

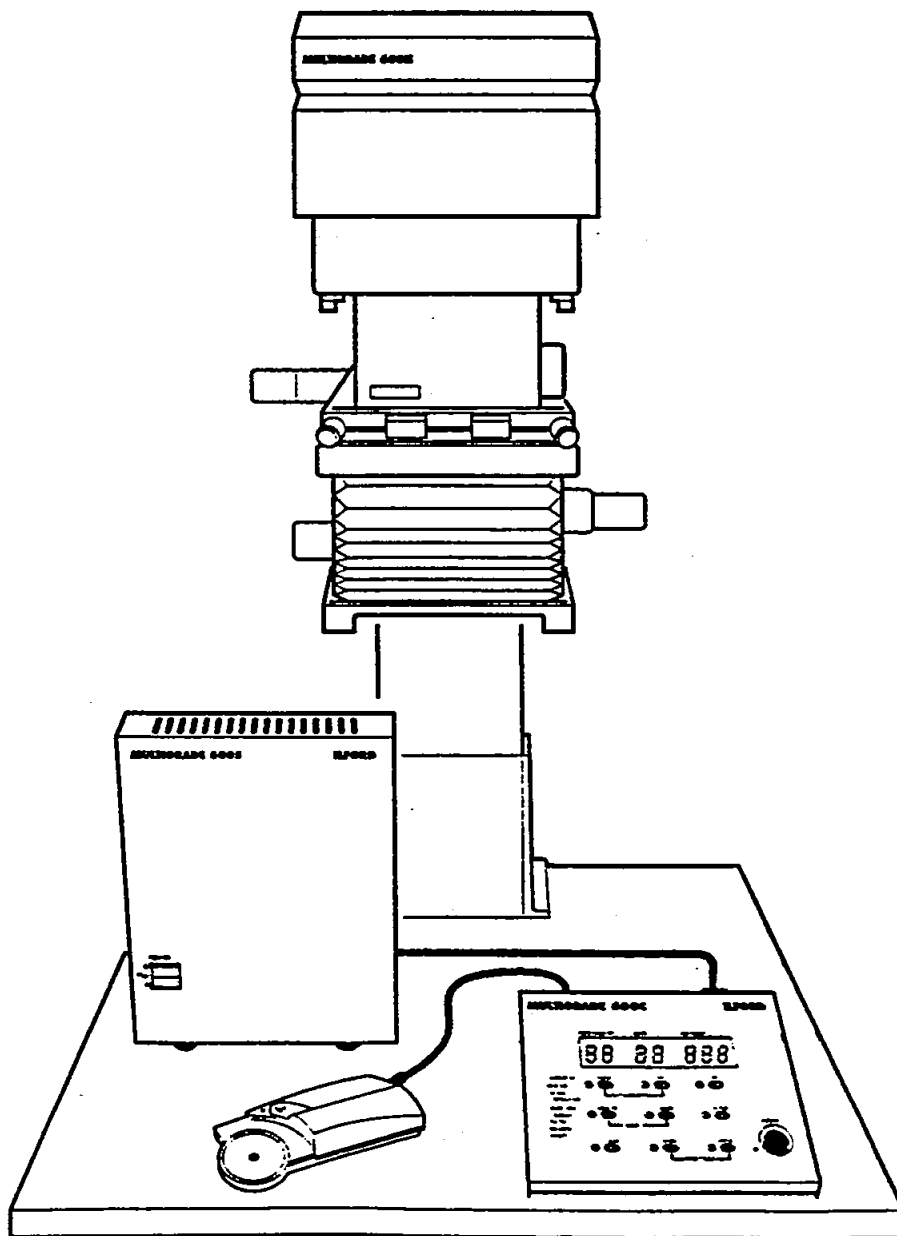
**ILFORD**

50/60Hz

**SERVICE INFORMATION**

# **ILFORD MULTIGRADE 600**

**VARIABLE CONTRAST  
ENLARGER HEAD AND CONTROL SYSTEM**



**CE**

**UL**

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### **SAFETY PRECAUTIONS**

Your photographic equipment is powered by mains electricity, and is designed to comply with international electrical safety standards. However, basic safety precautions must always be followed when operating electrical equipment, including the following, where applicable:

- 1 Read and understand all instructions.
- 2 Observe labels on the equipment, particularly those advising of possible hazards.
- 3 Close supervision is necessary when the equipment is being used by inexperienced personnel.
- 4 Take care to avoid burns. Some internal parts of the equipment can become very hot with continuous use.
- 5 Do not operate equipment that has been dropped or damaged, or has damaged electrical leads. Have the equipment examined by qualified personnel.
- 6 Do not allow any electrical lead to touch hot surfaces.
- 7 To comply with safety and EMC requirements, ensure that the mains socket provides a proper connection to earth.
- 8 Ensure the leads are arranged such that they cannot be pulled or tripped over.
- 9 Ensure the air flow through the vents is not obstructed when operating the equipment. An obstructed air vent can lead to overheating.
- 10 Do not dismantle the equipment unless you are qualified to do so. Incorrect assembly can cause hazards both to yourself and to the equipment.
- 11 Always obey local codes of practice, particularly for installation requirements.

**Do not destroy these instructions**

## SERVICE MANUAL

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| - Keyboard PCB        | MF47201                |
| - Power PCB           | ME47201                |
| - Motor Control PCB   | CC47201                |
| - Y-M-Signal PCB      | CC47251                |
| - Picto Probe PCB     | MB48201                |
| - Lamp EST Multigraph | 1872676 or<br>ME47251* |

\* = use circuit diagram ME47251 for Pcb Lamp EST Multigraph (ME4725A) and use circuit diagram 1872676 for Pcb EST-Multigraph 08\*93 (1872676).

## 1 Introduction

The instructions given in this manual are meant to help service engineers repair and maintain the machine to enable it to perform to its optimum performance.

Please read and observe the safety rules mentioned in this manual. Contact local authorities regarding regulations for environmental protection.

Please read the following hints carefully; they will help you to use this manual efficiently.

The enlarger documentation includes

"User's Manual"  
"Service Manual"

For detailed informations about the contents of each manual please refer to the respective table of contents.

This manual enables you to carry out adjustments and service procedures. Furthermore, this manual contains the enlarger specifications.

It is assumed, that you are familiar with enlarger operations. You should at least be able to master all procedures outlined in the User's Manual.

Please observe the following rules for safe operation of the machine:

- the machine should only be operated, maintained and serviced by sufficiently qualified persons who are familiar with the machine.
- Observe all local safety regulations regarding the handling of electric/electronic equipment. Carefully read and observe all safety rules. Contact your local authorities regarding regulations for environmental protection.
- The enlarger must be connected to a ground socket. Do not disable protection by using extension cord without protection grounding!  
Interruption of the protective conductor inside or outside the unit, or disconnecting protective grounding can cause possible danger.
- Switch the machine off when opening covers and before disconnecting any electrical wire.
- Never carry out working steps if you are uncertain about the effect.

## 1.1 Technical data

Film size:	up to 10.2 x 12.7 cm (4 x 5 in.) available light mixing boxes 35 mm, 6 x 7 cm (2.25 x 2.75 in.) and 10.2 x 12.7 cm (4 x 5 in.) except M 805: available light mixing boxes 35 mm, 6 x 6 cm (2 sq. in.) and 6 x 9 cm (2.25 x 3.5 in.).
Weight (head only)	7.5 kg (16.5 lbs)
Noise level:	56 dB (A)
Usable focal lengths:	50 - 150 mm
Supply voltage:	100/110/120/220/240 Volts - 50-60 cycles
Stabilization:	+10 % / - 15 %
Power consumption:	ca. 500 VA
Temperature:	+ 15 °C to 30 °C (59 °F to 86 °F)
Relative humidity:	5 - 95 %
Light source:	250 W/24 V
Connections:	- foot switch or roll paper easel - probe for determination of exposure time and gradation
Closed loop:	
Max. error during lamp change:	+/- 0.025 D Gamma I
Cold-warm-drift at constant room temperature:	grad. 0 - 2.5 = max. 0.04 D on paper grad. 3 - 5 = max. 0.06 D on paper
Power fluctuation error ±10%:	density error at gradation I = max. +/- 0.005 D gradation error = max. +/- 0.1 grad.
Reproducibility:	+/- 0.008 D Gamma I
Max. filter density Y:	170 densitometric units adjustable in 0.01 - D-steps
Max. filter density M:	170 densitometric units adjustable in 0.01 - D-steps
Exposure time range:	1.0 - 999 sec.
Grade table:	Any gradation table can be programmed for any available or future variable contrast paper (pre-programmes for Ilford MG III).
Contrast correction range:	+/- 30 %
D-compensation:	+/- 99.9
Paper channel:	1
Grade range:	00-0-1-2-3-4-5 (half steps)

Grade steps: manual input = 1/10  
with reading probe = 1/10

Diameter of reading point: 7.5 mm

Correction range "% Time": + 999 % - 99 %

## 1.2 Power on cycle

Burn in	Grade	Exp. Time
	2.5	10.0

Switch power on. Is the machine dead?

