Digital weight display
PR 1557/02A

9405 315 57022

Operating manual
Bedienungsanleitung
Instructions de commande

9499 050 11701
830201 01

PHILIPS

PLEASE NOTE (2762)

In correspondence concerning this instrument, please quote the type number and serial number as given on the plate.

BITTE BEACHTEN

Bei Schriftwechsel über dieses Gerät wird gebeten, die Typennummer und die Gerätenummer anzugeben. Diese befinden sich auf dem Typenschild an der Rückseite des Gerätes.

NOTER S. V. P.

Dans votre correspondance et dans vos réclamations se rapportant à cet appareil, veuillez toujours indiquer le numéro de type et le numéro de série qui sont marqués sur la plaquette de caractéristiques.

IMPORTANT

As the instrument is an electrical apparatus, it may only be operated by trained personnel. Maintenance and repairs may also be carried out only by qualified personnel.

WICHTIG

Da das Gerät ein elektrisches Betriebsmittel ist, darf die Bedienung nur durch eingewiesenes Personal erfolgen. Wartung und Reparatur dürfen nur von geschultem, fach- und sachkundigen Personal durchgeführt werden.

IMPORTANT

Comme l'instrument est un équipement électrique, le service doit être assuré par du personnel qualifié. De même, l'entretien et les réparations sont à confier aux personnes suffisamment qualifiés.

Issued by Philips GmbH - Unternehmensbereich Elektronik für Wissenschaft und Industrie - Werk für Messtechnik
- Printed in Germany -

2nd edition 2. Ausgabe 2me tirage

CONTENTS

LIST OF FIGURES

1. DESCRIPTION

1.1. General

The PR 1557/02 A Digital Weight Display Unit is a low cost reliable instrument for digital display of analog bipolar voltages. The display is 5999 counts on a range of 5.999 V.

The PR 1557/02 A is a line-operated meter with 14 mm high 7-segment LED readout. The housing is an unbreakable phenylene oxide case. No zero adjustment is required and full scale and offset adjustments are easily accessible with the lens removed.

Accuracy at the low end of the range is not degraded by normal mode noise because the PR 1557/02 A performs true bipolar signal integration around zero. Many competitive meters rectify the signal before integration which erroneously adds the absolute value of the normal mode noise to the signal reading. PR 1557/02 A average value circuit provides full normal mode and superior AC line transient noise rejection at signal levels from zero to full scale.

Data output lines are parallel BCD, compatible with TTL and DTL. External control signals are also TTL and DTL compatible and increase the flexibility and ease of interfacing the PR 1557/02 A with other instruments.

1.2. Theory of operation

The PR 1557/02 A Digital Weight Display uses the dual slope method of conversion. Many state-of-the-art panel meters use dual slope conversion, but the PR 1557/02 A includes automatic zeroing before each reading and does so with a minimum of parts for increased reliability.

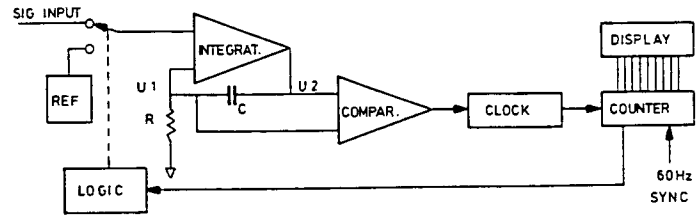


Fig. 1 Block diagram of the PR 1557/02 A

At the beginning of a conversion, the voltage across C is zero. The signal is then applied to the integrator and the voltage across C rises by the formula

$$U_{capacitor} = U_{in} \times \frac{time}{R \cdot C} \qquad (V, s, \Omega, F)$$

At the end of a fixed period of 2000 counts, the counters are reset to 0000. The signal input is turned off and a stable reference voltage of the opposite polarity is now applied to the input. Since the reference voltage is constant, the slope, in volts/sec, during this second period is constant and independent of input signal levels. The time required to discharge the capacitor back to zero volt is then proportional to the signal voltage.

Note: Capacitor voltage Uc is equal to $U_2 - U_1$

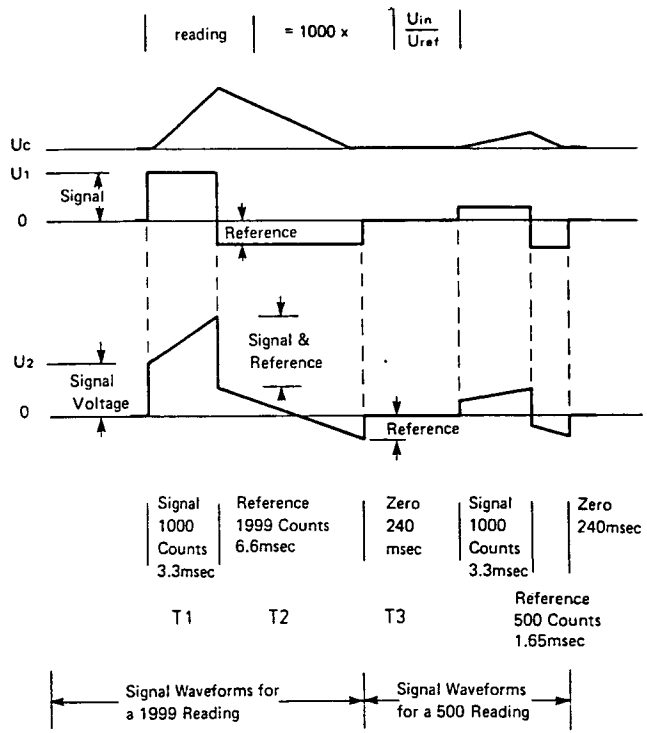


Fig. 2 Voltage wave forms at U_1 and U_2

After the clock is stopped by the capacitor voltage reaching zero, a third period allows the circuit to zero the integrator and comparator for the next reading.

