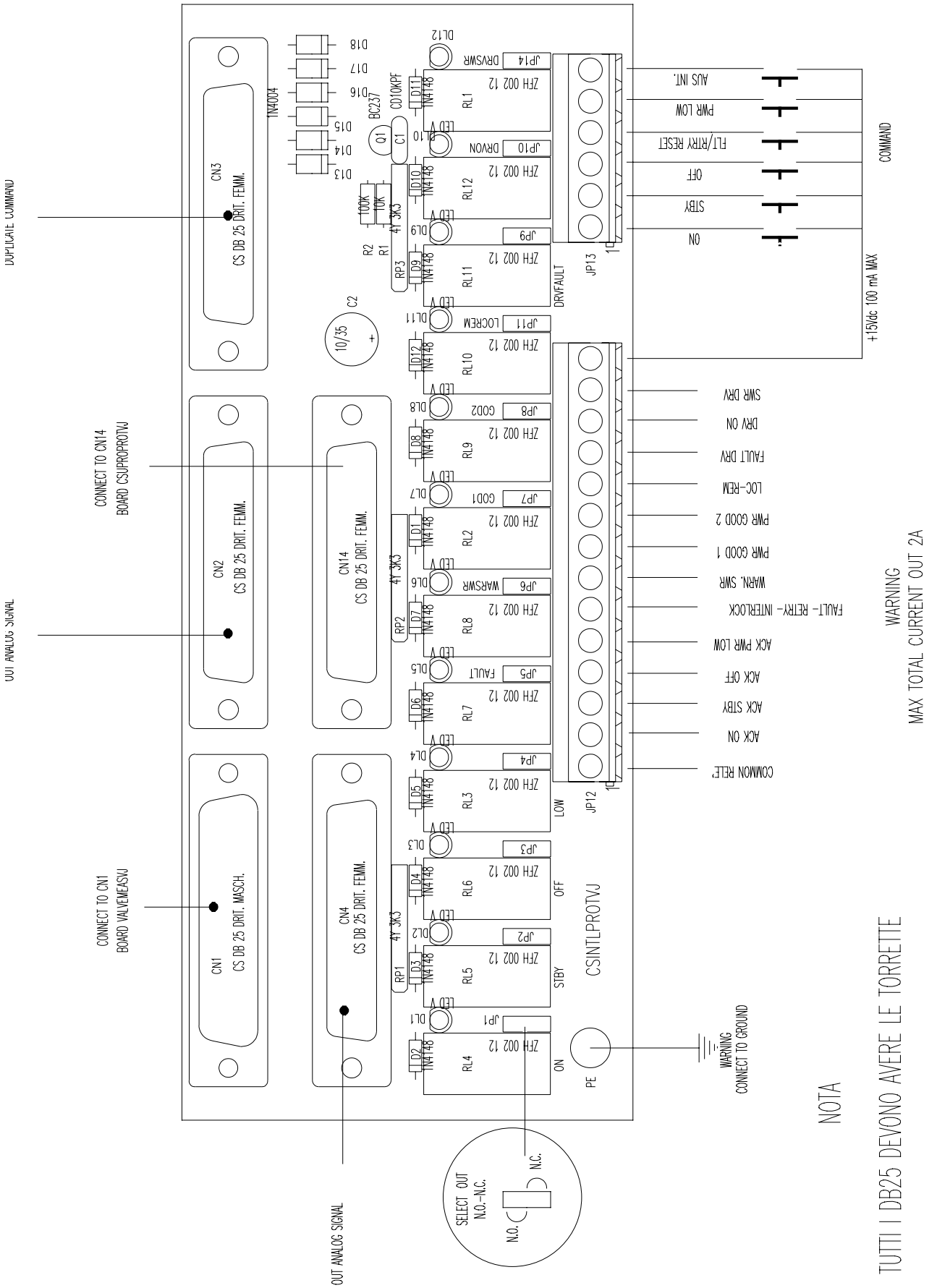

CSUPROPROTVJ

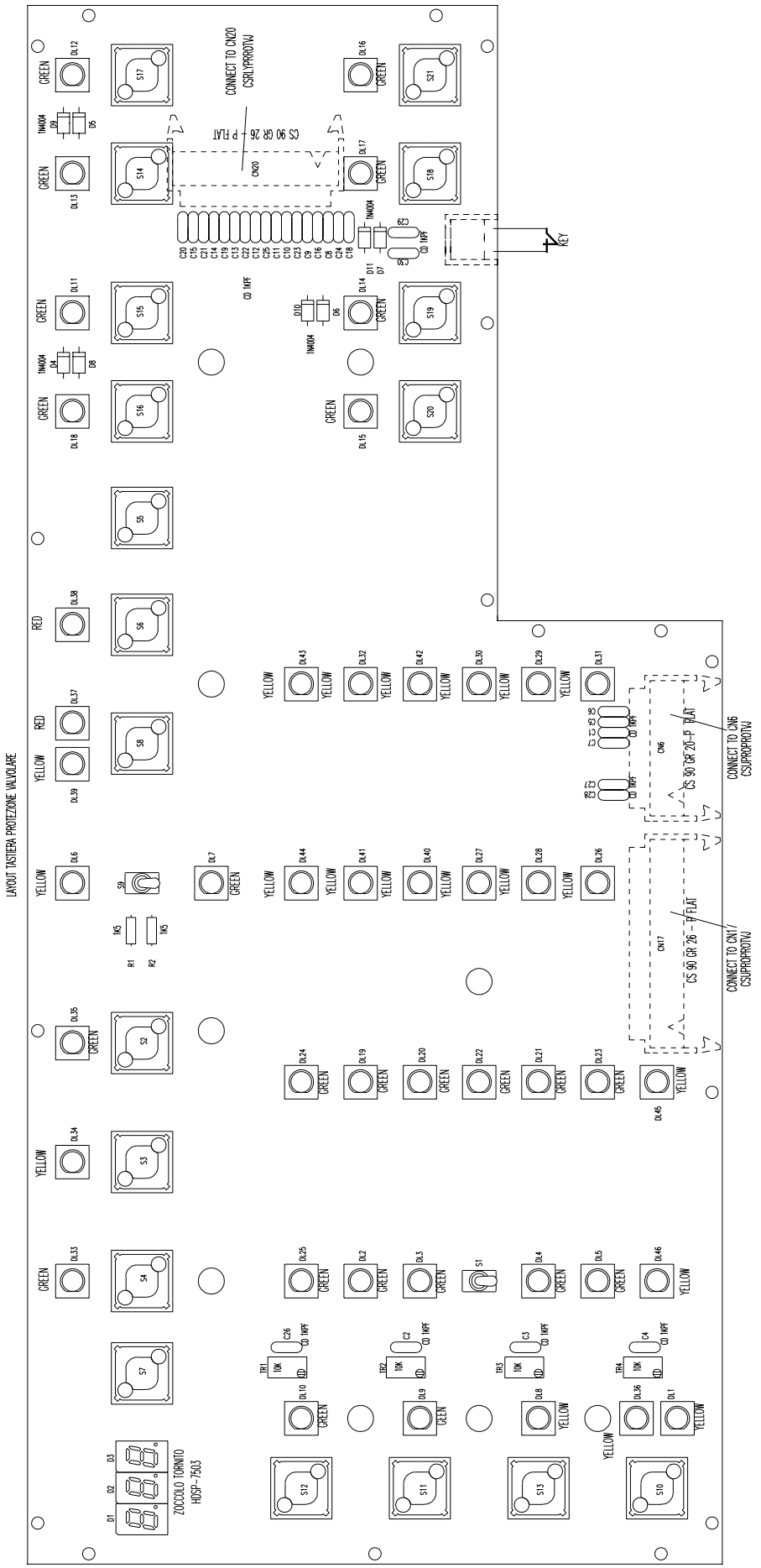
PIANO DI MONTAGGIO SCHEDA METER VALVOLARE



