Farnell

INCORPORATING WAYNE KERR INSTRUMENTS

Instruction/Service Manual
for

PSG2400A
PORTABLE SIGNAL GENERATOR

Part No. 9HPSG2400A

FARNELL INSTRUMENTS LIMITED, SANDBECK WAY, WETHERBY, WEST YORKSHIRE LS22 4DH, UK
TELEPHONE (UK) 0937 581961 TELEX 557294 FAX (UK) 0937 586908
(INT) +44 937 581961 (INT)+44 937 586908

Scans
By
Artek Media

Artek Media
1042 Plummer Cir. SW
Rochester, MN 55902

www.artekmedia.com

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Dave & Lynn Henderson
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FARNELL

Part No. 9HPSG2400A

INSTRUCTION/SERVICE MANUAL

FOR

PSG2400A

PORTABLE SIGNAL GENERATOR

Farnell Instruments Limited, Sandbeck Way, Wetherby, West Yorkshire, LS22 4DH, U.K.

Overseas Dialling	Telephone +44 937 581961	Fax +44 937 586908
UK Dialling	Telephone 0937 581961	Fax 0937 586908

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CONTENTS

1. SAFETY

GENERAL

This equipment has been designed to meet the requirements of IEC publication 348, "Safety Requirements for Electronic Measuring Apparatus", and has left the factory in safe condition.

The remainder of this section on safety provides information and warning which must be followed by the user to ensure safe operation and to maintain the equipment in a safe condition.

AC POWER SUPPLY

If it is necessary to fit a suitable AC power plug to the power cable, the user must observe the following colour code:-

LIVE terminal to BROWN lead
NEUTRAL terminal to BLUE lead
EARTH terminal to GREEN/YELLOW lead

The user must also ensure that the protective earth lead would be the last to break should the cable be subject to excessive strain.

If the power cable electrical connection to the AC power plug is through screw terminals then, to ensure reliable connections, any solder tinning of the cable wires must be removed before fitting the plug.

WARNING! Any interruption of the protective earth conductor inside or outside the equipment or disconnection of the protective earth terminal is likely to make the equipment dangerous. Intentional interruption is prohibited.

Before switching on the equipment, ensure that it is set to the voltage of the local AC power supply.

ADJUSTMENT, REPLACEMENT OF PARTS, MAINTENANCE AND REPAIR

When the equipment is connected to the local AC power supply, internal terminals may be live and the opening of covers or removal of parts (except those to which access can be gained by hand) is likely to expose live parts.

The equipment must be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair.

Capacitors inside the equipment may still be charged even if the equipment has been disconnected from all voltage sources.

Any adjustment, maintenance and repair of the opened equipment under voltage must be carried out only by a skilled person who is aware of the hazards involved.

Ensure that only fuses with the required rated current and of the specified type are used for replacement. The use of make shift fuses and the short-circuiting of fuse holders is prohibited.

HANDLING HAZARDS

Cathode ray tubes can implode if subject to excessive mechanical shock. Wear safety goggles if removing or replacing a CRT.

Any battery which is no longer serviceable should be disposed of intact and never incinerated. Replacement of lithium based batteries requires particular caution. Do not allow a new or used lithium based battery to be short circuited, subject to any charging current or temperatures in excess of +70°C. Insulate terminals before disposal.

Beryllium oxide washer must be treated as toxic waste and be disposed of intact and never incinerated.

EPROMs could lose data if exposed to direct sunlight for 1 week or room level fluorescent lighting for 3 years.

Many components contain polymers which give rise to toxic fumes if incinerated.

STATIC ELECTRICITY

Assume all integrated circuits are 'static sensitive'. Before handling these components or printed circuit board assemblies containing these components, personnel should observe the following precautions:

1) The work surface should be a conductive grounded mat.

2) Soldering irons must be grounded and tools must be in contact with a conductive surface to ground when not in use.

3) Any person handling static-sensitive parts must wear a wrist strap which provides a leaky path ground, impedance not less than 1 megohm, and not greater than 100 megohm.

4) Components and printed circuit board assemblies must be stored in or on conductive foam or mat while work is in progress.

5) New components should be kept in the supplier's packaging until required for use.

2. SCHEDULE OF EQUIPMENT

The instrument has been carefully packed to prevent damage in transit. When removing the unit from the packing box, ensure that all parts and accessories are removed from the packing material. Retain the packing box and material.

The complete equipment comprises:	Farnell part number
1 off Farnell PSG2400A Signal Generator	1ERPSG2400A
1 off detachable AC power lead	HC22V2
1 off type N to BNC adaptor	TR201A
1 off BNC to BNC coaxial cable	HC0264
1 off Instruction/Service manual	9HPSG2400A
1 off three pin DC input plug	TG212
1 off extractor for power selector card	HW3114003

Any factory fitted options will be marked on the unit back panel.

Note: In the event of damage in transit or shortage in delivery separate notices in writing should be given to both carriers and Farnell Instruments Limited, or local agent if outside the U.K., within three days of receipt of goods, followed by a complete claim within five days. All goods which are the subject of any claim for damage in transit or missing items should be preserved intact as delivered, for a period of seven days after making the claim, pending inspection or instructions from Farnell Limited, or an agent of this company.

3. INTRODUCTION

The Farnell PSG2400A is a portable synthesized signal generator covering the frequency range 100kHz to 2.4GHz with a full +19/+16dBm to -143 dBm output level range. This range covers virtually all radio services in the MF, HF, VHF, UHF bands and also L band microwave. Designed to operate from any standard AC supply or from 12V DC (24V option) the compact lightweight unit is ideal for bench, field or system use. The GPIB interface for system use conforms to the IEEE 488.2 standard. Reverse power protection to 25 Watts safeguards the RF output from accidental damage.

