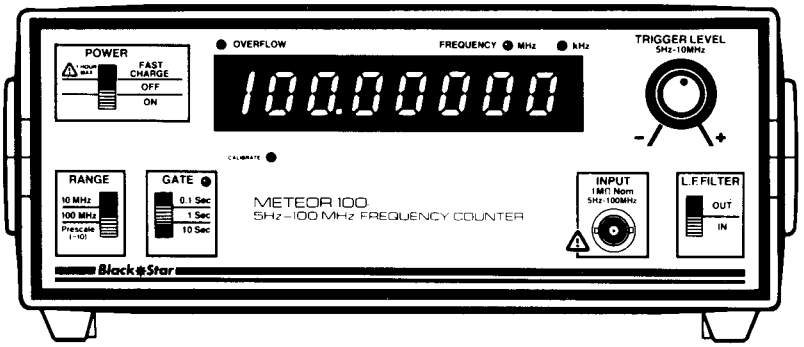
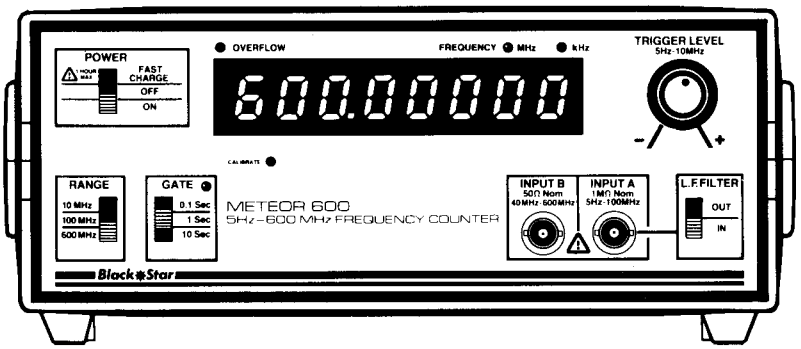
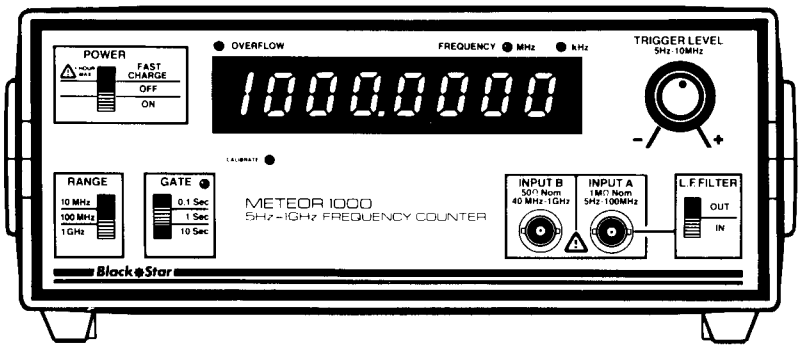


Black Star

METEOR SERIES DIGITAL FREQUENCY COUNTERS

METEOR 100
METEOR 600
METEOR 1000





Service Manual

METEOR SERIES FREQUENCY COUNTERS
SERVICE MANUAL

INDEX

1. INTRODUCTION

a) Handling

While the Meteor Counters have been designed to be rugged, severe shocks can be destructive and should be avoided. Suitable precautions against static should be taken as the unit contains CMOS components. Do not expose to radiant heat, including direct sunlight for prolonged periods, or high humidity including conditions conducive to the formation of ice. Remove batteries if storing for prolonged periods. If accidentally immersed, rinse in fresh water, dry as far as possible after removing batteries, then stand in a dry warm atmosphere (40°C - 60°C) away from direct heat until dried.

b) Equipment

To check a Meteor 100 Frequency Counter, Signal Generators must be available covering the band 2Hz to 100MHz. In addition, generators covering the band 100MHz to 600MHz or 1GHz (as appropriate) are required to check Meteor 600 and 1000 models. The output level of all generators must be adjustable by a calibrated control. It is helpful (though not essential) if the output impedance is 50Ω.

Frequency calibration requires a highly stable signal source of better than 1×10^{-7} error. Ideally an Off-Air Frequency Standard should be used. In the U.K. a Burns Frequency Standard SD-12 locked to Droitwich transmissions would be appropriate.

For routine servicing a 20MHz bandwidth Oscilloscope, preferably dual beam, with a sensitivity of 5mV must be available, equipped with x10, 10MΩ input impedance probes. An accurate Multimeter, preferably digital, capable of measuring 20V and 500mA must be available.

The following sundry equipment may also be needed:-

Screwdriver - pozidrive No. 2 point.
Soldering iron & solder.
Desoldering tool (desolder wick may damage p.c.b.).
Insulated trimming tool (or suitable insulated screwdriver).
Small hand tools (pliers, cutters etc.)
Black Star Mains Adaptor or appropriate bench power supply (9V 600mA).
Set of 6 Nickel Cadmium cells, 'C' size, with a capacity of 1.2Ah or greater.
Through termination (50Ω or as appropriate for signal generator).
Appropriate BNC connecting leads (at least one with crocodile clips).

c) Dismantling

i) Remove instrument from packing.

ii) Remove knob from front panel by pulling from shaft. If it is necessary to apply leverage, be careful not to apply side thrust to the potentiometer spindle.

iii) Remove cells if fitted.

iv) Remove metal leg by pushing inwards on one side.

v) Unscrew the four recessed pozidrive screws set into the feet on the underside of the case.

vi) Gently separate the two case halves.

vii) Remove front panel assembly and desolder BNC sockets and braid (if necessary). When optional External Reference Oscillator facility is fitted the 2 P.C.B. screws must be removed.

Disassembly is now complete. Reassembly is the reverse of disassembly.

