

Instruction Manual

MANLMC10070C

Rev. F0805

LMC-20 DIGITAL LIGHT MONITOR

Software Version _____



Serial Number: _____



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eddyco.com

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BASIC DESCRIPTION

The LMC-20 is designed to meet and exceed today's critical optical coating standards. Anything less than results that are precise and consistent from run to run could spell disaster for your operation.

The LMC-20's high resolution, backlit LCD screen provides you with comprehensive data much like a stripchart recorder. It also displays your program, the layer running, material specifications, and Xtal monitor run parameters.

The LMC-20 integrates easily into existing systems. Installation is as easy as plugging in sub-components. The multiple RS-232 ports communicate with several popular crystal deposition controllers, the XYC-20 programmable sweep, and the SC-20 system controller. Together these can provide complete data to your PC with our EDDY Link software.

Final thickness shut-offs are calculated to an accuracy of 0.1% of amplitude change. Together with the SC-20 and XYC-20, the LCM-20 will offer you the ability to perform 40 different processes, providing precise control over the optical thickness of each layer. Each coating design may contain up to 50 individual layers. The input and output characteristics can be customized to create up to 99 different materials.

LIMITED WARRANTY

This LMC-20 Light Monitor is warranted against defects in materials and workmanship for a period of one year from the date of shipment to the original purchaser. This warranty will be void if the instrument is not properly operated under conditions of normal use and if normal and accepted maintenance protocols are not performed.

Defects resulting from, or repairs necessitated by, improper installation, misuse, negligence, accident or corrosion of the equipment or any cause other than defective materials or workmanship are not covered by this warranty. No other warranties are expressed or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. EDDY Company is not liable for consequential damages resulting from the use of its equipment.

Purchaser's sole and exclusive remedy under the above warranty is limited to EDDY Company, at its option, repairing or replacing any item which proves to be defective during the warranty period provided the item is returned to EDDY Company together with a written statement of the problem encountered. Any such obligation on the seller's part is subject to the following requirements: 1) defect must be promptly reported to the seller, 2) if so advised by the seller, component must be returned to the seller, no later than seven (7) days after the end of the warranty period, and 3) on examination by the seller the part or component must be found to comply with the above warranty. Any item claimed to be defective during the warranty period must be returned to the builder with the transportation charges prepaid. Return trip transportation charges will be paid by the purchaser. In the event that the seller elects to refund the purchase price, the instrument shall be the property of the seller and shall be promptly shipped back to the seller at the seller's expense. EDDY Company reserves the sole right to determine whether service is covered by the warranty.

If there are any questions about any of the equipment, parts or service call EDDY Company. For all repairs, whether or not they are covered by the warranty, call EDDY Company service line or our Internet address.

Phone number: 760-961-8457

Internet: www.eddyco.com

If the equipment needs to be returned for any reason you will be given a Return Material Authorization (RMA) number.

UNPACKING

DANGER

Potentially lethal voltages may exist in the unit, even with the power switched off. Service should be attempted only by experienced personnel. Failure to observe safety protocols that are standard for high voltage equipment could result in personal injury.

1. Completely unpack the instrument. Your LMC-20 was released to the carrier in good condition and properly packed. It is essential to examine the contents of the shipment to ensure that no damage occurred during transit.
2. Compare the shipped materials to the packing list. Items included with your LMC-20 are:
 - a. LMC-20 Digital Light Monitor.
 - b. Operation and service manual.
 - c. Power cord.
 - d. Installation kit: Two 14-pin AMP male connectors, 28 male pins, one 14-pin strain relief, one 9-pin AMP connector with strain relief, and 1 each 6 amp SB fuse, 3 amp SB fuse, and 2 amp SB fuse.
3. Call EDDY Company first if there are any problems.

Phone: 760-961-8457

Fax: 760-961-8458

E-mail: tech_support@eddyco.com

USER RESPONSIBILITY

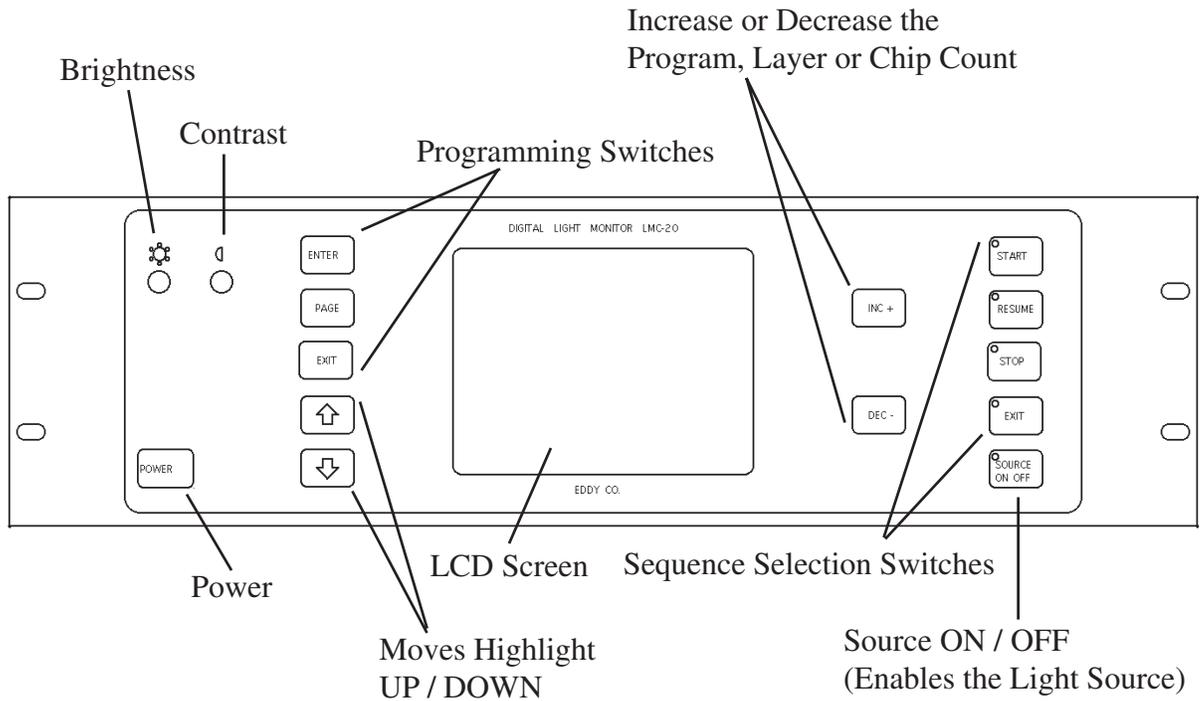
This equipment will perform in accordance with the instructions and information contained in the user's manual when the equipment is installed, operated, and maintained in compliance with the instructions. Equipment should be checked periodically, routine maintenance performed and broken or non-working parts replaced immediately.

The user/purchaser shall have sole responsibility for any malfunctions resulting from their improper use or lack of maintenance of the equipment.

INITIAL STARTUP

1. Read the manual.
2. Connect all shipped parts.
3. After reading the manual, establish that all the connected instruments are working properly.
4. Connect power, check that line cord matches the line voltage, and turn LMC-20 on.
5. The main menu will appear.
6. Adjust the brightness and contrast for optimum viewing.

FRONT PANEL (description)



Press this key with the Start up screen and the program and layer shown will be initiated. It will process one layer. With other screens this key will commit the entered value to memory.



This key will change the display or move between I/O ports.



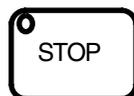
Returns to start up or manual menu.



Starts selected program and layer in full automatic mode.



This key will over-ride the out of temperature error and continue the run process.



Used when the process is in progress (it will stop the coating process), also used in different maintenance modes.



Returns program to main menu.



Pressing once will turn on the source at low power. Pressing twice will turn source to high. Pressing a third time will turn the source off.

LMC-20 LIGHT MONITOR SPECIFICATIONS

All inputs and outputs are optically isolated for noise immunity. Each I/O Port can be programmed individually, giving you a selection of programming choices. Six output ports may be programmed for DC closure or five volts output, both of which can drive your opto isolators. The seventh output is isolated and capable of controlling up to 60 volts at 1 amp. The inputs are user programmable to accept contact closure or standard TTL logic.

CABINET:	5" X 17.2" X 13.5" deep includes mounted parts on back panel.
DISPLAY:	Fluorescent backlit LCD.
WEIGHT:	18 lbs
SHIPPING WEIGHT:	22 lbs
AC INPUT VOLTAGE RANGE:	97 TO 245 VAC. 50/60 Hz
Power:	250 VA
Fuse:	120V - 2 amp SB fuse.
Fuse:	240V - 1 amp SB fuse.
POWER OFF MEMORY LIFE:	120 months
I.R.DET.:	+ 47.5 V.D.C. + - .02% - 47.5 V.D.C. + - .02%
SOURCE POWER:	10.5/11.5 VDC regulated to + - .01%.
REAR CONNECTORS:	
Chip changer:	14 pin Twistlock
Mono:	14 pin Twistlock
Det. A and B:	14 pin Twistlock
Source:	14 pin Twistlock
Digital I/O A and B:	14 Pin Twistlock
Test:	LED
Heater:	3 amp SB Fuse
Source Lamp:	6 amp SB Fuse
DATA PORTS RS 232:	
Terminal:	4800 baud (8,N,1)
Printer:	Not enabled with V 6.2 or higher software.
Xtal.:	
MAXTEK MDC-360	9600 baud (8,N,1)
SYCON	300 baud (8,N,1)
INFICON IC5	9600 baud (8,N,1)
XYC-20:	Not enabled with V 6.2 or higher software

OPERATOR SAFETY

DANGER:

Potentially lethal voltages may exist within this unit, even with the power shut off. Only qualified personnel should attempt service. Failure to observe all safety precautions may result in personal injury.

Observe the following precautions when servicing this instrument because of the potential high voltage.

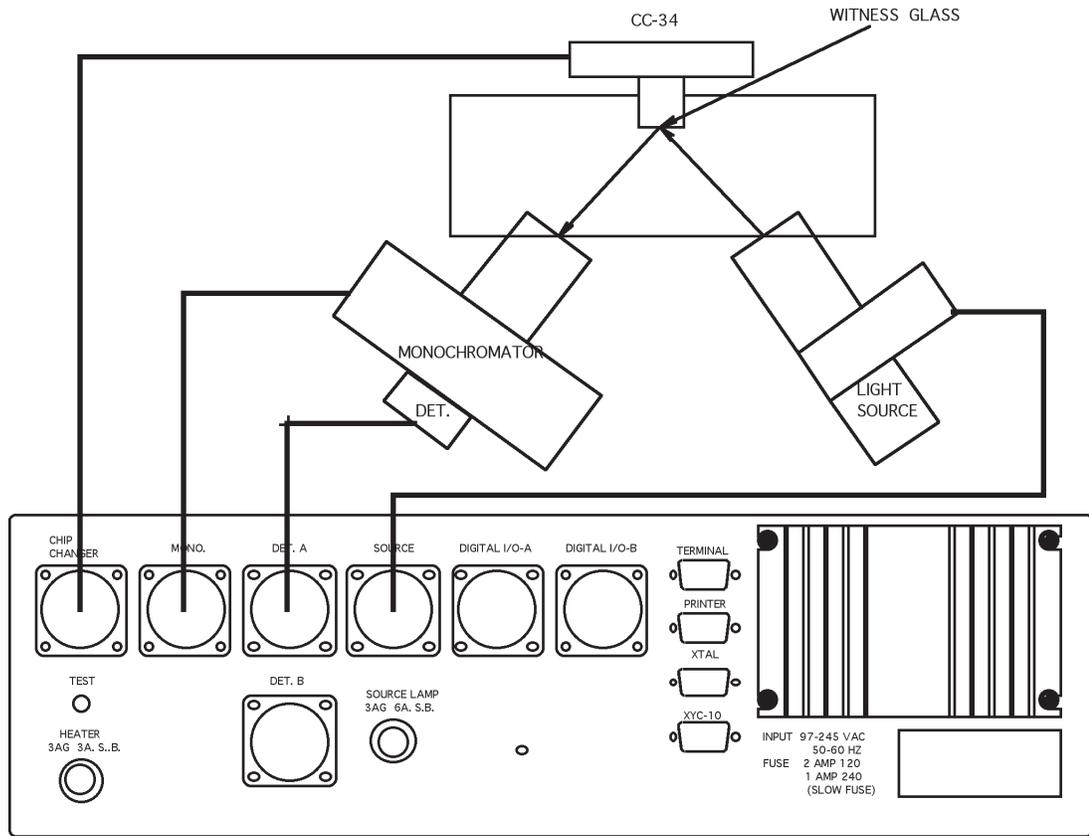
1. Make sure HIGH VOLTAGE WARNING signs are posted in the service area.
2. Remove rings, watches, bracelets, and any other metal jewelry before working around high voltage.
3. DO NOT WORK ALONE.
4. Be sure all equipment is connected to a power source that has the correct polarity and grounding, as prescribed by the local electrical codes.
5. Before servicing equipment be sure it is switched off at the main power switch. This switch should have a lock out feature.
6. Use a grounding hook to discharge any electrical parts that hold a lethal voltage after shutoff. Be sure these parts are discharged before attempting any repairs.
7. Do not touch any high voltage leads unless the power is off and a grounding hook is connected to the parts being serviced.
8. This instruments high-voltage components are equipped with electrical interlocks to protect personnel from injury. DO NOT ATTEMPT TO DEFEAT, OVERRIDE, OR BYPASS THESE PROTECTIVE DEVICES.
9. Never leave loose ends on high voltage devices.

Health Hazard

The nature, as well as the form, of the condensates deposited on the tank walls and the materials used in the coating process can pose health hazards. Some precautions to take include the following:

1. To prevent inhaling the fine particles and prevent damage to the lungs, wear a protective respirator mask that has been approved for this use by the National Institute for Occupational Safety.
2. Some of these materials are toxic. Inhaling them could prove to be deadly. Be sure to know the toxic qualities of each material being worked with.
3. Certain materials can cause flash fires when exposed to oxygen. (Example: Titanium). When opening the chamber door after running a process use extreme caution.

REAR PANEL-INSTALLATION



- CHIP CHANGER: Connects to chip changer.
- MONO.: Connects to the monochromator.
- DET. A and B: Connects to the light detector.
- SOURCE: Connects to the light source.

I/O PORTS A and B: Each Digital I/O Port has 7 isolated selectable outputs and 4 isolated selectable inputs. Each port can be easily configured to communicate with the XYC-20 and any standard opto isolator.

TERMINAL PORT: This port allows you to communicate with the EDDYLog and EDDYLink software installed on a PC compatible computer. This will allow complete memory upload and download and complete data logging. This port may be connected to a PC with a terminal port program, configured for 4800 baud.

PRINTER: Not enabled by our V 6.2 or higher software.

XTAL: This standard RS-232 port is configured for Sycon (set to 300 baud), Maxtek MDC-360 (set to 9600 baud), Inficon IC5 (set to 9600 baud). This port is used to select the material and initiate and terminate the coating process at the appropriate optical thickness or designated physical thickness.

XYC-20: Not enabled by our V 6.2 or higher software.

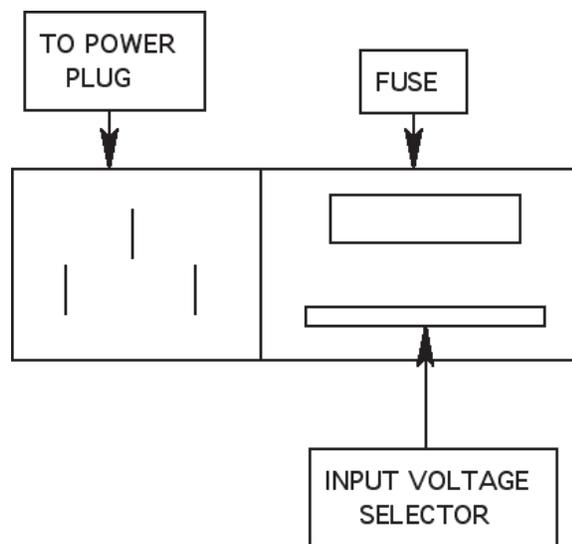
REAR PANEL

DANGER

Potentially lethal voltages may exist within this unit, even with the power shut off. Only qualified personnel should attempt to service this unit. Failure to observe all safety precautions may result in personal injury.

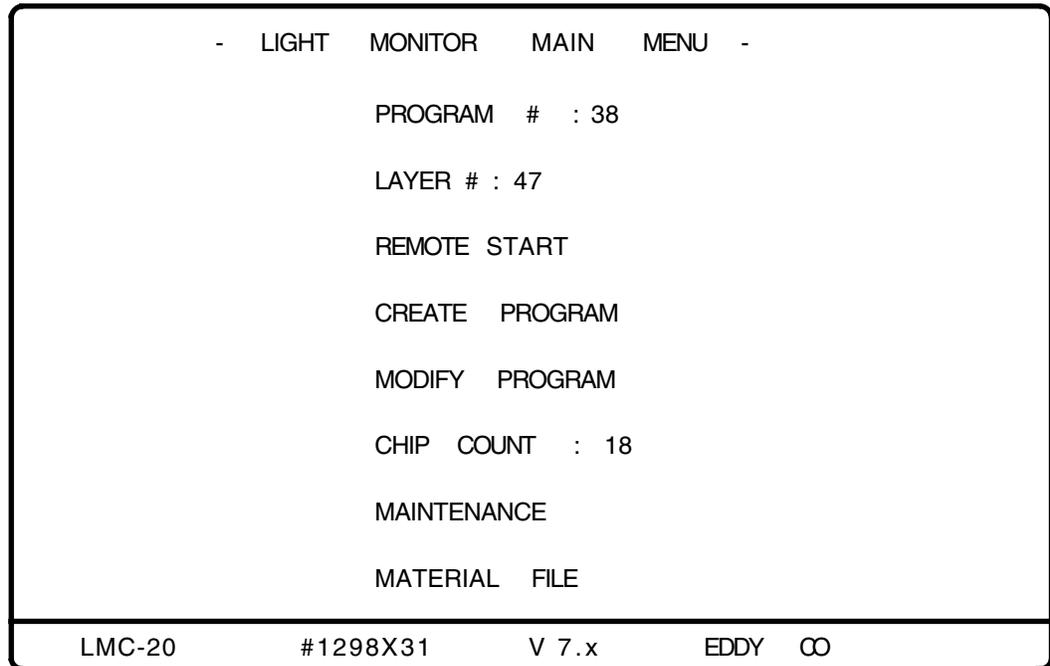
POWER INPUT and FUSE HOLDER:

The LMC-20 can be configured to use either 120 V ac or 240 V ac. The voltage selected is controlled by the CORCOM power card which is installed in the slot below the fuse holder. To remove the card use a pair of needle nosed pliers and pull out. To configure for 120 volts turn card so the 120 is right side up and facing you. For 240 volts turn card over and turn so 240 is right side up and facing you. Insert card into slot. Make sure the fuse is the right one for the voltage selected. 120 volts requires the 2 amp SB fuse and 240 volts requires the 1 amp SB fuse.



STARTUP MENU

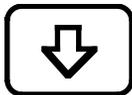
When first powered up the following screen will display. This is the default screen



Read all of the following sections before changing or initiating any selected line.



Moves highlight up (will roll over) to select a line.



Moves highlight down (will roll over) to select a line.



Caution: Pressing this button will start the selected program with the selected layer, in full automatic mode, from any highlighted line.

The following is a brief description of the options on this screen:

REMOTE START:

This allows the LMC-20 to start the process, without an operator present, once it gets the correct signal from the SC-20. It will initiate the program starting at the displayed layer on the screen. Because the power is available to all systems, it is not recommended that this option be used less someone is on hand to monitor all the systems, and ensure that no problems occur.