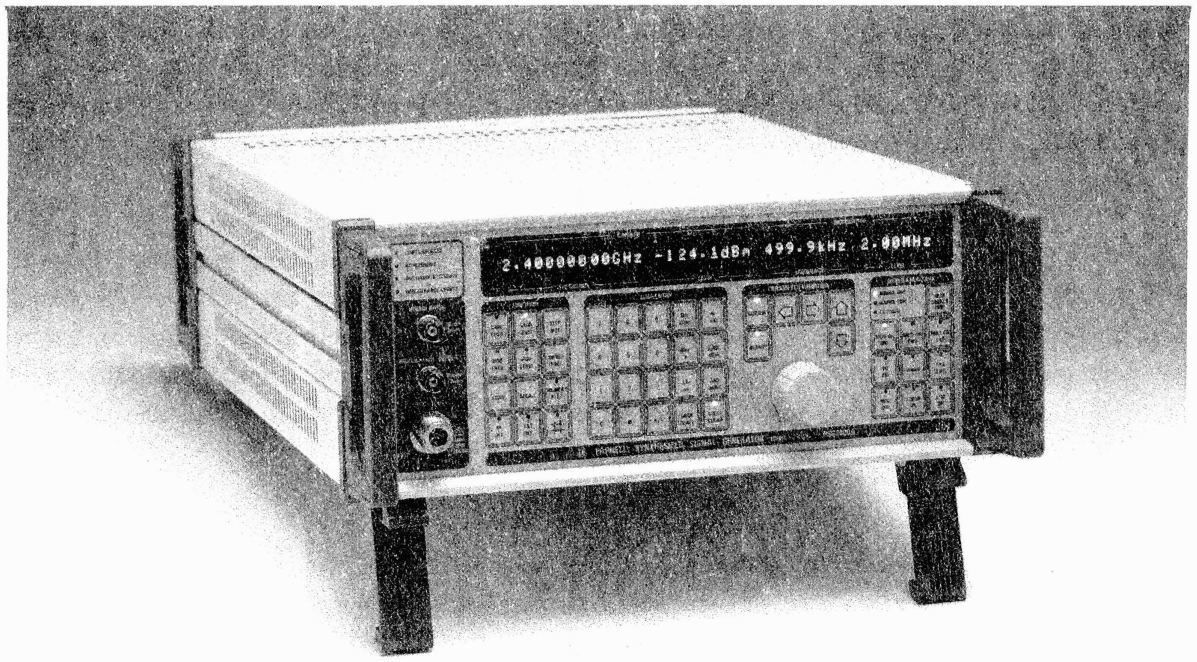
Front panel control is by a tactile membrane switch assembly, completely sealed against the ingress of moisture and dust, and incorporating an EMC shield. A high visibility 40 character alphanumeric LED display is used to indicate carrier frequency, carrier level, modulation frequency and modulation level settings simultaneously. The addition of a rotary control enables displayed data to be conveniently adjusted in integer steps of any resolvable size.

The entire parameters of the last front panel settings and 99 user defined set ups are retained in non-volatile memory following a power break. Individual memories are available for recall or store and protect, with a memory step facility incorporated to enable rapid switching between pre-determined tests. Automatic conversion calculations are performed by the microprocessor enabling carrier level to be entered and displayed in the various units of dBm, dBμV, μV, mV, V pd or μV,mV,V emf.

Comprehensive modulation capability is provided internally with two wide band 0.1Hz to 500kHz audio synthesizers fitted as standard. These sources may be mixed internally to produce complex modulation waveforms for the testing of CTCSS, DTMF and SELCALL systems. In addition to the usual 5 tone SELCALL systems, the user may also define unique tone bursts with up to 16 consecutive tones. The last used tone sequence is also stored in non-volatile memory. The wide modulation bandwidth extends to DC for low rate digital modulation applications, and simultaneous AM/FM(ØM) is permissible.

An internal 1kHz distortion analyser is a standard feature allowing SINAD sensitivity tests to be performed on mobile radios, thus enabling rapid and consistent alignment checks to be made. The SINAD signal to noise ratio is displayed to a resolution of 0.1dB, with the facility of user defined digital averaging.

Extra features include a secondary function key for access to special facilities and digital sweep of displayed data with the ability to set start, stop points and the total sweep time. The instrument's low power consumption allows field operation from an optional 12V rechargeable external add-on battery pack. Other options include a high stability crystal reference and pulse modulation.



4. SPECIFICATION

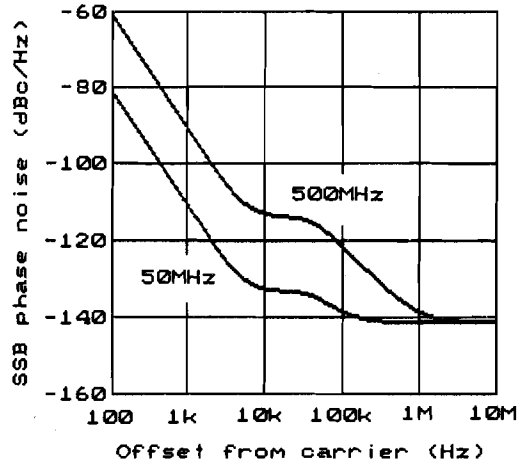
FREQUENCY

Range	100kHz to 2.4GHz. Extended range 50kHz to 2.5GHz (with error limits removed).
Resolution	5Hz (carrier 100 kHz to <37.5MHz), 1Hz (carrier 37.5MHz to <75 MHz), 2Hz (carrier 75 MHz to <150 MHZ), 5Hz (carrier 150 MHz to <600 MHz), 10Hz (carrier 600 MHz to <1.2 GHz), 20Hz (carrier 1.2 GHz to 2.4 GHz).
Stability (standard)	$\pm 1E^{-6}$ (0 to +55°C), $\pm 2E^{-7}$ per month.
(option O)	$\pm 2E^{-7}$ (0 to +40°C), $\pm 8E^{-8}$ per month during first year, $\pm 4E^{-8}$ per month after first year.

RF OUTPUT

Range	-143.0dBm to + 16dBm, (0.016μV to 1.41V rms pd). Overrange to +19dBm (carrier <600MHz).
Resolution	0.05dB (carrier $\geq$-100dBm), 0.1dB (carrier <-100dBm).
Units	dBm, dBμV, V, mV, μV (pd).
Absolute level accuracy	±1dB for carrier levels of +4dBm to +16dBm. For carrier levels of -127dB to <+4dBm: ±1.5dB (carrier <1.2GHz), ±2.5dB (carrier $\geq$1.2GHz). For carrier levels of <-127dBm: ±3.0dB, typical.
Source impedance	50Ω.
VSWR	<1.5:1 (carrier <+4dBm).

Third order intermodulation (modulation off)	<-50dBc for carrier levels of ≥+4dBm with two PSG2400A signal generators combined in a resistive 6dB coupler (carrier separation ≥5kHz). <-60dBc for carrier levels of <+4dBm.
Reverse power protection	25W maximum (from 50Ω source), 100kHz to 2.4GHz, user reset. 25V DC maximum.
Trip level	100mW typical.
SPECTRAL PURITY	For carrier levels of <+10dBm.
Harmonics	<-30dBm.
Sub-harmonics	<-70dBc (carrier <1.2GHz), <-30dBc (carrier ≥1.2GHz).
Non-harmonic spurious	<-60dBc at carrier offsets ≥3kHz.
Residual FM	<20Hz rms at 2.4GHz (CCITT P53A weighting) reducing by 6dB/octave to <0.625Hz rms at 37.5MHz, <2.5Hz rms below 37.5MHz.
Residual AM	<0.1% rms, 50Hz to 15kHz bandwidth.
SSB phase noise	Typical characteristics shown for carrier frequencies of 50 and 500 MHz.