A low level on the $\overline{\text{HOLD}}$ input prevents the reset pulse from starting the counters. The relationship between T1 (signal integrate) and T2 (reference integrate) time can be expressed by the formula

$$U_{ref} \times T2 = U_{sig} \times T1$$

2. SAFETY INSTRUCTIONS

Upon delivery from the factory, the instrument complies with the required safety regulations.

To maintain this condition and to ensure safe operation, it is recommended to follow the instructions given below.

2.1. Before commissioning

General
Before putting the instrument into operation after storage or transport, visually check it for physical damage.

- Mounting

  The instrument is suitable for panel mounting.

  Please observe the required environmental conditions as given in the technical data.

- Type of protection

  The instrument is protected according to class I (protective earth) of the IEC 348 or VDE 0411 regulations. The connection cable must contain a protective earth conductor, which must not be interrupted inside or outside the instrument (e.g. by connecting an extension cable without protective earth conductor).

- Mains connection

  The instrument may be connected to nominal 110 or 220 V AC.

  Upon delivery it is set to 220 V AC. Check whether the instrument is adapted to the nominal mains voltage.

  For connecting the mains cable including the protective earth to the instrument, strictly observe the relevant Directions for Use.

  As this instrument has no mains switch, it will be in operation as soon as the mains voltage is connected.

- Earthing

  The instrument has to be earthed according to the latest safety regulations which are valid locally.

2.2. Maintenance and Repairs

General

- Failure and use beyond specified limits

  If the instrument is suspected of being unsafe, take it out of operation. This is the case when the instrument shows physical damage or does not function any more or is stressed beyond the tolerable limits, e.g. during storage or transportation.

- Calibration

  For the safety of personnel and interconnected equipment, all calibration should be done by using a plastic screw driver.

- Repairs

  Maintenance or repairs must be performed only by trained personnel who are aware of the risks. Ensure that the construction of the instrument is not altered to the detriment of safety. Above all, leakage paths, air gaps, and insulation layers must not be reduced.

- Dismantling the instrument

  When removing covers or components, live parts could be exposed. Therefore, before opening the instrument, disconnect it from all power sources.

- Replacing parts

When replacing, use only original parts. Other spare parts are only acceptable when the safety precautions for the instrument are not impaired and accuracy requirements are still met.

2.3. Checks after repair and maintenance

- Checking the insulation resistance

Measure the insulating resistance at a test voltage of 500 V DC between the mains connections and the protective lead connections. For this purpose remove the mains supply cable from the corresponding terminals. The insulation resistance should be $> 2\ M\Omega$.

3. TECHNICAL DATA

3.1. General data

- Typ: PR 1557/02 A
- Ordering number: 9405 315 57022
- Conversion

Technique	Dual slope, average value
Signal integration	50 msec (60 Hz); 40 msec (50 Hz)
Read rate	3.6/sec@ full scale (50/60 Hz). 0 ; 3.6/sec with external control
Polarity	Automatic
Full scale voltage	±5.999 V
Resolution	1 mV

- Accuracy @ 25 °C

Total error	±0.02 % reading ±1.0 count
Offset tempco	±2 µV/°C
Reading tempco	±0.005 % reading/°C
Warm-up time	1 hour

- Display

Type	14 mm (0.56"), 7-segment LED
Digits	-5.999
Weighing symbols	kg (t) selectable by changing the filter screen
Decimal point	Any of 3 to the right of the most significant digits
Polarity indicator	Minus indicator
Overload indicator	Digits flash

- Environmentals

Operating temperature	0 °C to 50 °C
Storage temperature	-40 °C to +75 °C
Humidity	up to 95 % at ≤ 40 °C
Warm-up time	1 hour
Safety class	I (protective earth) acc. to IEC 348
Protection	acc. to IP 20
Housing	Black polycarbonate

Dimensions	see fig. 6 page G - 1
Panel cut-out	92 x 45 mm
Weight	480 g net

3.2. Inputs

- Mains supply: settable to 110 or 220 V AC

Permissible deviation	±10 %
Frequency	50 or 60 Hz
Power consumption	5 watts at nominal range

- Signal input

Full scale voltage	±5.999 V
Resolution	1 mV
Impedance	1000 MΩ
Bias current	1 nA
Overvoltage protection	100 V
External reference	+1.0 V to +3.5 V
Common mode rejection	120 dB @ 60 Hz
Normal mode rejection	40 dB @ 50/60 Hz

- Digital signals

	Logical "0"	Logical "1"	Isink	Isource
$\overline{\text{HOLD}}$	0 V - 0.6 V	2.0 V - 5.0 V	0.4 mA	1.6 mA
$\overline{\text{BLANKING}}$	0 V - 0.4 V	Open *	---	1.6 mA

* Not compatible with $\overline{\text{TTL}}$ totem-pole outputs; $\overline{\text{TTL}}$ open-collector devices (or equivalent) must be used to drive the $\overline{\text{BLANKING}}$ input.