CREATE PROGRAM:

This allows the creation of a new program. There are 40 programs available, each with up to 50 layers. Always check the Modify Program screen to ensure you are not overwriting an existing program.

MODIFY PROGRAM:

This allows the modification of existing programs.

CHIP COUNT:

This indicates the number of the chips in the chip changer at the start of the process. (Nominally 35) As the run proceeds and the chips are dropped this amount will go down. Since a running total of the remaining chips is kept, if this amount is not updated with each run the LMC-20 will use the last figure, which may not be enough chips to finish the run. This value equals the amount of chips needed plus two. Example: 20 needed for run, add 2, for a total of 22 chips.

MAINTENANCE:

The maintenance option allows the operator to individually operate each function to locate and isolate troubles.

MATERIAL FILE:

This option allows the operator to program the output and input pattern to coincide with patterns from other devices.

With either the Program, Layer, or Chip Count line highlighted the following keys are used:



Increases the highlighted selection.



Decreases the highlighted selection.



Starts a single layer run from highlighted program and layer; stops at the completion of the selected layer.



Will start selected program and layer in full automatic mode.

With any of the following lines highlighted: Create Program, Modify Program, Maintenance, or Material File, these keys have the following functions.



Will enter the selected option.



Will go to the next page in the selected option.



If pressed from the selected option will go to the Main menu, if pressed from a sub-screen will go to the selected option.



Will start selected program and layer in full automatic mode.

Use the up and down ARROWS to scroll through the selections and the INCR + or DECR – to increase or decrease values or enable or disable functions.

The + or – in front of a selection indicates if that selection is enabled or disabled.

Highlight the MAINTENANCE line and press ENTER. Use the INCR+ and DECR – keys to highlight SET CLOCK. Press ENTER to show the SET CLOCK screen.

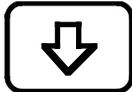
SET CLOCK

This option allows the setting of the internal clock to correspond with the other devices

- SET CLOCK -		
18	=	SECONDS
37	=	MINUTES
17	=	HOURS
05	=	DATE
05	=	MONTH
92	=	YEAR
LMC-20	V7.x	EDDY CO.

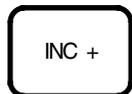


Moves highlight up (will roll over) to select line.



Moves highlight down (will roll over) to select line.

Values that are highlighted can be changed.



Will increase selected value.



Will decrease selected value.

Press EXIT to return to the Maintenance screen.

MAINTENANCE

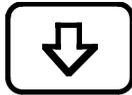
The Maintenance menu allows manual operation of each function for testing and diagnostic actions or to locate and isolate any problem encountered

- MANUAL OPERATION / PAGE 1 -	
OUTPUTS	INPUTS
- MATERIAL I/O	
- SET CLOCK	
- GAIN 312400	LM VALUE 430
- TIME CONSTANT	LAMP = 5.0 AMPS
- DETECTOR A	
- LM ZERO FLAG	
- MONO SET 500	
- BLOCKING FILTER	
LMC-20	V7.x
	EDDY CO.

The + and the – in front of an item indicates enabled or disabled.



Moves highlight up (will roll over) to select line.



Moves highlight down (will roll over) to select line.



Will increase the highlighted value.



Will decrease the highlighted value.



Will activate the highlighted line.

MATERIAL I/O:

Press ENTER to display I/O values. The operator may change the output bits status (enabled, disabled) and read the status of the input bits.

SET CLOCK:

Press ENTER to set the internal clock to the correct time.

LM SIG:

The INCR + or DECR – key changes the numerical value. Pressing the ENTER key starts auto gain change. The unit will adjust the gain to give a signal within 10% of the entered value.

LM GAIN:

Set the gain with the INCR + or DECR -key. Observe the proportional reading change on the LM Value.

TIME CONSTANT:

Lower values give faster response, and higher values give less noise. Try 3 to start.

DETECTOR:

Changes input port from A to B.

LM ZERO FLAG:

Applies voltage for mechanical shutter when appropriate.

MONO SET:

Sets the value of the monochromator from 350nm to 850nm.

BLOCKING FILTER:

Enables and disables the blocking filter on the light source.

LM VALUE:

This is a display of the light signal with a range of 0 to 1000.



Cycles the light source lamp through off - 95% - 100% - off.



Press to change displayed page.



Returns the program to the startup menu.

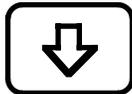
MATERIAL I/O

- MATERIAL I/O PORT A -	
OUTPUTS	INPUTS
-PIN 1	-PIN 10 OFF
-PIN 2	-PIN 11 OFF
-PIN 3	-PIN 12 OFF
-PIN 4	-PIN 13 OFF
-PIN 5	
-PIN 6	
-PIN 8 / 9	
LMC-20 V7.x EDDY CO.	

Note: The inputs are read in real time.



Moves highlight up (will roll over) to select a line.



Moves highlight down (will roll over) to select a line.



Cycles between I/O ports A and B.



Will enable output on selected pin outputs.



Will disable output on selected pin outputs.



Returns to the manual operation menu.

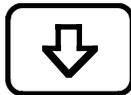
MAINTENANCE

From Material I/O press EXIT to return to Manual Operation page 1, then press PAGE to go to Manual Operation page 2.

- MANUAL OPERATION / PAGE 2 -	
OUTPUTS	INPUTS
-CHIPHEATER	CHIP TEMP = 20
-CHIPMOTOR	CHANGER SWITCH
CHIP DROP 1 CYCLE	
TEMP BAND : 50	
MDC STOP : ON	
GRAPH DELAY : 10	
MDC 360 : ON	
MIN ZERO : 10	
MAX GAIN 10000000	
LMC-20	V7.x
EDDY CO.	



Moves highlight up (will roll over) to select a line.



Moves highlight down (will roll over) to select a line.



This will enable, disable or increase the values on the selected line.



This will enable, disable or decrease the value on the selected line.

The + and – at the beginning of the highlighted line indicates if cycle is enabled or disabled.

CHIP HEATER:

INCR + and DECR – enables the heater power. (Make sure the fuse is removed or the heater is in vacuum before starting the heater).

CHIP MOTOR:

Pressing INCR + will cause the motor to continuously drop chips until DECR – is pressed.

CHIP DROP CYCLE:

Pressing ENTER will cause the chip changer to operate for one cycle.

TEMP BAND:

Sets the maximum allowable limit for witness chip temperature (+ or -).

SYCON,MDC 360, IC-5, STOP:

Will stop the process if communication failure is detected.

GRAPH DELAY:

This value is the amount of seconds between redraws on the data logging screen (Suggested time: 15 seconds). This has no effect on the response time of the instrument.

SYCON

MDC-360: This is enabled to allow the instruments to talk to each other.
IC/5

MIN ZERO:

Maximum allowable signal seen by the detector with the light source off. (25 suggested)

MAX GAIN:

The maximum allowable gain for the process. Set this value to about 5 million higher than your highest achieved gain. If it should need more gain than this then it might be an indication there is an alignment problem or an obstruction in your light path.

CHIP TEMPERATURE:

Temperature at the chips in degree C.

CHANGER SWITCH:

The status of the chip changer, end of cycle, switch.

CREATE A NEW PROGRAM

There are 40 programs available, each with up to 50 layers. The values set will affect all layers of the program entered. The screen starts with a default value for each layer. Once you start entering the values for a program you cannot go backwards. To save the program you must cycle through the entire list on both pages. If you need to change anything go into MODIFY PROGRAM from the main menu.

CAUTION:

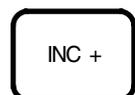
Before using the Create Program check the program number you will use with the Modify Program screen to ensure you do not overwrite an existing program.

PROGRAM # : 1	LAYER # : 1
WITNESS CHIP TEMPERATURE : 20 C	
OVERSHOOT : 10%	
NOISE REJECTION LEVEL : 10	
# OF LAYERS : 2	

When this screen first comes up it will display only the Witness Chip Temperature line. After the correct value is entered or verified pressing ENTER will activate the next line.



Use this key to activate the next line after entering the values on the current line.



Will increase the highlighted value.



Will decrease the highlighted value.

WITNESS CHIP TEMPERATURE:

This sets the target temperature for the chip heater. This temperature is usually the same as the substrate temperature.

OVERSHOOT:

Nominally 4%, this sets the amount of signal change required to determine a quarter wave transition.

NOISE REJECTION LEVEL:

20 times the noise rejection level is the minimum change in signal necessary for the computer to recognize that the signal is going through the maximum or minimums set. Typically set for 5.

Example: Set noise to 5, and set initial signal intensity to 100. The signal will have to increase from 100 to greater than 200 for the computer to recognize a quarter wave.

OF LAYERS:

Total amount of layers in this coating. Pressing the INCR + key will increase the layer count, and the DECR- key will decrease the layer count. After pressing enter (# of layers) the individual layer parameter screen(s) will then sequence.

CREATING A PROGRAM:

There are three standard ways to enter a layer. The following three diagrams will show you.

PROGRAM #	1	LAYER #	: 1
CHIP DROP	:	YES	
QUARTER WAVES	:	2.22	
INITIAL SIGNAL	:	800	
MONOCHROMATOR	:	550	
MATERIAL	:	20 SiO2	

This screen shows a basic layer consisting of a witness chip change, 2.22 quarter waves, initial signal of 800, monochromator of 550nm, and material 20 (SiO₂). When you first enter a layer screen the only option you see is Chip Drop. You use the INC+ and DEC - buttons to change the values. Once a value is set you press ENTER to see the next parameter. NOTE: No changes will be saved until you press ENTER after selecting your material. Exiting before will result in all changes for that layer being lost.

```
PROGRAM # 1                                LAYER # : 1

CHIP DROP : YES

THICKNESS : 230

INITIAL SIGNAL : 800

MONOCHROMATOR : 550

MATERIAL : 20 SiO2
```

This screen is similar to the last screen except instead of quarter waves we are using physical thickness (in angstroms). To use a physical thickness run the value for the quarter waves down to 0.00. Now press ENTER and the line will now read thickness: 0. In the example above the thickness is set to 230 angstroms. To change back to quarter waves just run the thickness back to 0 and press ENTER and you will go back to quarter waves.

```
PROGRAM # 1                                LAYER # : 1

CHIP DROP : YES

QUARTER WAVES : .9

FRACTIONAL 1/4 WAVE

CUTOFF INTENSITY : 650

INITIAL SIGNAL : 900

MONOCHROMATOR : 550

MATERIAL : 20 SiO2
```

Finally, if you enter in anything less than a quarter wave you will be able to do a fractional quarter wave. The screen will show Fractional 1/4 Wave and below it there will be a line called Cutoff Intensity. Here you put in the intensity value that you want the layer to stop at. For example if you know that one quarter wave will roughly go from 900 to 400 and you want half of a quarter wave then you put in 650.

CHIP DROP: “YES” to start with a clean chip.

QUARTER WAVES:



Increases the value of quarter waves.



Decreases the value of quarter waves.

Select from 1 to 99.9. Use INCR+ OR DECR – to select the values. Press ENTER to go to next parameter.

FRACTIONAL 1/4 WAVE

CUTOFF INTENSITY:

This line is displayed when less than one quarter (1/4) wave is selected. The cutoff intensity values are from 10-999 representing 0-100% reflection at the gain set. If 0.00 is selected and ENTER pressed, the physical thickness parameters will display. Select 0 from the physical thickness parameters, PRESS ENTER and the program will return to quarter waves. Press ENTER to go to next parameter.

INITIAL SIGNAL: (In reflectance monitoring mode)

This is set high for low index materials and low for high index materials. For example TiO₂ start at 100, and SiO₂ start at 900. Press Enter to go to next parameter.

MONOCHROMATOR:

Values for the monochromator range from 350nm to 850nm in a 1:1 ratio. For greater wavelengths this value must be multiplied by the grating calibration factor. (2:1), (3:1), (4:1).

MATERIAL:

Material range: 1 to 99. This relates to the RS-232 output signals controlling the xtal monitor, through the I/O ports. The tens digit tells the xtal monitor which material or film to run. Selecting material 20 will send a start signal to the crystal monitor requesting material or film 2 and create an output pattern matching material 20.

NOTE: Some rate controllers refer to materials differently than others. The Sycon STC-200 calls them Films. The Maxtek MDC-360 and Inficon I/C-5 call them Materials.

MATERIAL FILE MODE

From the Main Menu select Material File and press ENTER.

MATERIAL : 20		DESCRIPTION : SiO2			
	OUTPUT A	OUTPUT B	INPUT A	INPUT B	
1	OFF	OFF	OFF	OFF	1
2	OFF	ON	OFF	OFF	2
3	OFF	OFF	OFF	OFF	3
4	OFF	OFF	OFF	OFF	4
5	OFF	OFF			5
6	OFF	OFF			6
7	OFF	OFF			7
E GUN VOLTAGE : 6 K.V.					
LMC-20		V7.2		THE EDDY CO.	



Pressing this key will cycle the highlighted options through MATERIAL, DESCRIPTION, OUTPUT A, OUTPUT B, INPUT A, INPUT B, and E-GUN VOLTAGE.

MATERIAL:



This increases the highlighted value.

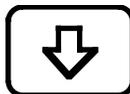


This decreases the highlighted value

DESCRIPTION:



Moves selected sub-field left. Selects 1 of 8 possible fields to modify.



Moves selected sub-field right. Selects 1 of 8 possible fields to modify.



This will select the ASCII characters.



This will select the ASCII characters.

The description field is composed of up to 8 sub fields. Press INCR + or DECR – to select the character displayed in the highlighted position. All standard keyboard characters are available to be used for the description.

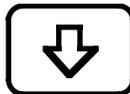
Character set available in description field (In order of appearance):

! “ # % \$ ’ () * + , - . / 0-9 : ; < = > ? @ A-Z [\] ^ _ ‘ a-z { } Æ ”

OUTPUT A-B and INPUT A-B:



Scroll up to select field to modify.



Scroll down to select field to modify.



Will enable the output.



Will disable the output.

The outputs of the 2 output ports may be set to match any control pattern required to operate other equipment or communicate with other components used in automatic coating processes

The input patterns must be set to match outputs from other equipment. Input B, 1-4 will match Output B, 1-4, from the XYC-20. There are 16 different patterns. Each program has its own unique pattern. When the input pattern is exactly matched for more than 1 second the pattern will be run.

E-GUN VOLTAGE:

Voltage may be set from 0 to 10KV in 1KV increments. This is for reference only.

NOTE: You must cycle through all the fields and bring the highlight back to the Material # before exiting for the changes to be stored to memory.

When done press EXIT to return to the Main Menu.

EXAMPLE:

From the main menu screen select the Material file.

When the screen is visible the material number will be highlighted. Use the INCR + or DECR – keys to select the material number. When selecting the material number you must keep in mind that the tens digit will determine which material is to be sent to the Xtal monitor. For example: materials 10-19 will command material 1 on the Xtal monitor to be used. The materials 20-29 will command material 2 to be used.

Press the ENTER key to go to the description field. The description field is composed of up to eight characters. The ARROW key selects the position of the character being displayed, and the INCR + and DECR – keys toggle through the description. All standard keyboard characters are available to be used for the description. Enter the description for Aluminum Oxide, Al₂O₃, by pressing the INCR + and DECR – keys to select the ASCII character “A”. Press the down ARROW key to move the field right and use the INCR + and DECR – to select the ASCII character “1”. Continue until all the characters are entered.

Press the ENTER key to go to the top of each output or input column and the arrow keys to move up or down the field. Use the INCR + and DECR – keys to enable or disable the selected field.

The outputs of the two I/O ports may be set to match any control pattern required to operate any other equipment or communicate with other components used in the automatic coating process. Typically, Output B, 1-4 are used to communicate with Input B, 1-4 on the XYC-20.

The input must be set to match outputs from other equipment. There are 16 different combinations. Each program has its own unique description. When the descriptions are met for more than 1 second the coating will run.

Once selections are made, press ENTER to scroll to the Material field. This action will put the file into memory.

NOTE: Failure to go back to material feild prior to pressing EXIT may result in changes not being saved.



Press to return to the main menu.

LMC-20:

MATERIAL : 20		DESCRIPTION : SiO2			
	OUTPUT A	OUTPUT B	INPUT A	INPUT B	
1	OFF	OFF	OFF	OFF	1
2	OFF	ON	OFF	OFF	2
3	OFF	OFF	OFF	OFF	3
4	OFF	OFF	OFF	OFF	4
5	OFF	OFF			5
6	OFF	OFF			6
7	OFF	OFF			7
E GUN VOLTAGE : 6 K.V.					
LMC-20		V7.2		THE EDDY CO.	

Patterns must match (over 99 possible matches)
each program needs to have its own unique pattern

Connect bits 1-4 Output B to bits 1-4 Input B

XYC-20: Connect bits 1-4 Output A to bits 1-4 Input A.

MATERIAL : 20		DESCRIPTION : SiO2			
	OUTPUT A	OUTPUT B	INPUT A	INPUT B	
1	OFF	OFF	OFF	OFF	1
2	OFF	ON	OFF	OFF	2
3	OFF	OFF	OFF	OFF	3
4	OFF	OFF	OFF	OFF	4
5	OFF	OFF			5
6	OFF	OFF			6
7	OFF	OFF			7
E GUN VOLTAGE : 6 K.V.					
LMC-20		V7.2		THE EDDY CO.	

Output A 1-6 refer to
e-gun pockets 1-6

————— Typical system interconnect.

----- Optional for increase beyond 15 matches.

SUGGESTED MATERIAL I/O LIST

(Please photocopy for each material)

MATERIAL: _____

DESCRIPTION: _____

OUTPUT A/TYPE	USE	DESTINATION
---------------	-----	-------------

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

OUTPUT B/TYPE

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

INPUT A/TYPE

- 1.
- 2.
- 3.
- 4.

INPUT B/TYPE

- 1.
- 2.
- 3.
- 4.

E-GUN VOLTAGE:

I/O INTERFACE (ASYBUS10064F)

DIGITAL I/O - A and B

Pin #	Signal
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Common for outputs 1-6
8	Output 7 +
9	Output 7 -

Jumper PCBP4 installed from 1 to 2 will cause outputs 1 through 6 to source 5 VDC at 10 ma.

Jumper PCBP4 installed from 2 to 3 will cause outputs 1 through 6 to sink 500 ma at up to 60 VDC. Output 7 will sink up to 500 ma at up to 60 VDC.

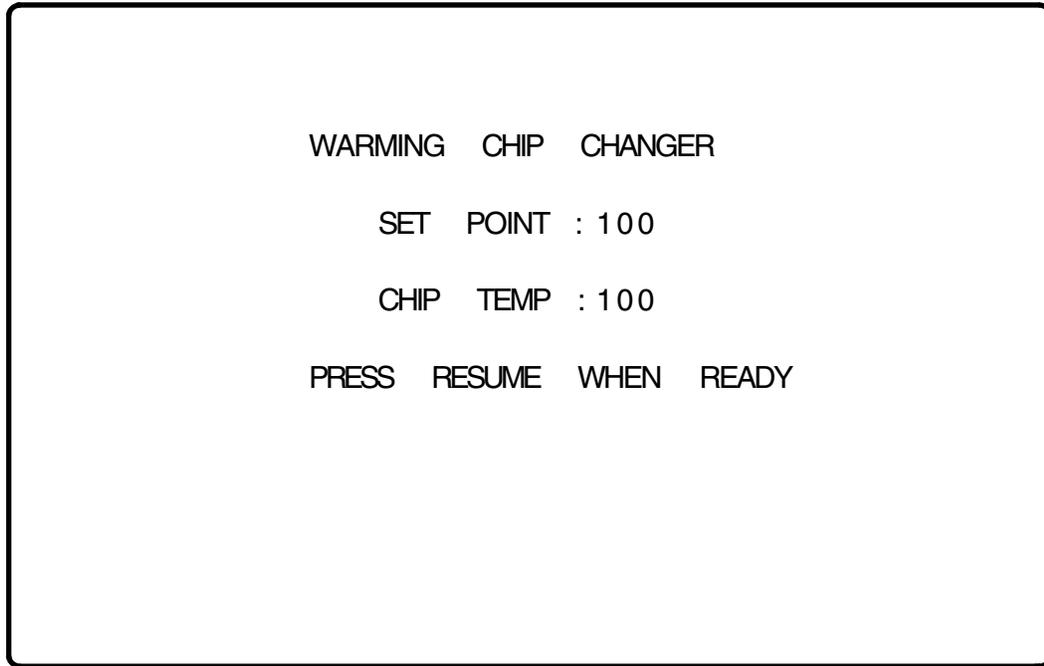
Pin #	Signal
10	Input 1
11	Input 2
12	Input 3
13	Input 4
14	Common for inputs 1-4

Jumper PCBP1 installed from 1 to 2 will cause inputs 1 to 4 to respond to a contact closure.