- Check connections
- Check fuse F1 on Power Unit
- Check Power PCB

The shutter opens and closes.

- N - Check Motor Control PCB
- Check Power PCB
- Check connections between shutter motor, Motor Control PCB and Power PCB

The lamp goes in stand by mode.

- N - Check fuse F2 on Power Unit
- Check lamp
- Check EST PCB
- Check Power PCB

The display shows: the last entered values.

Function test:

Press the F-light key on the keyboard.

The light and the fan must go on.  
The shutter opens.

- N - Check the lamp or the fan
- Check Phase Shift Capacitor PCB (only when fan does not work)
- Check fuse on the EST PCB
- Check the EST PCB
- Check Power PCB
- Check key on the Keyboard PCB
- Check Keyboard PCB (test program Test 2)
- Check connections between the PCBs

Press the White light key twice. (If light is still on)  
The shutter closes and opens again.  
The fan goes off for a short time, then it goes on again.  
The filters swing out.  
Does White light go through?

- N - Check the key on the Keyboard PCB
- Check the Keyboard PCB

Press the White light key.  
The lamp and the fan must go off.  
The shutter closes.

### 1.3 Error messages

Burn in	Grade	Exp. Time
Pr	bd	HI

The display shows:

Cause:

Probe reading out of range: excessive light

Remedy:

Close F-stop on the lens; point darker reading area.  
Execute Tests 4 and 5.

Burn in	Grade	Exp. Time
Pr	bd	LO

The display shows:

Cause:

Probe reading out of range: insufficient light

Remedy:

Open F-stop on the lens; point brighter reading area.  
Execute Tests 4 and 5.

Burn in	Grade	Exp. Time
LA	MP	Err

The display shows:

Cause:

No light!

Remedy:

- Check the lamp fuse F2
  - Check the lamp and lamp socket
  - Check fuse on the EST PCB
  - Check EST PCB and Power PCB in the Power Unit
- Execute Tests 6, 3 and 1.



Burn in	Grade	Exp. Time
Co	nt	Err

The display shows:

**Cause:**

Contrast value of paper grade out of range (range 0.02 to 0.40)

**Remedy:**

Select "Contrast" and press "Clear",  
All contrast values are initialized to default values.  
Check paper table and re-enter it if necessary.

**Error:**

Flashing display, calculated exposure time is shorter than 1.0 sec.

**Remedy:**

Repeat probe reading or re-enter data.

**Error:**

Flashing 999 on the display, calculated exposure time is longer than 999 sec.

**Remedy:**

Repeat probe reading or re-enter data.  
Execute Tests 4 and 5.

Burn in	Grade	Exp. Time
LO	OP	Er.5

The display shows:

**Cause:**

CL-error higher than 0.8; Close loop does not work correctly

**Remedy:**

Go into the test program Tests 3 and 8 and check Y/M-Signal PCB

Burn in	Grade	Exp. Time
Pr	b.	Er.4

The display shows:

Cause:  
Probe Offset out of range

Remedy:  
Adjust Offset (test program Test 4).  
Check Probe (test program Test 5).

Burn in	Grade	Exp. Time
OF	FS.	Er.3

The display shows:

Cause:  
Filter Offset out of range.

Remedy:  
Check Filter Offsets, go into test program Test 1.

Burn in	Grade	Exp. Time
rA	M	Er.1

The display shows:

Cause:  
RAM Hardware error

Remedy:  
Check Keyboard PCB (1.4.3), go into test program Test 1.

Burn in	Grade	Exp. Time
DA	TA	Er.2

The display shows:

Cause:  
Datas are lost.

Remedy:  
Check Keyboard PCB (1.4.3), go into test program Test 1.

#### 1.4 Description of PCB's

1.4.1 Power PCB	ME4720A
1.4.2 EST PCB	1872676 or ME47251
1.4.3 Keyboard PCB	MF4720A
1.4.4 Motor Control PCB	CC4720A
1.4.5 Y/M-Signals PCB	CC4725A
1.4.6 Picto Probe PCB	MB4820A
1.4.7 Phase Shift Capacitor PCB	AL4840A

### 1.4.1 Power PCB

The following voltages must be present.  
Measure voltages relative to P0 except 18 VAC.

18 Volt AC on X4 pin 1 and 2	+/- 2.0 Volt
+24 Volt DC on X7/4b	+/- 2.0 Volt
+12 Volt DC on X7/9b	+/- 0.5 Volt
- 12 Volt DC on V4 Anode	+/- 1.0 Volt
-0.3 Volt DC on X7/3b	+ 0.05 Volt

Correct?

- N - Check fuse F1
- Check PCB Input voltages
  - X4/2 18VAC      X4/5 0V
  - X4/1 18VAC      X4/4 0V
- Check main Power and voltage selector
- Disconnect X7 (Head) and measure the 24 Volts again.

The 24 Volts are used for the Motor Control PCB in the head.

Correct?

- Y - Short circuit on the Motor Control PCB.
- N - Check V1, C1, C10, C11, C12, C13, C1, C6.
- Check connections between transformer and PCB.

The 12 Volts are used on Y/M-Signal PCB, EST PCB, Keyboard PCB and Probe PCB.

Check the 12 Volts.

Correct?

- N - Check the 24 Volts.

Correct?

- Y - Check V3 (Voltage regulator 7812), C2, C5, V2, R2.

- N - Check the 24 Volts.

The -12 Volts are used on the Keyboard PCB and the Probe PCB. The -12 Volts are used to generate the reference voltage -0.3 Volts for the operational amplifier of the measuring system.

Measure the -12 Volts.

Correct?

- N - Disconnect Keyboard and Probe and measure again.

Correct?

- Y - Short circuit on Keyboard PCB or Probe PCB.

- N - Check the 24 Volts.

Correct?

- Y - Check C7, V4, R3, R4, C6.

- N - Check the 24 Volts.

The -0.3 Volts are used on the Y/M-Signal PCB. It is the negative supply voltage for the operational amplifier V5 (TLC277) Keyboard PCB.

Measure the -0.3 Volts.

Correct?

- N - Measure the -12 Volts.

Correct?

- Y - Check C9, C8, V5, R5.

- N - Check the -12 Volts.

## 1.4.2 EST PCB

The EST PCB generates the lamp voltage and the signal for the fan. The lamp voltage will stabilize main Power fluctuations of approx. +10 / -15 %.

Lamp voltages:

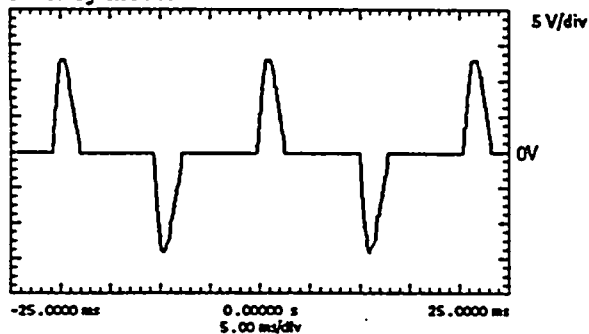
stand by: 4 - 7 VAC RMS

lamp on: 22-26 VAC RMS adjustable with trimmer P1 resp. R26.

Lamp voltage should be 22.5 VAC RMS.

The voltage must be measured with a True RMS Voltmeter close by the lamp socket and under load!.

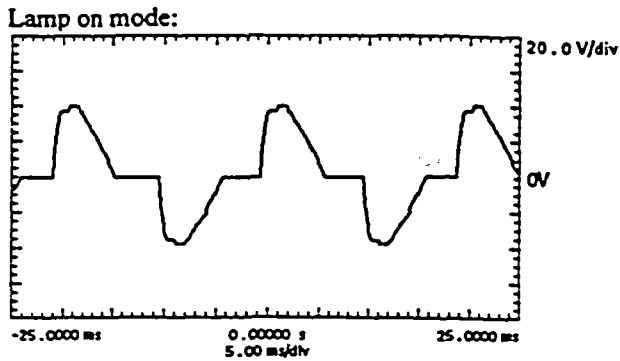
Stand by mode:



The fan must go on in lamp on mode and off in stand by mode.

If between pin 2 and 3 on connector 1 EST PCB voltage is 12 V the lamp is in stand by. On pin 2 is a constant 12 V supply. The lamp control signal is on pin 3. In case of stand by it is 0 V.

The diagram on the left shows the lamp voltage during stand by mode.



If lamp control signal goes High (12 V) so that between pin 2 and 3 is 0 V, lamp goes full power 22.5 VAC RMS. The lamp voltage can be adjusted with trimmer P1 resp. R26.