METEOR SERIES 8-DIGIT FREQUENCY COUNTERS

SPECIFICATIONS

	METEOR 100	METEOR 600	METEOR 1000
FREQUENCY RANGE	5Hz - 100MHz (Typically 2Hz to 120MHz) Switch selectable in 2 ranges with third range for ÷10 prescaler option	5Hz - 600MHz (Typically 2Hz - 700MHz) Switch selectable in 3 ranges	5Hz - 1000MHz (Typically 2Hz - 1.2GHz) Switch selectable in 3 ranges
MEASUREMENT ACCURACY	± (1 count + timebase accuracy)		
TIMEBASE Crystal Oscillator Frequency	10MHz		
Setability	< ± 0.5 ppm Fully calibrated before leaving factory. Front panel access for any future adjustment.		
Temperature Stability	Typically < ± 2.5ppm from + 10°C to + 40°C		
Aging	< ± 10ppm/year		
Time between Measurements	200 mS		
GATE TIMES	0.1 sec., 1 sec., 10 sec., switch selectable with L.E.D. Gate status indication		
LOW FREQUENCY (Input A) Ranges	5Hz - 10MHz; 10MHz - 100MHz		
Input Impedance	1MΩ//30pf nom. (Low Frequency Filter - 'Out')		
Maximum Input Voltage	50VDC or 250V rms @ 50Hz decreasing to 5V rms @ 70kHz and above		
Sensitivity	10MHz range :< 5mV 5Hz - 10MHz 100MHz range: < 10mV 10MHz - 50MHz < 25mV 50MHz - 100MHz		
Resolution	10MHz Range 10Hz - 0.1 sec. Gate Time 1Hz - 1 sec. Gate Time 0.1Hz - 10 sec Gate Time		100MHz Range 100Hz - 0.1 sec Gate Time 10Hz – 1 sec Gate Time 1Hz - 10 sec Gate Time
Low Frequency Filter	Cut-off frequency 50kHz nom. from source impedance of <50Ω Switch selectable 'In' or 'Out'		
Trigger Level	Front panel adjustment of Trigger Level on signals 5Hz - 10MHz		
HIGH FREQUENCY (Input B) Range		40MHz - 600MHz	40MHz - 1GHz
Input Impedance		50Ω nom.	
Maximum Input Voltage		50VDC or 250V rms @ 50Hz decreasing to 2V rms @ 50MHz and above	
Sensitivity		<25mV 40MHz to 600MHz	<25mV 40MHz - 600MHz <50mV up to 1GHz
Resolution		1kHz - 0.1 sec. Gate Time 100Hz - 1 sec. Gate Time 10Hz - 10 sec. Gate Time	
GENERAL Display	8 - Digit 0.5" 7 - segment L.E.D. Display with automatic decimal point and leading zero suppression. Frequency unit (kHz or MHz) indication by L.E.D. and Overflow warning by L.E.D.		
Power Requirements	9V DC @ (max) 600mA. Operation by Mains Adaptor/Charger (supplied) or 6 x NI-CAD 'C' Cells (optional)		
Battery Life	Typically 6 hours (100MHz range using 1.2Ah cells)		
Charging Rate	'On' or 'Off' 50mA nom. ; 'Fast Charge' 340mA nom.		
Environmental operating range	0°C to + 40°C (10% - 80% RH non-condensing)		
Case	Custom-moulded, sturdy, lightweight A.B.S. with tilt-stand and internal battery compartment with rear panel access.		
Size	219mm x 240mm x 98mm (Product only)		321mm x 352mm x 174mm (Packed)
Weight	980g (Product only)		1.9Kg (Packed)
Supplied Accessories	Mains Adaptor/Charger and Instruction Manual		
Optional Accessories	Set NI-CAD Rechargeable Cells Passive Probes External Reference Input Facility (10MHz) Prescalers		Telescopic R.F. Pick-up Antenna B.N.C. - B.N.C. Coax Leads Service Manual

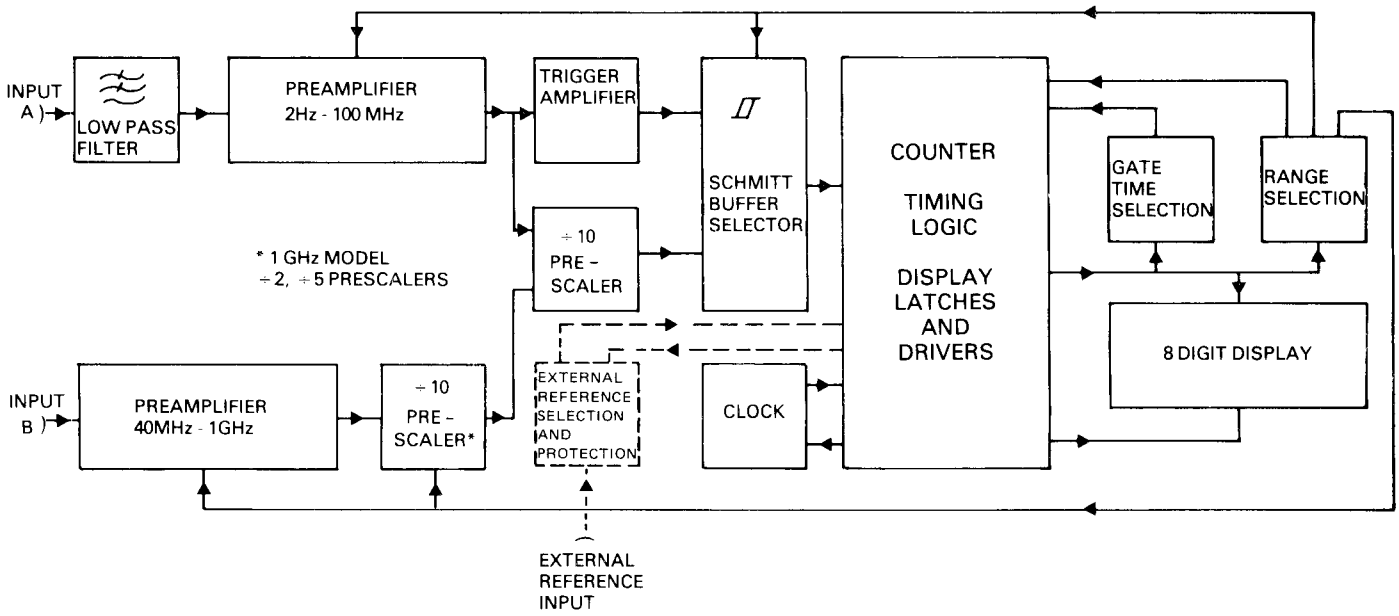
2. FUNCTIONAL DESCRIPTION

10MHz Range - the signal at input A is filtered if required and amplified. It is further amplified and the trigger threshold adjusted before being squared and fed to the main counter I.C. The signal is also fed to a decade prescaler, the output of which is not used on this range.

100MHz Range - the signal path is similar to that for 10MHz, but the output from the previously mentioned prescaler is selected by the schmitt buffer under control of the range selection circuitry. The trigger amplifier output is not used on this range.

600MHz/1GHz Range - for power economy, the preamplifer and trigger amplifier associated with input A are powered down when this range is selected. Power is only applied to the B input preamplifier and prescalers when this range is selected. The signal at input B is fed through a limiting preamplifier to one of two prescalers. 600MHz models use a decade prescaler, while 1GHz models use cascade ÷2 and ÷5 prescalers. The output from whichever used is fed to another decade prescaler (common with the A input) and thence to the schmitt buffer and main counter I.C.

The main counter I.C. generates all the necessary timing logic and contains all the display storage and driving circuitry. External switches route control signals determining decimal point position and gate period.



METEOR SERIES FUNCTIONAL BLOCK DIAGRAM

3. CIRCUIT DESCRIPTION

Power Supply

The instrument operates from a stabilised supply which uses the band-gap diode D8 as a 2.45V reference. D7 acts as an overvoltage capture diode when setting up the suppy with RV2. TR10 and TR11 form a long tailed pair differential amplifier feeding TR13 and TR12 current amplifier. When rechargeable cells are fitted, power is fed via D9. When a Mains Adaptor is used, trickle charging of the battery takes place by the constant current supply TR14, TR15 and associated components. D9 is reverse biased, overriding the battery supply. In the fast charge configuration, TR12 and TR13 form the pass element for a constant current source using R43 for current sensing and the Vbe of TR16 as a reference.