3.3. Outputs

- Digital signals

	Logical "0"	Logical "1"	Isink	Isource
Parallel BCD	0 V - 0.5 V	2.7 V - 5.0 V	4.8 mA	0.4 mA
+POLARITY	0 V - 0.4 V	2.4 V - 5.0 V	1.6 mA	0.4 mA
$\overline{\text{DATA READY}}$	0 V - 0.4 V	2.4 V - 5.0 V	16.0 mA	0.8 mA

- Analog output: +4.75 V ±5 % @ 50 mA

4. ACCESSORIES

1 36-pole connector
1 filter screen printed with t
1 Directions for Use

5. MOUNTING AND CONNECTING

5.1. Mechanical installation

The drawing on page G - 1 illustrates the mounting method. The unit is inserted from the front of the panel and hold in place by two extrusions. The panel thickness may be between 0.8 mm (0.030") and 6.4 mm (0.25").

5.2. Dismantling

Dismantling the unit is shown in fig. 7. Before dismantling ensure that the instrument is disconnected from all power sources.

The instructions given in para. 2.2. have to be observed.

5.3. Interfacing

5.3.1. Screw assignements of terminal block TB1

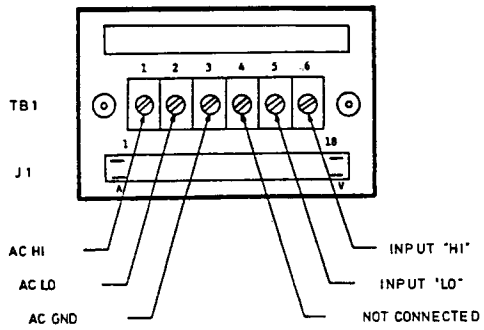


Fig. 3 Rear view of the unit

5.3.2. Pin assignements of connector J1

Pin	Function	Pin	Function
1	No Connection	A	AC Power Hi*
2	AC Power Lo*	B	No Connection
3	No Connection	C	AC Power Gnd*
4	DP x.x x x	D	1 BCD
5	DP x x.x x	E	2 BCD
6	DP x x x.x	F	4 BCD
7	$\overline{\text{Blanking}}$	H	8 BCD
8	80 BCD	J	100 BCD
9	40 BCD	K	200 BCD
10	20 BCD	L	400 BCD
11	10 BCD	M	800 BCD
12	1K BCD	N	+ Polarity
13	2K BCD	P	$\overline{\text{Data Ready}}$
14	4K BCD	R	$\overline{\text{Hold}}$
15	+4.75 V DC Out	S	Spare
16	Analog Gnd In*	T	Digital Gnd
17	Signal In*	U	Spare
18	Spare	V	Ref In*

* Not connected (internally interrupted)

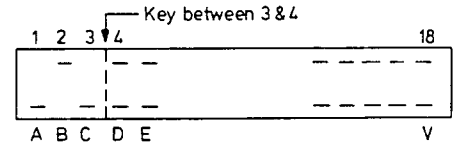


Fig. 4 Connector pin orientation as viewed from the rear of the meter

5.3.3. Signal input

For best results, shielded, twisted cable should be used for the input signal, with the shield terminated to Analog Ground at terminal TB1 screw 5.

Analog Ground and Digital Ground are internally connected and should not be connected externally. The Analog Ground must be referenced to the Digital Ground to realize the full capability of the meter.

5.3.4. Digital input signals

- $\overline{\text{Hold}}$ (Pin R)

  logical "1"; 2.0 to 5.0 V, source 1.6 mA
  logical "0"; 0 to 0.6 V, sink 0.4 mA

  When a logical "0" is applied to the $\overline{\text{Hold}}$ input, the meter will finish the conversion cycle it is on and will hold that reading. If it is applied before the beginning of a conversion, the meter will not start that conversion. Upon a logical "1" at the $\overline{\text{Hold}}$ input, a new conversion will begin within 133 msec.

- $\overline{\text{BLANKING}}$ (Pin 7)

  The digital display may be blanked by grounding the $\overline{\text{BLANKING}}$ input. The internal blanking signal occurs at displayed reading > ±5999.

- Decimal Points

  Any of three decimal points can be lighted by connecting a solder blob on the display board or by grounding (digital ground – Pin "T".) the appropriate pin at the rear connector. If the decimal point pin is grounded with a transistor or I.C. it must be capable of sinking 0.5 mA. The decimal points blank during overload.