The fan will be working at the same time as lamp goes on (Triac Q2 resp. V11). The diagram on the left shows the lamp voltage during lamp on mode.

No light!

Check lamp.

Lamp OK?

- N - Replace lamp.

- Y - Measure the lamp voltage on the lamp socket with a True RMS Voltmeter.

- Check Lamp on signal; must be +12V

Correct?

- N - Check Triac Q1 (BTA41) resp. V7 (TIC246M).

Fan is not working.

Check Triac Q2 (BT137200E) resp. V11 (TIC246M).

No light - fan is not working.

Check Integrated circuit and Optoelectronic coupler OK2 (SHF 620) resp. V10 (SFH600-1).

### 1.4.3 Keyboard PCB

This PCB contains the following circuits.

- Power circuit
- Processor circuit
- Keyboard circuit
- Roll paper easel
- Probe circuit
- U/t converter

#### Power circuit

The 5 Volts are generated by the voltage regulator V34 (7805).

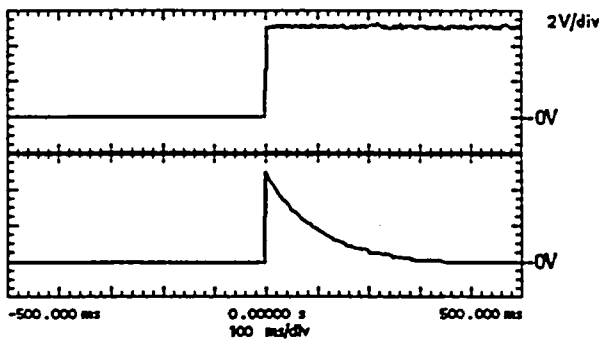
Measure the 5 Volts on C18(+).

- N - Check V34.

Check the -0.3 Volts on V35(+).

- N - Check the -12 Volt on X1/8.

## Processor circuit



Correct?

- N - Check the Power PCB.
- Y - Check V35, C20, C21, R8.
  - Check all ICs which are supplied with 5 Volts.

The following signals must be present on processor V1:

- Supply voltage
- Clock signal
- Reset signal

Measure supply voltage on pin 44 VCC relative to pin 22 GND. There must be 5 Volts.

Correct?

- N - Check Power circuit on the PCB
  - Remove V1 and measure again on the socket (pin 44 relative to pin 22)

Correct?

- Y - Replace V1.
- N - Check C21, C22.

The Clock signal is created by the Quarz G1 measurable between pin 20 and pin 21 on V1.  
The Clock frequency is 11 MHz.

The Reset signal is on pin 10 relative to pin 22.  
This signal is high active. It starts the program on a defined address.

Check supply voltage on pin 24 relative to pin 12 on the RAM V2 (MK48Z12B).

Measure 5 Volts.

Correct?

- N - Check Power circuit
  - Remove V2 and measure the 5 Volts again

Correct?

- Y - Replace RAM V2.
- N - Check C3, C23.

Check supply voltage on pin 28 relative to pin 14 on the EPROM V3 (27C512).

Measure 5 Volts.

Correct?

- N - Check Power circuit.
- Remove V3 and measure the 5 Volts again.

Correct?

- Y - Replace EPROM V3.
- N - Check C2.

#### Processor, RAM and EPROM Test.

If CPU is working correctly but RAM V2 is not working the display shows the following error message:

Burn in	Grade	Exp. Time
rA	M	Er.1

In this case replace RAM.

Measure with an Oscilloscope on processor V1 (80C32) the following signal:  
Pin 11= RXD - there must be a square signal of 3 KHz.

Correct?

- Y - The processor V1 (80C32), RAM and EPROM are working well.
- N - Check 5 Volt supply voltage coming from the Power PCB.

#### Keyboard circuit

The signals for the seven 7-Segment displays V9-V15 are coming from Keyboard driver V6.

The supply voltages for the displays are switched by the transistors V24 - V31.

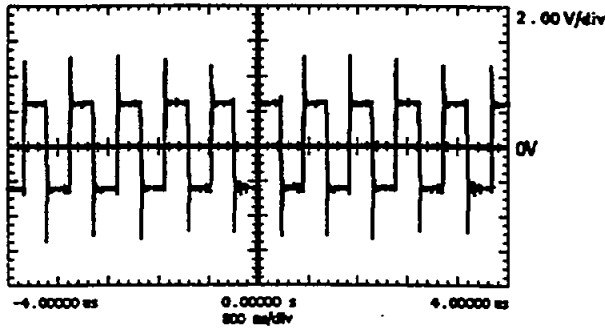
To check this circuit use the test program Test 2.

One key is not recognized.  
Check the key.

More keys are not recognized.  
Check V6, V8, R1, R3.

- V6:
- Check Clock signal with frequency 1.38 MHz on pin 3 relative to pin 20
  - Check Reset signal on pin 9
  - Check supply voltage 5 Volts on pin 40





None key is recognized.  
Replace V6, V8, R1, R3.

Do the LEDs V16 - V22 light?

- N - Check 5 Volts supply voltage of V7, V23, V24.

Correct?

- N - Check 5 Volt on Power circuit.

- Y - Replace V7, V23, V24.

Roll paper easel

X2 Pin 8	Exp End1	Output	
Pin 9	Exp End2	Output	
Pin 1	Exp Start	Input	Low active
Pin 2	Foc on	Input	Low active

Check V32, C29, C30.

"Exp. End" Signal is given by V1 microprocessor pin 13. That signal switches V44 and relais K1. The relais of K1 makes a short contact between pin 8 and 9 connector X2 for 0.5 sec.

- N - Check transistor V44.

For more informations see point 1.6.

Probe circuit

The Probe Signal goes through the U/t Converter. There the signal is trasformed into a digital signal. From the U/t converter the digital signal goes to the CPU.

U/t Converter

The U/t Converter trasforms analog signals into digital signals (High or Low Level) in a way CPU V1 can work with them.

The U/t Converter trasforms the Probe-, Yellow-, and Magenta Signal. All signals are switched on and off by V49-A-B-C. Each signal goes through the same U/t converter sequentially. The U/t converter has two ranges switched by V49-D. There is a software adjustment for U/t converter only. See Test 1 and 6 in the test program.

#### 1.4.4 Motor Control PCB

Motor Control PCB controls the two motors of shutter and filters.  
The shutter is driven by a DC motor, whereby the filters are driven by one stepper motor.

Check 5 Volts between C7(+) and P0 (GND).

Correct?

- N - Measure 24 Volts on X10/1 relative to X10/2 or X10/3

Correct?

- N - Check Power PCB.

- Y - Check voltage regulator V12 (7805).

V1 and V3 generate the 4 power signals for the stepper motor. V2 consists in protection diodes.  
V9 generates the (+) and (-) signal for the DC shutter motor. The motor turns left and right.

#### 1.4.5 Y/M-Signal PCB

This PCB reads the Yellow and Magenta light. The signals are amplified so they can be used by U/t Converter on the Keyboard PCB.

Measure -0.3 Volts on V5 pin 4 relative to AGND.

Correct?

- N - Remove V5 and measure -0.3 Volts again.

Correct?

- Y - Replace V5.

- N - Check C3, C5.

Correct?

- N - Check Power PCB and connections.

Measure +12 Volts on V5 pin8 relative to AGND.

Correct?

- N - Remove V5 and measure +12 Volts again.

Correct?

- Y - Replace V5.

- N - Check C4, C6, V1, V2, V3, V4.

Correct?

- N - Check Power PCB and connections.

For electrical adjustment see Tests 1 and 3 in the test program.

#### 1.4.6 Picto Probe PCB

The signal coming from this PCB is used to analyse the negative. Exposure time and Grade will be calculated.

The following signals must be measurable relative to P0.

Measure +12 Volts on V2 pin7 and V4 pin14.

Correct?

- N - Check V2, V4, C4, C5.
- Check Power PCB and connections.

Measure -0.3 Volts on V2 pin 4 and pin 8.

Correct?

- N - Remove V2 and measure again.

Correct?

- Y - Replace V2.

- N - Measure -12 Volts on X3 pin8.

Correct?

- Y - Check V5, C6, C7.

- N - Check Power PCB and connections.

For electrical adjustment see Tests 4 and 5 in the test program.

#### 1.4.7 Phase Shift Capacitor PCB

This PCB must create the duty cycle of 3 AC signals for fan motor.

## 1.5 Test program

Burn in	Grade	Exp. Time
TE	ST	1

### Test 1

Burn in	Grade	Exp. Time
OF	F.Y	84.0

Burn in	Grade	Exp. Time
OF	F.M	84.0

Burn in	Grade	Exp. Time
OF	F.d	84.0

### Introduction:

The test program includes 9 steps. To activate it press and hold F. Light and Expose while switching on Power.