10MHz/100MHz Preamplifier

C1 and C3, R1 and R2, D1 and D2 form an input protection and clamp network, capable of withstanding short term connection to 240V a.c. at 50-60Hz (stress rating only). R69 and C2 form a switch selectable 50KHz Low Pass Filter. TR1 and TR2 are emitter follower buffer amplifiers, biased from the collector of TR3, and bootstrapped from the emitter of TR2 to give very high input impedance. TR3 and TR4 form a longtailed pair voltage amplifier, the output being taken from the collector of TR4 to avoid collector-base feedback limiting bandwidth. TR5 defines the working point, and D19 prevents TR3 from saturating with high input levels. TR6 is an emitter follower buffer and level shifter to ECL levels. From the emitter of TR6 the signal is fed to IC2, a ECL prescaler, and the base of TR7. TR7 and TR8 form a voltage amplifier, with TR9 as an output amplifier/CMOS buffer stage. Overall feedback is applied by R70 and R71 to define a gain of 30. The working point of TR8, and hence the trigger level is set by RV1.

600MHz/1GHz preamplifier

C33 provides isolation for accidental mains voltage inputs, and R46 in conjunction with D11 and D12 provides some protection at high frequencies. C34 couples the signal to the base of TR18, a low-level current amplifier and phase-splitter. Antiphase signals are coupled by C37 and C38 to IC4, a monolithic voltage amplifier. The antiphase outputs are fed to TR19 and TR20, a longtailed pair providing further voltage amplification to a level adequate for ECL operation. The output is fed to the appropriate prescaler by C44 or C52.

Prescalers

The 1GHz model has a 1GHz ÷2ECL prescaler, IC6, fed from C52, which in turn feeds IC7, a 600MHz, ÷5 ECL prescaler. The 600MHz model only uses one prescaler for this function, IC5, a 600MHz ÷10 ECL device. These prescalers and preamplifiers have their supply switched on as required by the range switch S1. D4, D13 and D14 determine which signal is fed to the input of IC2, another 600MHz ÷10ECL prescaler, but this time offering a TTL compatible output. This is adequate to drive IC3, a high-speed CMOS schmitt trigger quad nand gate. S1 also selects between 10MHz inputs and any other range. With most sinusoidal inputs the output from IC3 is a 1:1 mark-space ratio square wave suitable for driving IC1. C25, at the input to IC2, allows the internal biassing of IC2 to correct for the d.c. shift caused by D4, D13 or D14.

Main counter IC1

a) **Input.** The input on pin 28 is a CMOS structure capable of accepting 1:1 mark space ratio inputs up to typically 12MHz, allowing some overrange capability.

b) **Range selection.** The internally generated decimal point is disabled by D17, and selected externally by the digit strobe routed to pin 13. As this is dependant on resolution, and hence gate time, S1B, S2B, S2C and S2D form a complex switching net selecting the appropriate digit. D15 prevents a latch-up condition during range selection.

c) **Gate time selection.** This is carried out by S2A selecting the appropriate digit strobe to drive pin 14.

d) **Reset.** Occurs automatically on power-up due to the action of C53 and R68 on pin 12. D18 prevents damage (due to stored charge in C53) when the unit is switched off.

e) **Gate period.** Pin 2 provides a measurement in progress signal which is buffered and inverted by R39, R41, R44 and TR17 to drive D10 with a constant current.

f) **Display** Common cathode Digits 0 - 7 are directly driven by IC1, no limiting resistors being necessary. Matched high-efficiency displays are used, so to get even intensity the intensity code must be specified when ordering spares.

g) **Indicators** D3 replaces the decimal point of Digit 7 to indicate overflow but due to its high sensitivity C21 and R25 are necessary to avoid ghosting. D5 and D6 are not directly driven from IC1 but are switch selected with IC3 inputs to indicate the display scale factor.

h) **Oscillator** XL1, R26, C22, C23 and C24 together with a CMOS inverter between pin 25 and 26 form a precision oscillator. R26 biases the inverter, while C22, C23 and C24 load and tune the crystal for 10MHz operation. Note, for stability, only cold welded crystal types should be used for replacement, not soldered can.

i) **External Reference Oscillator facility** Pin 24 is an external oscillator input and when used an input protection circuit is employed. From PL4, C27 and R9 decouple d.c. and limit surge current to the protection diodes (D20, D21). These diodes prevent excursion more than 0.8V beyond either rail. R8 limits input currents to about ½mA under these

conditions, preventing destructive latch-up. D20 and D21 are a compromise between surge capacity and speed, and should not be substituted for other types. The external oscillator option is selected on IC1 by the inclusion of D16 and an appropriate switch.

j) **Main Counter I.C.** Pins 1, 13 and 14 on the main counter I.C. are the control, decimal point and range inputs respectively. These are selected by strobing with one or more of the display digit drive signals (active LOW). The effect of various connections is shown below:

Control Input	**Display Digit**	**Effect/Comments**
Counter I.C. pin 1 to:	D_0	External oscillator input enabled
	D_1	Selects 1MHz reference clock option.
	D_2	External decimal point enable. Activates pin 13.
	D_3	Blank display when hold input (pin 27) is high.
	D_4	Test mode, never used. Counter latches random display.
	D_7	Display test. All segments lit. Overridden by D3.

Decimal Point input	**Display Digit**	**Effect/Comments**
Counter I.C. pin 13 to:	D_0-D_6	Lights corresponding decimal point(s).
	D_7	Lights overflow l.e.d. Disables overflow and blanking.

Range Input	**Display Digit**	**Effect/Comments**
Counter I.C. pin 14 to:	D_0	Gate time 10 ms selected
	D_1	Gate time 100 ms selected
	D_2	Gate time 1 sec selected
	D_3	Gate time 10 sec selected

4. CALIBRATION

The Meteors are designed to require a minimum of calibration. Two adjustments only are required. For the first, Vcc, it is necessary to dismantle the case (but NOT the front panel) see Section 1c - Dismantling. When the case has been separated leave the printed circuit board assembly in the case lower. Attach a meter (6VDC minimum) between test pins P9 (lowest test point below gate time switch) - ground, and P8 (lowest test point below range switch) - Vcc. The voltage measured should be 5.2V ±0.05V. If incorrect, adjust RV2, the trimmer at the top of the front panel assembly, until within limits. This adjustment is normally only needed if power supply components have been changed.

The second adjustment, the crystal clock calibration, is required if crystal drift exceeds requirements. No dismantling is required for this, but as the metal trimmer is at Vcc potential it is ESSENTIAL that an insulated trimming tool is used. A Vcc short circuit to ground (via the front panel) will damage the power supply and regulation circuitry.