Jumper PCBP1 installed from 2 to 3 will cause inputs 1 to 4 to respond to 5 VDC input with a source current of 5 ma.

RUN MODE

Press START to enter the Run Mode.



SET POINT: Target chip temperature for the selected run.

RUN MODE

CHIP TEMP: Actual chip temperature.

PRESS RESUME

WHEN READY:

Pressing RESUME will override the temperature window.

Note: This screen passes quickly and will only stop if parameters are out of bounds.

RUN MODE

SETTING MATERIAL OUTPUTS	
WAITING FOR MATERIAL INPUTS	
RUN NUMBER : 1023	STANDBY
RUN TIME :	SIGNAL :
LAYER : 1	MAXIMUM :
MATERIAL : MGF2	MINIMUM :

RUN NUMBER:

There is no user access to this number.

RUN TIME: Keeps a running total of time on the current run.

This screen will stay up for about 10 seconds. It displays until the correct I/O pattern is met.

There is a 15 second delay after the input pattern is met before the coating program continues.

RUN MODE

CHANGING CHIP	
AFTER MANUAL CHANGE PRESS RESUME	
RUN NUMBER :1023	STANDBY
RUN TIME :	SIGNAL :
LAYER : 1	MAXIMUM :
MATERIAL : MGF2	MINIMUM :

CHANGING CHIP:

Displayed at the start of the chip changer motor.

AFTER MANUAL CHANGE PRESS RESUME:

Displayed when the time required to change the chip is exceeded.

If there is a chip change, the screen will display a time count up. Up to 12 seconds is normal. If there is more than 15-17 seconds, the changer has jammed. It will also display when the chip changer is not connected to the LMC-20.

RESUME: Continues the run process.

RUN MODE

SETTING MONOCHROMATOR	
WAVE LENGTH : 500	
POSITIONING ERROR	
AFTER MANUAL SETTING PRESS RESUME	
RUN NUMBER :1023	STANDBY
RUN TIME :	SIGNAL :
LAYER : 1	MAXIMUM :
MATERIAL : MGF2	MINIMUM :

SETTING MONOCHROMATOR:

The servo is adjusting the monochromator to the programmed wavelength.

POSITIONING ERROR:

This message indicates the monochromator is not connected or is not working properly.

1. Confirm that all connections are good.
2. If all the connections are good, you have the option to operate manually or send the unit for service. For manual operation disengage the motor drive and manually adjust the monochromator. Caution: Failure to disengage the motor will result in motor gear train damage.
3. Press RESUME to continue the program.

RUN MODE

SETTING GAIN	
GAIN : 6137000	
LM VALUE : 800	
RUN NUMBER : 1023	STANDBY
RUN TIME :	SIGNAL :
LAYER : 1	MAXIMUM :
MATERIAL : MGF2	MINIMUM :

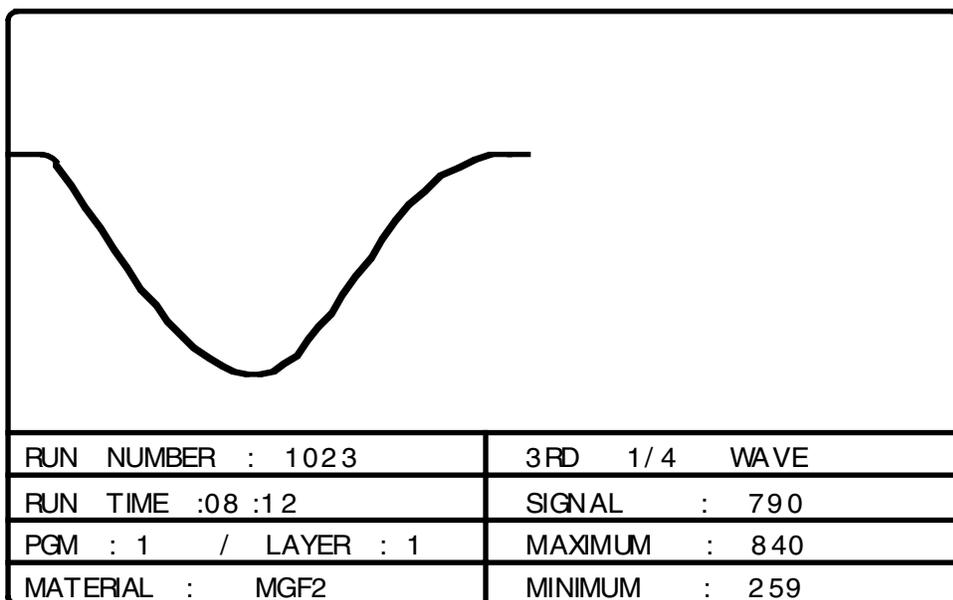
SETTING GAIN: The gain is being varied from 1 to 1.676×10^9 .

MAXIMUM GAIN: This display indicates lack of expected optical signal.
NOTE: Calculations are based on the gain value. LM Value (0-1000) is used for operator interface purposes. (Recommended: 1,000,000 gain should give approximately 100 signal value at monochromator setting of 600nm). Also see page 19.

Some possible causes of a maximum gain error are:

1. Chip fell into light path or some other obstruction.
2. A misalignment problem.
3. Out of witness chips.

RUN SCREEN



RUN NUMBER:

This number increases each time a run is started. There is no method for the user to modify this number.

RUN TIME: This is the amount of time this coating program has been running.

PGM: This is the program selected.

LAYER: The layer being coated is displayed.

MATERIAL: The material being used to coat the substrate. Will be blank if not entered into the material file description feild.

COATING: Indicates program status. Will display current thickness in angstroms when physical thickness has been selected for the layer. Also shows coating complete.

SIGNAL: Intensity reading.

MAXIMUM: The value of the last peak detected.

MINIMUM: The value of the last valley detected.

RUN/SETUP EXAMPLE

This example involves the use of the following devices:

- A. LMC-20 DIGITAL LIGHT MONITOR
 - 1. LMC-10A CHOPPED LIGHT SOURCE
 - 2. LMC-10C VISIBLE DETECTOR
 - 3. MONOCHROMATOR
 - 4. PS-4 POCKET SELECT
 - 5. TWO SHUTTERS
 - 6. EXTERNAL PRESURE CONTROL
 - 7. XTAL MONITOR (SYCON, INFICON, MAXTEK)
 - 8. COMPUTER SOFTWARE (V 6.2 or higher)
- B. XYC-20 DIGITAL E-GUN SWEEP

This example will show the steps for 1 layer.

- A. Load all the necessary parameters for SiO₂ into the Xtal monitor. (Material/Film 2)
- B. On the XYC-20 select pattern 20. Enter SiO₂ into description field and from I/O columns assign appropriate outputs in Output A for pocket select. Select Input B and select 1 off, 2 on, 3 off, 4 off. Confirm that in Input A column all are off. Load in a 9x3 pattern.
- C. Run Xtal monitor in manual mode for SiO₂ to confirm parameters.
- D. On the LMC-20 in the Material file select Material - 20, Description – SiO₂, and Output B select 1 off, 2 on, 3 off, 4 off, 5,6,7, all off. (This will match Input B pattern 20 on XYC-20). See page 28 for diagram.
- E. In the Create New Program Mode program the following:

Witness Chip Temp.	150 degrees C
Overshoot	4%
Noise Rejection Level	8
# Of Layers	1

Layer 1

Chip Drop	Yes
Quarter Wave	2.00
Initial Signal	900
Monochromator	550
Material	20 SiO ₂

- F. Start will start the selected program.

EDDY-20 BUS LIST

BRAIN BOARD IC SIGNALS			SIGNAL NAMES
A/D	IC-26	J-1	LMC-20
0	26	50	DET. SIGNAL
1	27	20	LAMP TEST HI
2	28	51	LAMP TEST LO
3	1	21	MOTOR POS. SWI.
4	2	52	CHIP TEMP.
5	3	22	MONO POS. INPUT
6	4	53	
7	5	23	
D/A	IC-28		
0	2	24	MOTOR CONTROL
1	1	55	
2	20	25	
3	19	56	E GUN VOLTS
BIT	IC-18		
0	4	3	I/O BD AD 0
1	3	33	I/O BD AD 1
2	2	2	I/O BD AD 2
3	1	32	I/O BD AD 3
4	37		LAMP 1
5	36		LAMP 2
6	35		LAMP 3
7	34		LAMP 4
BIT	IC-18		
0	18	38	GAIN SET
1	19	8	CLOCK
2	20	39	LOAD GAIN
3	21	9	LOAD 20 GAIN
4	22	40	LAMP LOW
5	23	10	CHIP HEAT
6	24	41	LAMP HIGH
7	25	11	CHIP MOTOR
BIT	IC-18		
0	14	36	I/O BD DATA 4
1	15	6	I/O BD DATA 5
2	16	37	I/O BD DATA 6
3	17	7	BITS 3-7 NOT USED
4	13	5	
5	12	35	
6	11	4	
7	10	34	

EDDY-20 BUS LIST

<u>BRAIN BOARD IC SIGNALS</u>			<u>SIGNAL NAMES</u>
<u>BIT</u>	<u>IC-17</u>	<u>J-1</u>	<u>LMC-20</u>
0	4		LAMP 5
1	3		LAMP 6
2	2		LAMP 7
3	1		LAMP 8
4	37		LAMP 9
5	36		LAMP 10
6	35		LAMP 11
7	34		LAMP 12
<u>BIT</u>	<u>IC-17</u>		
0	18	15	.5 TC
1	19	45	1 TC
2	20	14	5 TC
3	21	44	2 TC
4	22	13	BLKS FILTER
5	23	43	DET. A/B
6	24	12	ZERO FLAG
7	25	42	X100 GAIN
<u>BIT</u>	<u>IC-17</u>		
0	14	19	I/O BD DATA 0 OUT
1	15	49	I/O BD DATA 1 OUT
2	16	18	I/O BD DATA 2 OUT
3	17	48	i/O BD DATA 3 OUT
4	13	17	I/O BD DATA 0 IN
5	12	47	I/O BD DATA 1 IN
6	11	16	I/O BD DATA 2 IN
7	10	46	I/O BD DATA 3 IN

FRONT PANEL

IC-33 BRAIN BOARD DECODER

0	ENTER
1	PAGE
2	EXIT
3	UP ARROW
4	DOWN ARROW
5	INCR +
6	DECR -
7	START
8	RESUME
9	STOP
10	EDIT
11	SOURCE

EDDY-20 BUS LIST

POWER DISTRIBUTION EDDY-10 BUS

<u>BUS</u>	<u>J-1</u>	<u>LMC-20</u>
	31	GROUND
	1	GROUND
	61	5
	30	5
	60	15
	29	-15
	59	24
	28	
	57	I/O ENABLE

LMC20 / MDC 360 INTERFACE

HARDWARE

The LMC-20 and MDC 360 physically connect as shown in tables 1 and 2. The RS-232 port connection allows the LMC-20 to command the MDC 360 to use the programmed materials and thickness', and to start the coating process. The parallel discrete I/O port connection allows the LMC-20 to hold the MDC 360 in a soak state and to terminate a deposit when the programmed number of quarter waves have been completed, or the coating is manual terminated.

The RS-232 communication speed is fixed at 9600 baud / 8 data / no parity / 1 stop. There are no adjustments or settings for this port in the MDC 360. In the LMC-20, turn on the MDC communications by accessing the control switch under the maintenance menu second page.

The parallel connection is fixed in the LMC-20 to Port A / Bit 7. This bit is not available for programmed material I/O. The MDC 360 however must be configured for the control function to work. The actual bit used within the MDC 360 does not matter. It can be assigned to any available bit. For this example input bit 7 is used.

CONFIGURING THE MDC 360

Refer to the MDC 360 operators manual section 4.4.2. "PROGRAM INPUTS". Follow the procedures covered there to assign a logical name to input #7. Use "COAT" for this example. The name "COAT" will be used in all subsequent referrals to input #7.

Next configure the MDC 360 to take the action "Hold in State" when the controller is in the "Soak Hold" state and the input bit "COAT" is false. Refer to section 4.4.4 "PROGRAM ACTIONS". The first action to program is "Hold in State". Select the "Hold in State" action from the table and then enter a condition string to specify when to take this action. Refer to section 4.4.3.1 "ENTERING A CONDITION STRING". The first element of the condition string is the "Soak Hold" state. The second element in the condition string is the input bit "COAT". The condition string should look like this: Soak Hold & (!COAT). This will cause the controller to hold in state when the "Soak Hold" state is reached and the "COAT" bit is false.

Next configure the MDC 360 to take the action "Terminate Deposit" when the controller is in "Deposit 1" state and the "COAT" bit is false. Again refer to sections 4.4.4 and 4.4.3.1 to configure the controller. The condition string should look like this: Deposit 1 & (!COAT). This will cause the controller to terminate the deposit when the "Deposit 1" state is reached and the "COAT" bit is false.

PROGRAMMING MATERIALS

The LMC-20 uses material numbers from 1 through 99. The 10's digit of the LMC-20 material number corresponds to the 1's digit of the MDC 360's material number. This allows the LMC-20 to be programmed to use the same MDC 360 material, but vary the pocket or pattern outputs used by the E-gun controller. For example the material LMC-20 material #31 would use MDC material #3 and the 1st E-gun pocket. While material #33 would still use the MDC material #3 but the 3rd E-gun pocket.

LMC-20 materials 1 through 9 correspond to MDC materials 11 through 19. MDC materials 10 and 20 through 31 are not accessible through the LMC-20.

OPERATION

When the LMC-20 starts a coating program it sends an "ABORT" command followed by a "RESET" command to the MDC 360. The MDC 360 will beep and the front panel indicators will change state to indicate the commands. This is a sure indication that the RS-232 interface is configured and working properly.

The LMC-20 then does various housekeeping functions like printing the program, warming the chip changer etc. When the LMC-20 displays the message "SETTING MATERIAL OUTPUTS, WAITING FOR MATERIAL INPUTS", one of the inputs the LMC-20 is waiting for is the MDC 360 to report that it is in the "Process ready" or "Process complete" state. Until the MDC reports either of these two states the LMC-20 will stay in this condition.

When the material inputs have been satisfied the LMC-20 sends the new material for this program / layer to the MDC 360. The LMC-20 always uses MDC process #1 and MDC layer #1. The LMC-20 always names the process "LMC-20 PP/LL". Where PP = LMC-20 program # and LL = LMC-20 layer #. This is displayed in the process name position on the MDC 360's LCD screen. Next the LMC-20 sends the start command to the MDC 360. The LMC-20 must rely on the proper configuration of the "COAT" bit input to the MDC 360 for the process to stay synchronized.

The LMC-20 then adjusts the monochromator and the detector gain (if needed). The LMC-20 then starts the layer by turning the "COAT" bit on (0 volts) and begins monitoring the quarter wave (or thickness) readings. If coating by quarter waves the LMC20 determines when the layer is complete, if coating to a thickness the MDC 360 determines when the layer is complete. In either case, at the end of the layer the "COAT" bit is turned off (open / 5 volts) and the process is repeated for the next layer. If all layers are complete both instruments will beep until a front panel key is pressed.

LMC20 Terminal Port Command & Data Protocol

Communications settings: 4800 baud, 8 data bits, 1 stop bit, and no parity.

General

All of the inputs and most of the outputs are printable ASCII characters. The instrument responds to single character commands. No terminators or checksums are required. The operator can invoke the commands and observe the outputs by connecting a “dumb terminal” program directly to the instrument.

Remote Start

With the instrument at the main menu (start up condition), the desired program and starting layer selected, and the cursor highlighting “REMOTE START” an ASCII 7 received via the terminal port will start the coating process. This is identical to pressing the start key.

Remote Stop

During the coating process if the instrument receives any ASCII number between 1 and 6 the coating will be halted. This is identical to pressing the stop key. At the end of a coating the instrument will send “COATING COMPLETE” <cr><lf> about once every 2 seconds until an operator presses a front panel key or until the instrument receives a remote stop command.

During the coating process if the instrument receives an ASCII H the crystal monitor will be halted, but the LMC20 will remain in the coating state. The operator must restart the crystal monitor to resume the coating.

Data logging outputs

The instrument outputs various program, status, and data values during the coating process. Each line is terminated with carriage return and line feed characters. Below is a typical output from a 2-layer coating.

The instrument first lists the program that will be executed followed by an XON (11H) character. After the instrument programs the crystal monitor, adjusts the monochromator, and sets the signal gain it sends “LAYER STARTED”, followed by the date and time.

As the coating proceeds the instrument outputs single lines of coating data at the graph delay interval. A data line consists of:

The light level value followed by a graphed representation of that value. The graph has a resolution of 70 points with a full-scale value of 1365. The light value graph is followed by the crystal monitor power reading in percent and coating thickness in angstroms.

Peak and valley values are reported as they occur. Quarter waves and any fractions are reported as the program values are attained. When a layer is complete the date and time are reported along with the process data shown in the example.

When the "COATING COMPLETE" state is reached that message is reported every two seconds until the operator presses a front panel key or a remote stop is received.

PROGRAM # 1
 OVERSHOOT = 4 % NOISE LEVEL REJECTION = 5
 WITNESS CHIP TEMPERATURE = 134

LAYER	# OF QWAVES	INITIAL RDG	MATERIAL	MONOCHROMATOR	CHIP DROP
1	1	500	10	600	YES
2	1	500	20	500	NO

LAYER STARTED
 7 / 30 / 2
 10 : 24 : 47

500	*				05.0% 0000A
500	*				05.0% 0000A
500	*				06.4% 0000A
500	*				08.1% 0000A
500	*				09.5% 0000A
500	*				09.5% 0000A
500	*				09.5% 0032A
500	*				09.5% 0070A
512	*				09.5% 0108A
610		*			09.6% 0146A
711			*		09.6% 0185A
774				*	09.6% 0224A
828				*	09.6% 0263A
888				*	09.6% 0302A
928				*	09.6% 0341A
970				*	09.6% 0380A
1010				*	09.6% 0419A
1026				*	09.6% 0458A
1012				*	09.6% 0497A

PEAK FOUND 1026
 FRACTIONAL QUARTER WAVE 0.00 FOUND VALUE = 1004.00
 7 / 30 / 2
 10 : 26 : 2
 SHUTTER CLOSED
 LAYER 1 IS DONE NOISE= 28 MATERIAL # 10
 COATING THICKNESS = 0562
 CRYSTAL LIFE = 99

Errors and exceptions

Should the operator press the stop key during the coating process the Date and Time are reported along with "COATING STOPPED" + "MANUAL STOP". Had the coating been stopped via a remote stop command the message would have been "SC10 ERROR" instead of "MANUAL STOP". Other error conditions are: LAMP FAILURE and CHIP TEMPERATURE ERROR.