With "+" and "-" keys the test step 1-9 has to be selected. To execute it press Expose. Each step can be left with Clear.

If displays shown in this manual differ to the real display it is because the seven segment display is not able to show certain letters.

This test is used to initialise the RAM (set default values) and check the offset of U/t converter.

Color head and probe must be disconnected to execute this test.

At the moment Expose key is pressed display shows the 3 Offset values for y, m, D.

y  $84 \pm 10$   
 m  $84 \pm 10$   
 D  $84 \pm 10$   
 in a sequence of ca. 1".

This offset can not be adjusted because it is given by V51, V55 and surrounding components on Keyboard PCB.

Signals on P1 P2 P3 measured relative to P0 must be  $\leq 3$  mV, if not values shown will be out of tolerance.

## Test 2

Test 2 is a hardware test of Keyboard PCB. After Expose key has been pressed display shows successively:

22	22	222
55	55	555
88	88	888
H.H.	H.H.	H.H.H.

At the same time left LED row lights up as a running light.

When any key is pressed the above cycle will be stopped.

Further each key can be checked. If any key is pressed a corresponding number must be shown in the display, see following table:

Cal	1
-	2
+	3
Burn in	4
Grade	5
% Time	6
F.Light	8
W.Light	9
Expose	10
Measure	11
Foc. Light roll paper	12
Exp. Start roll paper	13

With Clear exit from test step.

## Test 3

Adjustment of Y-M Signals PCB and check of Motor Control PCB.

Measure voltage of Keyboard PCB between P1-P0 (y) and P2-P0 (m). Lamp must be disconnected. Voltage must be  $\leq 3$  mV. If not check Y/M-signals PCB, page 19.

Move both filters y and m out of the light channel with "+" and "-" keys. Make sure filters are really out.

Lock the shutter with a tape in a way it can not open anymore.

Use a new lamp and turn lamp on with W.Light key. Measure voltage for y-signal P1 and m-signal P2.

Voltage has to be  $4 \text{ V} \pm 0.04 \text{ V}$ . If adjustment is needed use R7 for P1 and R1 for P2 on Y-M signal PCB.

Test 4

Burn in	Grade	Exp. Time
OF	Fd.	84.0

Test 5

Burn in	Grade	Exp. Time
Pr	bd	130

When pressing "-" or "+" key Filter stepper motor moves y- and m-filter in and out.

The direction of stepper motor is given by CW/CCW signal. If "+" key is pressed m-filter drives in and signal on V3 pin 17 (Motor Control PCB) goes high 5V. If "-" key is pressed y-filter drives in and signal on V3 pin 17 goes low 0 V.

The steps for stepper motor are given by clock signal on V3 pin 18 Motor Control PCB.

See on the left.

Probe Offset adjustment.

Darken the probe completely.

Press and hold red key of Probe. The display shows offset value which must not differ more than +/- 3 of offset value in Test 1.

If it differs more adjust value with R7 on Picto Probe PCB.

A tolerance value of +/- 3 is 0 V +/-2 mV on P3 measured against PGND Keyboard PCB.

Test 5 is a linearity, range signal and amplifire check of Probe.

To execute this step a separate adjustable lamp source, a Photometer as well as a Luxmeter is needed!

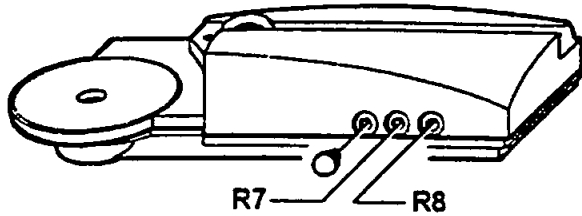
Increase and decrease light intensity of additional lamp source while pressing red key of probe.

The measured density value is showed in the display. Check with an additional Photometer the liniarity:

0.0D - 200D +/- 2 difference to  
200D - 400D +/- 3 Photometer

While increasing D-value the range signal must switch from High to Low at a Density value of 160D. While decreasing D-value the range signal must switch from Low to High at a Density value of 130D.

D value >160 range signal = 0V  
D value <130 range signal = +5V



With R8 the amplification of V2 Picto Probe can be adjusted.

Before this adjustment make sure Test 4 was executed successfully.

Use the adjustable light source and the Luxmeter. Set a light of 2.3 Lux, measure with Multigraph Probe this 2.3 Lux while pressing red key. The value indicated must be 100 if not adjust with R8. Set a light of 0.23 Lux and measure with Probe. The indicated value must be 200 ±3.

Check Probe offset with Test 4 again if a readjustment is necessary repeat Test 5 as well.

**Test 6**

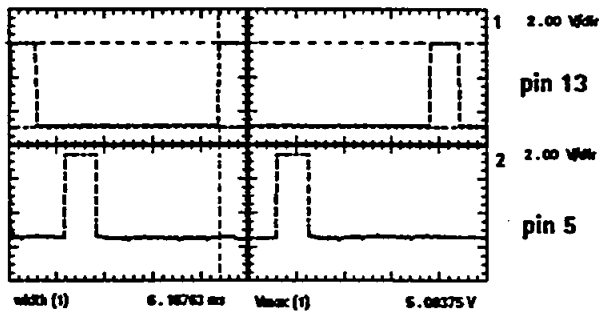
Test 6 is used as a stress test for lamp (lamp circuit), shutter (shutter circuit), filters y + m (filter circuit), probe shutter and its circuit as well as Exp. End signal for roll paper easel.

Furthermore the range signal of Probe is changing between 0 V and 5 V. Check it between Picto Probe PCB pin 3 cable soldering and measuring point P0.

Burn in	Grade	Exp. Time
00	00	023

Colour filters are moving continuously, all other functions are turned on and off in cycles of approx. 1.2".

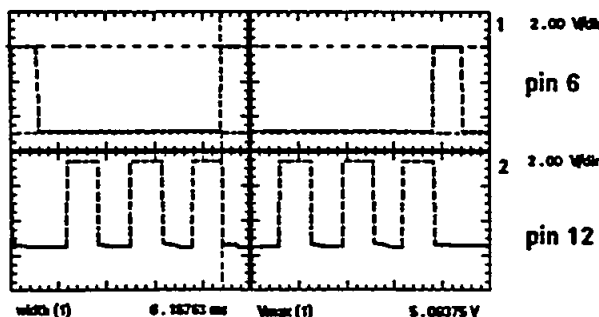
Cycles are counted and shown in the display. Exp. End Signal can be checked on X5 Power Unit pin 2a - 2d. These two contacts must be closed and open continuously.



**U/t Converter Check**

Make sure that Y-M Signals PCB is adjusted (see Test 3).

Multiplexer V49 gets a continuous signal during this test. Each channel (y- m-probe) is selected for 6 ms. Check the signal on V49 pin 13, 5, 6. Also V49-D of U/t Converter gets a 6 ms signal.



If one of the above functions is not working properly check it with its proper test step.

Test 7

Burn in	Grade	Exp. Time
13	00	500

Test 7 checks the steepness of filter slope. This test should be done if CLS is not able to set filter position, continues moving of filters. Before executing this test make sure y/m Signals PCB is adjusted properly (see Test 3).

First two displays show the y - m density increment. Filters can be moved with "+" and "-" keys in steps of 10. The range goes from 500 (y filter in) over 770 (filters out) to 1020 (m filter in).

These values are shown in the third display. Motor steps 500 till 770 is the range for y-increment and 770 till 1020 is the range for m-increment.

**Note:**  
There is just one stepper motor moving both y and m filters.

Maximum increment value per each 10 steps is 15. A normal average value is 8. If value is too high change of light value is too much.

When entering in Test 7 display 3 shows always 500 regardless the filter position. To be sure that display value corresponds with filter position proceed as follows:

Press "+" key till display shows 020 = 1020. Do not care if M filter hits the stopper.  
Now press "-" key till display shows 500. Do not care if Y filter hits stopper.

**Warning:**  
Do not set a value below 500 or above 1020.

Counter will count further but filters will hit stopper, so filter position does not correspond with motor steps shown in display 3.

Test 8

Burn in	Grade	Exp. Time
	Y	0

Test 8 checks the Closed Loop system.

Display shows the y- filter aim value. This value can be changed with "+" and "-" key.



Burn in	Grade	Exp. Time
	M	0

Burn in	Grade	Exp. Time
0.8	0.8	60.0

Grade	Yel	Mag
00	131	0
0.0	68	0
0.5	47	0
1.0	26	0
1.5	8	0
2.0	0	10
2.5	0	19
3.0	0	48
3.5	0	60
4.0	0	72
4.5	0	121
5.0	0	170

Test 9

Press and hold "cal" key and use "-" key to switch between Y- and M- filter aim value. This value can be changed with "+" and "-" key.

If Expose key is pressed Closed Loop starts working continuously. The values shown in the first two displays are the Closed Loop Errors for y and m. Value must be  $\leq 0.8$ .