Normally, a minimum 5 minute warm-up period is required for the instrument to reach a stable operating temperature. Connect a frequency standard of known accuracy (0.1ppm or better) to input 'A'. Typically a 10MHz source would be used and the following description assumes this:

> Set the front panel controls to filter out, power on, 10MHz range, 0.1 sec gate, and adjust trigger level to obtain a stable reading. Set to 10.00000 ± 1 digit using the trimming capacitor accessible through the front panel. Select 1 sec gate and carefully trim for a reading between 9.999995 and 10.000004. Typically an error of 0.2ppm can be achieved, but the temperature during calibration should be noted for maximum accuracy.

5. TROUBLE SHOOTING AND FAULT LOCATION

It is worth checking all control settings before looking for a fault. Particular attention should be paid to the External Reference Oscillator switch, if fitted, the Trigger Level Control (very sensitive at low levels, and/or high frequencies) and the Low-Pass Filter switch.

Where no socket has been used for an integrated circuit, this is an intended part of the design and not an economy measure. Stray capacitance will degrade performance. To replace an unsocketed faulty I.C. it is recommended (to minimise risk of p.c.b. damage) that all the legs on the I.C. be cropped and removed individually.

Note that typical voltages are shown on the circuit diagrams. These apply in the absence of input signal and switches selected as shown. It is assumed that the 600MHz/1GHz range is selected when testing these prescalers. The power supply voltages are independant of control settings, and are appropriate when a mains adaptor is in use.

Power Supply A wide variety of unrelated faults can occur if the wrong Vcc is present. If in doubt about any fault, ALWAYS check that Vcc is within limits, and repair or recalibrate if necessary.

Prescalers and preamplifiers These do not normally give trouble. If signal is not being passed, check for presence of Vcc for the appropriate part of the circuitry, and confirm absence of evidence of user servicing (solder splashers, lifted or broken tracks etc.) before checking voltages round the circuit. The H.F. preamplifier and prescalers will work with reduced sensitivity with a 10MHz input signal, and allowing the use of a low cost oscilloscope for signal tracing. A 10MΩ,10:1 attenuator probe should be used for this.

Main Counter If only one digit lights up, but with a high intensity, suspect the crystal clock. Checking the frequency on pin 25 is quite likely to load the clock enough to stop oscillation. Pin 26 should give good results with a high impedance probe.

The display digit strobes are used for control of some counter I.C. functions. Serious leakage can occur and cause a variety of problems. The input thresholds on the main counter i.c. lie between 3.2 and 4.4V so aggregate leakage over 4μA can give trouble, which may appear as a ghosting digit or an extra decimal point.

The tracks in the region of the display are very fine, and track damage or solder shorts can easily occur. Careful inspection may be necessary if faults remain after servicing.

External Reference Oscillator Input There are few things that can go wrong here. The important point is to ensure adequate drive is available for this or the display will exhibit a bright digit zero as the main counter I.C. selects the external oscillator input, waits 5μs (200KHz minimum input frequency), then reverts to the internal clock. The remaining digits are correspondingly dimmer due to the increased cycle time. If in doubt, check that the signal level is adequate at the main counter I.C. input (pin 24) (CMOS levels 20% - 80% of Vcc).

In general, note that excessively low input signals will give a reading which jitters, or no reading at all. The 600MHz and 1GHz prescalers self oscillate in the absence of an input, giving a false display typically in the region 600-700MHz. This will not affect normal sensitivity, and actually enhances it near the (random) frequencies of oscillation. The self oscillation does NOT give a stable display in the absence of an input signal.

PARTS LIST

CIRCUIT POSITION	DESCRIPTION	PART No.
Semiconductors		
IC1	ICM7216 DIPI	24-001
IC2	SP8680BDG	24-003
IC3	MC74HC132	24-008
IC4	SL952 DP	24-006
IC5	SP8630B DG	24-005
IC6	SP8605B	24-004
TR1	BC184	22-005
TR2	BF240	22-004
TR3	BF199	22-003
TR4	BF199	22-003
TR5	BC184	22-005
TR6	BF240	22-004
TR7	2N3906	22-006
TR8	2N3906	22-006
TR9	PN2369	22-008
TR10	BC184	22-005
TR11	BC184	22-005
TR12	BD437	22-002
TR13	BC212A	22-001
TR14	BC184	22-005
TR15	BC184	22-005
TR16	BC212A	22-001
TR17	BC212A	22-001
TR18	BFR90	22-007
TR19	BFR90	22-007
TR20	BFR90	22-007
D1	1N916	23-004
D2	1N916	23-004
D3	Lamp L.E.D.	26-001
D4	1N4148	23-005
D5	Lamp L.E.D.	26-001
D6	Lamp L.E.D.	26-001
D7	BZY88 C3V3	23-002
D8	ZN404	23-001
D9	1N4001	23-003
D10	Lamp L.E.D.	26-001
D11	1N916	23-004
D12	1N916	23-004
D13	1N4148	23-005
D14	1N4148	23-005
D15	1N4148	23-005
D16	1N4148 (for optional External Reference Oscillator Facility)	23-005
D17	1N4148	23-005
D18	1N4148	23-005
D19	1N916	23-004
D20/D21	See listing for optional External Reference Oscillator Facility	
Digit 0 to Digit 7	Display L.E.D.	26-002

CIRCUIT POSITION	DESCRIPTION	PART No.
Crystal		
XL1	Crystal 10MHz	25-001
Inductor		
L1	Inductor 1µH	17-001
L2	Inductor 1µH	17-001
Capacitors		
C1	Ceramic 0.1µf 50V	20-013
C2	Polyester 0.01µf 250V	20-007
C3	Ceramic 47pf 500V	20-006
C4	Tant. 4.7µf 6.3V	20-001
C5	Ceramic 10nf 63V	20-008
C6	Ceramic 10nf 63V	20-008
C7	Tant. 47µf 4V	20-002
C8	Ceramic 10nf 63V	20-008
C9	Electrolytic 220µf 10V	20-014
C10	Ceramic 0.1µf 50V	20-013
C11	Ceramic 10nf 63V	20-008
C12	Ceramic 10nf 63V	20-008
C13	Ceramic 0.1µf 50V	20-013
C14	Ceramic 10nf 63V	20-008
C15	Electrolytic 100µf 6.3V	20-011
C16	Ceramic 0.1µf 50V	20-013
C17	Ceramic 10nf 63V	20-008
C18	Electrolytic 47µf 6.3V	20-012
C19	Ceramic 0.1µf 50V	20-013
C20	Ceramic 47pf 100V	20-017
C21*	Ceramic disk 100nf 12V	20-004
C22	Ceramic 39pf 100V	20-009
C23	Ceramic 3p9 100V	20-010
C24	Trimmer 5pf to 65pf	21-002
C25	Chip 10nf	20-003
C26	Ceramic 0.1µf 50V	20-013
C27	See listing for optional External Reference Oscillator Facility	
C28	Electrolytic 100µf 25V	20-005
C29*	Ceramic disk 100nf 12V	20-004
C30*	Ceramic disk 100nf 12V	20-004
C31*	Ceramic disk 100nf 12V	20-004
C32	Electrolytic 100µf 25V	20-005
C33	Ceramic 47pf 500V	20-006
C34	Chip 10nf	20-003
C35	Chip 10nf	20-003
C36	Chip 10nf	20-003
C37	Chip 10nf	20-003
C38	Chip 10nf	20-003
C39	Chip 10nf	20-003
C40	Chip 10nf	20-003
C41	Chip 10nf	20-003
C42	Chip 10nf	20-003
C43	Chip 10nf	20-003
C44	Chip 10nf	20-003
C45	Chip 10nf	20-003