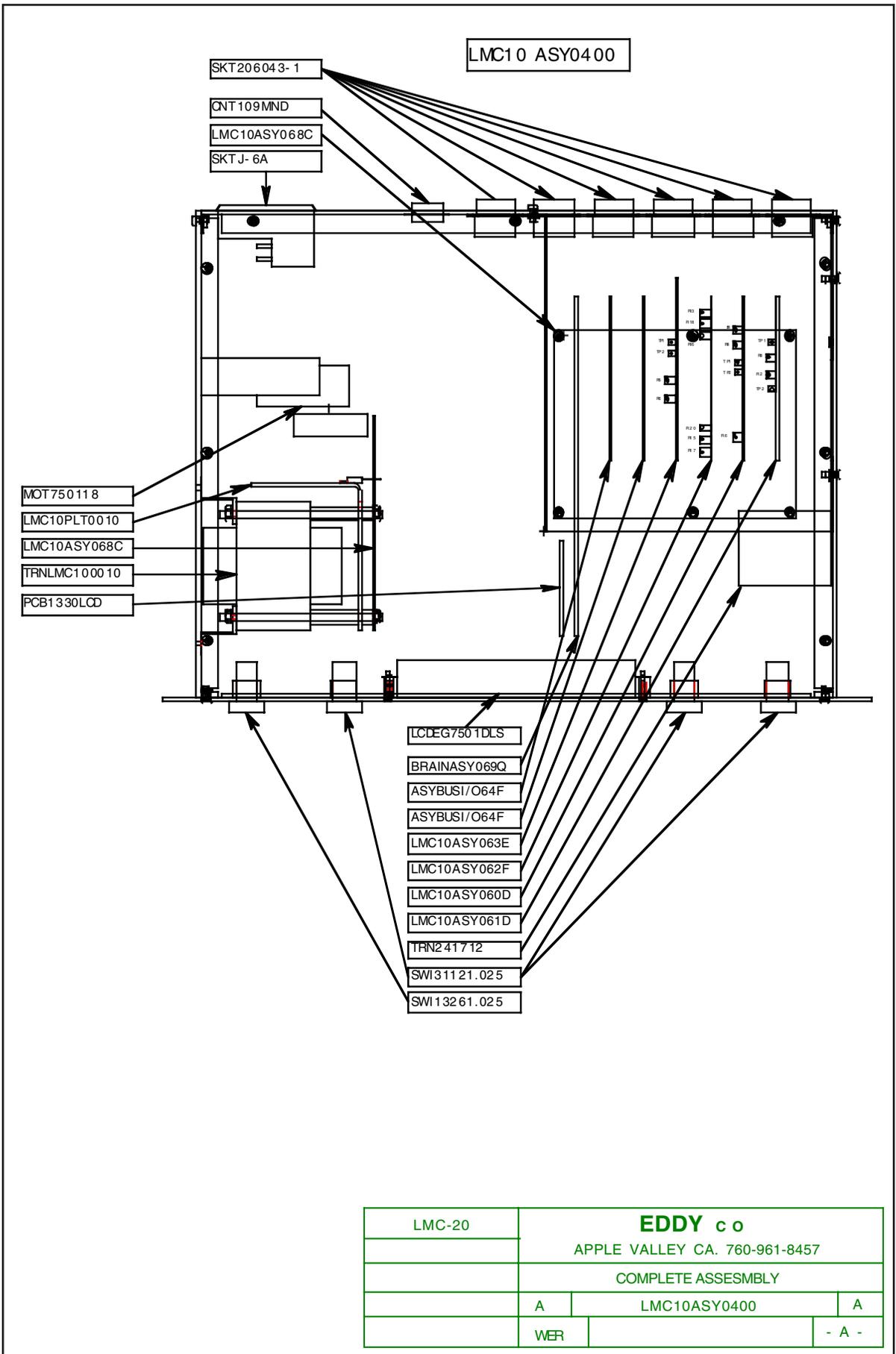
```
PROGRAM # 1
OVERSHOOT = 4 % NOISE LEVEL REJECTION = 5
WITNESS CHIP TEMPERATURE = 134
```

LAYER	# OF QWAVES	INITIAL RDG	MATERIAL	MONOCHROMATOR	CHIP DROP
1	1	500	10	600	YES
2	1	500	20	500	NO

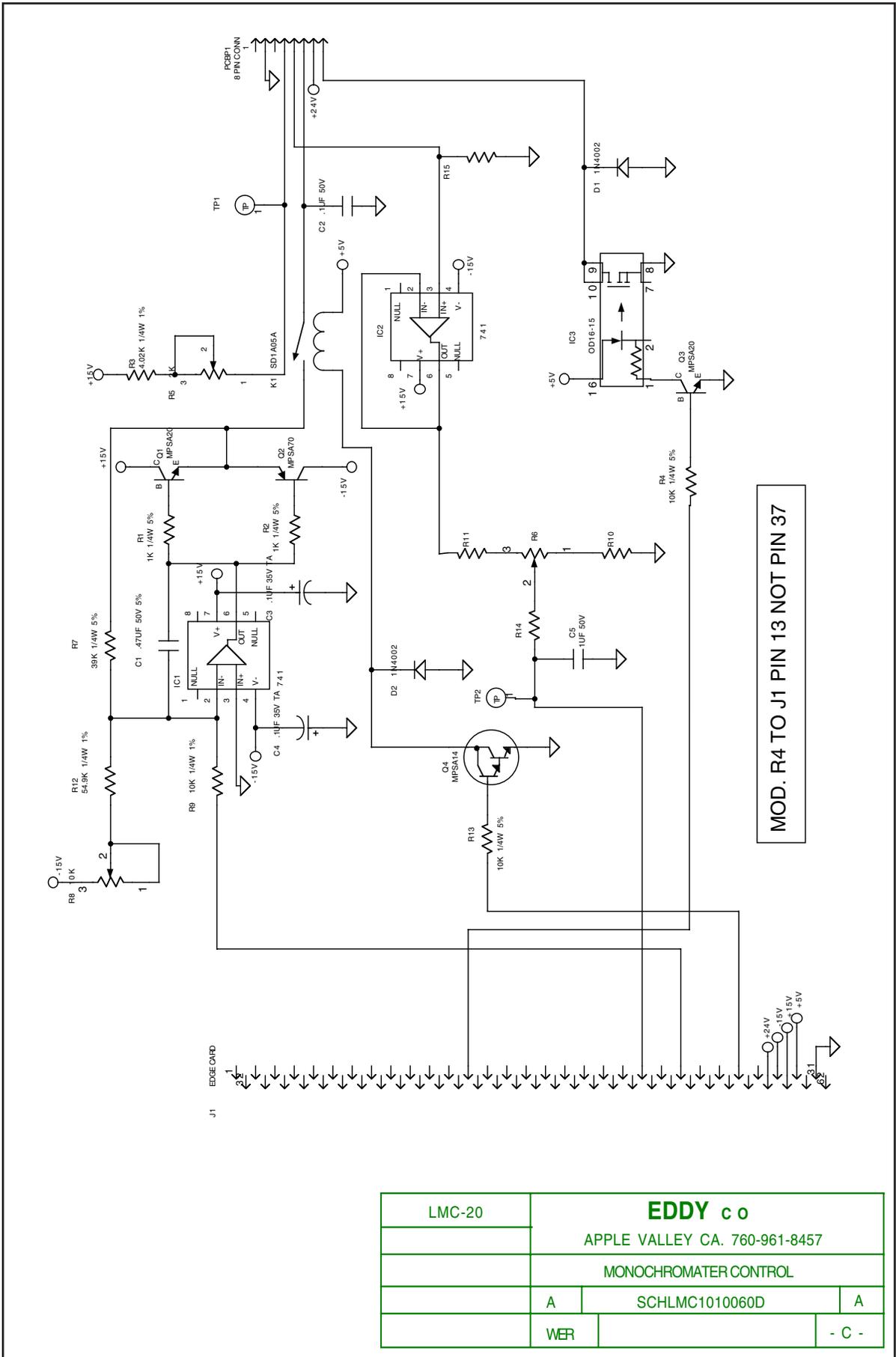
```
LAYER STARTED
7 / 30 / 2
10 : 31 : 40
```

500	*	05.0% 0000A
500	*	05.1% 0000A
500	*	06.8% 0000A
500	*	08.5% 0000A
500	*	09.5% 0000A
500	*	09.5% 0003A

```
7 / 30 / 2
10 : 32 : 3
COATING STOPPED
MANUAL STOP
```

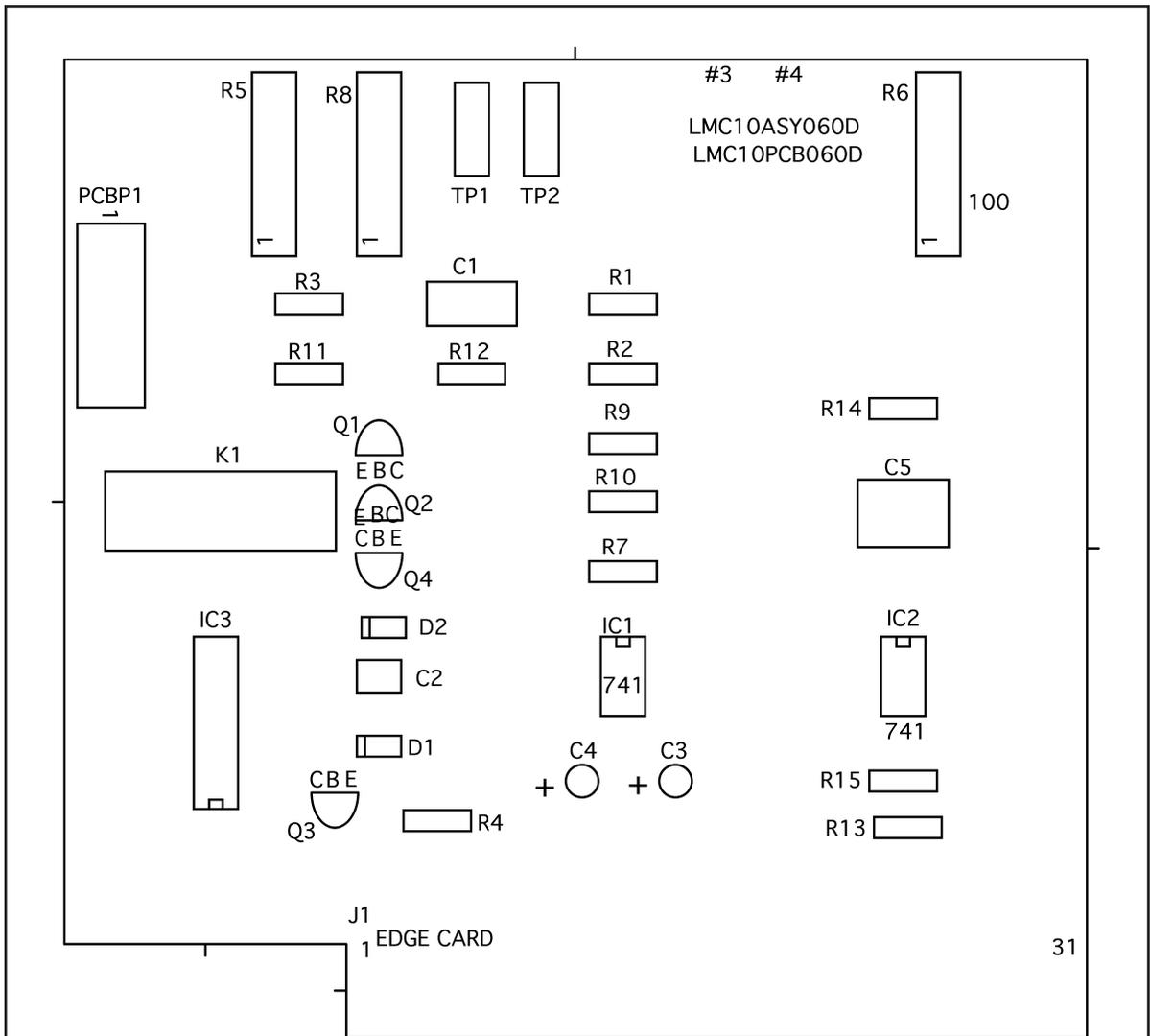


LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	COMPLETE ASSEMBLY		
	A	LMC10ASY0400	A
	WER		- A -



MOD. R4 TO J1 PIN 13 NOT PIN 37

LMC-20		EDDY c o	
		APPLE VALLEY CA. 760-961-8457	
		MONOCHROMATER CONTROL	
A	SCHLMC1010060D	A	
WER		- C -	

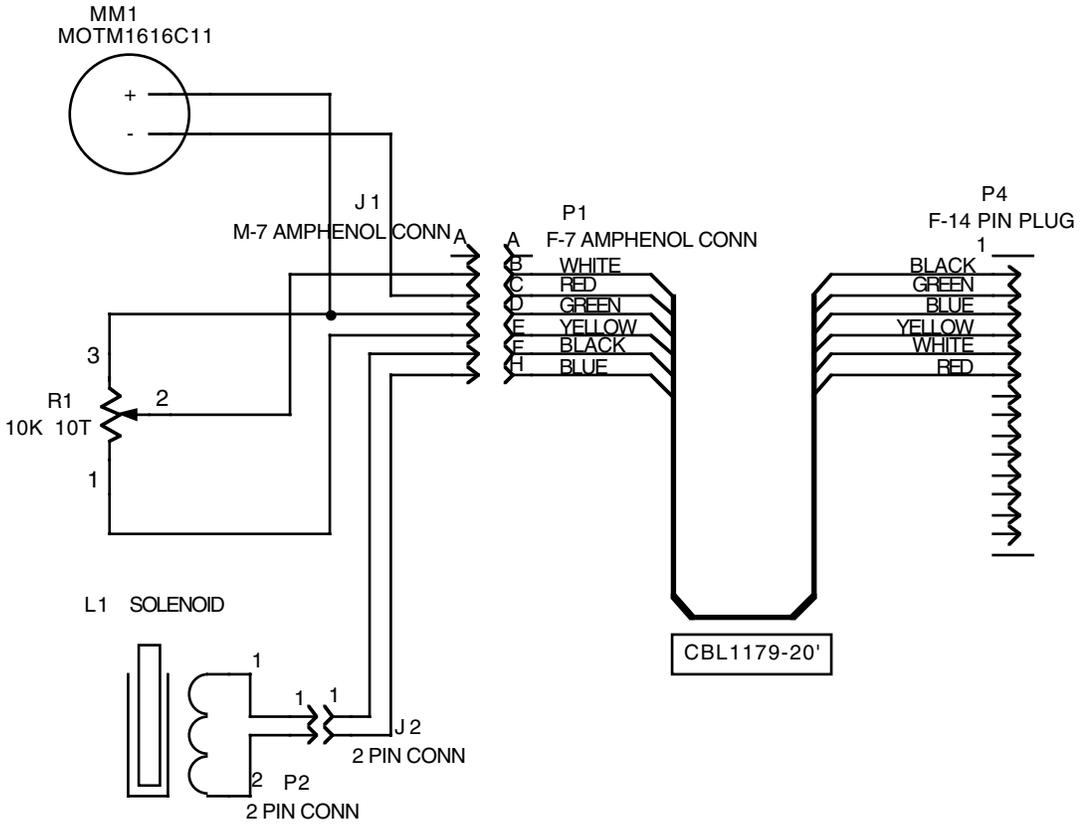


1. Make sure monochromator is connected to power.
2. Adjust R5 to give 10.00 V DC at TP1.
3. Observe display wavelength and confirm on PCBP1, pin 5, that the volts from the Servo pot is correct by using the formula: wavelength divided by 100. Example: Mono 500 divided by 100 will give 5.00 volts.
4. Adjust R11 to give exactly one half of 5.00 volts at TP2.
5. Adjust R8 to give as near as 0 volts as possible on common emitters Q1 and 2.

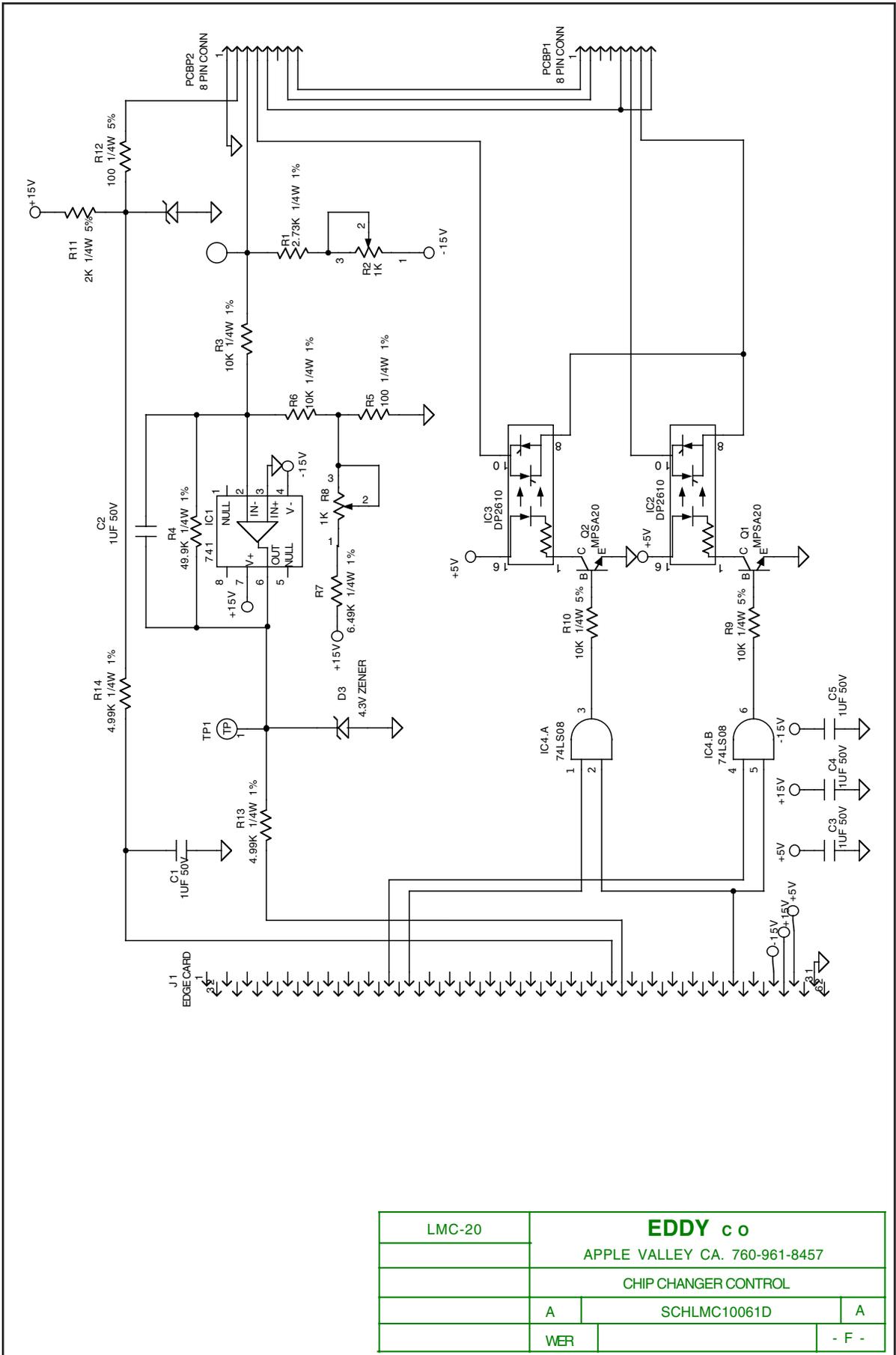
LMC-20		EDDY c o	
		APPLE VALLEY CA. 760-961-8457	
		MONOCHROMATER CONTROL	
	A	LMC10ASY060D	A
	WER		- D -