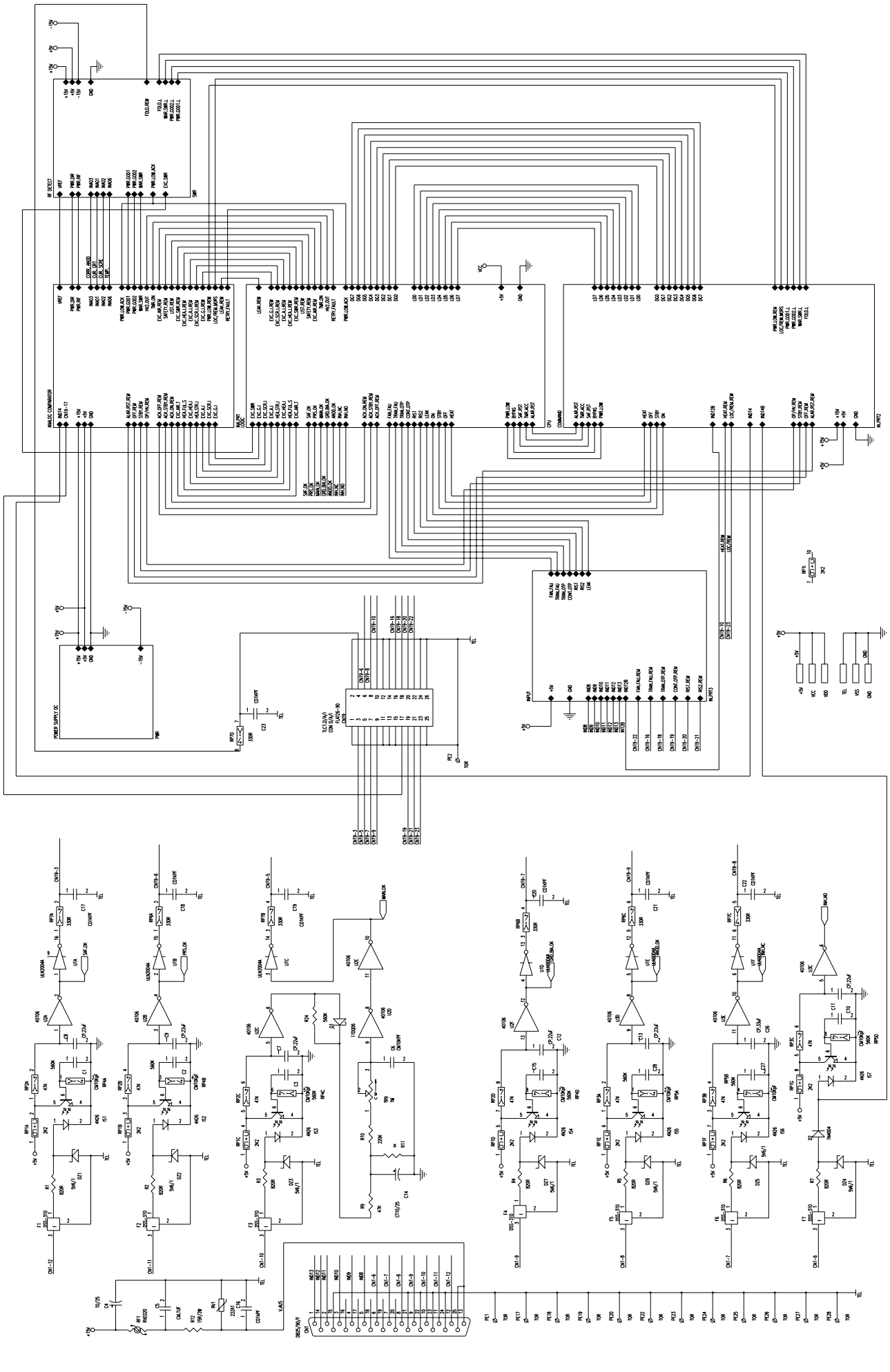

+15 Vdc
TO CN1 PIN 13
SAFETY INTERLOCK
WARNING
CONNECT TO GROUND
CONNECT TO CN18
BOARD CSUPROTVJ
BROKEN FUSE
TO CN1 PIN 12
CSRLYCPROTVJ
CS DB9 MASC.
CN18
D8
3K3
R13
DL8
LED V
1N4004
1M/2W
R15
R16
1M/2W
R14
PE1
C8
MKP 0.1 X2
JP1
3K3
D7
1N4004
12V 10A
47ZA1
RV7
22R/2W
RL7
R17
SAF
DL7
C7
LED V
C6
JP2
24 Vac
FS1
10A
10 x 38
10/35
AUS
DL6
R6
D6
RV6
22R/2W
R12
C1
FAN
DL1
3K3
R1
D1
1N4004
12V 10A
47ZA1
RV1
22R/2W
R7
RL1
MKP 0.1 X2
C5
HV2
DL5
3K3
R5
D5
1N4004
12V 10A
47ZA1
RV5
22R/2W
R11
RL5
MKP 0.1 X2
C4
HV1
DL4
3K3
R4
D4
1N4004
12V 10A
47ZA1
RV4
22R/2W
R10
RL4
MKP 0.1 X2
C3
FIL2
DL3
3K3
R3
D3
1N4004
12V 10A
47ZA1
RV3
22R/2W
R9
RL3
MKP 0.1 X2
C2
FIL1
DL2
3K3
R2
D2
1N4004
12V 10A
47ZA1
RV2
22R/2W
R8
RL2
JP3
FAN
HV2
HV1
FIL 2
FIL 1
+15 Vdc
TO CN1 PIN 4