*To be changed to 20-020 ceramic disk 100µf 50V

CIRCUIT POSITION	DESCRIPTION			PART No.
Capacitors				
C46	Chip 10nf			20-003
C47	Chip 10nf			20-003
C48	Chip 10nf			20-003
C49	Chip 10nf			20-003
C50	Chip 10nf			20-003
C51	Chip 10nf			20-003
C52	Chip 10nf			20-003
Resistors, Fixed				
R1	CF	W33	82R	18-038
R2	MF	1W	100K	18-002
R3	CF	W33	10K	18-029
R4	CF	W33	4K7	18-027
R5	CF	W33	680R	18-018
R6	CF	W33	560R	18-017
R7	CF	W33	4K7	18-027
R8	See listing for optional			
R9	External Reference Oscillator Facility			
R10	CF	W33	330R	18-015
R11	CF	W33	100R	18-012
R12	CF	W33	390R	18-039
R13	CF	W33	1K8	18-023
R14	CF	W33	2K2	18-024
R15	CF	W33	2K2	18-024
R16	CF	W33	820R	18-019
R17	CF	W33	1K8	18-023
R18	CF	W33	820R	18-019
R19	CF	W33	1K8	18-023
R20	CF	W33	1K	18-020
R21	CF	W33	1K5	18-022
R22	CF	W33	10K	18-029
R23	CF	W33	10K	18-029
R24	CF	W33	10K	18-029
R25	CF	W33	12R	18-010
R26	MF	W25	22M	18-001
R27	CF	W33	270R	18-014
R28	CF	W33	1K	18-020
R29	CF	W33	270R	18-014
R30	CF	W33	10K	18-029
R31	CF	W33	1K	18-020
R32	CF	W33	270R	18-014
R33	CF	W33	220R	18-013
R34	CF	W33	820R	18-019
R35	CF	W33	56R	18-011
R36	CF	W33	1K5	18-022
R37	CF	W33	2K7	18-025
R38	CF	W33	270R	18-014
R39	CF	W33	5K6	18-028
R40	CF	W33	12R	18-010
R41	CF	W33	47K	18-031
R42	CF	W33	1K2	18-021
R43	CF	W33	1R8	18-033
R44	CF	W33	220R	18-013
R45	CF	W33	10K	18-029
R46	CC	W125	10R	18-032
R47	CF	W125	2K7	18-007
R48	CF	W125	2K2	18-006
R49	CC	W125	47R	18-035
R50	CC	W125	39R	18-034
R51	CF	W33	270R	18-014
R52	CF	W33	10R	18-008
R53	CF	W33	1K2	18-021
R54	CF	W33	1K	18-020
R55	CF	W125	220R	18-005
R56	CF	W125	220R	18-005
R57	CC	W125	10R	18-032
R58	CF	W125	100R	18-004
R59	CC	W125	47R	18-035
R60	CC	W125	10R	18-032
R61	CF	W33	10R	18-008
R62	CF	W33	15K	18-036
R63	CF	W33	470R	18-016
R64	CF	W33	470R	18-016
R65	CF	W33	10K	18-029
R66	CF	W33	470R	18-016
R67	CF	W33	470R	18-016
R68	CF	W33	100K	18-037
R69	CF	W33	220R	18-013
R70	CF	W33	330R	18-015
R71	CF	W33	10K	18-029
R72	CF	W33	10R	18-008
Resistors, Variable				
RV1	Variable pot linear 2K			19-001
RV2	Open preset vert. W25 220R			19-002

DESCRIPTION	PART No.
P.C.B.	30-001
Socket, Displays (80)*	14-006
Switch, 4P3W, slide (S1/S2/S3)	16-002
Switch, 2P2W, slide (S4)	16-001
Socket I.C. 28 pin D.I.L.	14-004
Socket, power input (PL3)	14-001
Heatsink	38-001
Washer, mica	13-004
Washer, insulating (2)	13-005
Screw, 6BA x 6mm Round Head** (for Heatsink)	13-006
Washer, 6BA	13-007
Nut 6BA	13-009
Washer lock 6BA	13-008
Socket, BNC with nut & washer (PL1/PL2)	14-002
Tag BNC	14-003
Pins, terminal (P1-P9)***	14-005
Front panel printed 100MHz	28-001
Front panel printed 600MHz	28-002
Front panel printed 1GHz	28-003

Miscellaneous

Case upper with inserts	27-001
Case lower drilled	27-002
Case expansion strip (2)	27-003
Foot A (2)	27-004
Foot B (2)	27-005
Pad foot (4)	27-009
Leg	27-008
Screw M3 x 70 (4)	13-003
Back panel inc. battery compartment	27-007
Lid, battery compartment	27-006
Knob, black	29-001
Cap, grey (white dot)	29-005
Cap, blue (white dot)	29-004
Cap, green (white dot)	29-003
Cap, red (white dot)	29-006
Label, power input	31-001
Label, battery	31-002
Battery terminal neg	14-007
Battery contact	14-008
Battery terminal pos	14-009
Battery insulator	15-001
Foam insert (battery compartment lid)	31-007
Foam support (P.C.B.) (4)	11-002
Screw, battery connection	13-002
Manual	31-003
Guarantee Card (UK)	31-009
Packing styrofoam (2)	31-004

DESCRIPTION	PART No.
Miscellaneous	
Packing styrofoam	31-005
Outer box	31-006
Poly bag 12" x 16"	31-010
Poly bag 7" x 9"	31-011
Mains Adaptor/Charger (UK, EUR, or USA)	As appropriate

Optional External Reference Oscillator Facility

CIRCUIT POSITION	DESCRIPTION	PART No.
	PCB	30-002
D20	Diode 1N4148	23-005
D21	Diode 1N4148	23-005
P10, P11, P12	Pin, terminal	14-005
S5	Switch, toggle, single pole changeover****	16-003
R8	Resistor CF W33 1K	18-020
R9	Resistor CF W33 100R	18-012
	Coax. cable RG174u 250mm	13-001
	Wire 550mm 7/0.2mm	13-012
C27	Capacitor, ceramic Inf 100V	20-019
PL4	Socket, BNC with nut & washer	14-002
	Tag, BNC	14-003
	Label	31-013
	Screw (2) S/T No.4 x ¼" Pan Head Pozi	13-010