Noise floor	<-135dBc/Hz.

AM on 20kHz FM	<0.5% at 1kHz rate, 50Hz to 15kHz bandwidth.
FM on 30% AM	<200Hz at 1kHz rate, 50Hz to 15kHz bandwidth.
Carrier leakage	<0.5μV (2 turn 25mm loop, 25mm away).

AMPLITUDE MODULATION

For carrier levels of <+10dBm:

Depth	0 to 99.9%. AM depth reduces in a linear fashion from 99.9% at <+10dBm to 10% at +15.0dBm .
Resolution	0.1%.
Accuracy	All at 1kHz rate: ±5% of reading up to 90% depth,(carrier <600MHz), ±15% of reading up to 50% depth,(carrier ≥600MHz).
Modulation response	Relative to 1kHz rate: Internal: ±1dB 0.1Hz to 50kHz, External: ±1dB 50Hz to 50kHz, ±1dB DC to 50kHz (DCFM selected), -3dB typical at 100kHz, up to 50% depth.
Distortion (THD)	All at 1kHz rate, 50Hz to 15kHz bandwidth: <1% up to 30% depth (carrier <600MHz), <3% up to 80% depth (carrier <600MHz), <5% up to 50% depth (carrier ≥600MHz).

FREQUENCY MODULATION

Maximum peak deviation	100kHz to <37.5MHz, 250kHz, 37.5MHz to <75MHz, 62.5kHz, 75MHz to <150MHz, 125kHz, 150MHz to <300MHz, 250kHz, 300MHz to <600MHz, 500kHz, 600MHz to <1.2GHz, 1MHz, 1.2GHz to 2.4GHz, 2MHz. Extended range of 5x the above, (with error limits removed).
Resolution	10Hz (<10kHz peak), 100Hz (<100kHz peak), 1kHz (<1MHz peak), 10kHz (≥1MHz peak).

Accuracy	±5% of reading at 1kHz rate, excluding residual FM.
Modulation response	Internal/external relative to 1kHz rate: ±1dB 50Hz to 100kHz, ±1dB 0.1Hz or DC to 100kHz (DCFM selected), ±3dB up to 500kHz.
Distortion (THD)	All at 1kHz rate, 50Hz to 15kHz bandwidth: <0.5% up to 10kHz peak deviation, <1% up to 100kHz peak deviation, <2% up to maximum peak deviation typical.
DCFM frequency drift	After 30 minutes warm up and under constant ambient temperature conditions <±250Hz/10 minutes at 100MHz, typical.
DCFM frequency offset	<±150Hz at 100MHz, typical.
WIDEBAND FM	Using the external modulation input, (no internal level adjustment).
Bandwidth (6dB)	50kHz to 10MHz.
Impedance	50Ω nominal.
Sensitivity	1V peak for maximum peak deviation, (see frequency modulation).
PHASE MODULATION	
Deviation	0 to 9.99 rads.
Resolution	0.01 rad.
Accuracy	±10% of reading at 1kHz rate, excluding residual PM.
Modulation response	Internal/external relative to 1kHz rate: ±2dB 100Hz to 10kHz.
Distortion	<2% at 1kHz rate,300Hz to 3kHz bandwidth.

INTERNAL MODULATION (SOURCE ONE AND TWO)

Synthesizer range	0.1Hz to 500kHz.
Resolution	0.1Hz, frequency <1kHz, 1Hz, frequency <10kHz, 10Hz, frequency <100kHz, 100Hz, frequency ≥100kHz.
Waveform	Sine or square.
Accuracy	As internal standard.
Distortion (THD)in sinewave mode	<0.2% at 1kHz rate (50Hz to 15kHz bandwidth), <2% for rates <100kHz, <3% up to 500kHz rate, typical.

MODULATION OUTPUT

Fixed level	1V rms into 50Ω.
Variable level	0 to 1V rms in 1mV steps, into 50Ω.
Accuracy	±5% of reading for levels ≥100mV rms, at 1kHz rate.
Source impedance	50Ω nominal.
Distortion	As internal modulation source, (load impedance ≥ 10kΩ).

MODULATION SYSTEMS

User defined tones	User defined tone frequencies and durations with up to 16 consecutive tones.
SELCALL	CCIR, EEA, ZVEI, DZVEI, EIA and NATEL standards selectable.
DTMF	The standard low group/high group matrix tones are generated internally.
CTCSS	The audio synthesizers may be mixed internally or with an external input, both levels independantly adjustable.
Simultaneous modulation	AM plus FM or phase modulation, modulation levels independantly adjustable.

EXTERNAL MODULATION

Impedance	>5kΩ.
Level	1V peak for calibration.
Indication	Four digit display,range 0 to 1.000Vrms.
Simultaneous tones	The external input may be mixed with either or both internal sources.

SINAD

Input frequency	1kHz ± 1Hz.
Input level	30mV to 3V rms.
Impedance	≥10kΩ.
Indication	Three digit logarithmic display (true rms detection), with user defined digital averaging. Usable range 0 to 40dB.
Resolution	0.1dB.
Bandwidth	Wideband, 60Hz to 6kHz (-3dB) or CCITT P53A weighting.

SWEEP

Functions	Carrier frequency, carrier level, modulation frequency, modulation level.
Range (start, stop)	Any within setting range.
Total sweep time	1 to 999 seconds.
Sweep sync output	Available on back panel auxiliary socket. Analogue ramp proportional to sweep position with a range of 0 to +10V nominal corresponding to sweep start, stop respectively.

GENERAL

Programmability	GPIB (IEEE 488.2). Functions supported: SH1, AH1, T6, TE0, L4, LE0, SR1, RL1, PP0, DC1, DT0, C0, E2. Setting time (after receipt of last GPIB character): <200ms typical, to within 100Hz of final carrier frequency. <100ms typical, for carrier level and modulation functions.
Memory (non-volatile)	100 complete front panel set ups including last front panel settings. IEEE-488 address.
Internal crystal reference	TCXO, 10MHz.
Internal reference output	0.6V pk-pk into 50Ω, nominal.
External reference frequency	10MHz.
External reference level	0.3 to 3V pk-pk.

POWER REQUIREMENT

AC input	100, 120, 220, 240V AC ±10% 45 to 440 Hz.
DC input (standard)	11.5 to 15V DC.
(option A)	23 to 30V DC.
Consumption	50VA maximum.