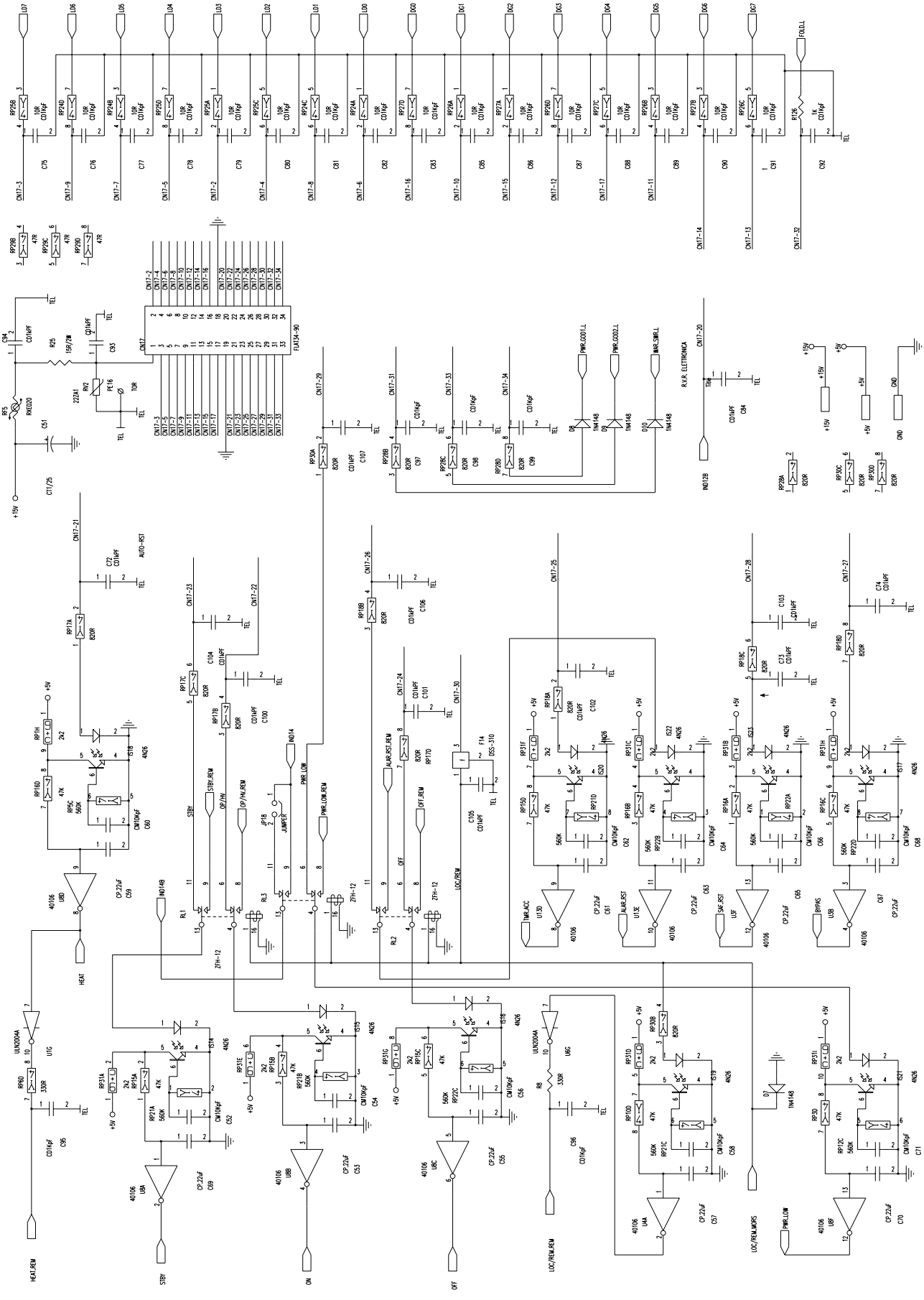

CONNECT TO CN20
BOARD CSKEBPROTVJ
CS 26FLAT M DIR.
CN20
CSRLYPPROTVJ
MONTARE LATO COMP.
KBPC250
D8
POWER SUPPLY 12Vdc
WARNING
CONNECT TO GROUND
LED V
DL9
PE1
R5 1K
R4 15R/2W
D10 1N4004
RXE020 R3
220/35 C5
FS1 10A 10 x 38
JP1
R2 1M 2W
R1 1M 2W
AC INPUT 12V
WARNING
CONNECT TO GROUND
C1 MKP 0.1 X2
C2 MKP 0.1 X2
C3 MKP 0.1 X2
C4 MKP 0.1 X2
LOAD JP5
PLATE JP4
INPUT JP3
GRID JP2
RV1 472A1
RV2 472A1
RV3 472A1
RV4 472A1
RP1 Y4-3K3
RP2 Y4-3K3
RP3 Y4-3K3
RP4 Y4-3K3
DL1 LED V
DL2 LED V
DL3 LED V
DL4 LED V
DL5 LED V
DL6 LED V
DL7 LED V
DL8 LED V
D1 1N4004
D2 1N4004
D3 1N4004
D4 1N4004
D5 1N4004
D6 1N4004
D7 1N4004
D9 1N4004
12V 10A
L.S. CCW
L.S. CW
DC SERVO MOTOR
LOAD
PLATE
INPUT
GRID