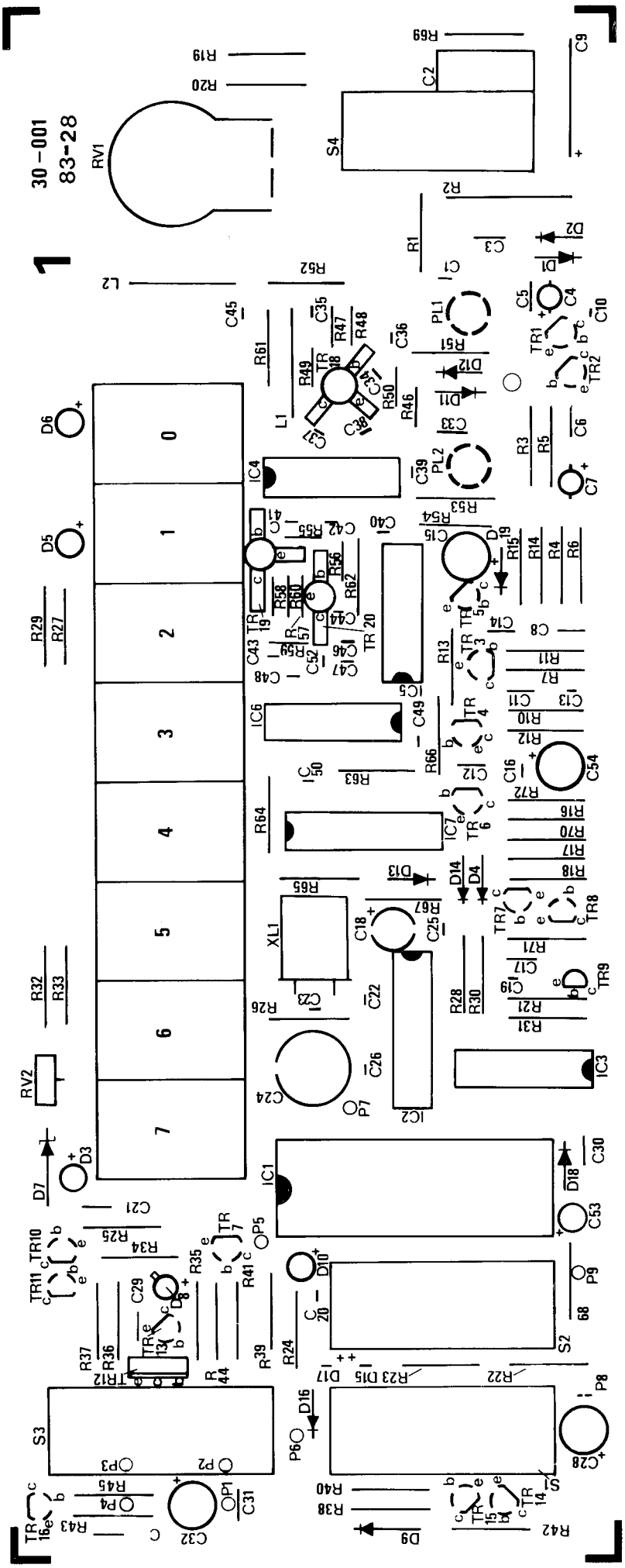
* To be changed to socket 40 Pin D.I.L. (2) 14-013

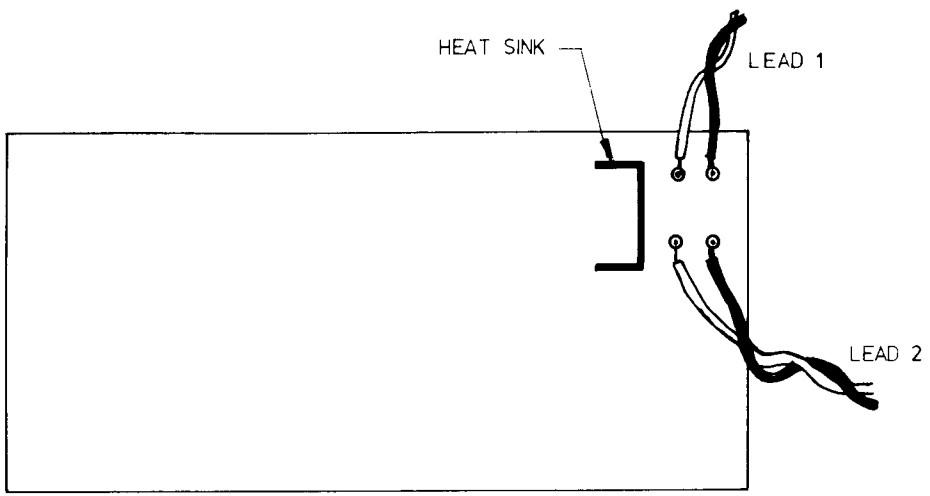
** To be changed to screw, 6BA x 8mm Round Head 13-013

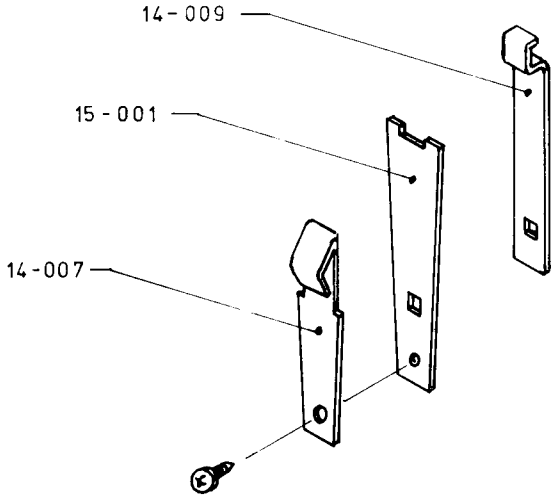
*** P5, P6, P7 used only for optional External Reference Oscillator Facility