ENVIRONMENT

Temperature (operating)	0 to +55°C.
(storage)	-40 to +70°C.
Relative humidity	95% to +40°C non-condensing.
Vibration	5 to 150Hz at 2G sinusoidal, 15 minutes in each of 3 orthogonal planes.
Shock	10 off 25mm drops on each of 6 faces.
Safety	Designed to meet the requirements of IEC publication 348 (BS4743).
EMC	Designed to meet European Standards EN 50 081-1 (generic emission) and EN 50 082-1 (generic immunity).

MECHANICAL (Approximate information).

Height (including feet)	145mm.
Width	330mm.
Depth	520mm.
Weight	14.5kg.

PULSE MODULATION OPTION

Frequency range	100kHz to 2.4GHz.
Carrier on/off ratio	≥60dB.
Rise/fall times	<25ns.
Simultaneous modulation	Pulse modulation may be used in conjunction with any combination of AM, FM (phase modulation) or wideband FM.

RF output level	All carrier level specifications reduced by 3dB. Minimum carrier level -143.0dBm. For example: Maximum level reduced from +16dBm to +13dBm, and spectral purity/amplitude modulation specifications apply for carrier levels of < +7dBm.
Minimum pulse width	50ns.
Maximum pulse repetition frequency	10MHz.
External control (via back panel BNC)	TTL High = carrier on, TTL Low = carrier off. +5V peak maximum.

ACCESSORIES SUPPLIED

Part Number	Description
HC22V2	Detachable AC power cable.
TR201A	N to BNC adaptor.
HC0264	BNC to BNC coaxial cable.
TG212	DC input plug.
HW3114003	Extractor for power selector.
9HPSG2400A	Instruction/service manual.

ORDER CODES/OPTIONS/ACCESSORIES

Standard model

1ERPSG2400A	PSG2400A Portable Signal Generator.

Factory fitted optional versions

1ERPSG2400A/A	As standard but 23 to 30V DC input.
1ERPSG2400A/F	RF output moved to rear panel.
1ERPSG2400A/M	Adds pulse modulation.
1ERPSG2400A/O	High stability frequency reference.

Accessories

1EXA10120	Rechargeable 12V 4Ah add-on battery pack for use with standard 11.5 to 15V DC input only.
15A20100	Rack mounting kit.
1EXA20180	Protective padded carrying case.
1ERA30320	Remote operation foot switch.

Farnell Instruments Limited reserves the right to amend specifications without notification.

5. INSTALLATION

5.1 INITIAL SETTING UP - AC SOURCE

Check the power input setting is correct for the local supply by looking through the clear window adjacent to the power input socket on the rear panel. One of four alternative settings will be visible. Should it be necessary to change the setting, slide the window across, remove the fuse and then pull out the small selector card using the extractor provided. Re-insert the card in the appropriate alternative position so that the required voltage setting is visible when the card is fully replaced. Replace the fuse ensuring the rating is correct for the voltage to be used, and slide the window across. The fuse rating for 230V operations is 500mA T type and for 115V operation is 1A T type.

Read the precautions listed in the SAFETY section at the start of this manual. Connect a suitable plug to the power cable observing the following colour codes:-

Live - BROWN
Neutral - BLUE
Earth - GREEN/YELLOW

Plug power cable into socket on rear of instrument and power source. Switch on using the power switch on the rear of the instrument.

5.2 INITIAL SETTING UP - DC SOURCE

Apply a DC input via the three pin connector on the rear panel by correctly wiring the three pin plug supplied as part of the accessory package. The connections are as follows:-

Pin 1 - Instrument chassis earth
Pin 2 - DC Negative
Pin 3 - DC Positive

The DC supply must be within the range 11.5 to 15V (or 23 to 30V for the 24V DC option) with a current capability of 4 amps.
Switch on using the power switch on the rear of the instrument. The instrument is fully protected against accidental DC polarity reversal. An internal relay is used to isolate the AC power input when a DC supply is present.
See section 6.6 Applications, part o).

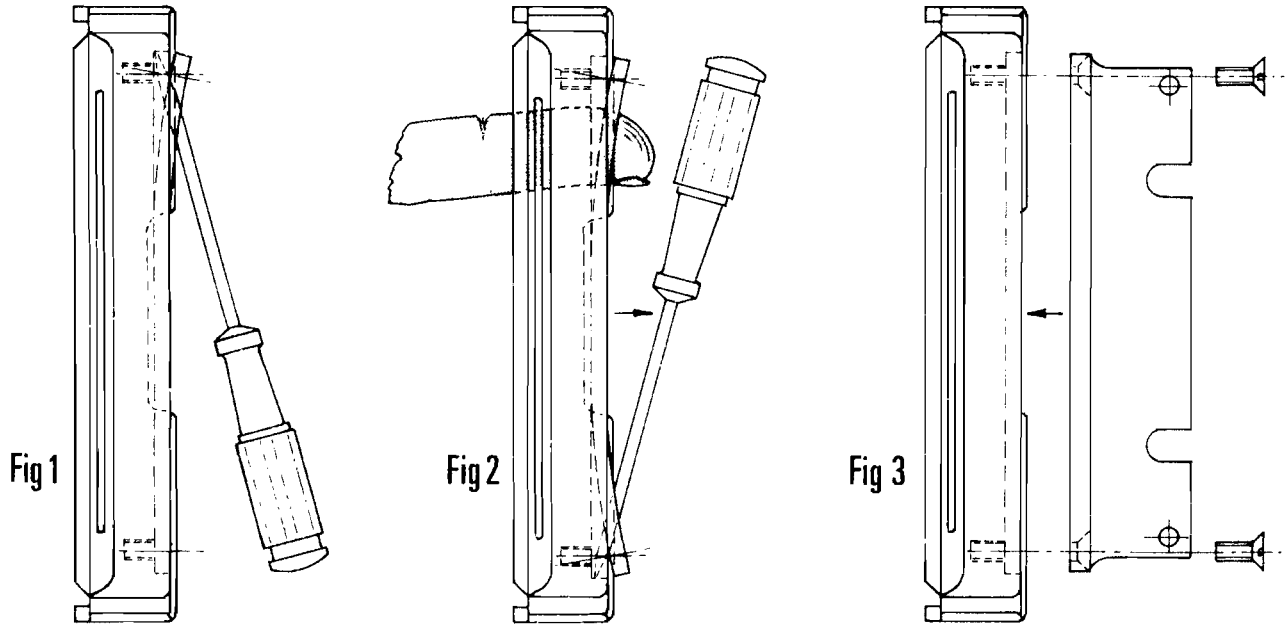
5.3 RACK MOUNTING

The instrument may be mounted in a standard nineteen inch rack using the kit available as an optional accessory (order code 15A20100).