Pin – T to		Display board-solder blob
x.x x x – Pin – 4		"J"
x x.x x – Pin – 5	or	"L"
x x x.x – Pin – 6		"K"

5.3.5. Digital output signals

- BCD Parallel Outputs

  All BCD outputs are TTL and DTL compatible. The data outputs are parallel BCD. The outputs are stable and valid while $\overline{\text{Data Ready}}$ (Pin P) is low.

- $\overline{\text{Data Ready}}$ (Pin P)

  Data Ready will go to a logical "0" at the end of a conversion cycle and to a logical "1" at the beginning of a conversion cycle.

- +Polarity (Pin N)

  The +Polarity output is a logical "1" when the meter indicates a positive reading.

5.3.6. Output voltage

The +4.75 V output is a regulated supply with the voltage range 4.75 V ±0.25 V. A maximum current of 50 mA is available for external use.

5.4. Mains connection

The instrument is connected to the mains via screws 1 (AC HI), 2 (AC LO), and 3 (AL Gnd) of terminal block TB1 (see also fig. 3).
Upon delivery, the instrument is connected to 220 V AC ±10 %.
For changeover proceed in accordance with instructions given in para. 6.1.

Attention:

As this instrument has no mains switch, it is in operation when the mains voltage is connected. Therefore, connect the instrument only to the mains, when it is ready for operation – after having finished the adjustments.

5.5. Earthing

The instrument must be earthed in accordance to the instructions given in para. 2.1.

6. ADJUSTMENTS AND CALIBRATION

6.1. Adjustment to local mains supply

Before connecting the instrument to the mains supply, it should be noted that it has no mains switch and is therefore ready for operation as soon as the supply is connected to it.

The instrument operates on mains voltage of 110 or 220 V AC and 50/60 Hz. Upon delivery it is set to 220 V AC/50 Hz.

For changing over from 220 V AC to 110 V refer to figure 5. and proceed as follows.

- Remove power lines from meter and remove the meter from the case.
- Remove jumper W3 on the PCB.
- Add the two jumpers on the transformer bobbin W1 and W2.

To change the meter from 110 V to 220 V operation, reverse the above steps.

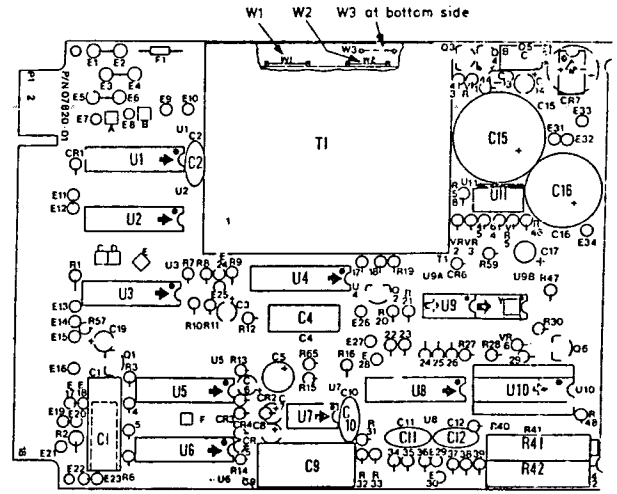


Fig. 5 Points of adjustments

6.2. Adjustment to local mains frequency

The standard PR 1557/02 A is set at the factory for 50 Hz. If a frequency change is required, the clock frequency must be changed. The easiest method is to short the signal inputs and adjust R42 for a reading of ±0000. Change the value of R8 until the positive portion of $\overline{\text{DATA READY}}$ is 50 mS ±0,5 ms for 60 Hz operation or 40 mS ±0,4 ms for 50 Hz operation.

Normal mode rejection is highly dependent on the clock frequency, and it is important that the above adjustments are set to ±1 % to prevent degradation of normal mode rejection of the PR 1557/02 A. R8 should be a ±1 % metal film resistor.

6.3. Calibrating and testing the instrument

The PR 1557/02 A was calibrated at the factory with a precision voltage source. Frequent calibration is not necessary due to the stability and internal accuracy of the meter. If recalibration is necessary, use the following procedure.

- Plug the PR 1557/02 A to be tested into an appropriate test cable.
- Turn on the power and adjust for 220 V AC.
- With the voltage source set to 0 V, adjust R42 (input-offset; 100 k) until the polarity sign is bouncing between plus and minus polarity.
- Apply an input signal equal to +3900.5 and slowly adjust R41 (full scale; 1 kΩ) until the display is bouncing between +3900 and +3901.
- Using the voltage source, check linearity at 10, 100, 500, 1000, 2000, 3000 and 3999 counts. Verify that linearity is not worse than 1 count throughout this range in both polarities.

  NOTE: This test requires the effects of zero offset, and full scale turnover to be taken into account.
- Using the voltage source, observe the Digital Panel Meter readout.
- Check all numbers for proper decoding.
- Check for Dim/Dead/Bright segments.
- Check individual displays for the same relative intensity/illumination.
- Check minus polarity sign.

7. MAINTENANCE

For maintenance, check the instrument from time to time for proper functioning. Should the instrument be subject to failures, call your local Philips Service Organisation for assistance. In addition observe the safety instructions in para. 2.2.