LM101SERVIO1

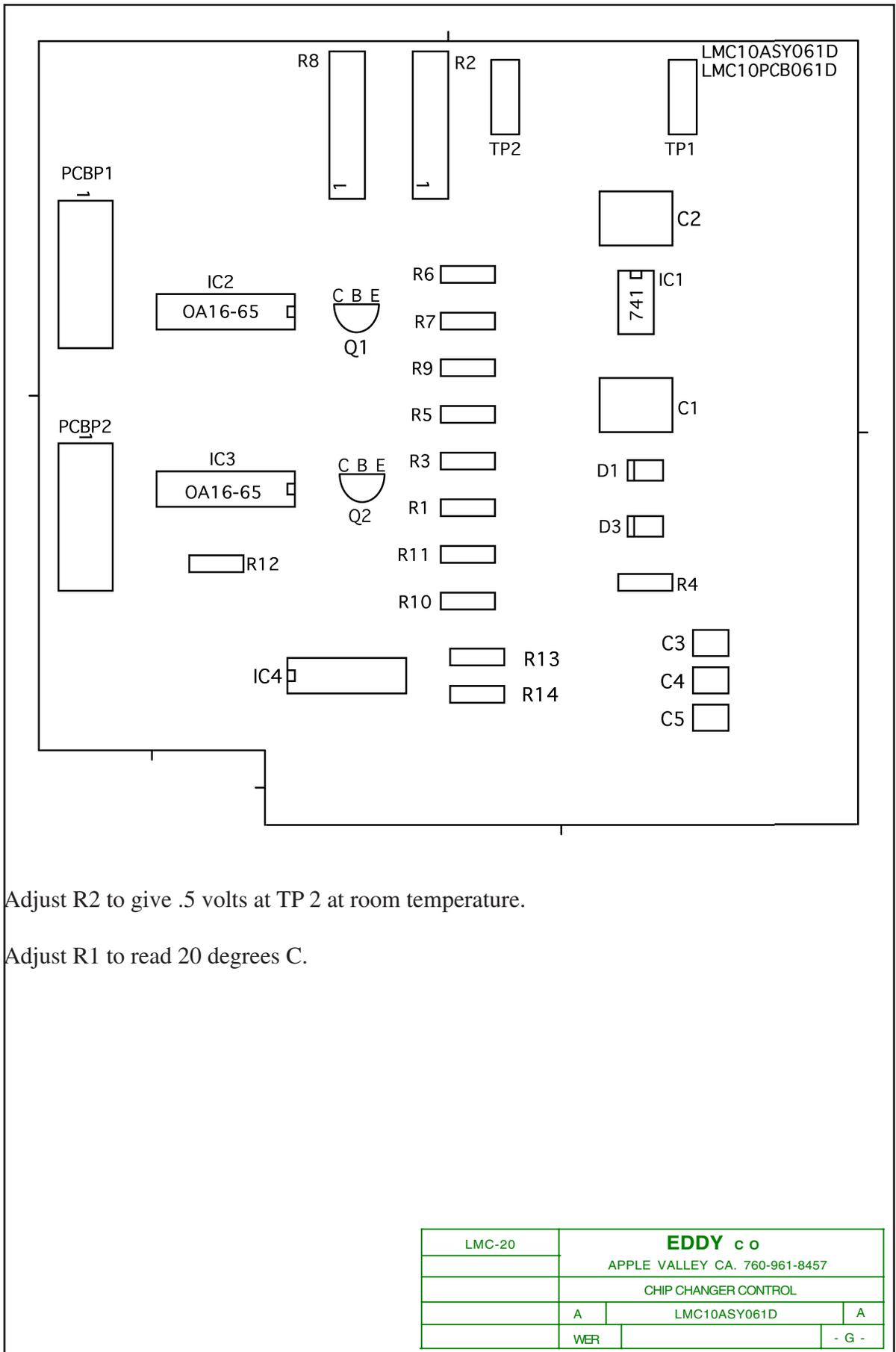
LM101MIQCBL1



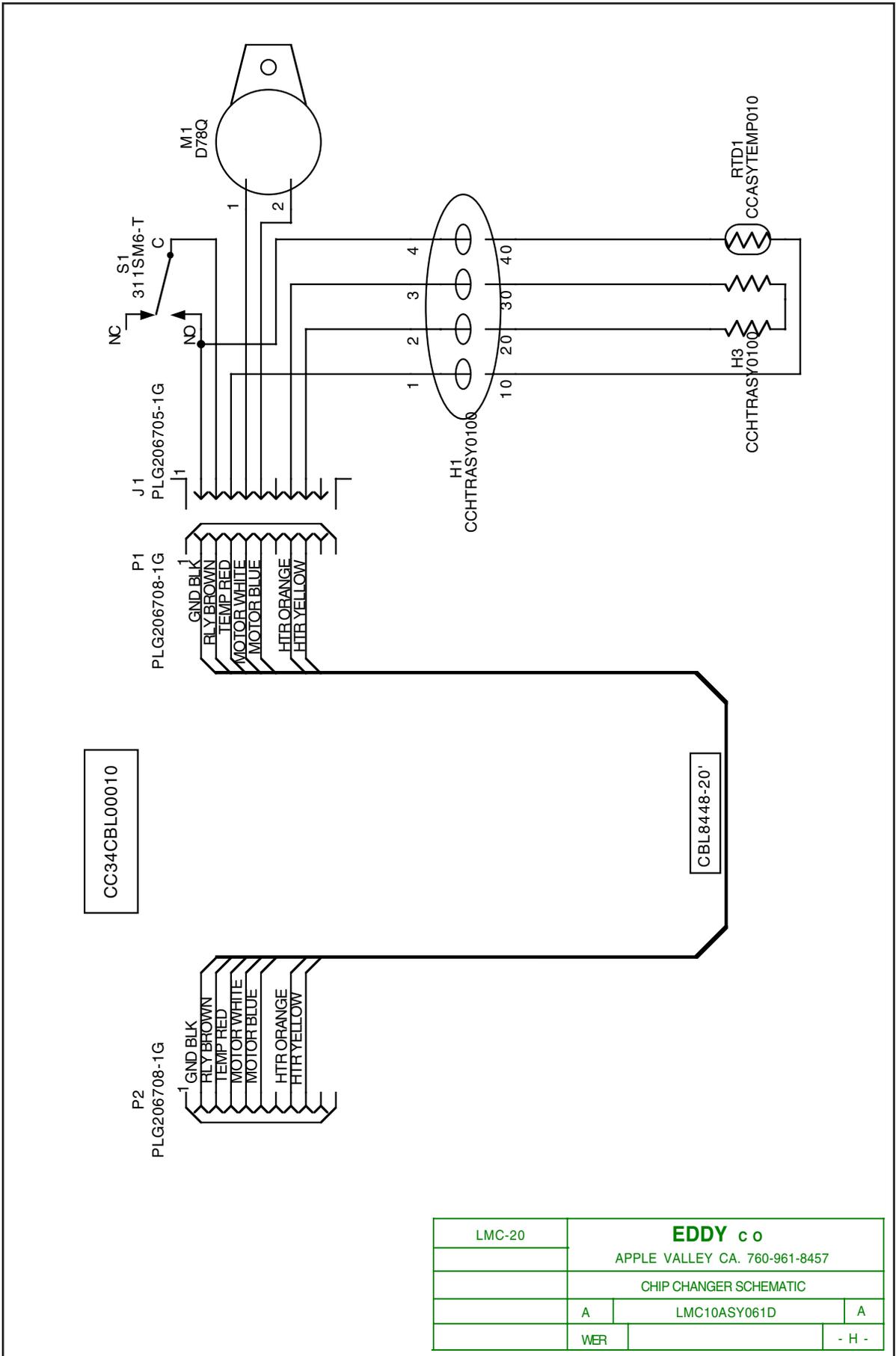
LMC-20	EDDY co		
	APPLE VALLEY CA. 760-961-8457		
	MONOCHROMATER CONTROL		
	A	SCHLMC10001MR05	A
	WER		- E -



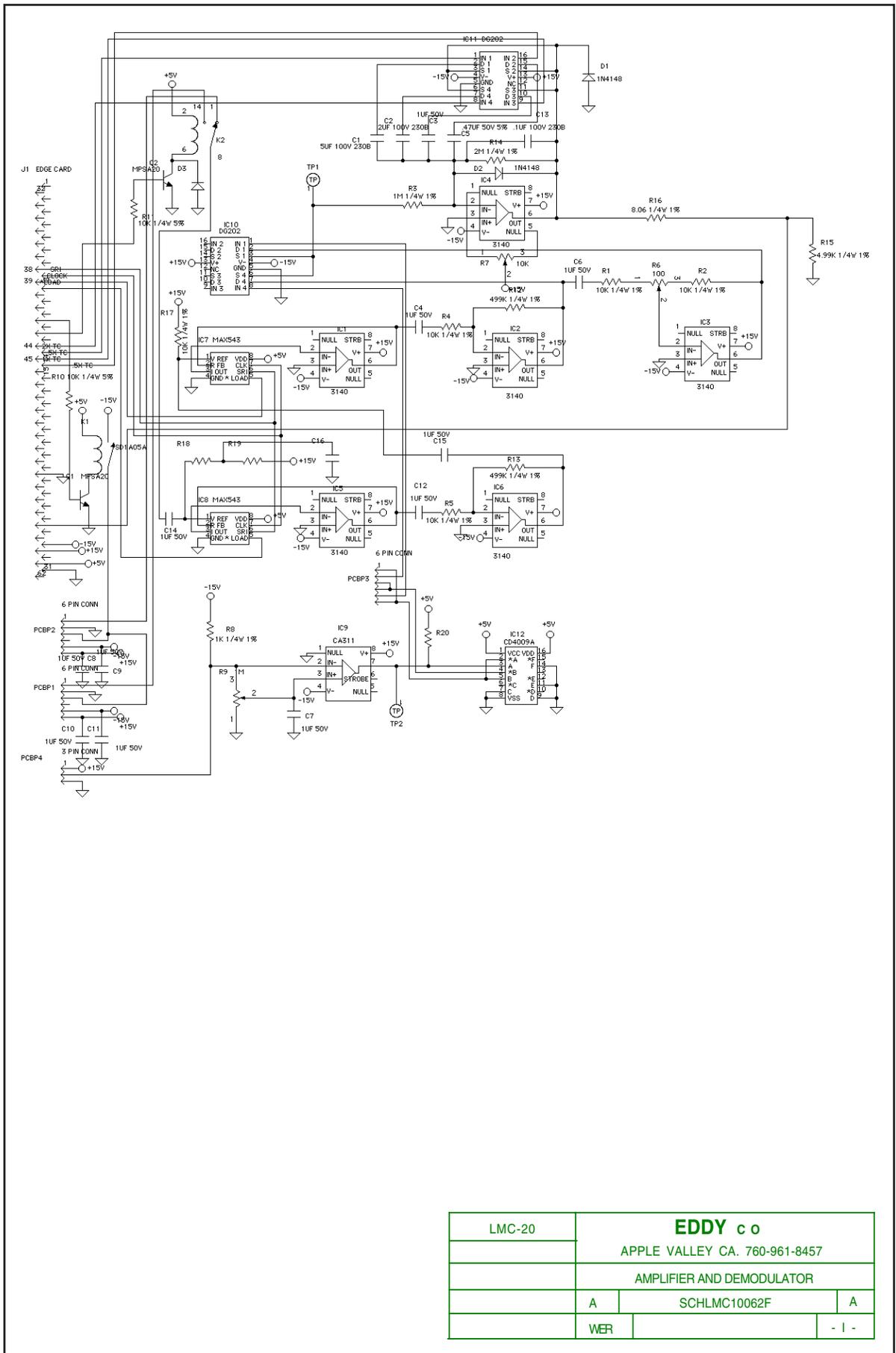
LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	CHIP CHANGER CONTROL		
	A	SCHLMC10061D	A
	WER		- F -



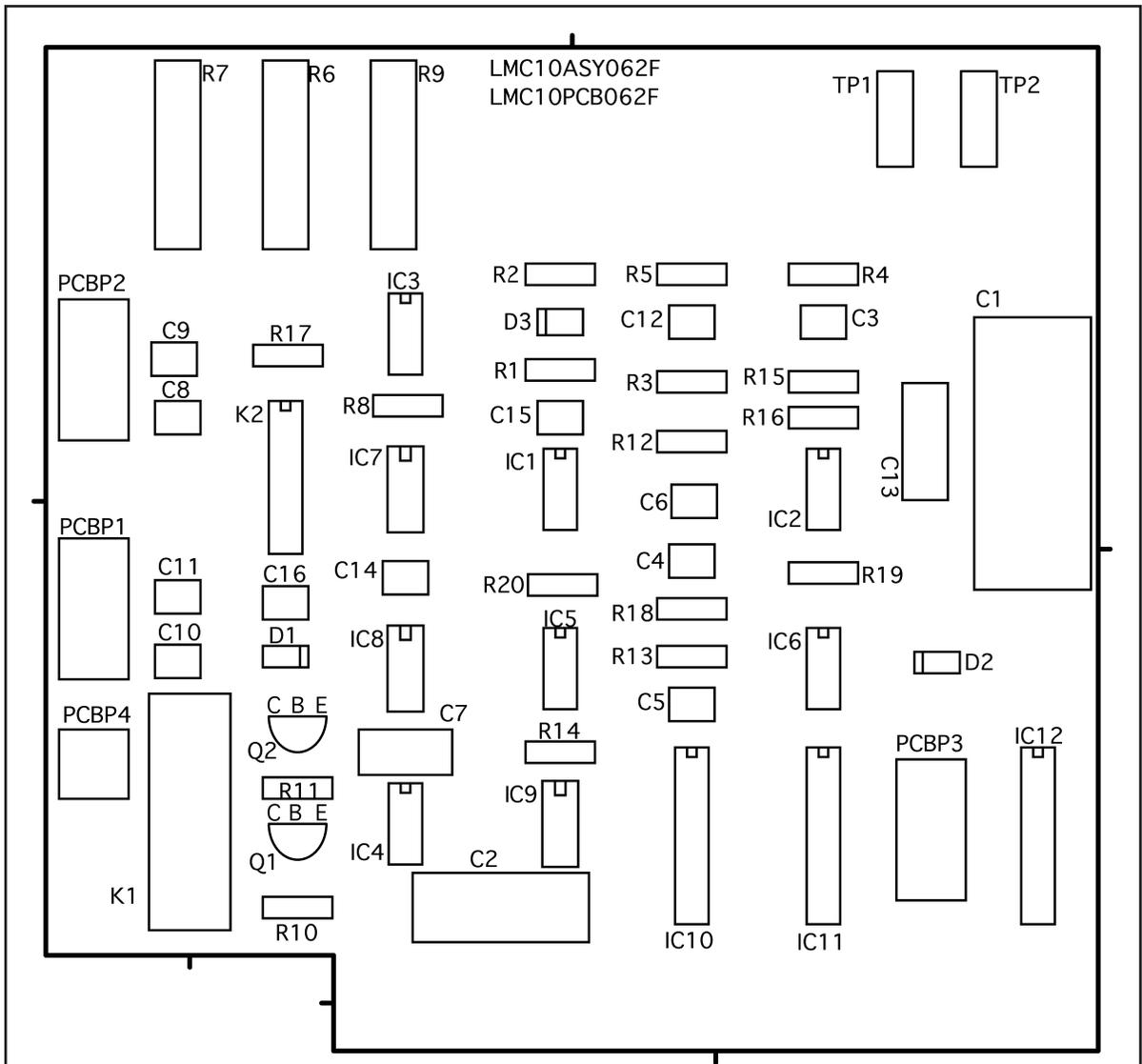
LMC-20	EDDY c o	
	APPLE VALLEY CA. 760-961-8457	
	CHIP CHANGER CONTROL	
	A	LMC10ASY061D A
	WER	- G -



LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	CHIP CHANGER SCHEMATIC		
	A	LMC10ASY061D	A
WER			- H -



LMC-20		EDDY c o	
		APPLE VALLEY CA. 760-961-8457	
		AMPLIFIER AND DEMODULATOR	
	A	SCHLMC10062F	A
WER			- -

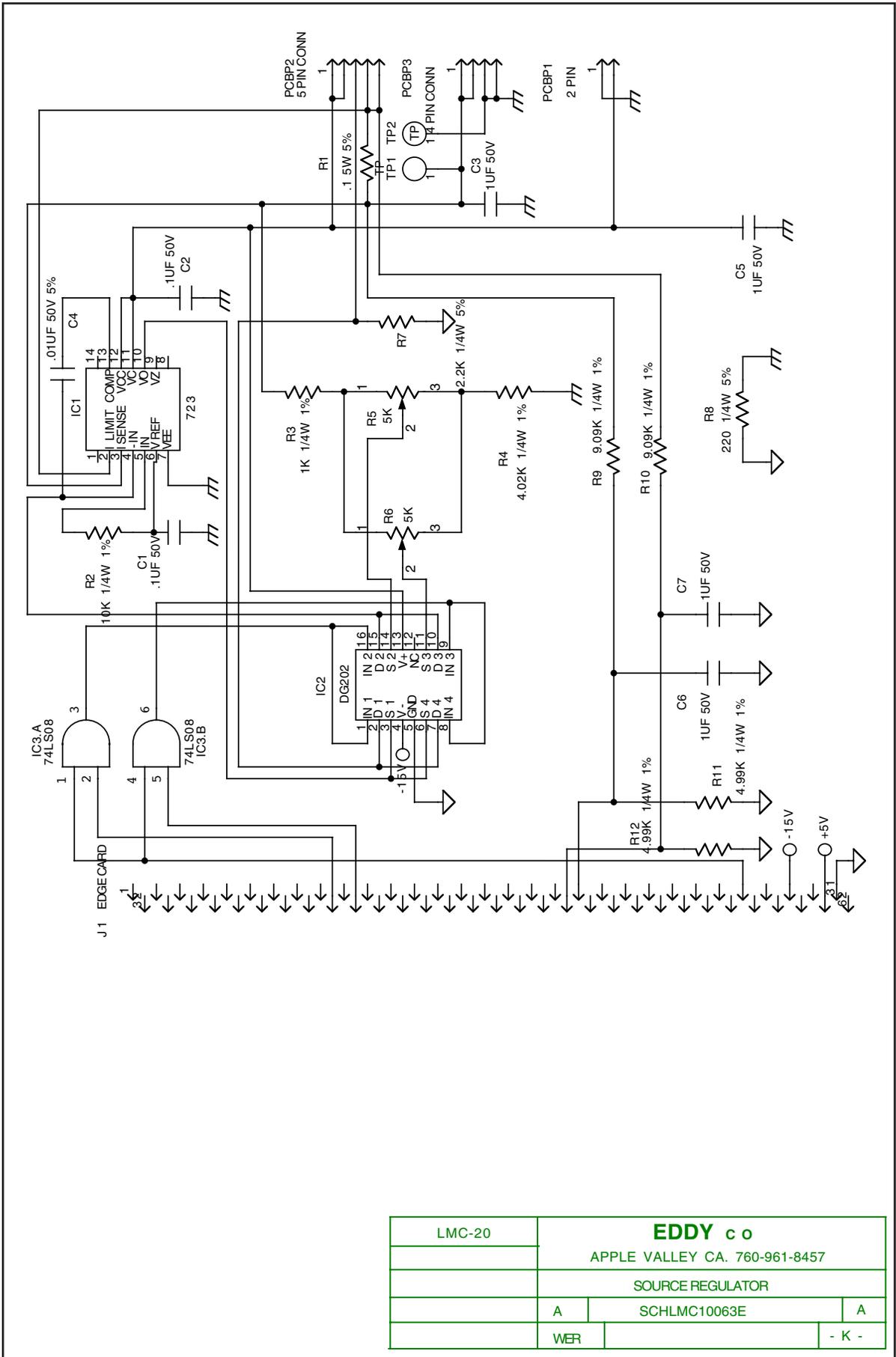


With source and detector connected turn R9 clockwise until TP 2 shows a short wave and rotate 4 more turns clockwise.