For rack mounting applications the unit's support feet (located on the lower cover) must be removed as follows:-

Place the instrument with the lower covering face upwards and hinge forward the front tilt feet. Remove the eight screws (four each side) securing the feet support bars to the lower cover and remove the support bars complete with feet. Retain the screws and support bars for future use.

To fit the rack mounting "ears", carefully prise out the insert in the outer face of both front handles (retain for future use). Fit each ear into the exposed recess, securing with the M4 x 10 CSK screws provided. It is important to ensure that some provision be made to support the rear of the unit when using the rack mounting ears.



PROCEDURE FOR ATTACHMENT OF RACK MOUNTING BRACKET

REF. FIG 1
Insert small screwdriver into thin gap between insert and handle body. Prise away one end slightly and hold in position with finger.
Note orientation of insert with styling cut-out opposite cut-out in handle.

REF. FIG 2
Insert screwdriver into other end and repeat procedure. This will relieve the small tapered pins of the insert from the threaded holes in the handle. Remove insert in direction of arrow.

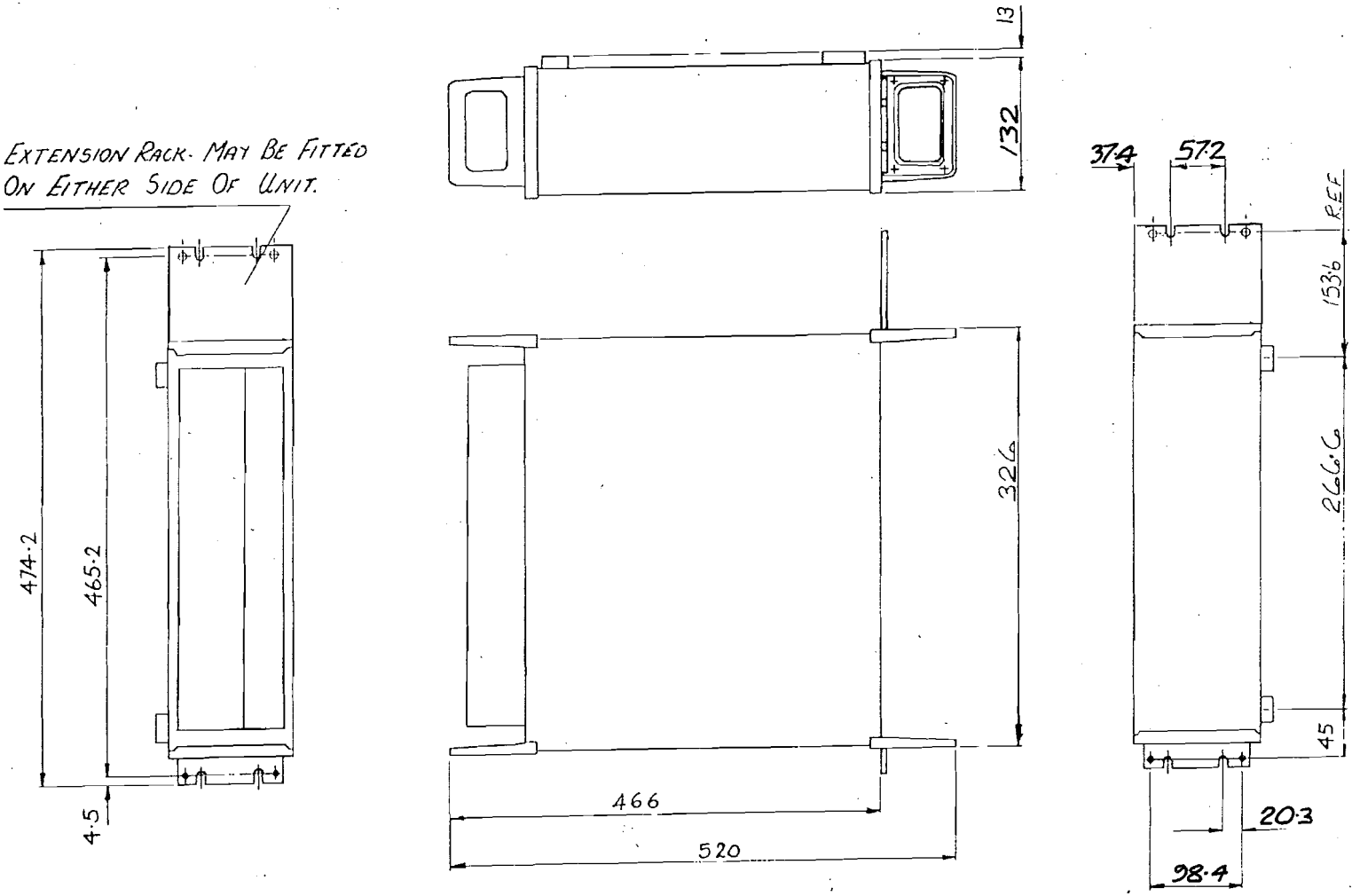
REF. FIG 3
Insert rack mounting bracket into recess in handle in attitude shown and secure firmly with 4 M4 x 10LG C'SK HD screws supplied.

DRAWING No. 3SZU0133

DO NOT SCALE

ALL ERRORS TO BE REPORTED TO DRAWING OFFICE
DRAWN IN ACCORDANCE WITH BS 308

EXTENSION RACK. MAY BE FITTED ON EITHER SIDE OF UNIT.



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ISS	DATE	MOD No.	CHECKED	TRACED	NOTE REMOVE ALL BURRS AND SHARP EDGES	UP TO 200 ± 0·1 / 200 TO 500 ± 0·2 / 500 → ±	UP TO 70 ± 0·1 / 70 → ± 0·2	MATL
						SCALE N.T.S.	No STAMP PART No WHERE SHOWN / DIMENSIONS IN mm	X X X

FARNELL INSTRUMENTS LTD. WETHERBY. YORKS

TITLE CASE & RACK 3U H x 3/4 W x FULL DEPTH

DRAWING No 3SZU0133

BASED ON

SHEET OF SHEETS

5.4 PSG2400A BATTERY PACK

a) INSTALLATION

The 12V battery pack (option order code 1EXA10120) is supplied with 2 off rack mounting ears to fix the pack to the PSG2400A. Secure the mounting ears, one at each end, to the battery pack using the M4 x 10 pan head screws supplied.

The battery pack complete with mounting ears is then fixed to the right hand side of the PSG2400A utilising the rack mounting fixings in the front and rear PSG2400A handles.

Carefully prise out the handle inserts (see section 5.3) and retain for future use. Align the battery pack (mains input connector facing the rear of the unit) with the exposed recesses and secure with the M4 x 10 screws supplied.

b) OPERATION

Check the mains tap slider switch (top edge of the battery pack) is set to the correct setting for the local supply.