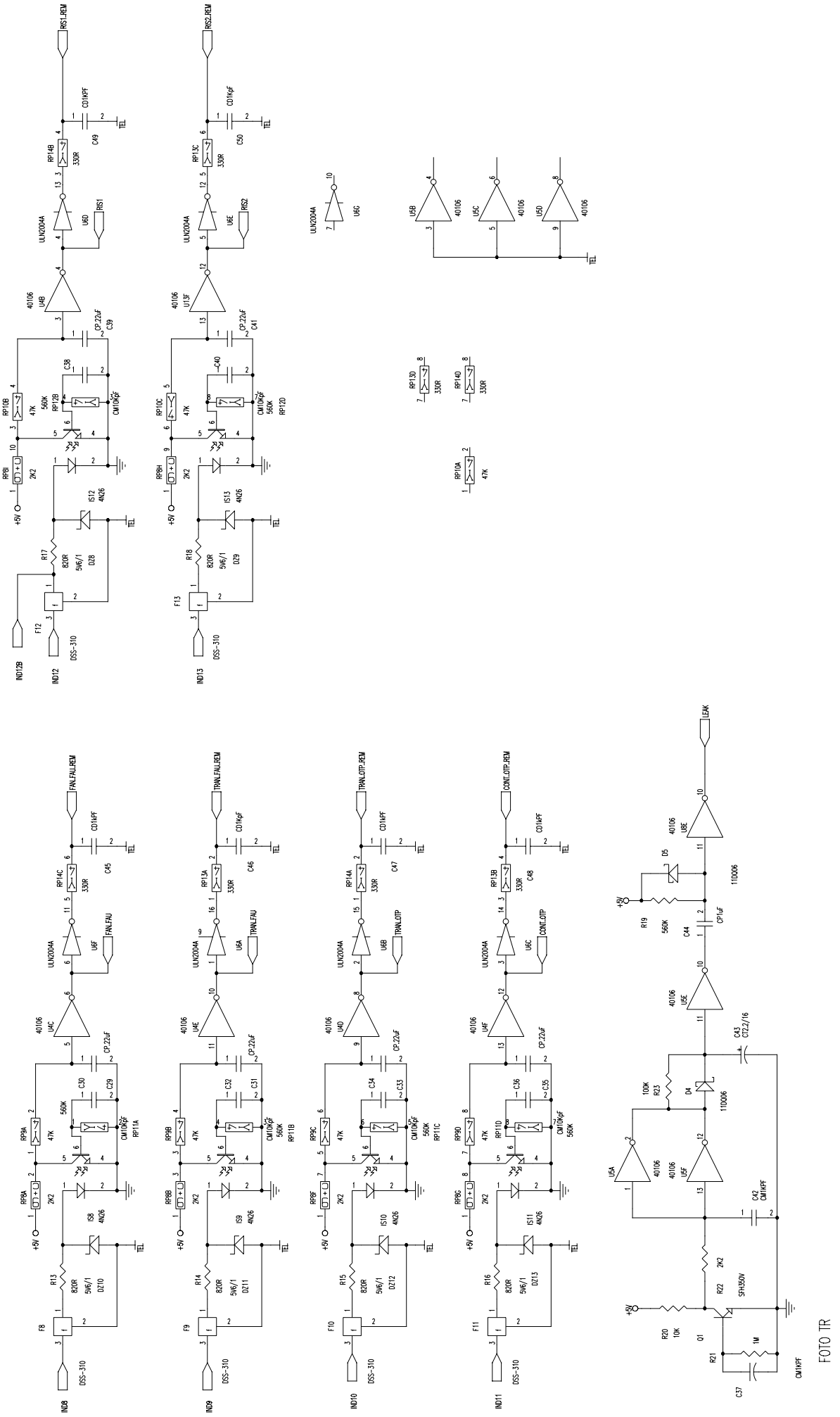

DUPLICATE COMMAND
CN3
CS DB 25 DRIT. FEMM.
1N4004
D18
D17
D16
D15
D14
D13
BC237
Q1
CD10KPF
C1
100K
10K
R2
R1
4Y 3K3
RP3
DL12
DL9
DL11
DL8
DL7
DL6
DL5
DL4
DL3
DL2
DL1
JP14 DRVSWR
JP10 DRVON
JP9
JP11 LOCREM
JP8 GOD2
JP7 GOD1
JP6 WARSWR
JP5 FAULT
JP4
JP3
JP2
JP1
ZFH 002 12
RL1
RL12
RL11
RL10
RL9
RL2
RL8
RL7
RL3
RL6
RL5
RL4
D11 1N4148
D10 1N4148
D9 1N4148
D12 1N4148
D8 1N4148
D1 1N4148
D7 1N4148
D6 1N4148
D5 1N4148
D4 1N4148
D3 1N4148
D2 1N4148
LED
DRVFAULT
JP13
JP12
LOW
OFF
STBY
ON
CSINTLPROTVJ
10/35
C2
+15Vdc 100 mA MAX
AUS INT.
PWR LOW
FLT/RTRY RESET
OFF
STBY
ON
COMMAND
SWR DRV
DRV ON
FAULT DRV
LOC-REM
PWR GOOD 2
PWR GOOD 1
WARN. SWR
FAULT- RETRY- INTERLOCK
ACK PWR LOW
ACK OFF
ACK STBY
ACK ON
COMMON REF?
WARNING
MAX TOTAL CURRENT OUT 2A
CONNECT TO CN14
BOARD CSUPROPROTVJ
CN2
CS DB 25 DRIT. FEMM.
CN14
CS DB 25 DRIT. FEMM.
UUI ANALOG SIGNAL
CONNECT TO CN1
BOARD VALVEMEASVJ
CN1
CS DB 25 DRIT. MASCH.
CN4
CS DB 25 DRIT. FEMM.
OUT ANALOG SIGNAL
SELECT OUT
N.O.-N.C.
N.O.
N.C.
PE
WARNING
CONNECT TO GROUND
NOTA
TUTTI I DB25 DEVONO AVERE LE TORRETTE

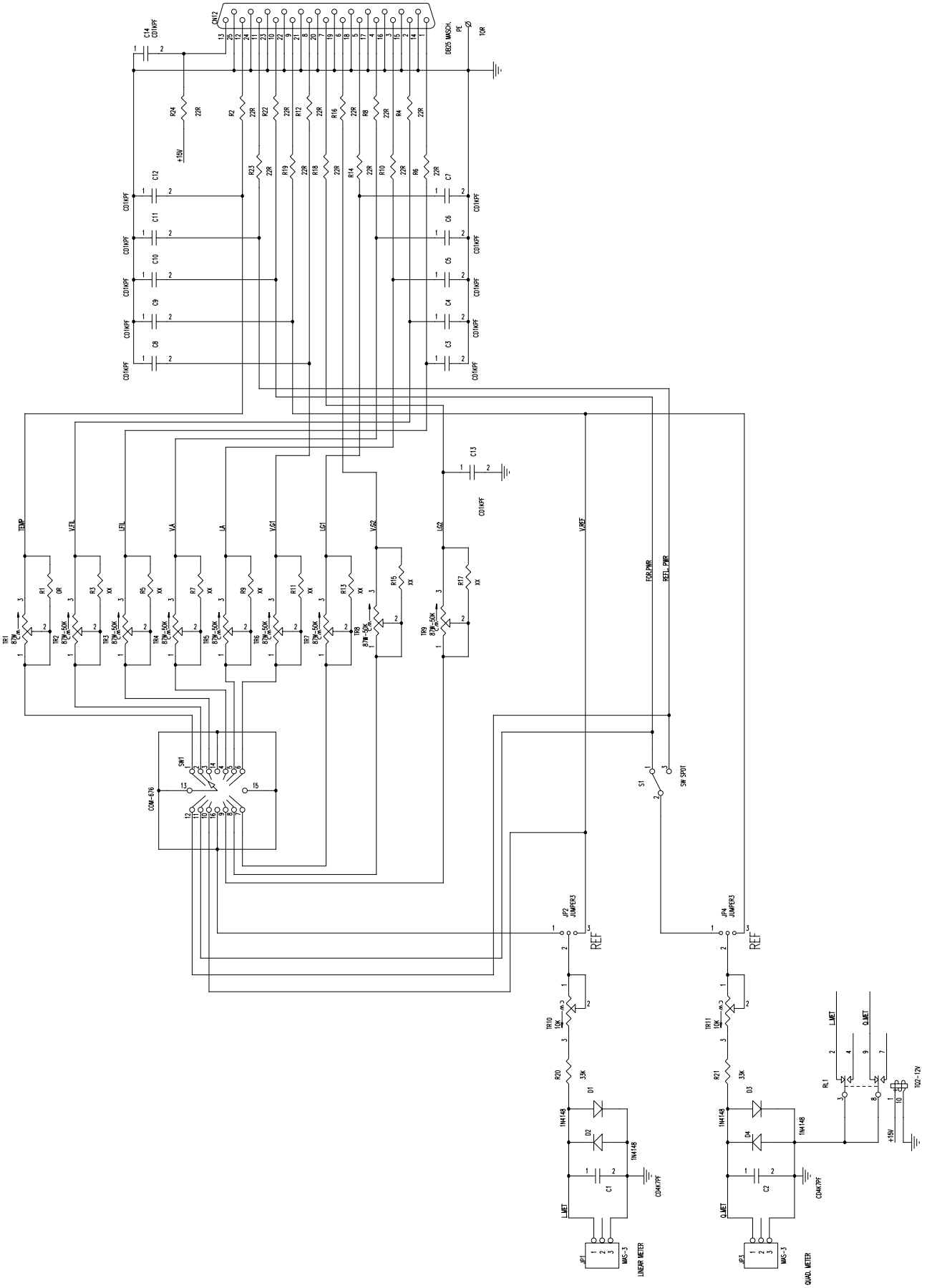

LAYOUT TASTIERA PROTEZIONE VALVOLARE
CONNECT TO CN20
CS90LYPRROTW
CS 90 GR 26 - P FLAT
CN20
KEY
CONNECT TO CN6
CS90PROTW
CS 90 GR 20-P FLAT
CN6
CONNECT TO CN17
CS90PROTW
CS 90 GR 26 - P FLAT
CN17
ZOCCOLO TORNITO
HDSP-7503