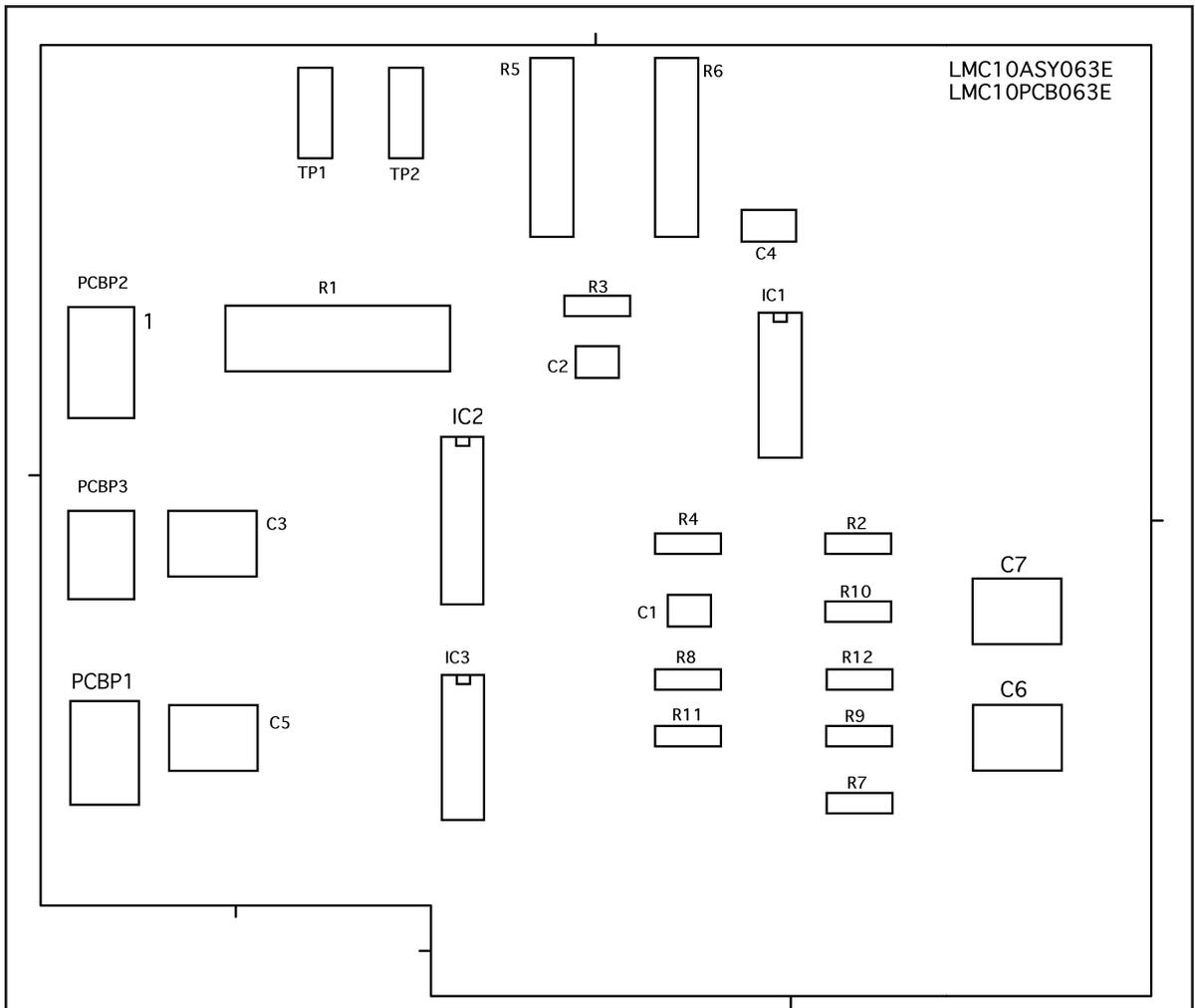
R6 Center

With no light signal and gain set at 10,000 adjust R7 between values of .001 and .000.

LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	AMPLIFIER AND DEMODULATOR		
	A	LMC10ASY062F	A
	WER		- J -



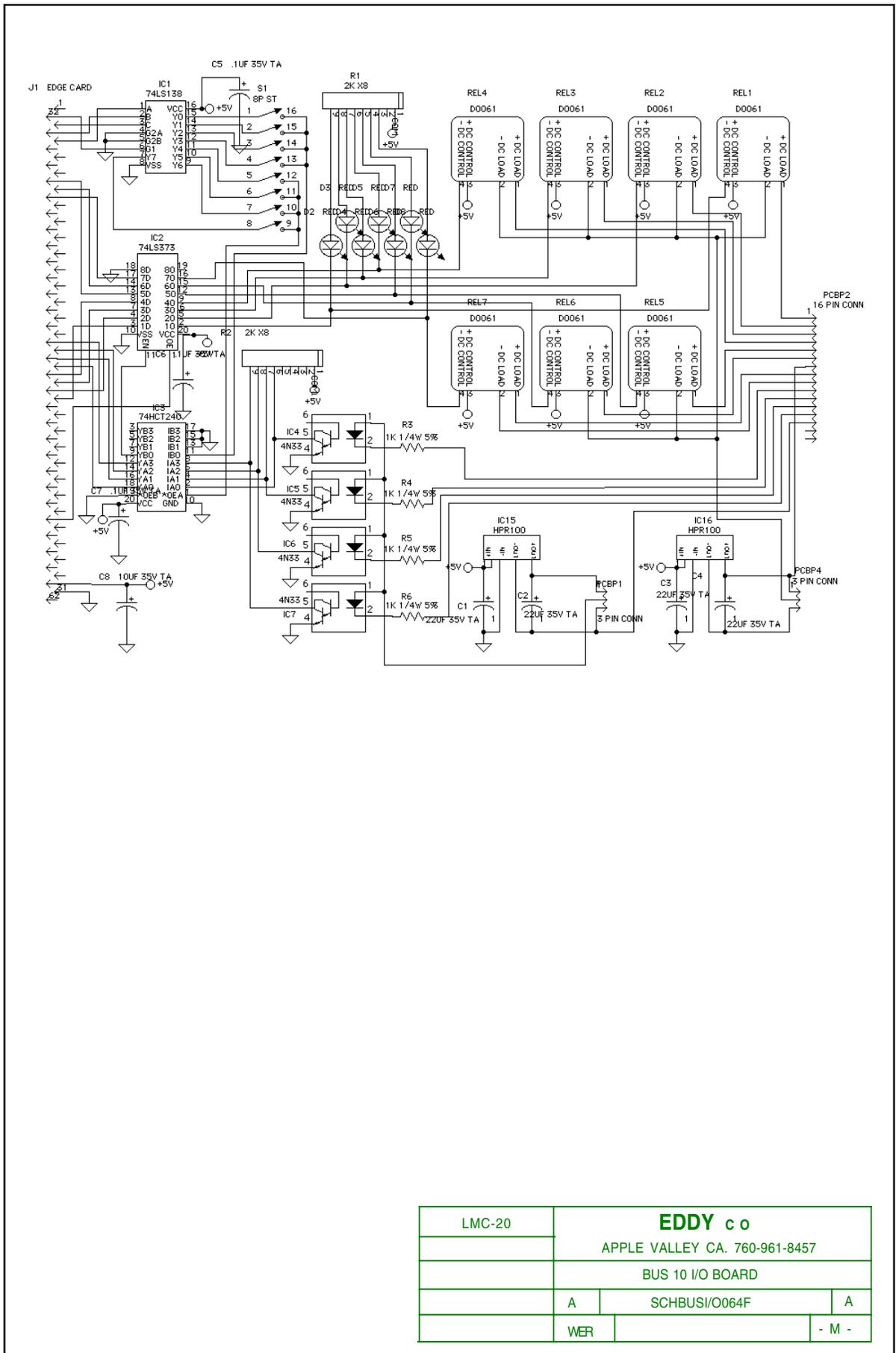
LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	SOURCE REGULATOR		
	A	SCHLMC10063E	A
WER			- K -



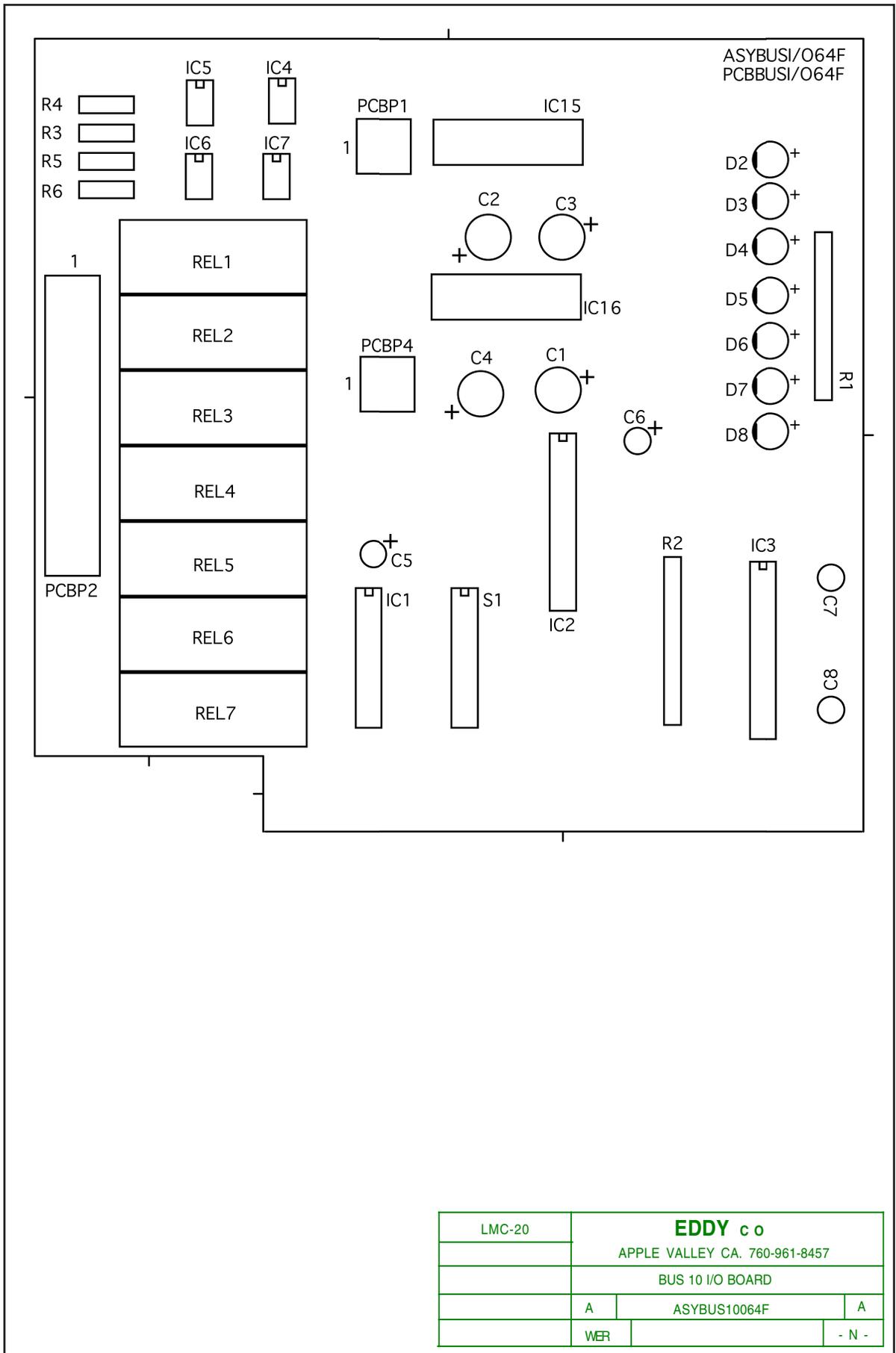
Measuring TP 1 to TP 2 adjust R6 to give 10.5 volts when intensity is set to low.

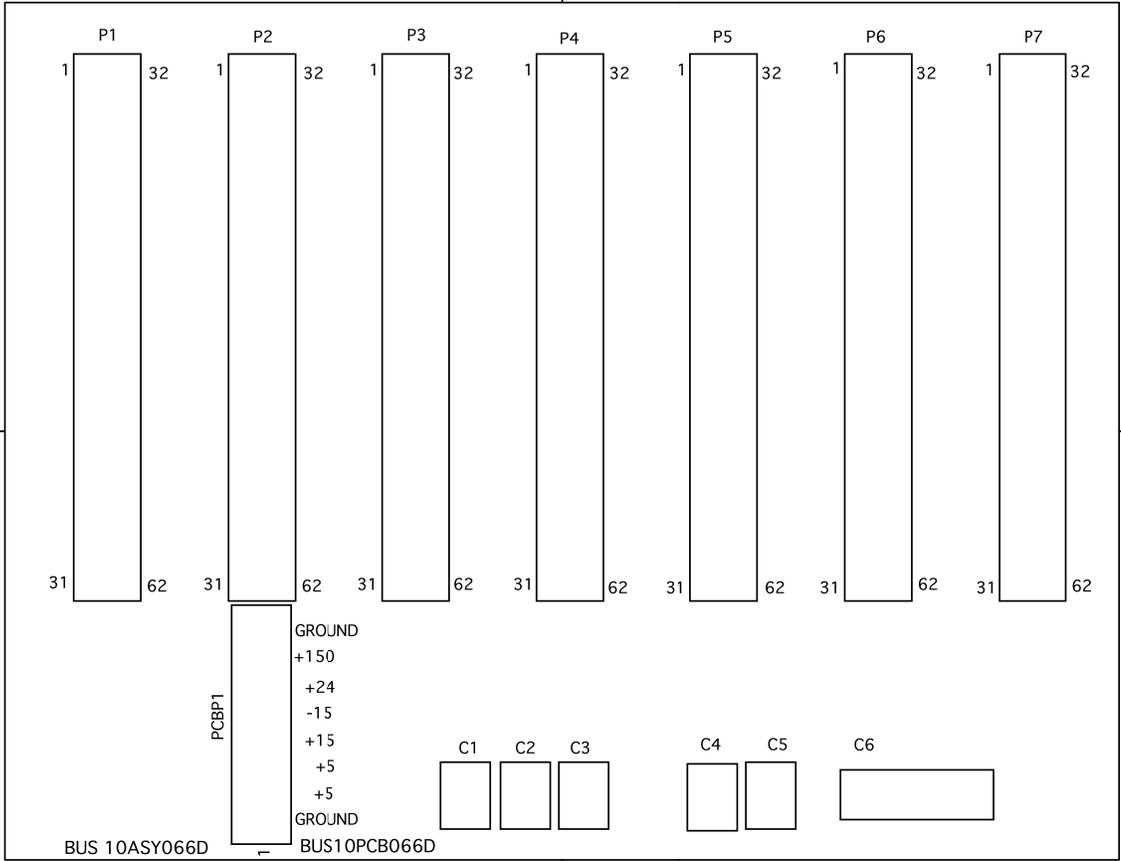
Adjust R5 to give 11.5 volts when intensity is set to high.

LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	SOURCE REGULATOR		
	A	PCBLMC10063E	A
	WER		- L -