To charge the battery connect the battery DC power plug to the charger output socket and connect mains power to the charger mains input socket. For a completely flat battery the charge time is approximately 10 hours.

To operate the PSG2400A from the battery connect the battery DC power plug to the PSG2400A DC input socket. A fully charged battery will give approximately 1 hour of continuous use.

The use of nickel-cadmium batteries ensures a relatively flat discharge voltage versus time characteristic, with the nominal battery voltage of 12.5V decaying rapidly when charging is required. See section 6.6 Applications, part o).

c) SPECIFICATION

Charger AC input	115 or 230V AC +15% -25% 45 to 440Hz 20VA maximum
Operating temperature	0 to 40°C

Mechanical information (approximate)

Height	132mm
Width	55mm
Depth	510mm
Weight	3kg

6. OPERATING INSTRUCTIONS AND APPLICATIONS

6.1 FIRST TIME OPERATION

This section introduces the major instrument functions for the first time user. Throughout this section, lower case letters in brackets refer to the annotated drawing of the front panel at the end of this section.

Switch on the unit by operating the red push button switch located on the back panel. The instrument will display "Farnell Instruments PSG2400A" momentarily, on the alphanumeric display,before completing some functional tests. On successful completion a message "self test pass" is displayed. A full list of possible messages displayed and further explanation is given in section 6.3.
The instrument will then display the previously stored front panel setting. In order to set the instrument to the default setting, press the #96 keys. This secondary command only effects the front panel setting and not the non-volatile stores. #99 can be used to clear the non-volatile stores and return the default setting.
Note: If the error message "REVERSE POWER OVERLOAD" is displayed, refer to section 6.6 applications, part p).

a) Display and data entry.

The PSG2400A can simultaneously display carrier frequency, carrier level, modulation frequency and modulation level.
The four function keys, (i), (j) [CARR FREQ, CARR LEVEL, MOD FREQ, MOD LEVEL] select the function to be changed, highlighting the function key with a lit LED and the alphanumeric display with a cursor and reduced character height.
Data is displayed on entry, with a prompt line in the appropriate window. The entered data may be edited by utilising the BACK SPACE key (l) to rub out the last entered digit. On selecting a valid units termination key(l), the data entry is accepted.

If an invalid key selection is chosen, a warning message is displayed and the input is ignored. Additionally, the data entry mode can be terminated at any point by selecting the LOCAL/CLEAR key. Entered data which exceeds the instrument's specification causes a warning message to be displayed and the setting is ignored.

b) Carrier frequency.

On selecting the CARR FREQ key (i), the cursor will be set in the carrier frequency window. Enter the data for the new carrier frequency, followed by a valid termination key (l) (GHz, MHz, kHz or Hz). On completion of data entry the new carrier frequency and units are displayed.

For example, to set up a carrier frequency of 460.425000MHz press:

CARR FREQ 460.425 MHz

The normal carrier frequency limits are 100kHz to 2.4GHz with an extended range of 50kHz to 2500MHz available using the relax error limits secondary function, #22.

The frequency resolution is dependent on the carrier frequency set. The following table shows the carrier frequency/resolution relationship.

CARRIER FREQUENCY RANGE MHz	RESOLUTION Hz
0.1 TO <37.5	5
37.5 TO <75	1
75 TO <150	2
150 TO <300	5
300 TO <600	5
600 TO <1200	10
1200 TO 2400	20

c) Carrier level.

To set up a carrier level select the CARR LEVEL function key (i), followed by the new data which is displayed on entry in the carrier level window. Now select a valid termination key (l) (dBm, dBμV, V, mV or μV) to complete data entry.

For example, to set up a carrier level of -47.5dBm press:

CARR LEVEL -47.5 dBm

The carrier level limits are -143.0dBm to +16.0dBm (+19dBm <600MHz) with a resolution of 0.05dB (0.1dB for carrier level <-100dBm). Full carrier level units conversion is provided so that outside of the data entry mode, selecting alternative units will update the carrier level display.
If desired carrier level may be entered and displayed in μV, mV or Vemf by utilising the secondary command #17.

Note: For glitch free level changes when checking squelch thresholds see section 6.6 Applications, part i).

d) Modulation sources.

The available internal modulation sources are two separate synthesized audio generators, with the added facility of using an external source. The modulation level, type (AM, FM, PM) and frequency can be independently set on either audio generator and also modulation level and type for the external modulation source. The settings can be viewed, in turn, by using the MOD SOURCE DISP key(n).

Note: Source 2 and external are combined before the DAC controlling the modulation level for source 2. If source 2 and external are selected on together the external modulation level and type are forced to be identical to source 2 with the MOD SOURCE DISP on EXTERNAL showing "external source 2". If MOD ON TWO is then turned off the MOD SOURCE DISP on EXTERNAL will revert to its previous setting with a warning message momentarily displayed in the alphanumeric display.

Any of the three sources may be selected independently or in any combination, using the MOD ON ONE, MOD ON TWO, MOD ON EXT keys(o), with the MOD OFF key (p) giving overall control. This allows complex dual tone modulation signals to be generated.

e) Modulation frequency

To set up modulation frequency first select and display either mod source 1 or 2 using the MOD SOURCE DISP key(n). Then press the MOD FREQ function key(j), enter the data for the new modulation frequency, followed by a valid termination key (Hz, kHz). On completion of the data entry the new modulation frequency and units are displayed.

For example to set up a modulation frequency of 1.345kHz on source 1 press:

MOD SOURCE DISP (until source 1) (is displayed) MOD FREQ 1.345 kHz

The modulation frequency range for source 1 and 2 is 0.1Hz to 500kHz. The resolution varies depending on the modulation frequency set:

MODULATION FREQUENCY	RESOLUTION
0.1Hz TO <1kHz	0.1Hz
1kHz TO <10kHz	1Hz
10kHz TO <100kHz	10Hz
100kHz TO ≤500kHz	100Hz

f) Modulation level.

The five possible termination keys (l) for modulation level are MHz, kHz or Hz for frequency modulation, %AM for amplitude modulation, and rad for phase modulation. The resulting level is displayed in the modulation level window.

For example to set up a modulation depth of 50.0% press:

MOD LEVEL 50.0 %AM

The modulation circuits may be DC coupled by selecting the DCFM key(q). In the %AM mode the isolating capacitor in the external modulation input path is shorted out so that all the circuits are DC coupled. When selected with frequency or phase modulation the synthesizer coarse step loop integrator is held at the last tuning voltage, thus disabling the correction loop. The unlocked carrier frequency can now be controlled with a DC voltage at the external modulation input. See section 6.6 Applications, part c).