If value is higher check Y/M Signal PCB, U/t Converter on Keyboard PCB and Motor control PCB as well as filter mechanics.

The third Display shows the secondary density absorption of filters and density shift of lamp. If y- and m- aim value is 0 the density shift value should be around 60. That means 4V on P1 and P2 Keyboard PCB.

Note:

Use common y- and m- filter aim values combinations as from a normal grade table. That means one of the y- m- filter aim values must be 0 if the other one is greater than 0. See example on the left. Only in such a case the closed loop test is reliable.

Test 9 was used for Multigraph development.

This test is not usefull for function test.

## 1.6 Connecting a roll paper easel

A roll paper easel can be connected together with the Multigraph by means of an eight - pin DIN plug (X5).

The pin allocations are as follows:

Foc on	X5/1b
Exp. Start	X5/3b
Exp. End 1	X5/2a
Exp. End 2	X5/2b
Pg	X5/4a

The otherwise familiar "Ready" signal is not used on the Multigraph. The enlarger does not need a "Ready" signal in order to recognize control signals.

### "Focus" Signal

The "Focus" Signal is used to adjust and check the focusing. When the key is activated, the signal on X5/1b goes low 0 Volt for ~0.5" (Low active signal) and the enlarger switches unfiltered light on. If the "Focus" key is pressed once more, the lamp goes off again.

### Warning:

If the Light has been switched on with "Light" key of enlarger keyboard so it must be switched off with the same key, otherwise the system will lock up.

### "Exp. Start" Signal

When the "Expose" key on the roll paper easel is pressed, the signal on X5/3b goes low 0 Volt for ~ 0.5" (Low active). This switches the enlarger lamp on, the light is correctly filtered and shutter will open.

### Notice:

The signals of Focus and Exp. Start must be inbetween 0.2" and 0.5".

After the exposure sequence, which is controlled by the microprocessor, the "Exp. End" signal is sent back to the roll paper easel.

### "Exp. End: Signal

The "Exp. End" Signal is an acknowledge signal from the enlarger sent to the roll paper easel. This signal can be measured via the microprocessor V1 pin 13 on the Keyboard PCB. It is a low active signal of ~0.5". The roll paper easel will close the curtain and transport the paper.

If any of the above function is not working properly execute Test 6 in the test program.

Usefull informations in configuration with a roll paper easel:

1. When working with a Papermot, "burn in" function works as following: Only after the last exposure an Exp. End signal is send by Multigraph. During the intermediate Exposures paper will not be transported as well as curtain will not be closed.
2. White light is automatically activated if "Focus on" key of roll paper easel is pressed.

## **2 Mechanical instructions**

### **2.1 Removing the enlarger head**

- Release the 4 fixing screws (A)
- Remove the head

### **2.2 Exchanging the colour filters**

- Open the 6 screws (B).
- Open the 4 screws (C).
- Remove the cap and the front plate
- Open the 4 screws (D).
- Remove retaining plate
- Replace Yellow and Magenta filter

### **2.3 Exchanging the colour - filter motor**

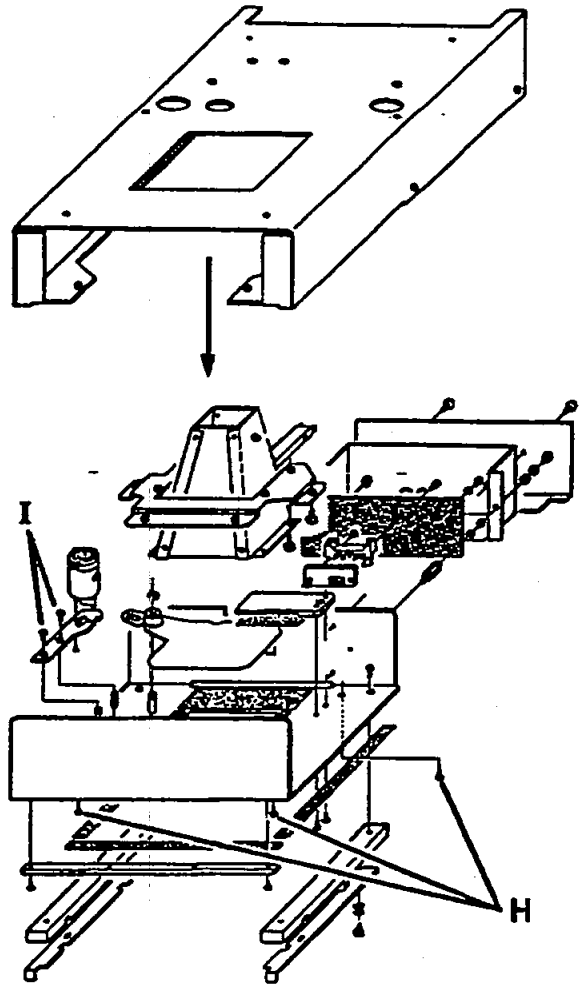
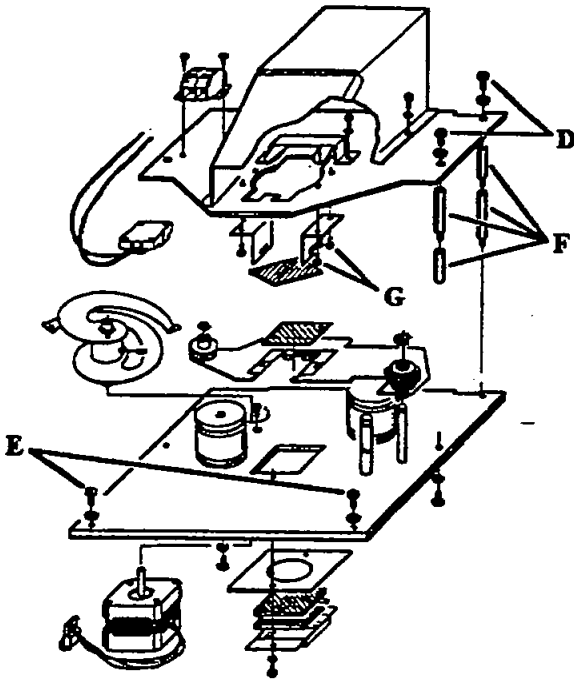
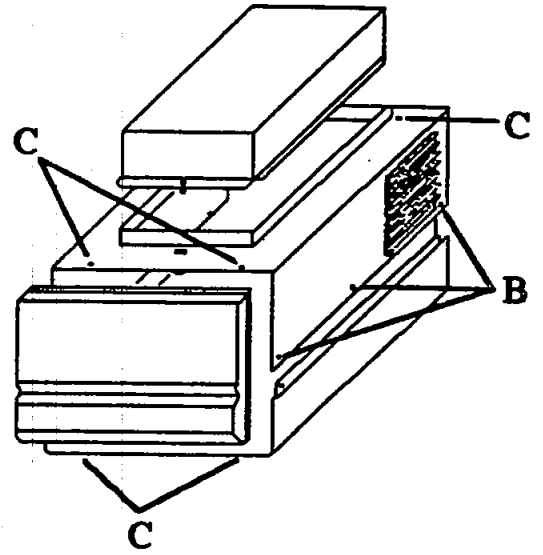
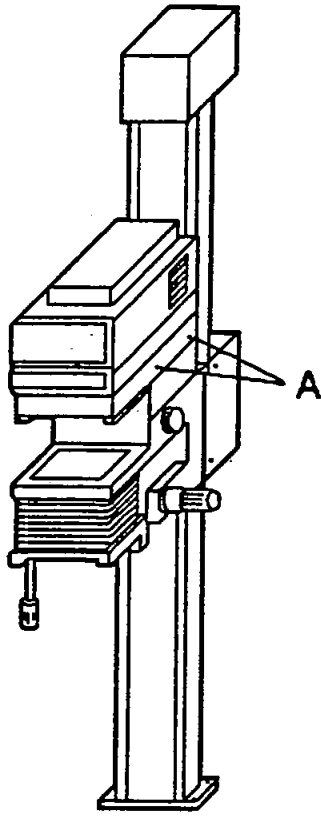
- Open the 6 screws (B).
- Open the 4 screws (C).
- Remove the cap and the front plate
- Open the 4 screws (D)
- Remove retaining plate
- Open the 2 screws (E).
- Open the distance bolts (F).
- Remove retaining plate.
- Replace filter motor.

### **2.4 Exchanging the heat - protection filter**

- Open the 6 screws (B)
- Open the 6 screws (C)
- Remove the cap and the front plate
- Open the 4 screws (D)
- Remove retaining plate
- Open the 2 screws (G)
- Remove the angle
- Replace the heat protection filter

### **2.5 Exchanging the shutter motor**

- Open the 4 screws (H) on bottom plate (Note: screws are covered by sealing strips)
- Remove bottom plate
- Open the 2 screws (I)
- Remove Mofor plate
- Replace shutter motor.