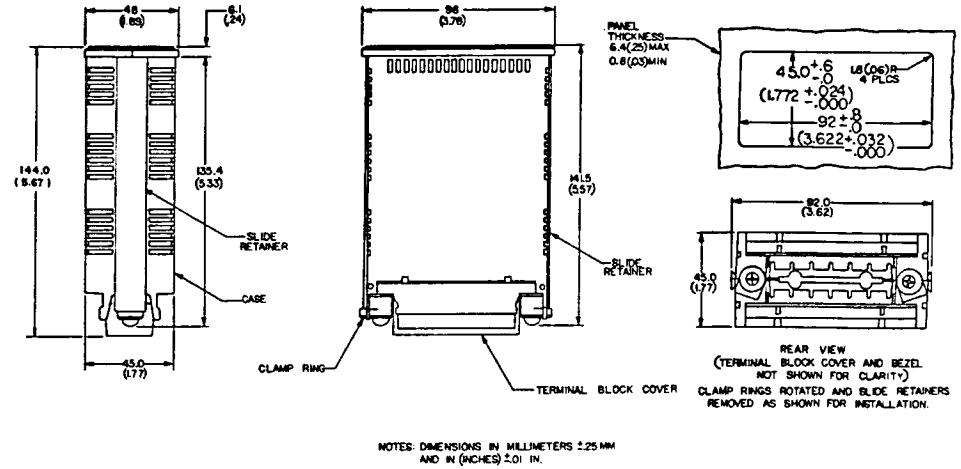
7.1. Input fuse

The power input to the PR 1557/02 A is protected by a carbon composition resistor fuse. If the meter does not light and it is suspected that the fuse has been blown, check the continuity of the primary circuit. The resistance from power Hi to power Lo will be approx. 180 Ω for a 110 V meter and 700 Ω for the 220 V meter. If the fuse is blown, it is imperative that it is replaced by an identical part, failure to do so will void the warranty. The fuse is an Allen-Bradley 1/8 W, 10 Ω, +10 % carbon composition resistor.

This resistor is available under PHILIPS-Service code number 5312 111 38002.

7.2. Recommended Spare Parts

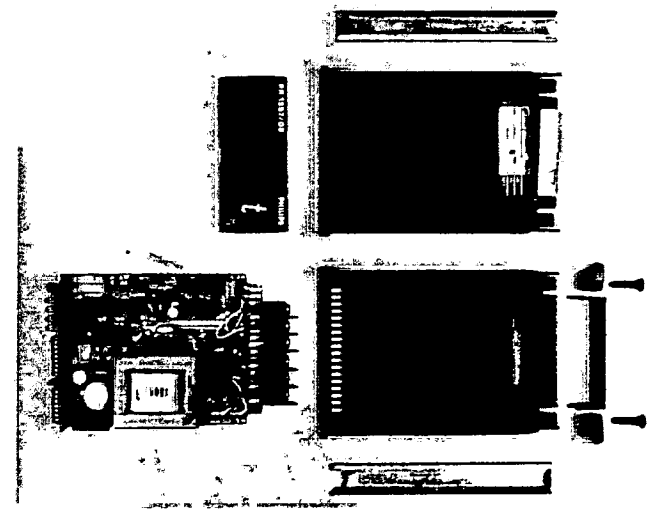
Item	Description	Service code number
F1	Fuse resistor, Carbon 10 Ω, ±10 %, 1/8 W	5312 111 38002
C15	Electrolytic 220 μF, 35 V	5312 124 48014
C16	Electrolytic 2200 μF, 10 V	5312 124 48009
U5/U6	C-Mos-switch HEF 4016 BP	5312 209 88195
U10	Comparator UA 3302	5312 209 88194
U11	Voltage regulator LM 317 MP	5312 209 88215
J1	36-pole connector	5312 266 68004
B1	Main PCB	5312 216 98222
B2	Display PCB	5312 216 98223
	Filter screen with "t"	5312 459 48006
	Filter screen with "kg"	5312 459 48007



NOTES: DIMENSIONS IN MILLIMETERS ±.25 MM
AND IN (INCHES) ±.01 IN.