In the DCFM mode the unlocked carrier frequency will be subject to drift dependent upon the carrier frequency range and ambient temperature fluctuations. To reduce errors it is recommended that DCFM should only be selected for the duration of the DC coupled test.

Additionally the modulation signal can be isolated from the carrier by selecting the MOD OFF key. This key also de-selects DCFM (if selected) permitting re-locking of the carrier.

g) External modulation level.

In order to calibrate the modulation level for an external source, an rms volt meter is built into the instrument. Selecting EXT LEVEL forces MOD ON EXT and configures the front panel MODULATION IN/OUT socket as an input. The modulation frequency and level windows on the display will change to read "Ext lev: 0.000V". Connect an external source to the MODULATION IN/OUT socket and adjust the source level to calibrate.

For example, to calibrate a 1kHz external sine wave to give 10kHz FM deviation:

Press EXT LEVEL.
Input the external 1kHz sine wave to the MODULATION IN/OUT socket.
Adjust the source level to read 0.707V in the modulation level window.
Deselect EXT LEVEL.
Press MOD SOURCE DISP to show external.
Press MOD LEVEL 10 kHz.

Press MOD ON EXT

Check MOD OFF is deselected (ie. mod on).

The rms volt meter can also be used to measure DC levels if DCFM is selected in the EXT LEVEL mode.

h) SINAD measurement.
Selecting SINAD forces the modulation frequency and level display to read "Sinad: **.*dB". Connect the 1kHz source under test to the SINAD front panel input. Valid input levels for signals under test are 30mV to 3Vrms.
Refer to section 6.6 Applications, part a), for SINAD measurement.

i) Cursor and rotary control.

Any of the displayed carrier and modulation data may be incremented or decremented in consecutive steps by utilising the UP/DOWN keys(v) or the rotary control. On selecting the CURSOR key(v), one of the displayed digits will reduce in size and be underscored, indicating the cursor position in the window defined by the preselected function. Now select either CARR FREQ, CARR LEVEL, MOD FREQ or MOD LEVEL to assign the cursor to the desired display window. After positioning the cursor with the LEFT or RIGHT arrow key over the desired digit, use the UP or DOWN key to alter the data as required.

A more convenient method of adjusting the data is provided with the rotary control. Select the function and digit to be altered, as with the cursor control, and simply select the ROTARY key(v) and turn the rotary control to alter the indicated data.

Additionally the displayed data may be altered in fixed steps by using the STEP SIZE key(w) and the STEP ON key(w).

For example to set up a carrier frequency step of 12.5kHz press:

CARR FREQ STEP SIZE 12.5 kHz

Select the STEP ON key(w).
Select CURSOR key on or ROTARY key on.
Now use the UP or DOWN key (v) or the rotary control to alter the carrier frequency in steps of 12.5kHz.

When the STEP ON key (w) is again pressed the incrementing reverts to the consecutive step mode at the cursor position.

Note: In step mode the the cursor remains at the single step position but the selected function increments in the set delta step.

j) Store and recall.

The instrument will store up to 100 complete front panel settings in non-volatile memory. These are designated store 00 through to store 99, with store 00 reserved for the current front panel setting.

To store a setting, select the STORE key(t).
The display will prompt for the store number.
Enter a two digit store number between 01 and 99.
Conversely to recall a setting select RECALL followed by the store number.

If an invalid setting is found during recall of any of the stores, a warning message is displayed: "53 non-volatile memory corrupted", and the stored data should be re-entered to that location.

By utilising the secondary function #90, selective stored settings may be write protected. #91 followed by the store number removes the write protection. Press LOCAL/CLEAR to exit the secondary command display mode.

Additionally the MEMORY STEP key (t) allows the contents of the stores to be viewed and set using the UP or DOWN keys (v).

k) Sweep.

A useful feature of the PSG2400A is the ability to digitally sweep the following functions:- carrier frequency, carrier level, modulation frequency (mod source 1 and 2) or modulation level (mod source 1, 2 and external).
Note: Modulation source 2 level cannot be simultaneously swept with external source level.

Sweep start values are entered in store location 01 and the final value in store 02.

Total sweep time is entered using the SWEEP TIME key(x), with a valid range of 1 to 999 seconds.

Selecting the SWEEP ON key(x) will now initiate the sweep. The sweep mode may be terminated at any point by deselecting SWEEP ON, and conversely press the SWEEP ON key to re-enter the sweep mode.

For example to sweep the carrier frequency from 1MHz to 1000MHz in 25 seconds press:

CARR FREQ	1 MHz	STORE 01
CARR FREQ	1000MHz	STORE 02
SWEEP TIME	25 SEC	SWEEP ON

The sweep steps are executed at the rate of 12 steps/second.

Note: By having more than one function parameter set differently between store 1 and store 2 the PSG2400A will simultaneously sweep each function.
Refer to section 6.6 Applications, part k).

l) Selective calling tone generator.

The instrument's internal synthesized tone generators are specially designed for rapid frequency hopping with minimum settling time, which is essential for the generation of SELCALL tone burst sequences.

Either standard 5 tone systems, user defined tone bursts or DTMF systems may be set up, with the last used settings stored in non volatile memory.

The software is designed to recognise the standard 5 tone systems currently in use of CCIR, EEA, ZVEI, DZVEI, EIA and NATEL and the DTMF system. A table of tone numbers, frequencies and durations is provided in Section 6.3, Reference Tables.

To store a tone sequence select #70.
The display shows "#70 Tone sequence [stored sequence]" and prompts for a new entry.
Key in the numbers corresponding to the tones required, refer to section 6.3 Reference Tables, and terminate using the "." key.

Select MOD ON ONE and MOD OFF-deselected(ie.mod on) for the five tone and the user defined tone.

Select MOD ON ONE, MOD ON TWO and MOD OFF deselected (ie.mod on) for DTMF system. Refer to section 6.6 Applications, part g).

Select the # function corresponding to the system required, refer to the secondary command listing, section 6.2, part (y) and press the "1" key to send the tone.

Note: A preamble blank period before the tones are sent can be programmed using secondary command #49. This can be set in the range 0msec to 999msec.

A gap between the tones can also be set using the secondary command #50. This can also be set in the range 0msec to 999msec.

Note: For the standard 5 tone systems any previously set modulation on source 1 is inhibited in the preamble blank period preceding the SELCALL tone burst and reinstated afterwards. Refer to section 6.6 Applications, part h).

m) User defined tones.

For the user defined tones enter the required tone frequencies using #30 to #45, the tone duration using #51 to #66, preamble and time delay between tones using #49 and #50, refer to secondary command listing, section 6.2, part y).

Store the user tone sequence required using #70 as before, select #79 and press the "1" key to send the tone sequence.