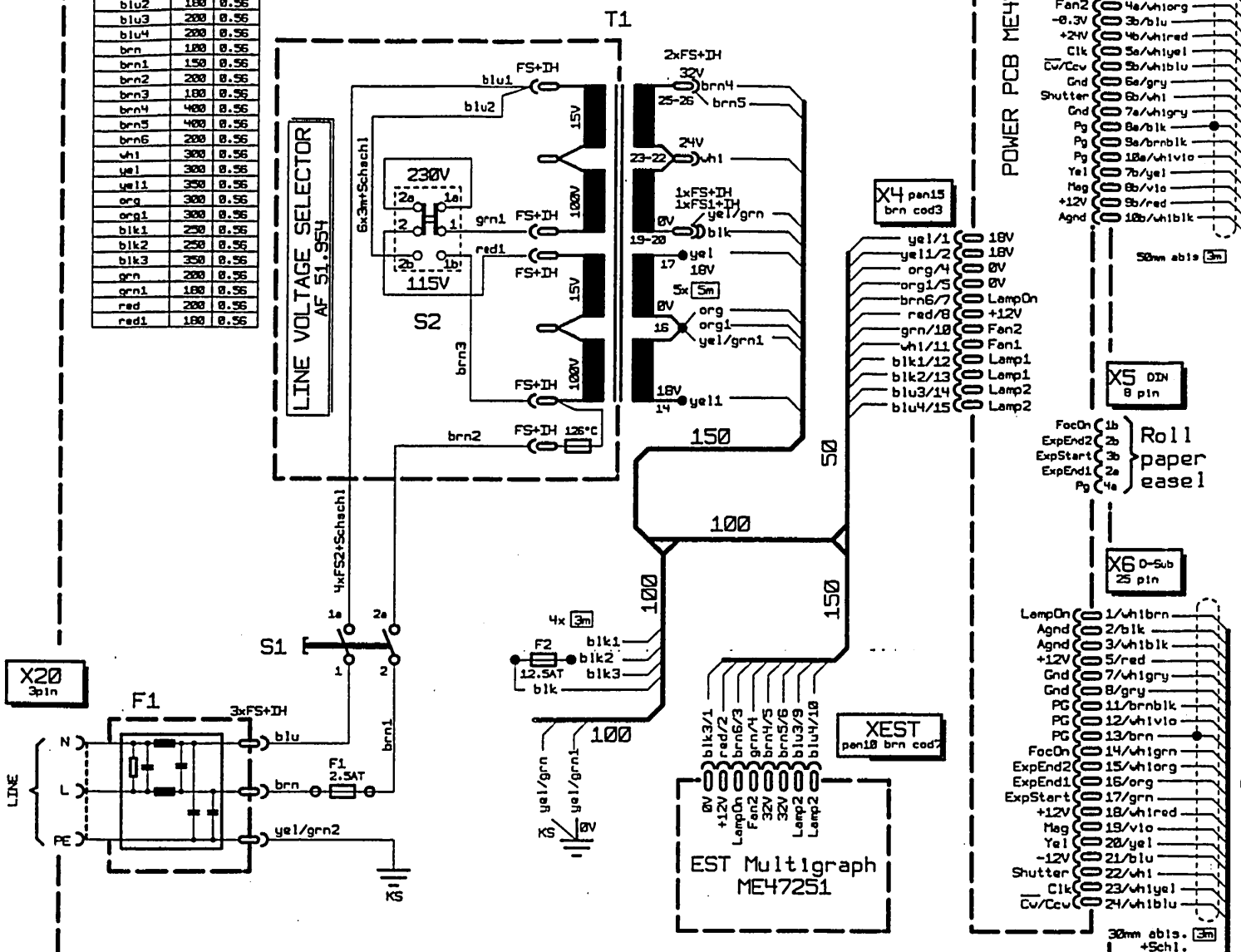


Drahttabelle Power Unit

yel/grn2	150	1.3
yel/grn	350	1.3
blk	250	1.3
yel/grn1	350	0.56
blu	180	0.56
blu1	250	0.56
blu2	180	0.56
blu3	200	0.56
blu4	200	0.56
brn	180	0.56
brn1	150	0.56
brn2	200	0.56
brn3	180	0.56
brn4	400	0.56
brn5	400	0.56
brn6	200	0.56
wh	300	0.56
yel	300	0.56
yel1	350	0.56
org	300	0.56
org1	300	0.56
blk1	250	0.56
blk2	250	0.56
blk3	350	0.56
grn	200	0.56
grn1	180	0.56
red	200	0.56
red1	180	0.56