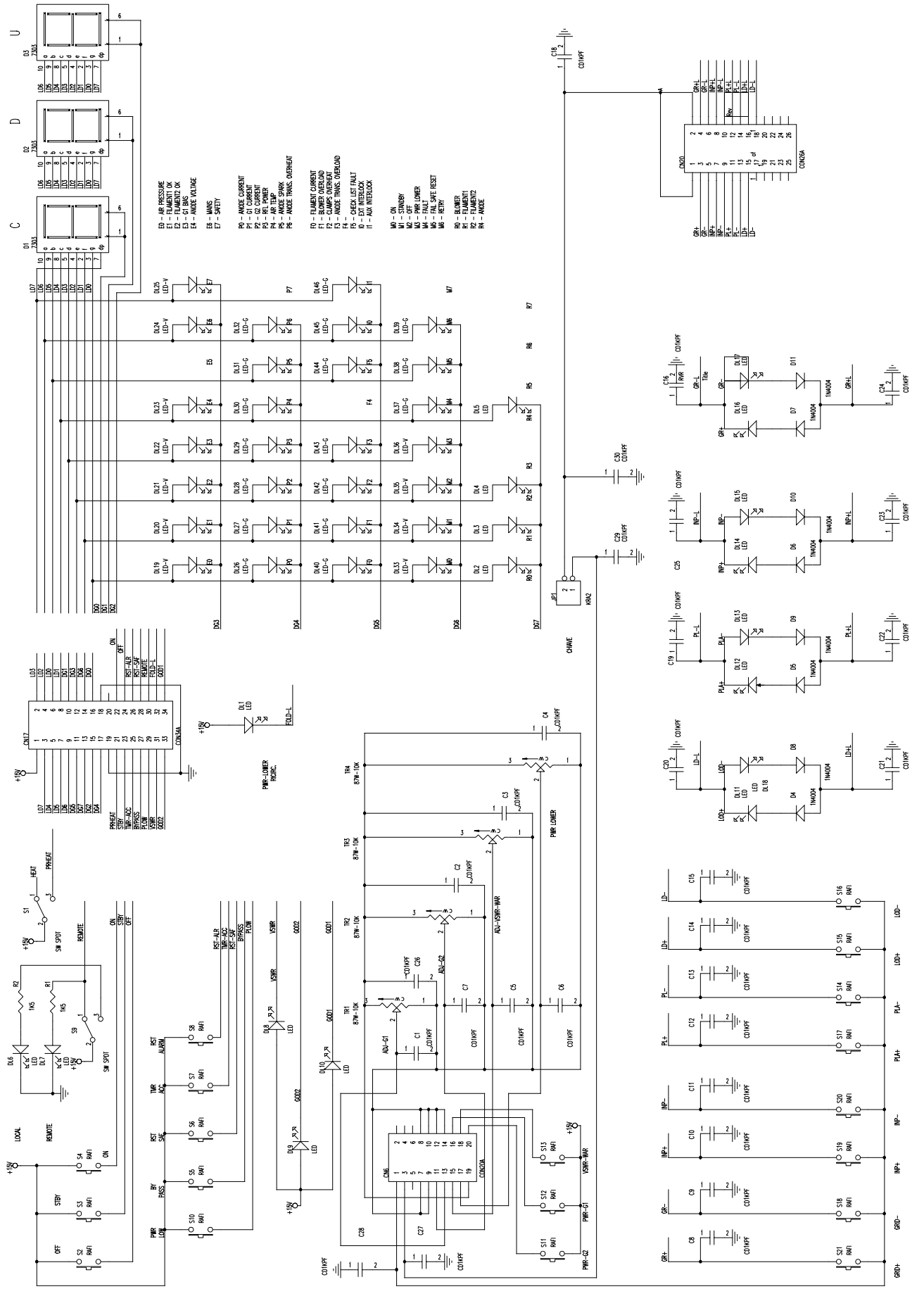
8-Electricals drawings

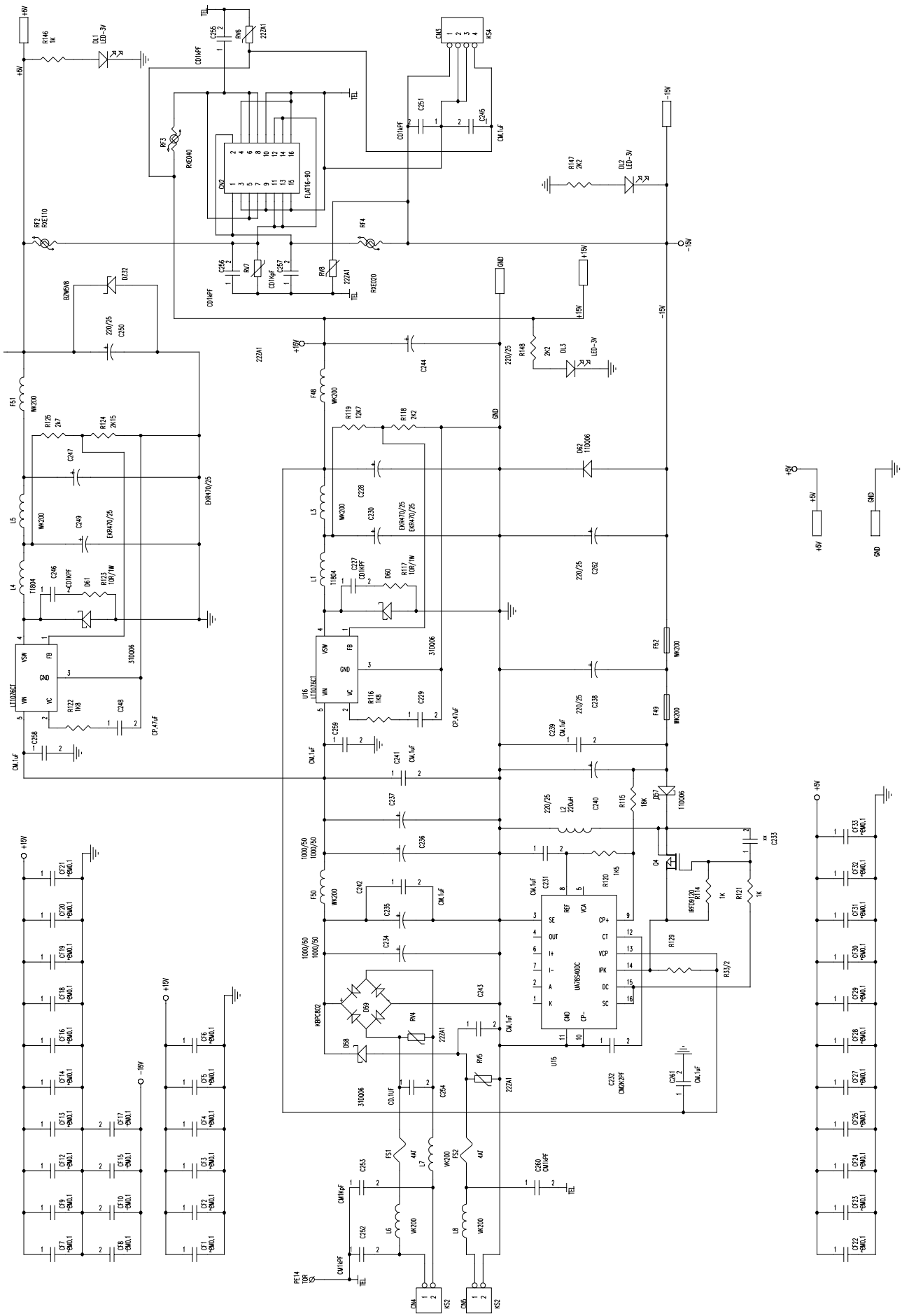


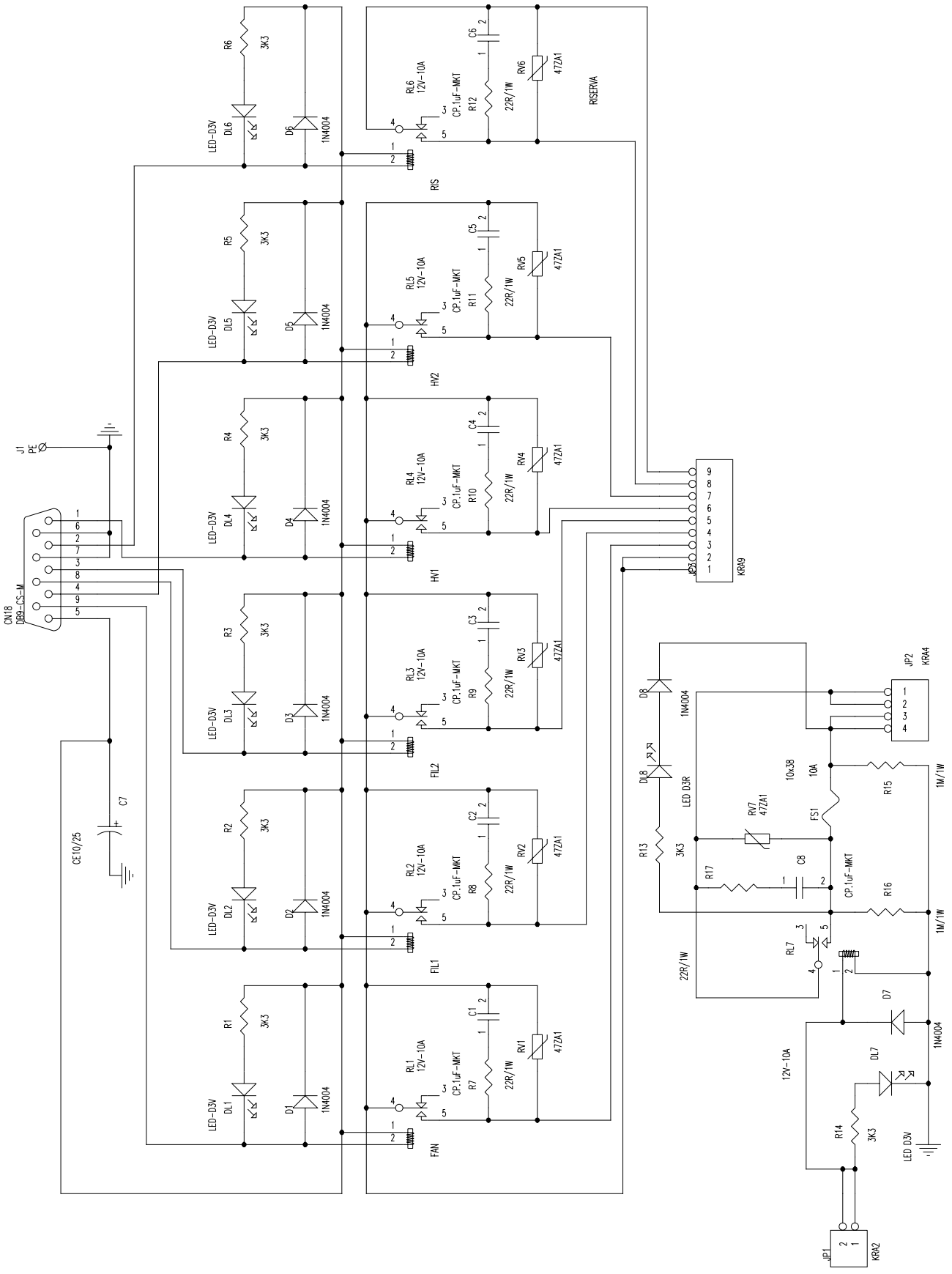


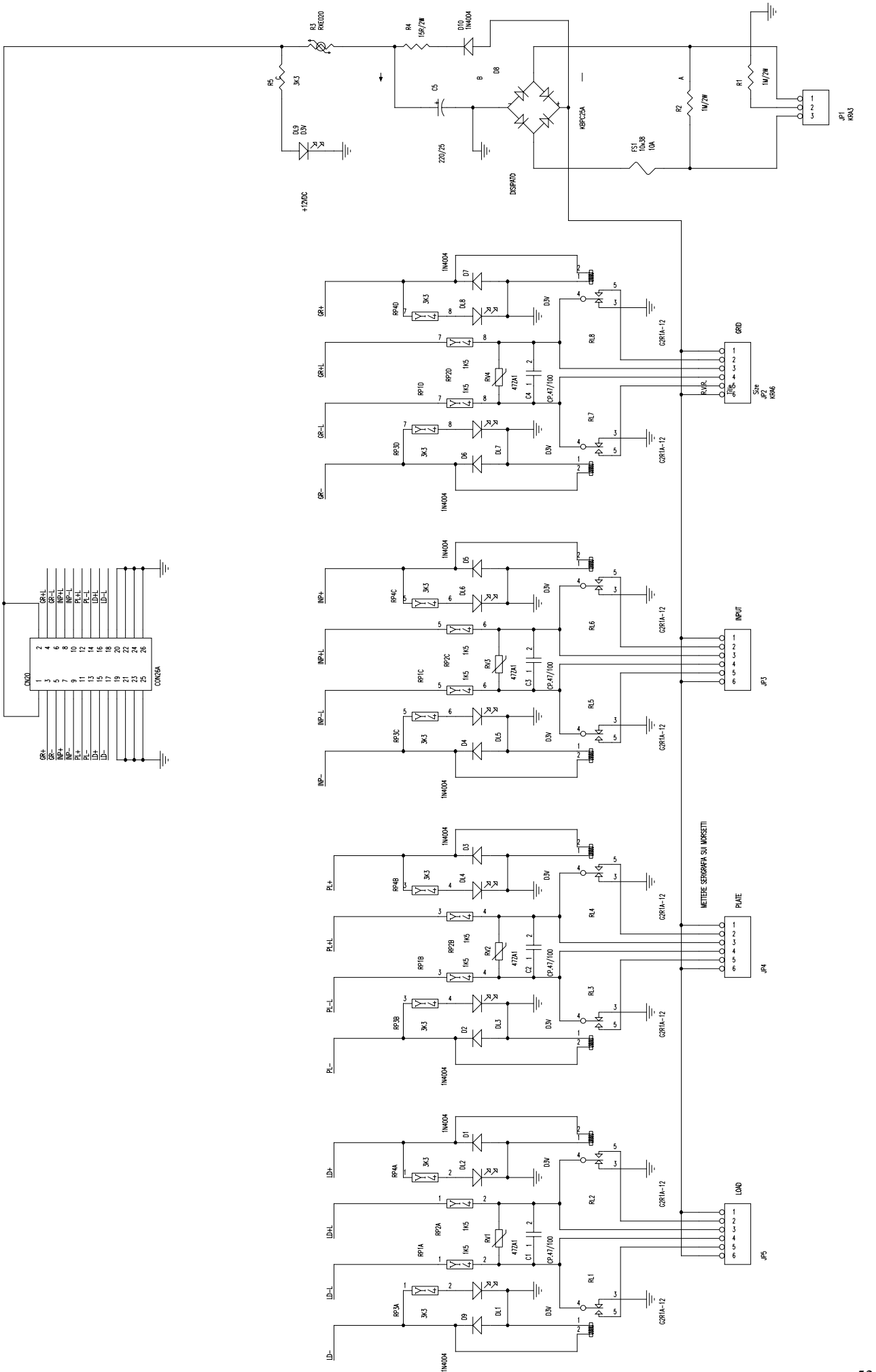

RIS1.REM
RIS2.REM
CD1KPF
TEL
RP14B
RP13C
330R
ULN2004A
U6D
U6E
RIS1
RIS2
40106
U4B
U13F
CP.22uF
C39
C41
C38
C40
RP10B
RP12B
RP10C
RP12D
47K
560K
CM10KpF
RP8
RP9B
2K2
+5V
IS12
IS13
4N26
R17
R18
820R
5W6/1
D28
D29
F12
F13
DSS-310
IND12B
IND12
IND13
RP13D
RP14D
RP10A
FANLFAU.REM
TRANLFAU.REM
TRANLOTP.REM
CONT.OTP.REM
RP14C
RP13A
RP14A
RP13B
C45
C46
C47
C48
FANLFAU
TRANLFAU
TRANLOTP
CONT.OTP
U6F
U6A
U6B
U6C
U4C
U4E
U4D
U4F
C30
C29
C32
C31
C34
C33
C36
C35
RP9A
RP9B
RP9C
RP9D
RP11A
RP11B
RP11C
RP11D
RP9E
RP9F
RP9G
IS8
IS9
IS10
IS11
R13
R14
R15
R16
DZ10
DZ11
DZ12
DZ13
F8
F9
F10
F11
IND8
IND9
IND10
IND11
U6G
U5B
U5C
U5D
LEAK
D5
1100D6
R19
560K
C44
CP1uF
U5E
U5A
U5F
C43
CT2.2/16
D4
R23
100K
C42
CM1KPF
R22
2K2
SFH350V
R20
10K
R21
1M
Q1
C37
FOTO TR