**** May be supplied as Switch 2P2W slide 16-001

METEOR SERIES COMPONENT LAYOUT

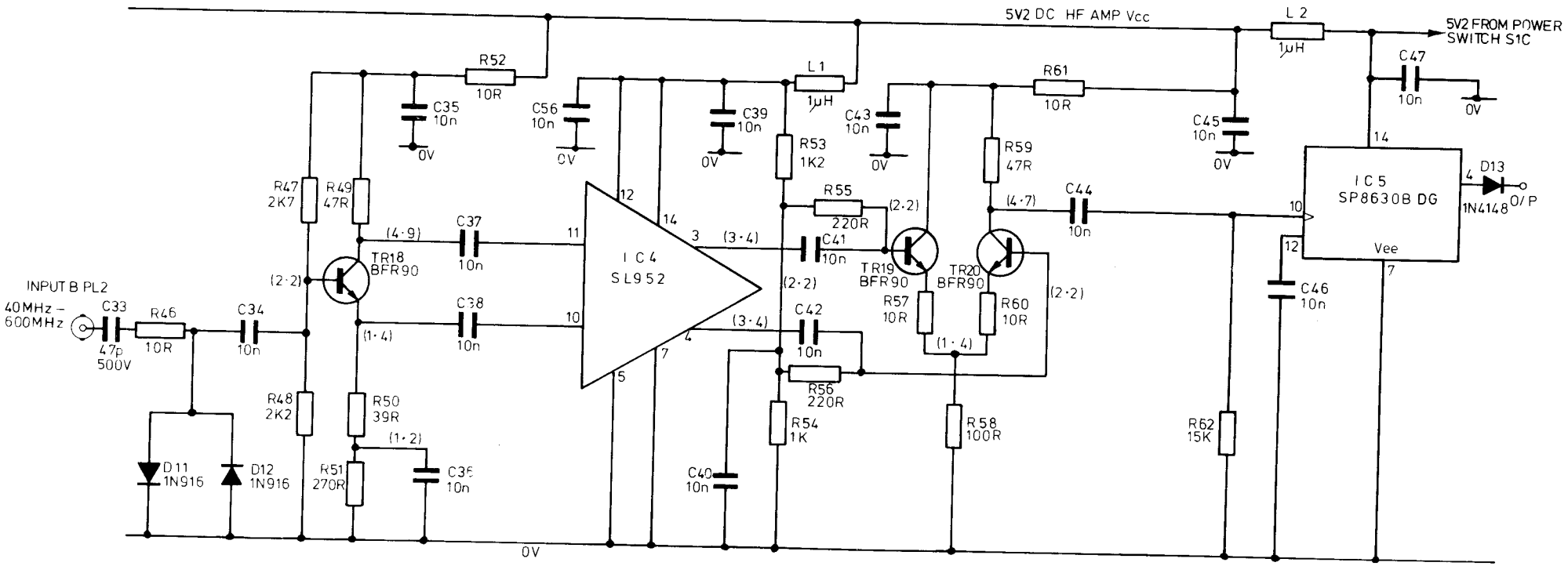






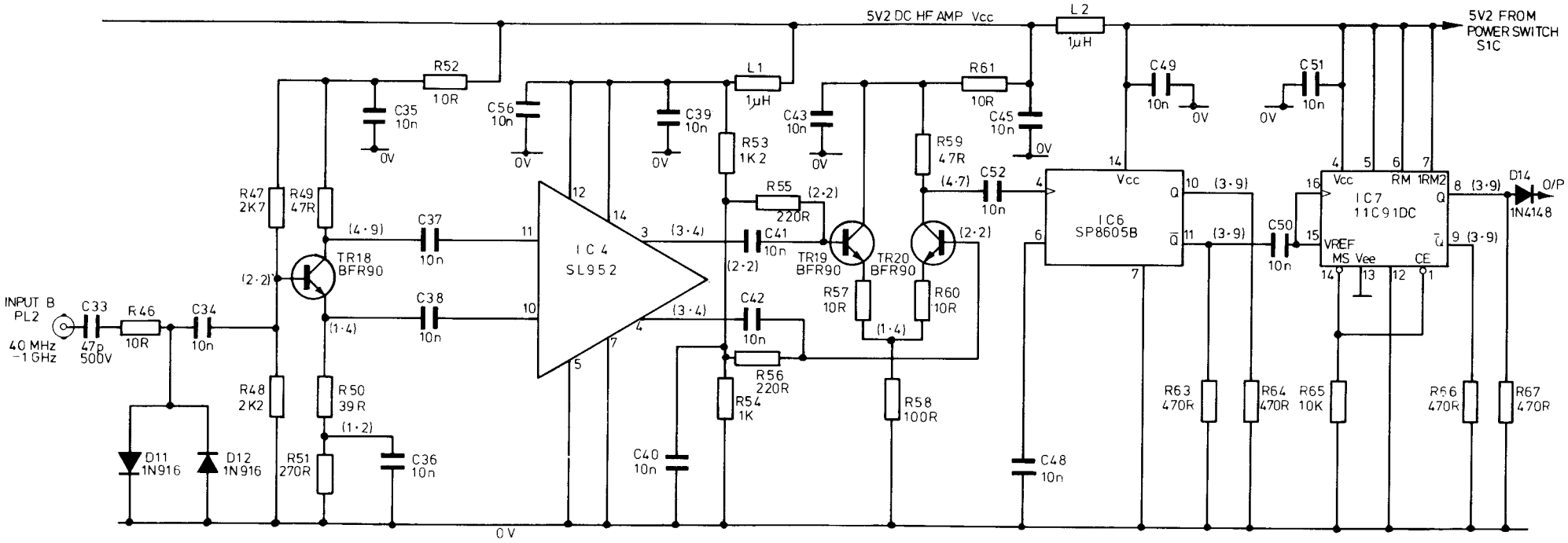
METEOR SERIES MAINS AND BATTERY CONNECTIONS