Fig. 6

Fig. 7



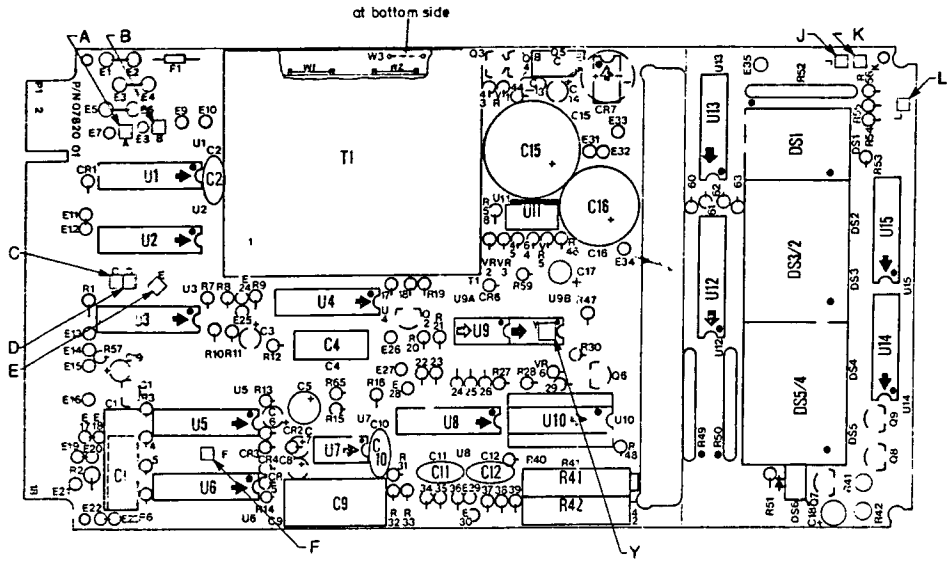
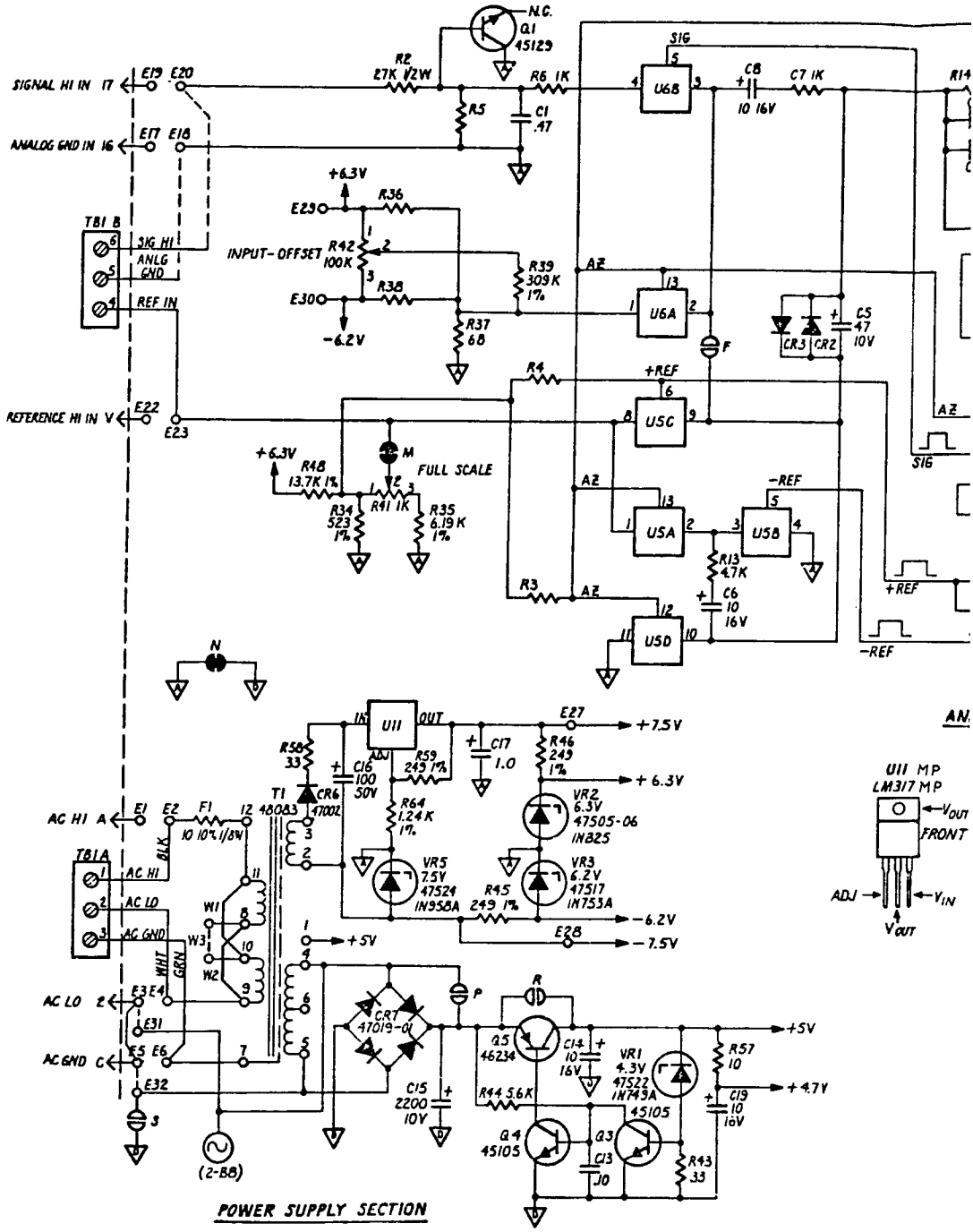

at bottom side
soldering side
T
V
W
X
M
H
J
S
N
R
P
F
Y

Fig. 8


SIGNAL HI IN 17
ANALOG GND IN 16
REFERENCE HI IN V
AC HI A
AC LO 2
AC GND C
+6.3V
-6.2V
+7.5V
-7.5V
+5V
+4.7V
FULL SCALE
INPUT-OFFSET
+REF
-REF
SIG
AZ
U11 MP
LM317 MP
POWER SUPPLY SECTION