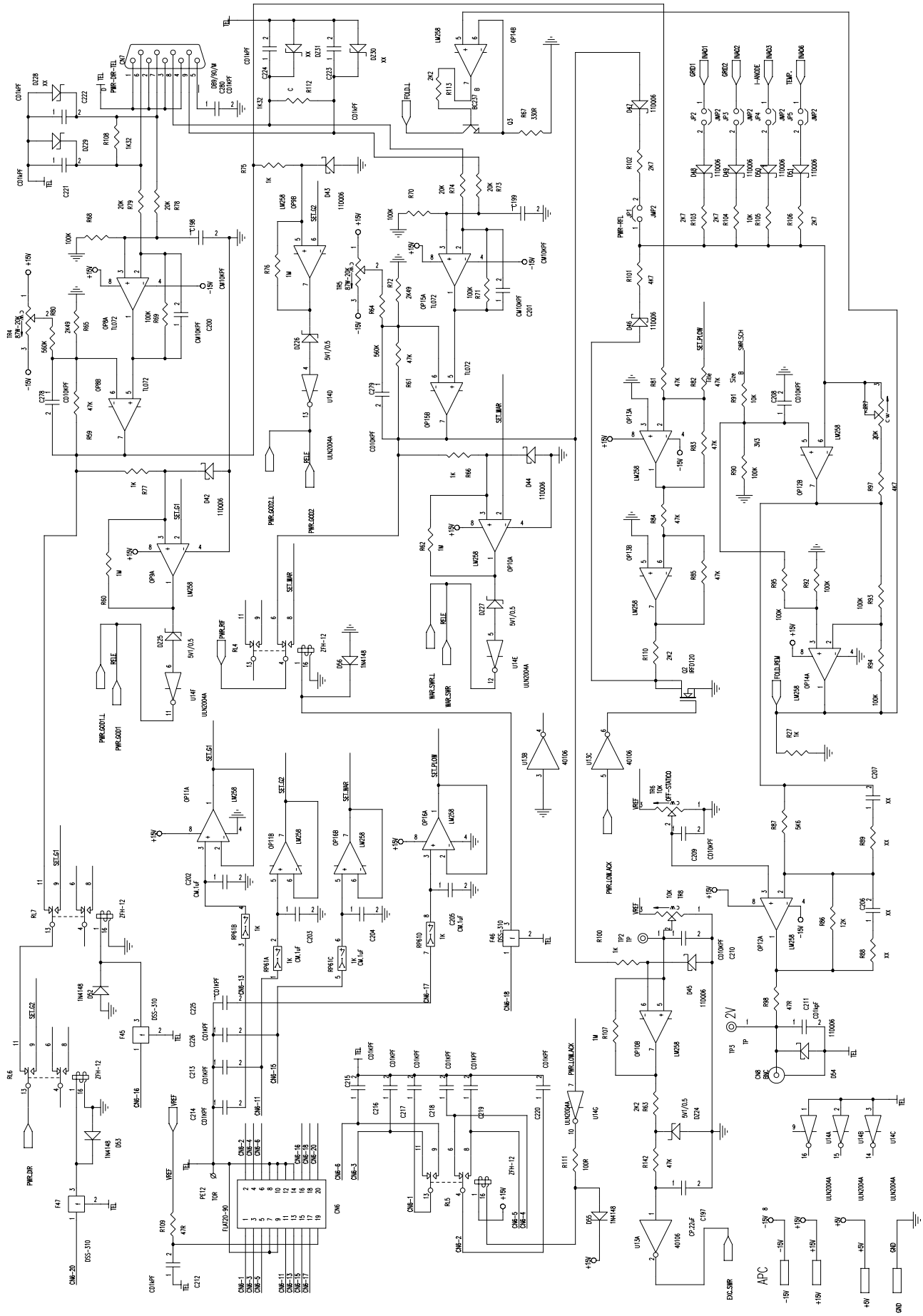

CN12
DB25 MASCH.
PE
TOR
C14 CD1NPF
R24 22R
+15V
R2 22R
R22 22R
R12 22R
R16 22R
R8 22R
R4 22R
R23 22R
R19 22R
R18 22R
R14 22R
R10 22R
R6 22R
C12
C11
C10
C9
C8
C7
C6
C5
C4
C3
CD1NPF
C13
TEMP
VFIL
IFIL
VA
IA
VG1
IG1
VG2
IG2
VREF
FOR.PWR
REFL.PWR
R1 OR
R3 XX
R5 XX
R7 XX
R9 XX
R11 XX
R13 XX
R15 XX
R17 XX
TR1 B/M 1K
TR2 B/M 50K
TR3 B/M 50K
TR4 B/M 50K
TR5 B/M 50K
TR6 B/M 50K
TR7 B/M 50K
TR8 B/M 50K
TR9 B/M 50K
SW1
COM-676
S1
SW SPDT
JP2 JUMPER3
JP4 JUMPER3
REF
TR10 10K m-3
TR11 10K m-3
R20 33K
R21 33K
D1 1N4148
D2 1N4148
D3 1N4148
D4 1N4148
C1 CD47PF
C2 CD47PF
LMET
QMET
JP1
JP3
MAS-3
LINEAR METER
QUAD. METER
RL1
102-12V
+15V