METEOR SERIES 600MHz PREAMP/PRESCALER CIRCUIT

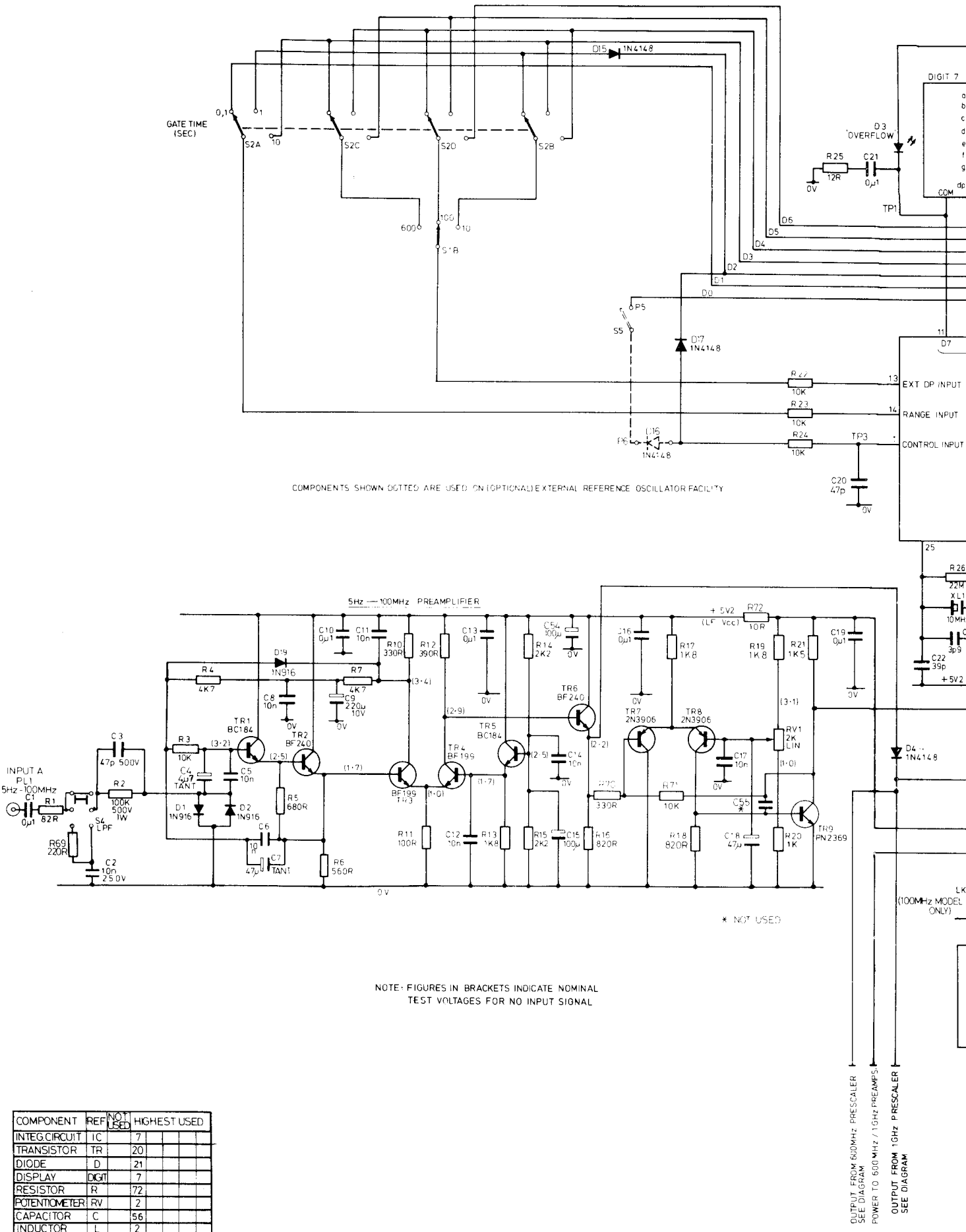


NOTE FIGURES IN BRACKETS INDICATE NOMINAL TEST VOLTAGES FOR NO INPUT SIGNAL

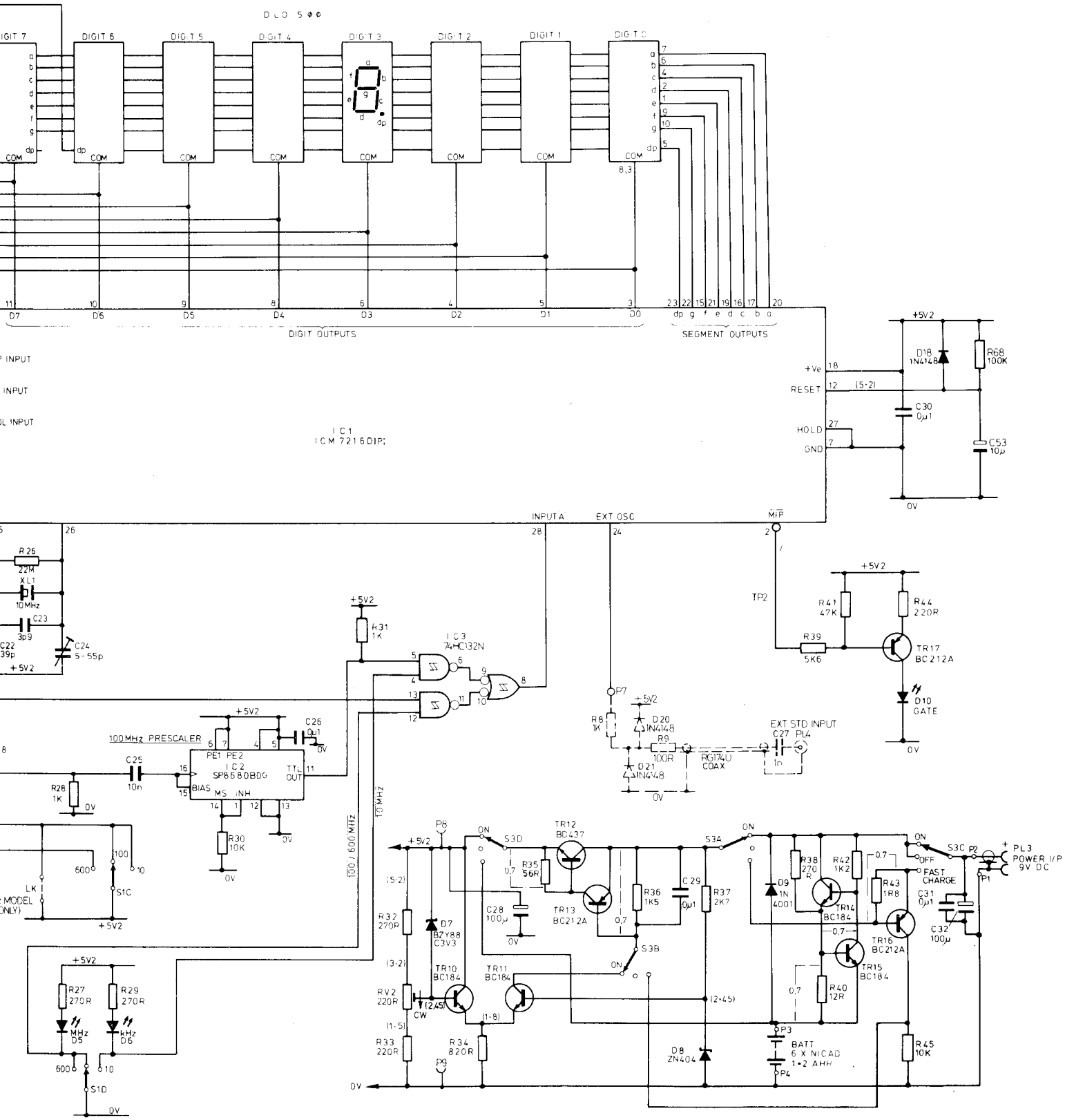
METEOR SERIES 1GHz PREAMP/PRESCALER CIRCUIT



NOTE FIGURES IN BRACKETS INDICATE NOMINAL TEST VOLTAGES FOR NO INPUT SIGNAL



COMPONENT	REF	NOT USED	HIGHEST USED
INTEG.CIRCUIT	IC		7
TRANSISTOR	TR		20
DIODE	D		21
DISPLAY	DIGIT		7
RESISTOR	R		72
POTENTIOMETER	RV		2
CAPACITOR	C		56
INDUCTOR	L		2
SWITCH	SW		5
PLUG/SOCKET	PL		4
CONNECTN PIN	P		9
TEST PAD	TP		3



METEOR SERIES MAIN CIRCUIT