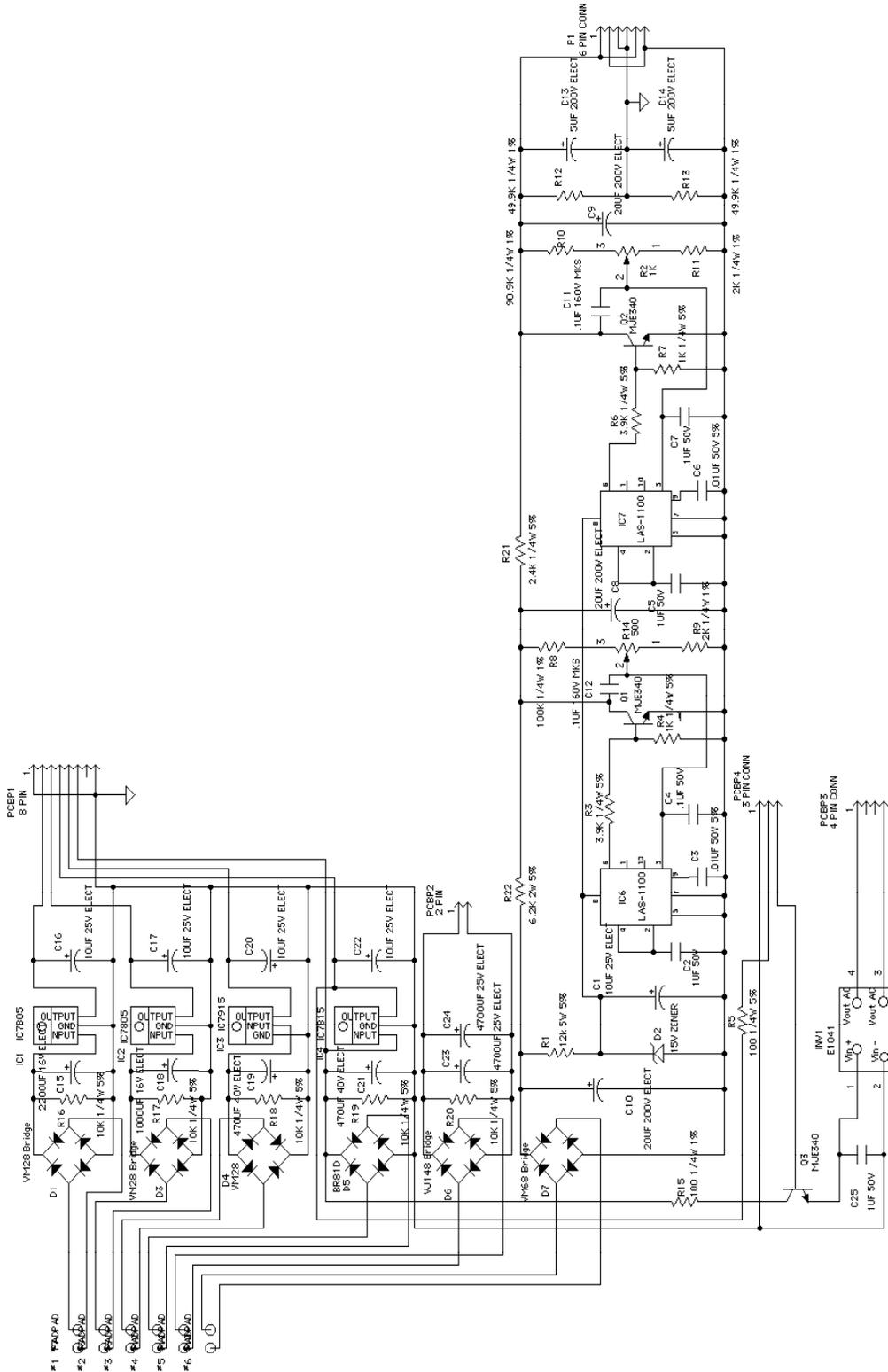


LMC-20	EDDY c o	
	APPLE VALLEY CA. 760-961-8457	
	BUS 10 I/O BOARD	
	A	A
	WER	- M -

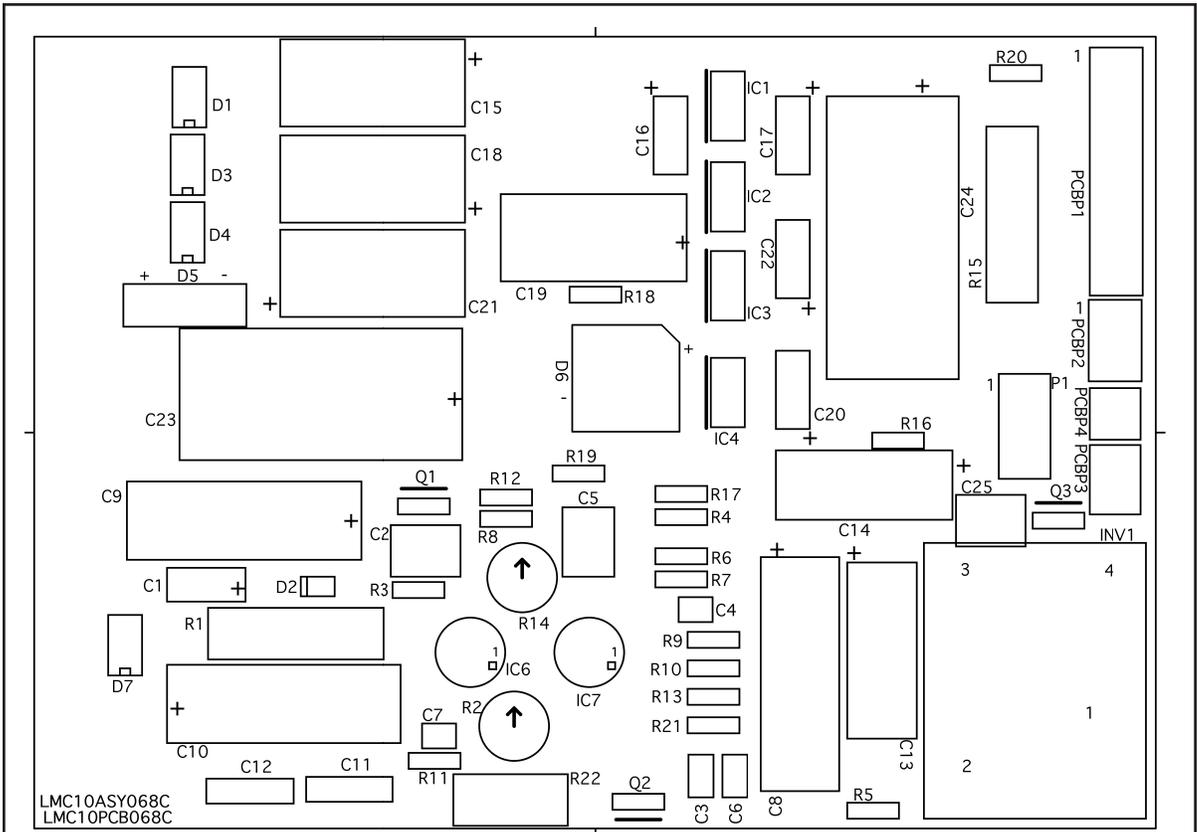




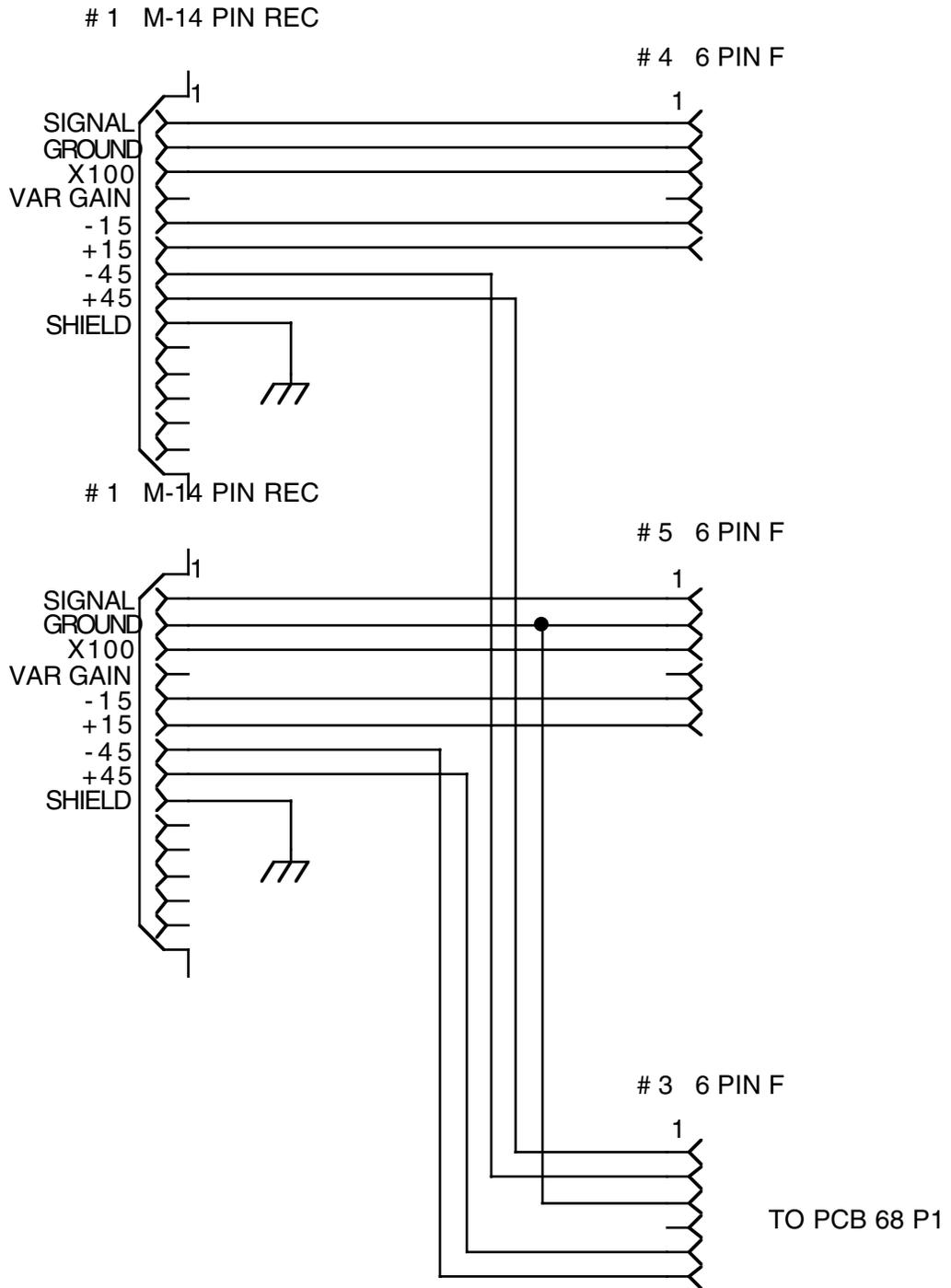
LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	BUS BOARD		
	A	BUS10ASY066D	A
	WER		- O -



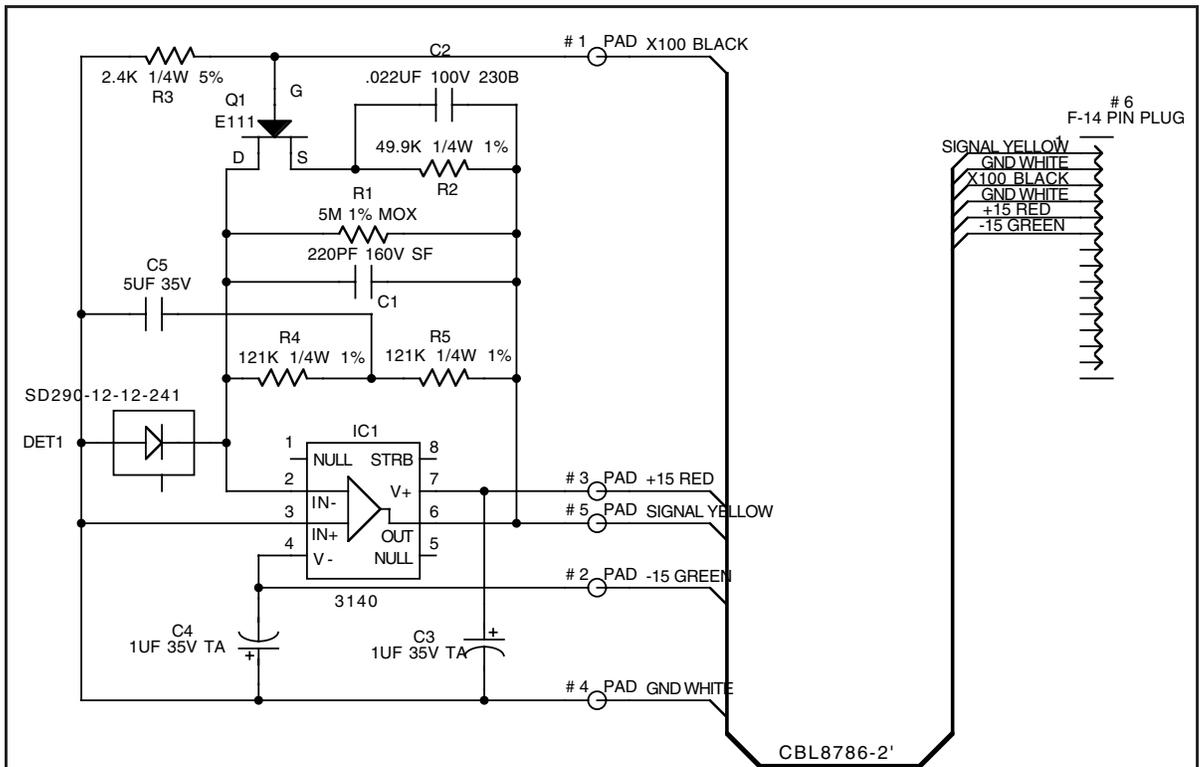
LMC-20		EDDY c o	
		APPLE VALLEY CA. 760-961-8457	
POWER SUPPLY			
A	SCHLMC10068C		A
WER			- P -



LMC-20	THE EDDY CO.		
	APPLE VALLEY CA. 760-9618457		
	POWER SUPPLY		
	A	LMC10ASY068C	
	WER		- Q -



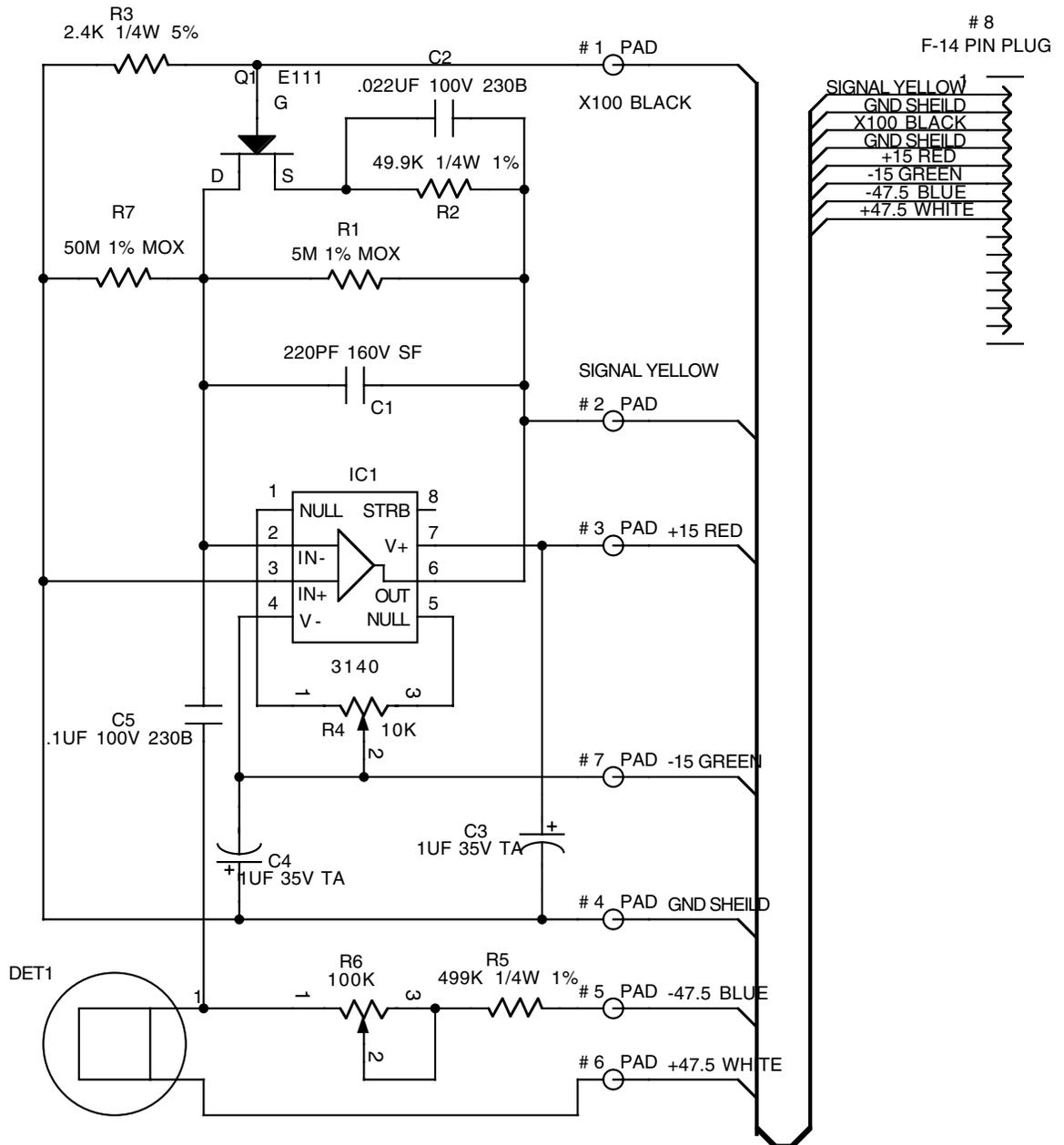
LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	DET.. WIRING		
	A	SCHLLMC100070V36	A
	WER		- R -



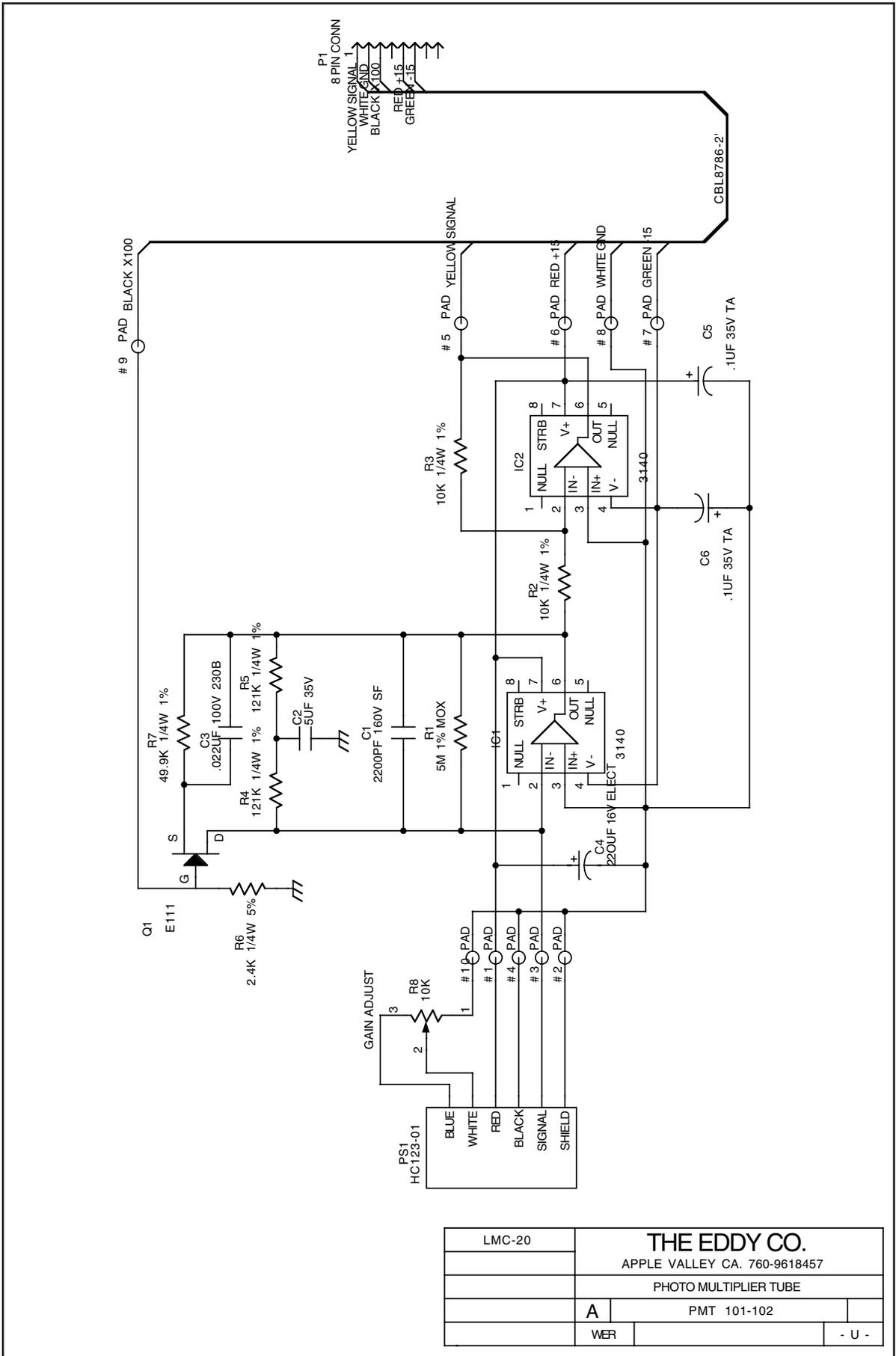
CBL8786-2'