# POWER UNIT

Litzen durchstecken  
unbiegen und schrumpfen



X20 3pin

S1

F1

F2

EST Multigraph ME47251

XEST pan18 brn cod2

KD

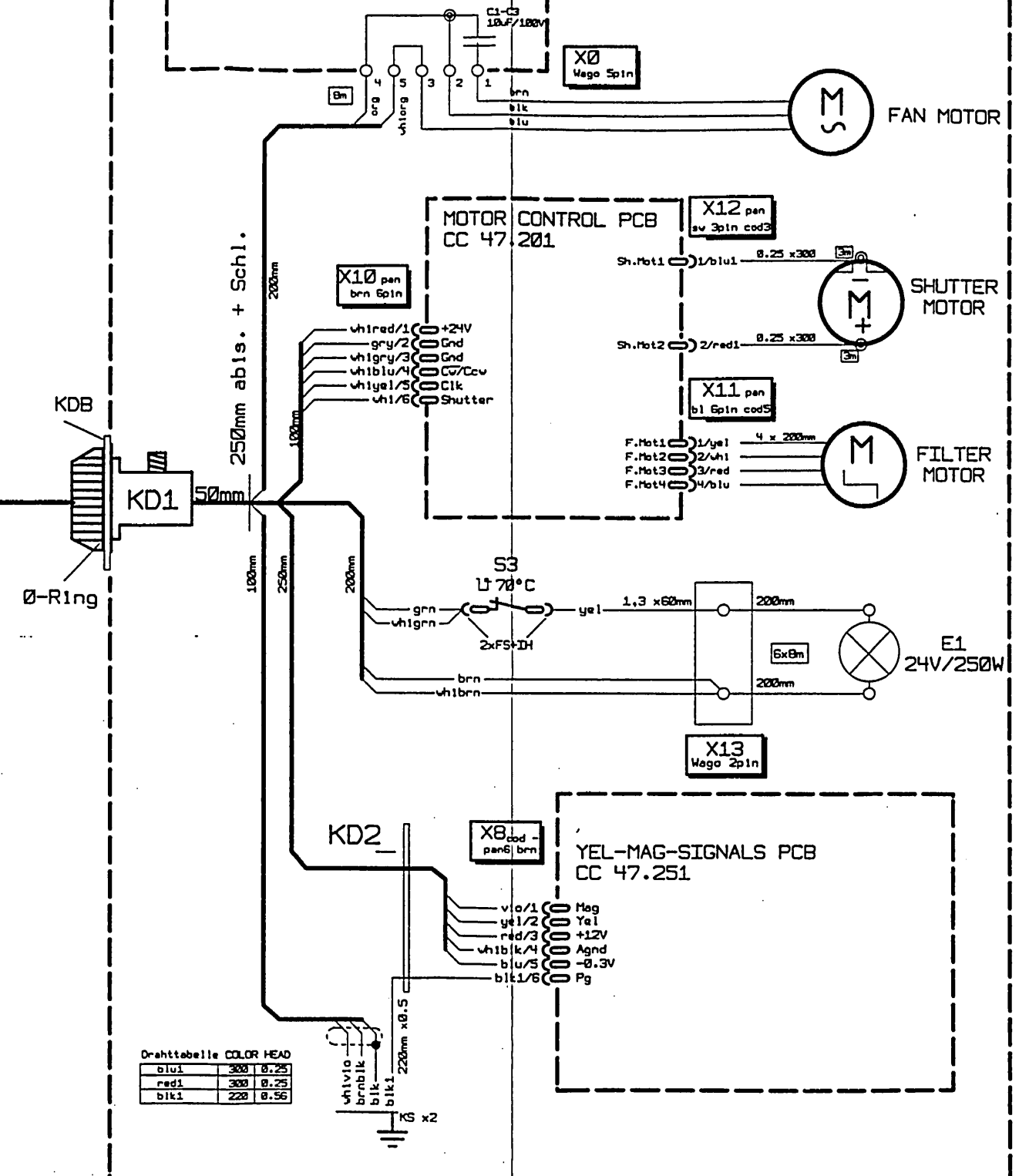
KDB1

Kabel Abg. 20pol 0,5 x 2100mm

Kabel Abg. 20x0,25, 2100mm

# PHASE SHIFT CAPACITOR PCB AC 90 92A

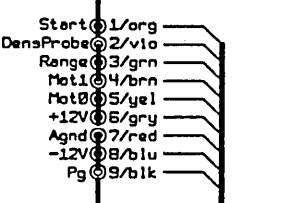
# COLOR HEAD



Drahttabelle COLOR HEAD

blu1	300	0.25
red1	300	0.25
blk1	220	0.56

# PROBE PCB MB48201



Kabel 8x0,14 abgesch. A1 48.355

X3 0-Sub 15pin



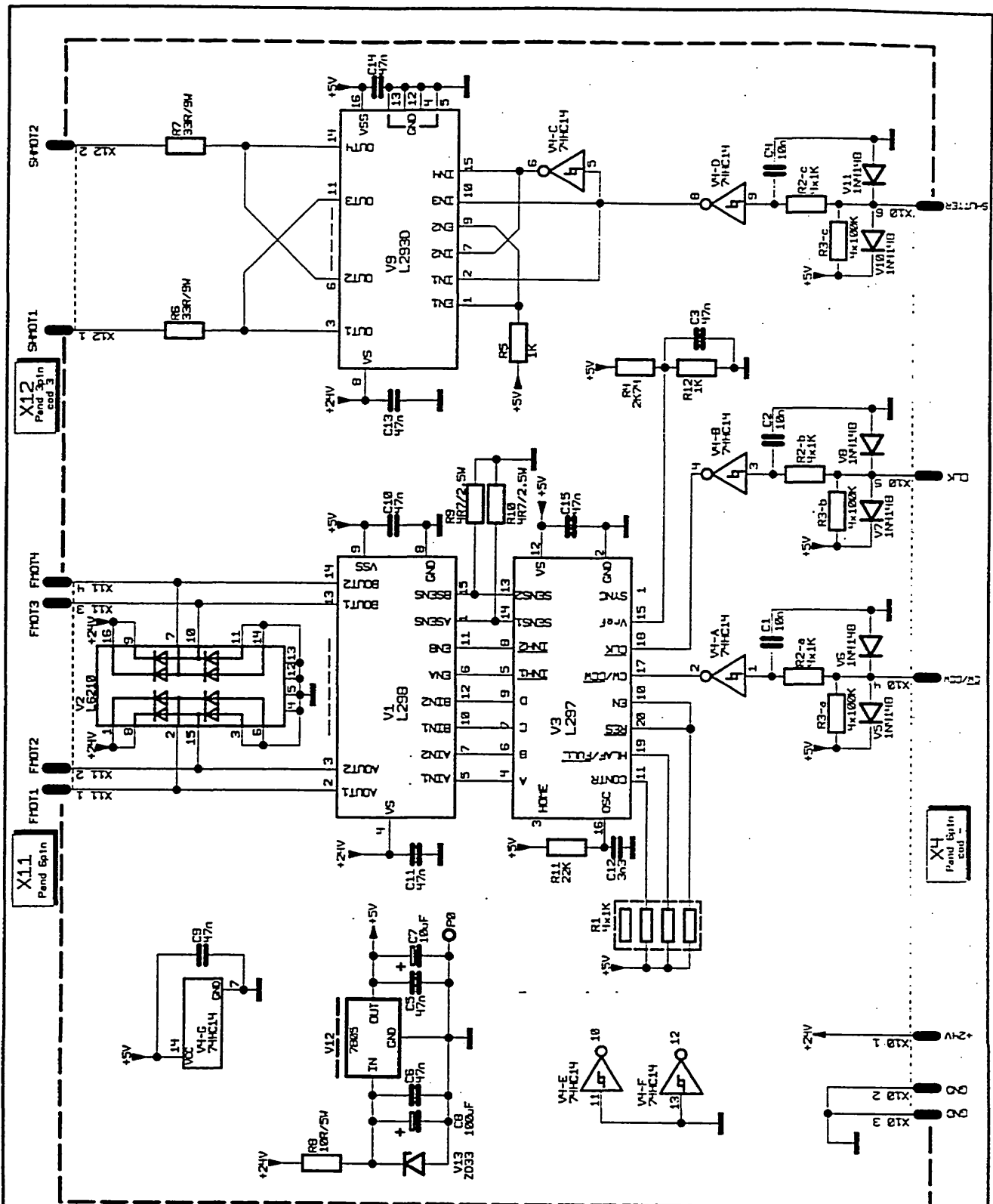
KEYBOARD PCB MF47201 (controller/display)

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3	ME4725A,S2	13.2.95	L.J.
2	F1 neu LP.Cap.	15.5.95	L.J.
1	Kab.Abg.CE Ab.	15.12.94	R.K.
Ausgabe	Anderung	Tag	Name

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wiring diagram + KBB  
MULTIGRAPH  
ME 47.205.4D  
MULTIGRAPH



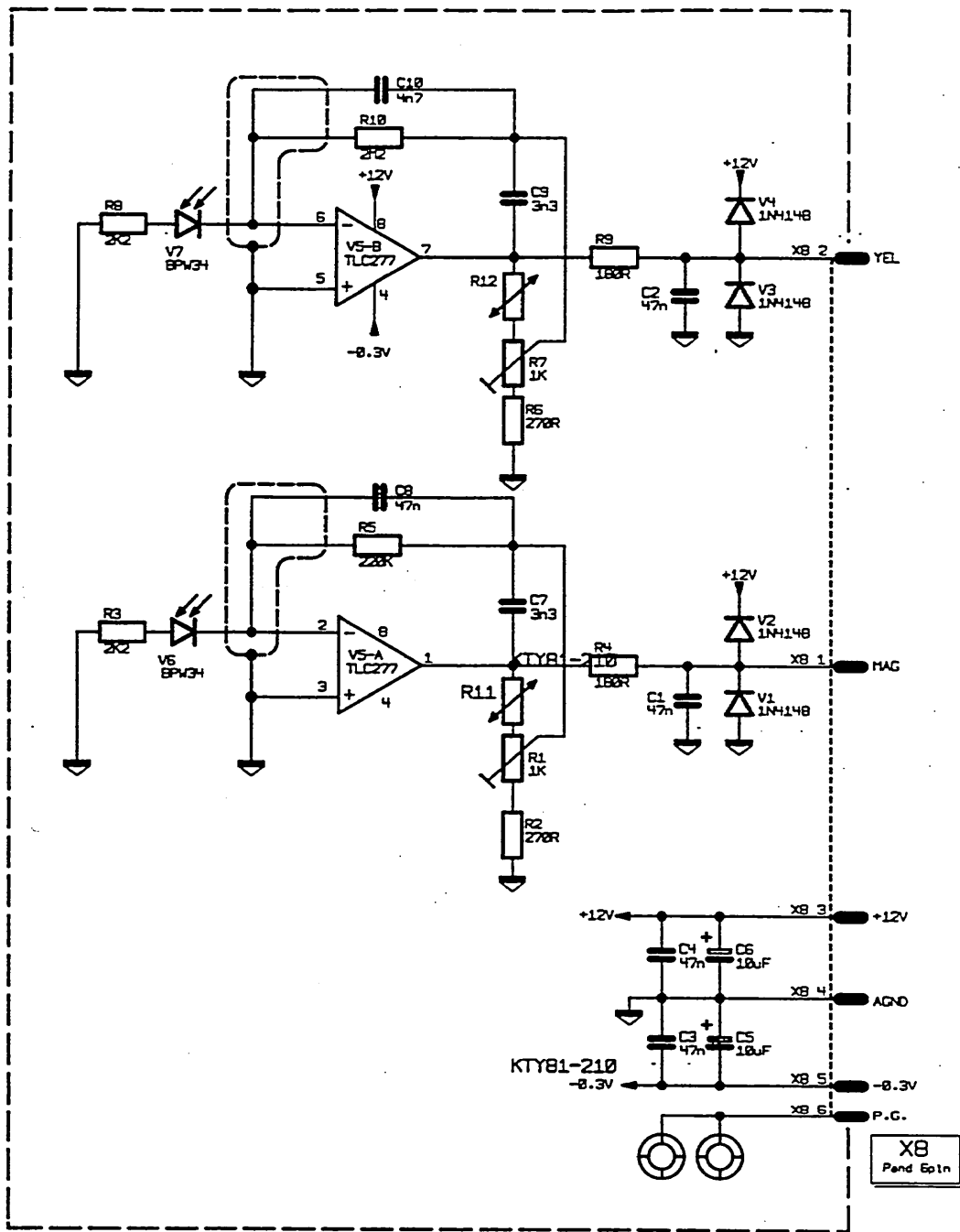
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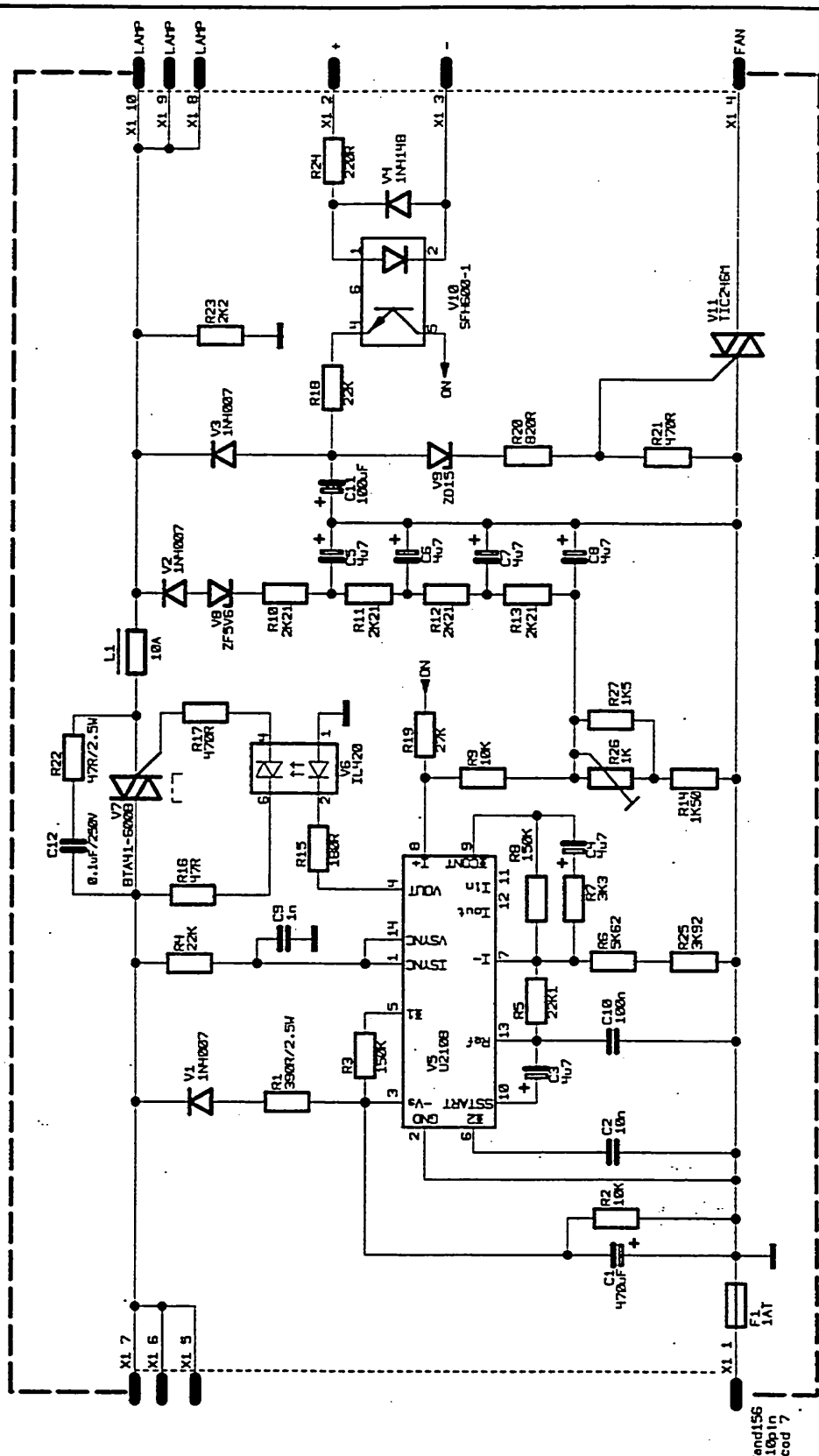
circuit diagram MOTOR CONTROL PCB		Masstab
CC 47.201.0E		
		MULTIGRAPH