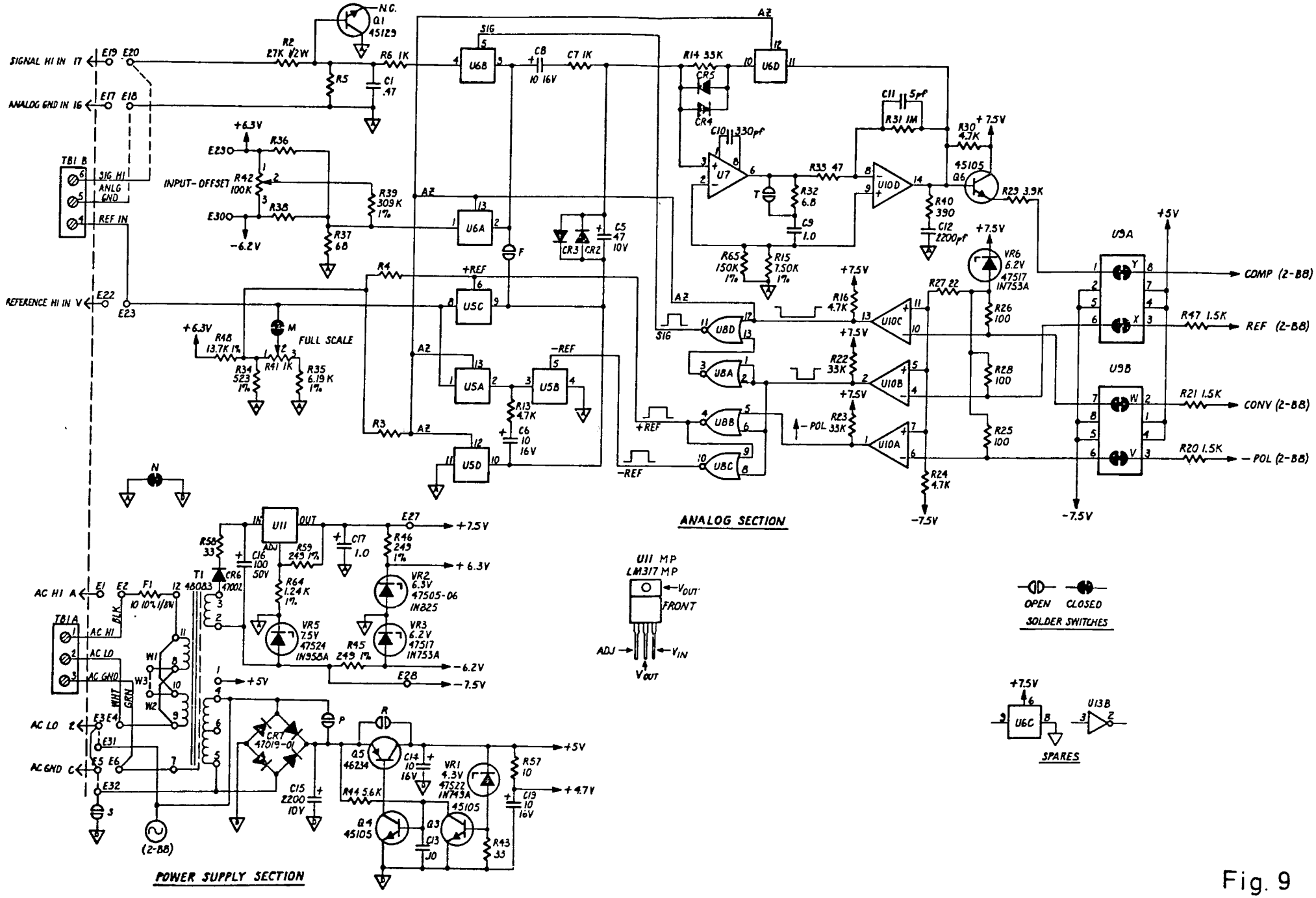

SIGNAL HI IN I7
ANALOG GND IN I6
REFERENCE HI IN V
SIG HI
ANLG GND
REF IN
INPUT-OFFSET
FULL SCALE
+6.3V
-6.2V
+REF
-REF
AZ
SIG
ANALOG SECTION
+7.5V
-7.5V
+5V
COMP (2-B8)
REF (2-B8)
CONV (2-B8)
-POL (2-B8)
AC HI A
AC LO
AC GND
(2-B8)
POWER SUPPLY SECTION
U11 MP
LM317 MP
FRONT
ADJ
OPEN
CLOSED
SOLDER SWITCHES
SPARES