LMC-20	THE EDDY CO.		
	APPLE VALLEY CA. 760-9618457		
	SI DETECTOR		
	A	SCHLMC10072B	
	WER		- S -

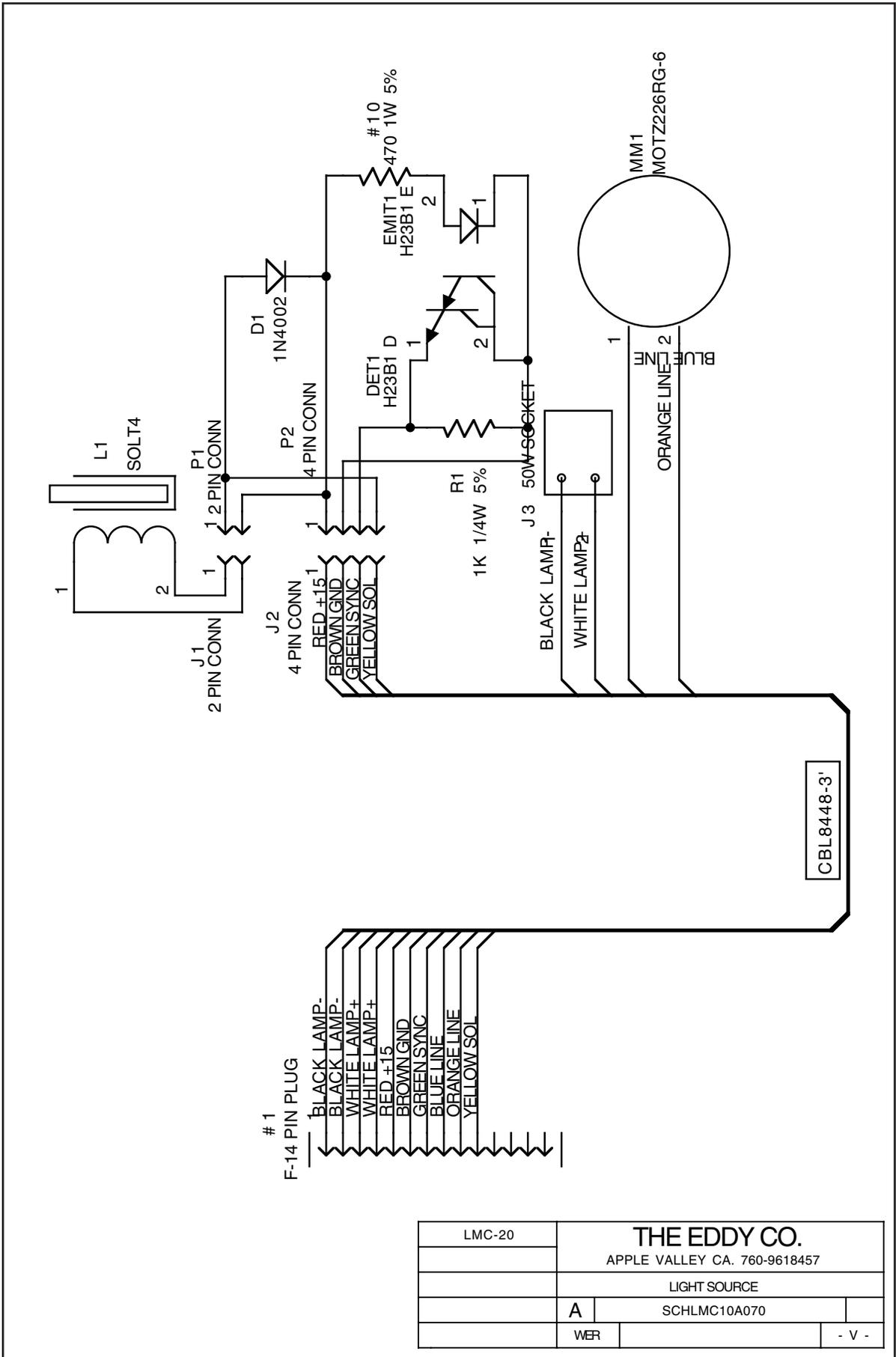
IR



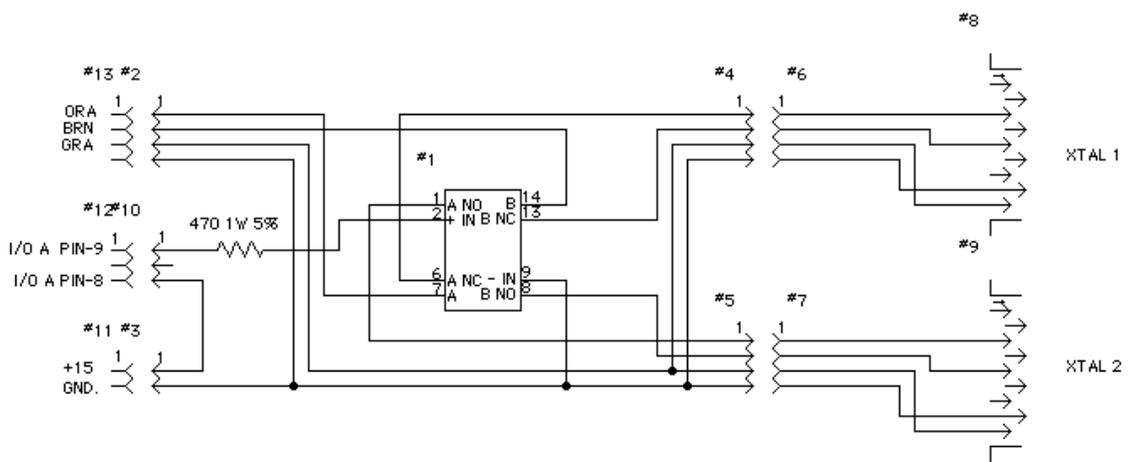
LMC-20	EDDY co		
	APPLE VALLEY CA. 760-961-8457		
	I.R. DETECTOR AMP		
	A	SCHLMC101CRO	A
WER			- T -



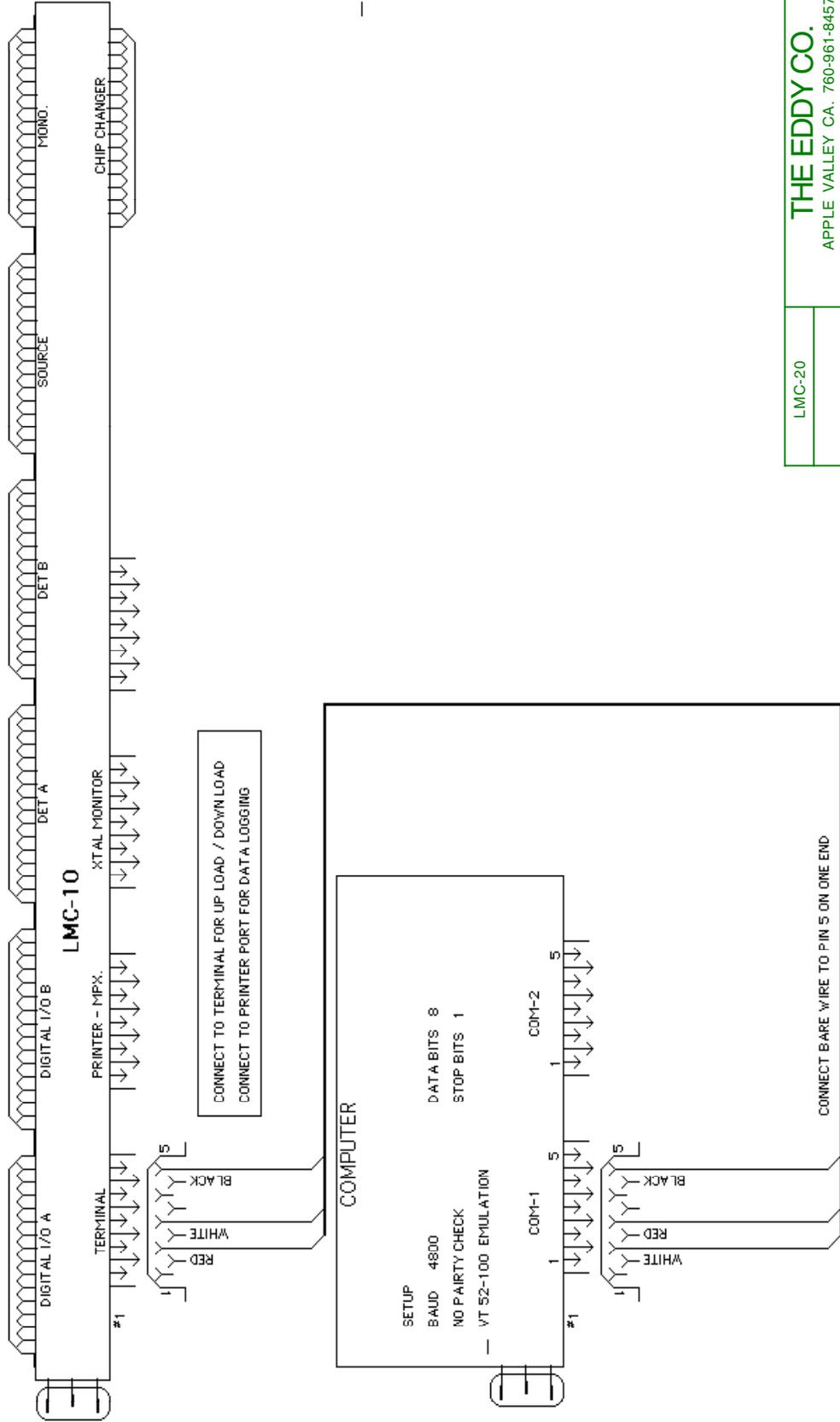
LMC-20		THE EDDY CO.	
		APPLE VALLEY CA. 760-9618457	
		PHOTO MULTIPLIER TUBE	
A		PMT 101-102	
WER			- U -



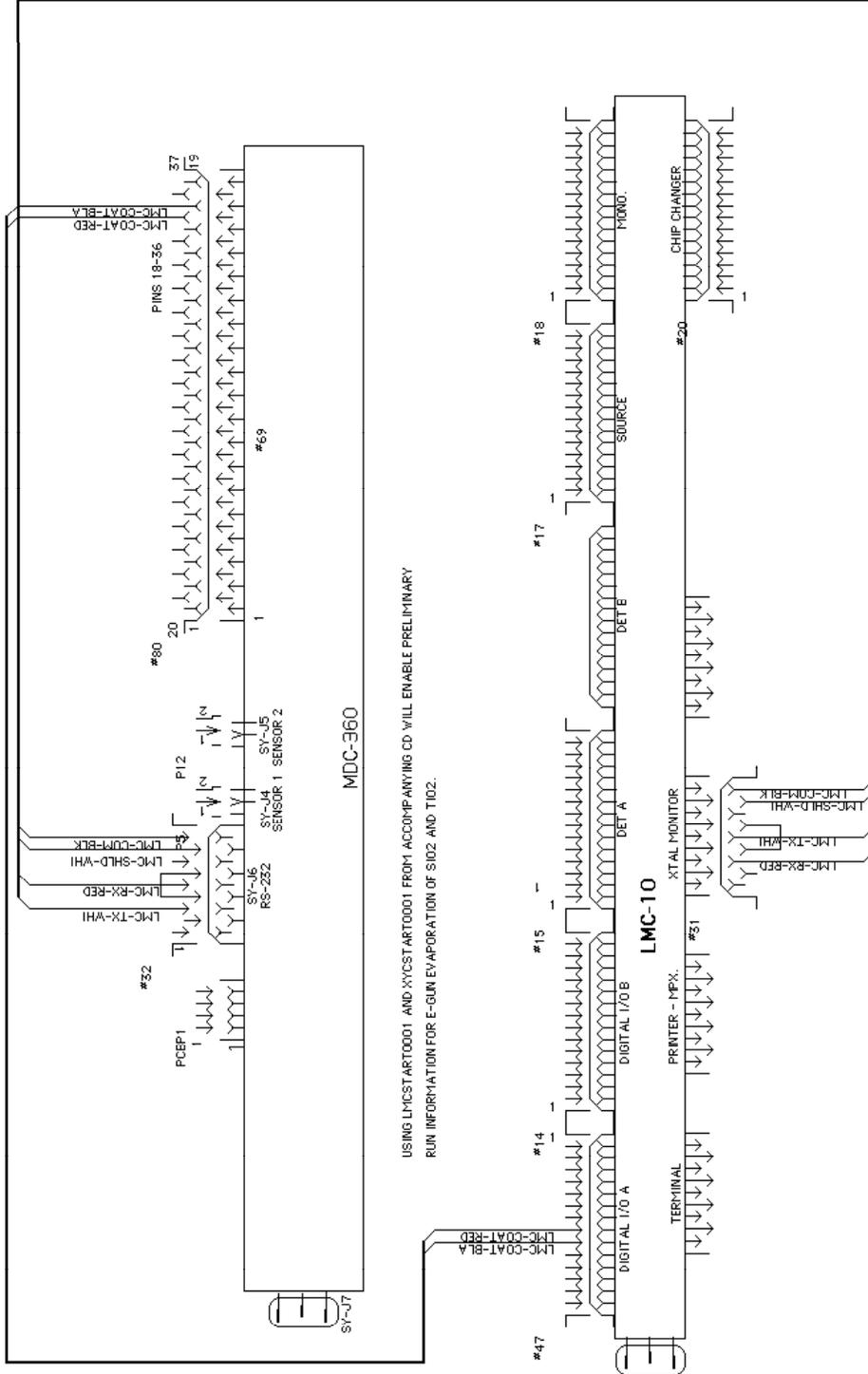
LMC-20	THE EDDY CO.	
	APPLE VALLEY CA. 760-9618457	
	LIGHT SOURCE	
A	SCHLMC10A070	
WER		- V -



LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	DUAL RS-232 CONNECT		
	A	MOD. V.36	A
	WER		- W -

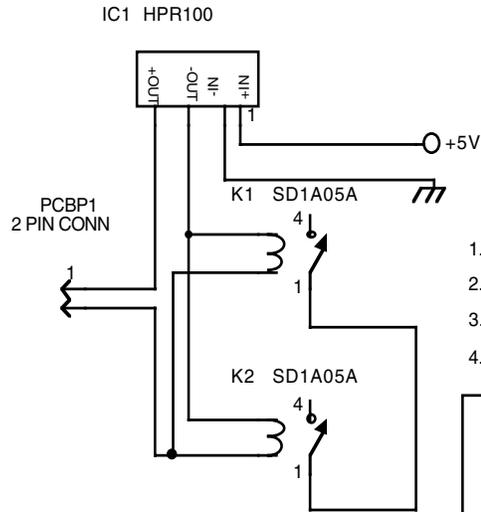


LMC-20	THE EDDY CO.	
	APPLE VALLEY CA. 760-961-8457	
	LMC-20 COMPUTER CONNECT	
	A	
	WER	- X -

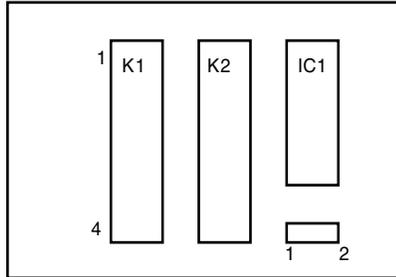


USING LMC1ART0001 AND XYCST ART0001 FROM ACCOMPANYING CD WILL ENABLE PRELIMINARY RUN INFORMATION FOR E-SUN EVAPORATION OF SIO2 AND TiO2.

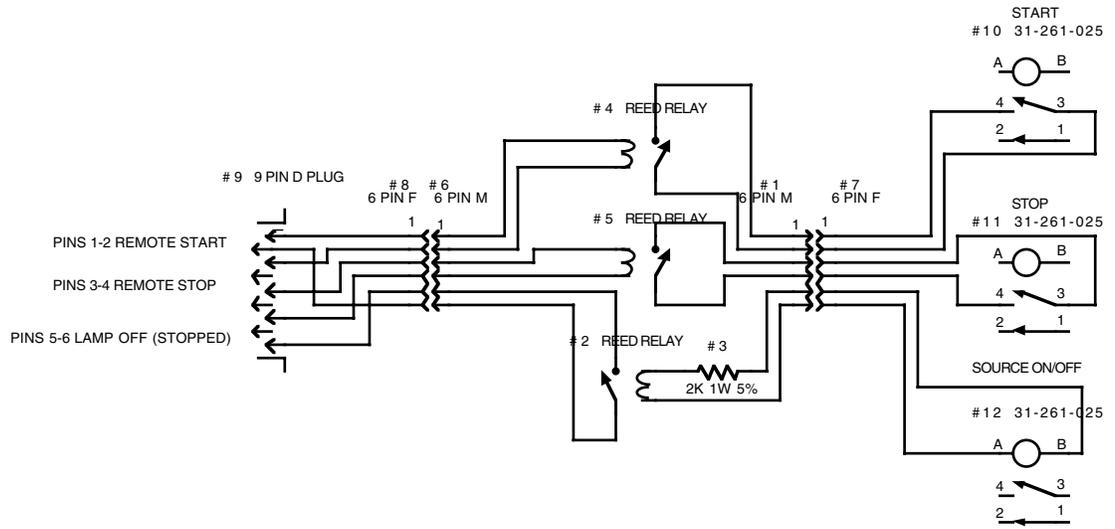
LMC-20	THE EDDY CO.	
	APPLE VALLEY CA. 760-961-8457	
	LMC-20/MDC-360 INTERFACE	
	A	
	WER	- Y -



1. REMOVE R9 FROM PIN 2 OF IC8 CONNECT TO K1 PIN 4
2. REMOVE R10 FROM PIN 2 OF IC8 CONNECT TO K2 PIN 4
3. CONNECT PIN 1 OF K1 AND K2 TO IC8 PIN 2
4. THE LMC-10 MEASURES THE SIGNAL WHEN PCBP1 PIN 1 @ 2 ARE CONNECTED

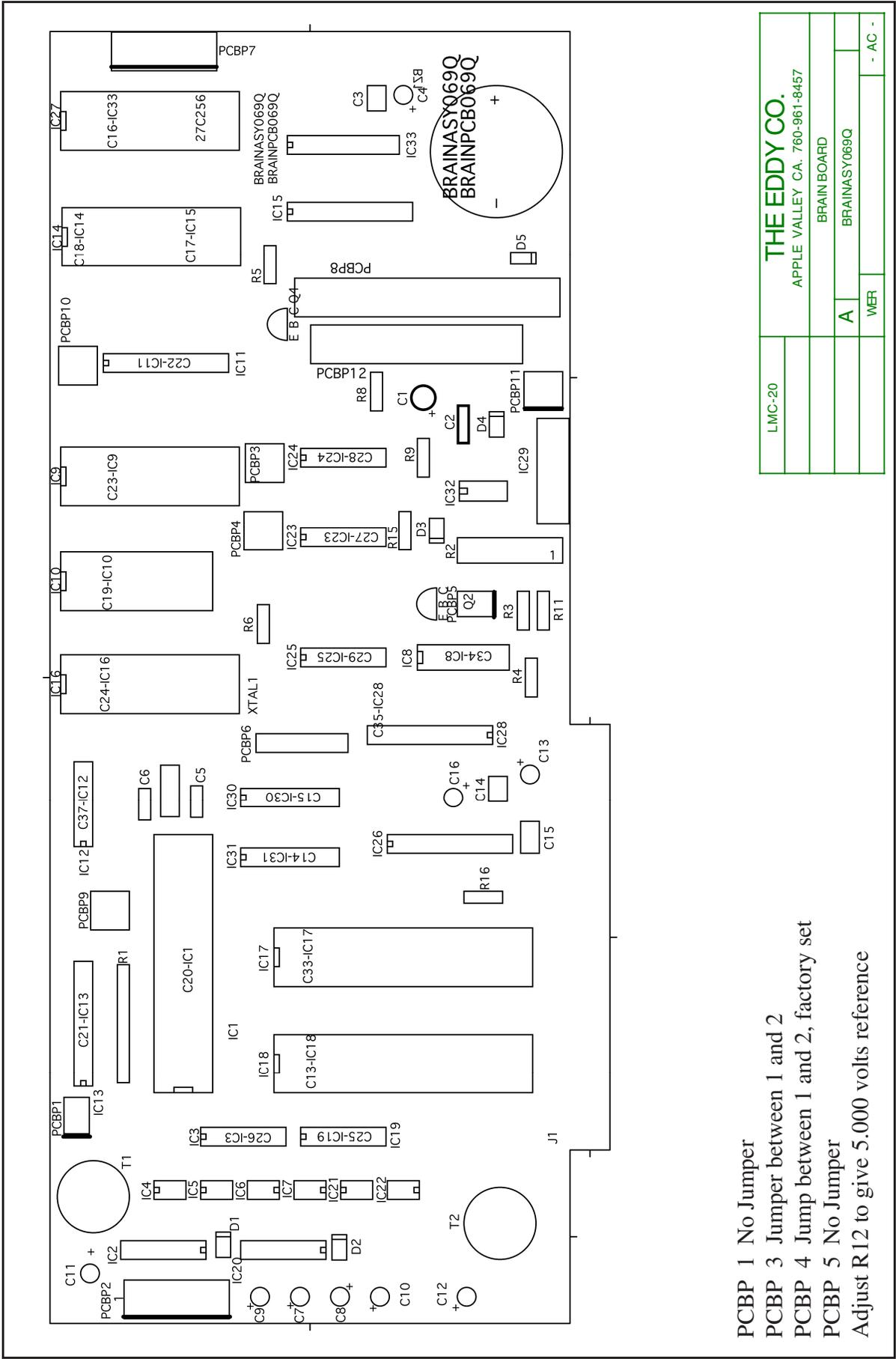


LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	MODIFICATION LMC-20		
	A	SIGNAL GATE	A
	WER		- Z -



Note: Special application

LMC-20	EDDY c o		
	APPLE VALLEY CA. 760-961-8457		
	MODIFICATION LMC-20		
	A	EXTERNAL START/STOP	A
	WER		- AA -



- PCBP 1 No Jumper
- PCBP 3 Jumper between 1 and 2
- PCBP 4 Jump between 1 and 2, factory set
- PCBP 5 No Jumper
- Adjust R12 to give 5.000 volts reference

LMC-20	THE EDDY CO.		
	APPLE VALLEY CA. 760-961-8457		
	BRAIN BOARD		
	A	BRAINASY069Q	
	WER		
		- AC -	