				Freimasstol.		The property of Durst Phototechnik AG. Copying of this document, and giving it to others and the use or communication of the contents thereof, are forbidden without express authority. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.		circuit diagramm Y-M-SIGNALS PCB CC 47.251.0E		Messtab	
				Teg Name Boerb. 27.8.93 S.M. Gepr. Stecher Norm.						MULTIGRAPH	
				Phototechnik AG Brixen - Bressanone							
Ausgabe		Anderung		Teg		Name					



Pend156  
10pin  
cod 7

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		Teg	Name
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Gepr.			Delueg
Norm.			
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1)	R27 1K > 1.5K	20.1.99	S.M.
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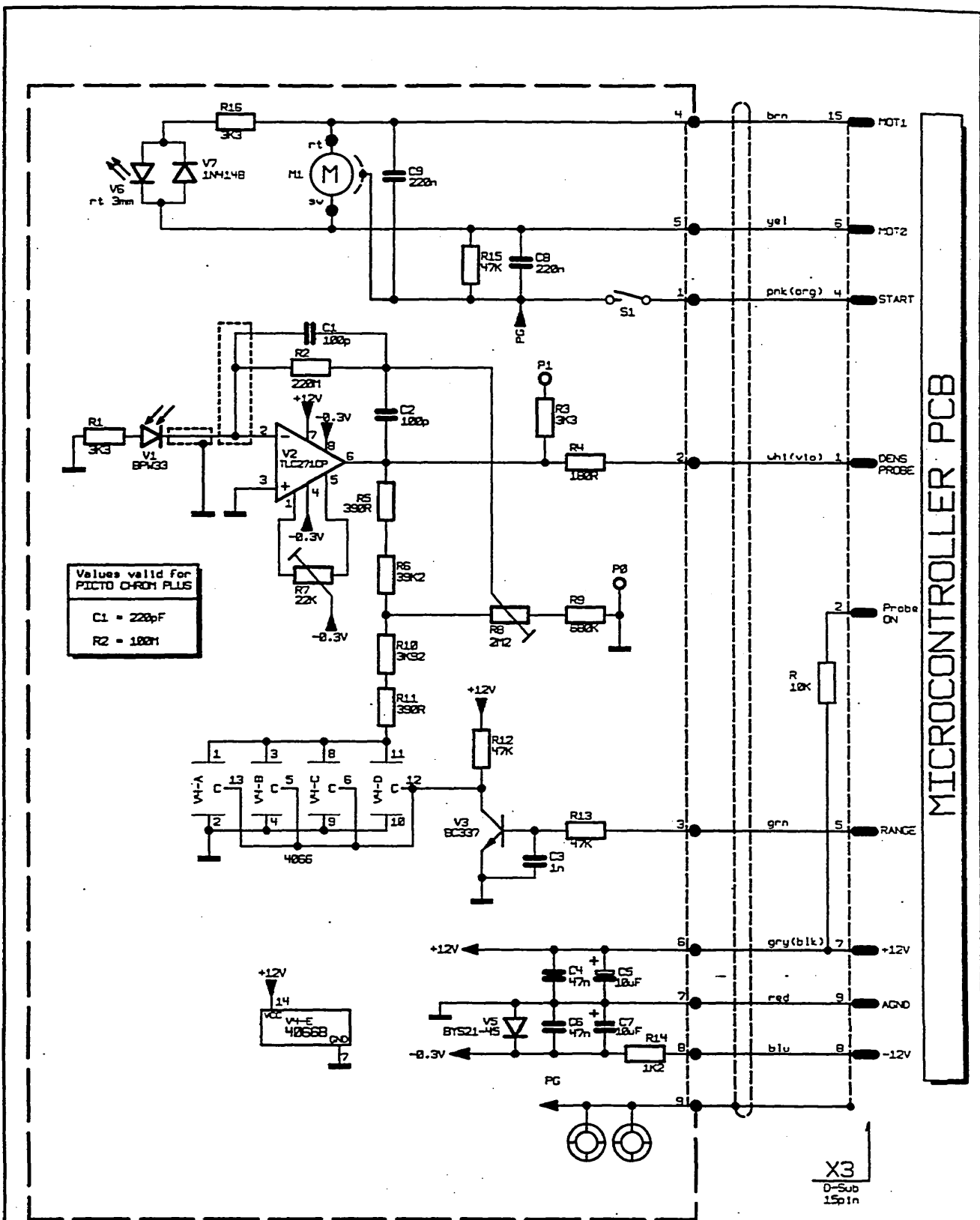
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circuit diagram  
EST MULTIGRAPH

ME 47.251.1E

Masstab

MULTIGRAPH



MICROCONTROLLER PCB

Freimasstol.			
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3)	R neu dazu	22.1.93	L.J.
2)	PICTO CHR PLUS	4.5.92	S.M.
1)	PG an St.Geh.	21.4.92	S.M.
Ausgabe	Aenderung	Tag	Name

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<p>circuit diagram <b>PICTO PROBE PCB</b> <b>MB 48.201.5E</b></p>	<p>Masstab</p> <p>PICTO GRAPH MULTIGRAPH PICTO D-RPT PLUS</p>
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