Fig. 9

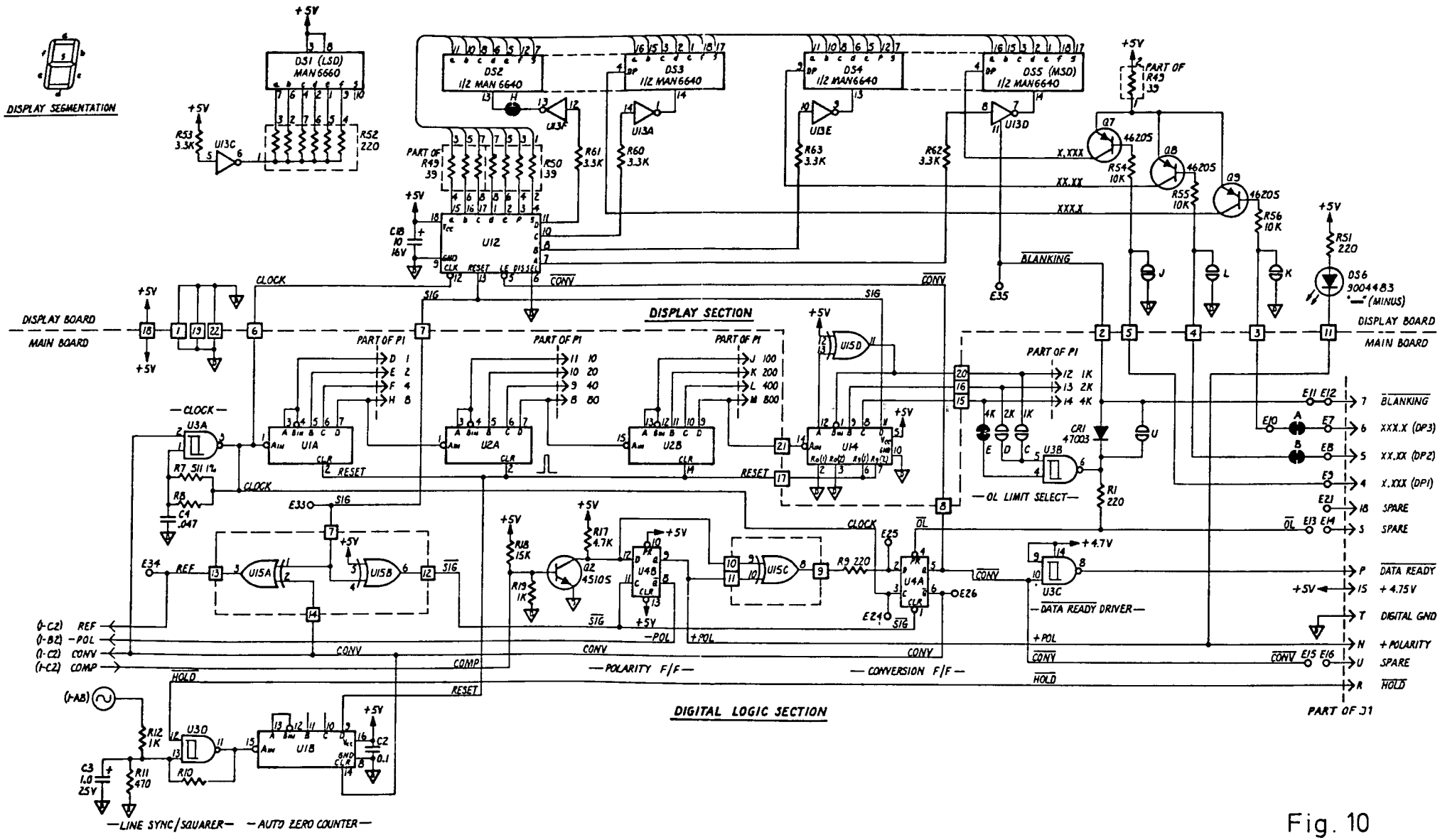

DISPLAY SEGMENTATION
DS1 (LSD) MAN6660
DS2 1/2 MAN 6640
DS3 1/2 MAN6640
DS4 1/2 MAN6640
DS5 (MSD) 1/2 MAN6640
U12
DISPLAY SECTION
DISPLAY BOARD MAIN BOARD
CLOCK
SIG
CONV
BLANKING
RESET
HOLD
REF
POL
COMP
PART OF P1
PART OF J1
U1A
U2A
U2B
U14
U15D
U3A
U15A
U15B
U15C
U4A
U4B
U3B
U3C
U3D
U3E
U3F
U13A
U13C
U3D
U3O
U1B
Q7 46205
Q8 46205
Q9 46205
Q2 4510S
CR1 47003
DS6 9004483
—OL LIMIT SELECT—
—DATA READY DRIVER—
—POLARITY F/F—
—CONVERSION F/F—
—LINE SYNC/SQUARER—
—AUTO ZERO COUNTER—
DIGITAL LOGIC SECTION
PART OF R43 39
PART OF R49 39
R50 39
R52 220
R53 3.3K
R60 3.3K
R61 3.3K
R62 3.3K
R63 3.3K
R54 10K
R55 10K
R56 10K
R51 220
R1 220
R7 511 1%
R8
R9 220
R10
R11 470
R12 1K
R17 4.7K
R18 15K
R19 1K
C1 .047
C2 0.1
C3 1.0 25V
C18 10 16V
BLANKING
XXX.X (DP3)
XX.XX (DP2)
X.XXX (DP1)
SPARE
SPARE
DATA READY
+4.75V
DIGITAL GND
+POLARITY
SPARE
HOLD
REF
-POL
CONV
COMP
+5V
+4.7V

Fig. 10