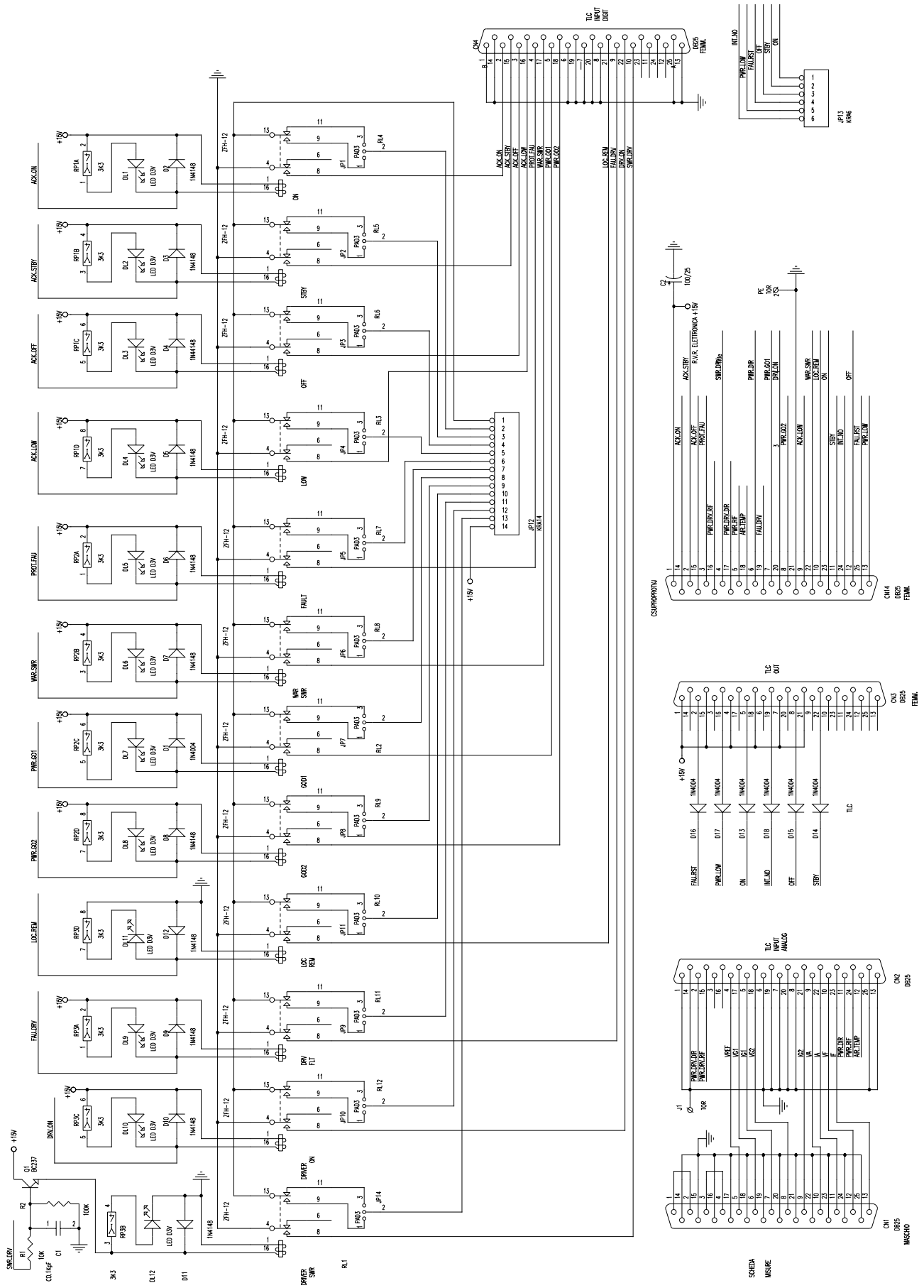


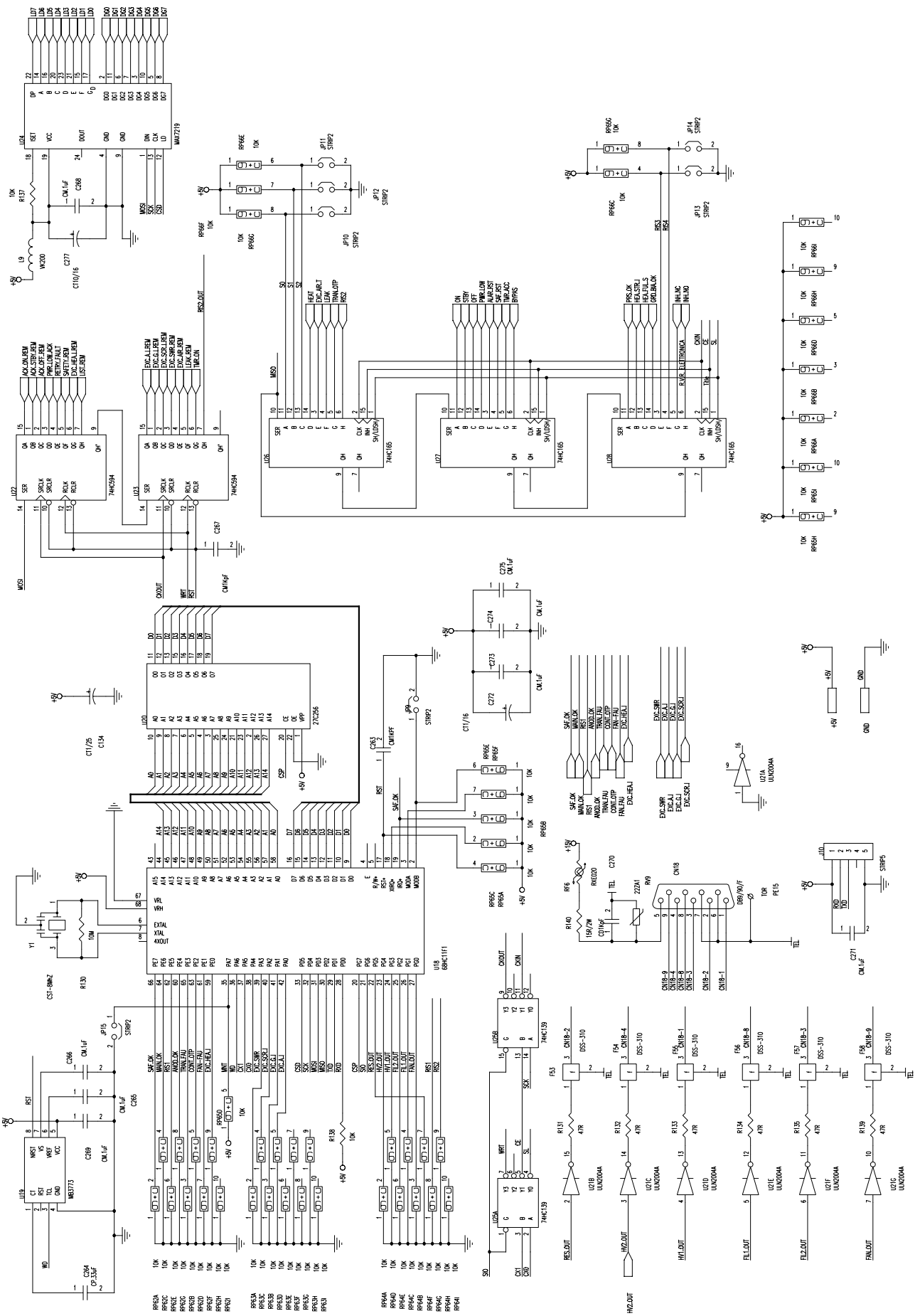



J1
PE
CN18
DB9-CS-M
CE10/25
C7
KRA9
KRA4
KRA2
RISERVA
RIS
HV2
HV1
FIL2
FIL1
FAN
LED-D3V
LED D3R
1N4004
12V-10A
CP.1uF-MKT
22R/1W
3K3
47ZA1
10x38
10A
1W/1W


R3 RXD220
R4 15K/2W
D10 1N4004
R5 3K3
C5 220/25
D8
KBPC25A
FS1 10x38 10A
R2 1W/2W
R1 1W/2W
JP1 KRA3
D9 D3V
+12VDC
DISSIPATO
GR+L GR-L INP+L INP-L PL+L PL-L LD+L LD-L
CN20 CON26A
GR+ GR- INP+ INP- PL+ PL- LD+ LD-
1N4004 D7 RP4D 3K3 DL8 D3V RL8 G2R1A-12
GR+L RP2D 1K5 RV4 472A1 C4 CP-47/100
GR-L RP1D 1K5 RL7
GR- RP3D 3K3 D6 DL7
GRID Size JP2 KRA6
INP+ RP4C 3K3 D5 DL6 RL6
INP+L RP2C 1K5 RV3 C3
INP-L RP1C 1K5 RL5
INP- RP3C 3K3 D4 DL5
INPUT JP3
PL+ RP4B 3K3 D3 DL4 RL4
PL+L RP2B 1K5 RV2 C2
PL-L RP1B 1K5 RL3
PL- RP3B 3K3 D2 DL3
METTERE SERIGRAFIA SUI MORSETTI
PLATE JP4
LD+ RP4A 3K3 D1 DL2 RL2
LD+L RP2A 1K5 RV1 C1
LD-L RP1A 1K5 RL1
LD- RP3A 3K3 D9 DL1
LOAD JP5




ACK_ON
ACK_STBY
ACK_OFF
ACK_LOW
PROT_FAU
WAR_SWR
PWR_G01
PWR_G02
LOC_REM
FAU_DRV
DRV_ON
SWR_DRV
ON
STBY
OFF
LOW
FAULT
WAR SWR
GOD1
GOD2
LOC REM
DRV FLT
DRIVER ON
DRIVER SWR
+15V
TLC INPUT DOUT
TLC OUT
TLC INPUT ANALOG
CSUPROPROTVU
SCHEDA MISURE
INT_NO
PWR_LOW
FAU_RST
OFF
STBY
ON



9 ELECTRICAL SPECIFICATIONS

Alternate mains voltage	230 V ac ±15%
Fuse AC	4AT
Continue mains voltage	24Vdc –10%+30%
Fuse DC	4AT
Absorbed Power	20VA
Max output current CN1	+15V ptc 200mA
Max output current CN2	+5V ptc 1A
	+15V ptc 400mA
	–15V ptc 200mA
Max output current CN3	+15V 2A
	-15V 200mA
Max output current CN6	+9V res 15mA
Max output current CN15 CN12	+15V ptc 200mA
Max output current CN14	+15V ptc 200mA
Max output current CN17	+15V ptc 200mA
Max output current CN18	+15V ptc 200mA
Converters working frequency PWM	100KhZ
Negative Converters working frequency FVM	15-50KhZ
Electromechanical contact current	15mA
Microprocessor	68HC11F1
Microprocessor clock frequency	8Mhz
Watch dog protection	YES
Working extreme temperatures	0°C +45°C