Tone frequency range as AF synthesizers (0.1Hz to 500kHz).
Tone, preamble, gap duration in the range 0 to 999msec.

Note: After selecting any # function the up or down cursor keys can be used to step through the # functions. This is particularly useful when setting the user defined tones.

For continuous repetition of the tone send, use the secondary function #71, pressing the "1" key to ENABLE. Select the tone system and send as before. Press LOCAL/CLEAR key to suspend the continuous tone send. Reselect the required tone system to restart the continuous tone send. eg. #72 1 to send.
Reselecting # 71 1 disables the continuous tone send mode.

For example, to set up and send tones of 1kHz, 2kHz, 3kHz with equal tone lengths of 33ms press:

#30 1 kHz CURSOR↑ (#31) 2 kHz CURSOR↑ (#32) 3 kHz

This defines the frequency for:

digit 0 (#30), digit 1 (#31) and digit 2 (#32).

Press:

#51 33 (m)sec CURSOR↑ (#52) 33 (m)sec CURSOR↑ (#53) 33 (m)sec

This defines the duration for:

1st tone (#51), 2nd tone (#52) and 3rd tone (#53).

To store sequence press:

#70 0 1 2

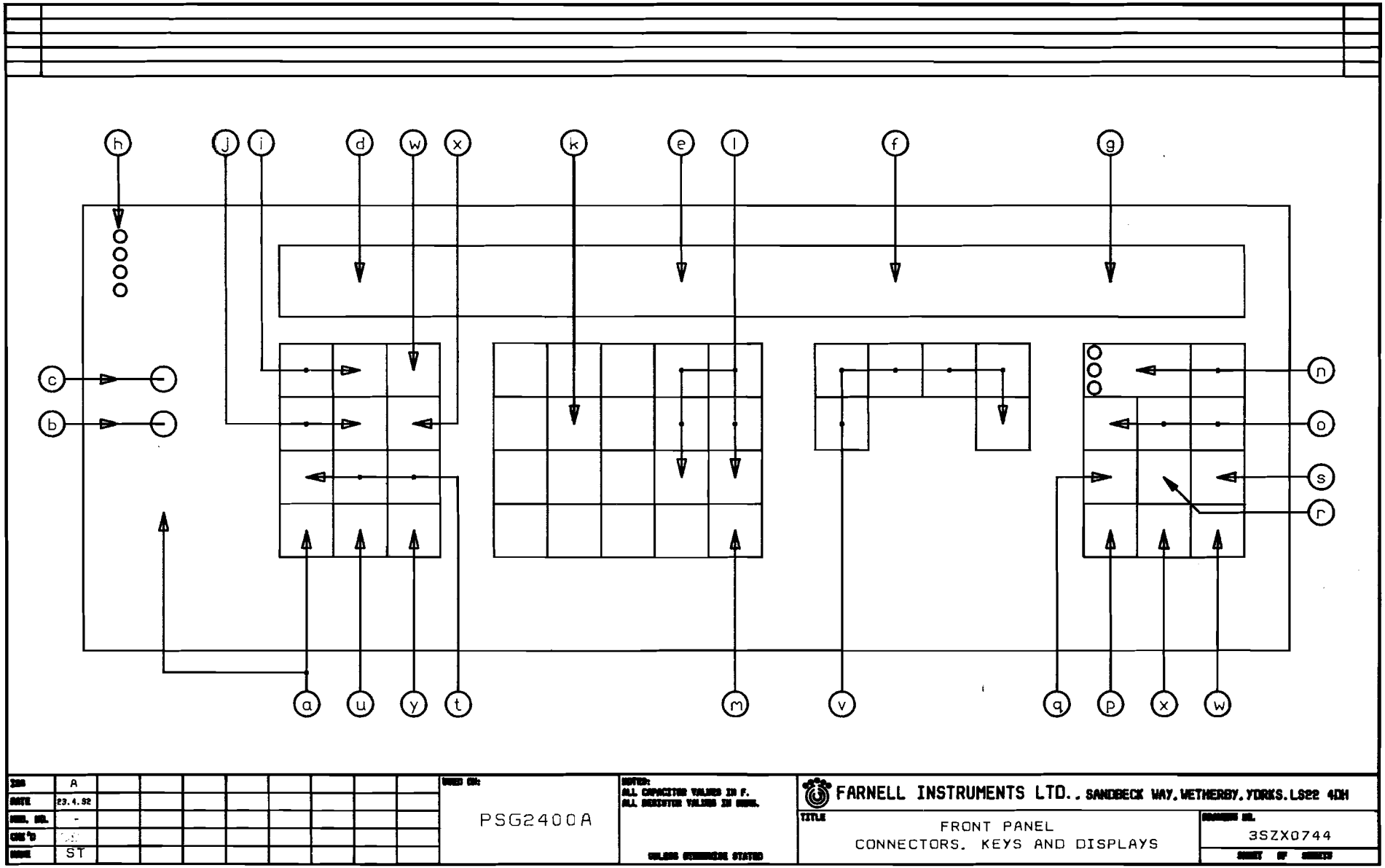
Ensure MOD OFF is deselected.

To send sequence ensure MOD ON ONE is selected and MOD OFF deselected and press:

#79 1 (to send)

If desired, MOD SOURCE TWO or an external modulation signal may be mixed simultaneously with the sequential tones, by selecting MOD ON TWO or MOD ON EXT with MOD ON ONE.

To avoid false triggering of the radio tone decoder, the mixed tone frequency must not lie within the bands of allowable sequential tone frequencies. See section 6.3 Reference Tables.



All paragraph numbers below refer to the annotated drawing on previous page.

a) RF output connector

This output is protected against accidental overload, up to a maximum level of 25W/25V DC. **Caution!** Exceeding this level may result in permanent damage to the instrument RF output section.
If the accidental overload exceeds the trip level of approximately 100mW, the reverse power protection circuit selects RF OFF and sounds a continuous tone accompanied by a displayed warning message.
Once the overload has been removed, the protection circuit can be reset by pressing the RF OFF key.
In normal use selecting RF OFF disconnects the RF output.

b) Modulation in/out connector

Allows access to the internal audio synthesizers to view the modulation signal applied to the carrier. This output may also be used as an AF. source, see section 6.6 Applications, part b). With MOD ON EXT selected an external source may be used to modulate the carrier,via this connector.

c) SINAD input connector

This input permits SINAD sensitivity measurements to be performed on mobile radio receivers, by monitoring the speaker output. See section 6.6 Applications, part a).

d) Carrier frequency display window

The generator frequency is displayed in the first part of the 24 character alphanumeric carrier functions field, with data displayed as entered.

e) Carrier level display window

The generator level is displayed in the second part of a 24 character field. The full field also serves as the keyboard buffer display or message display as required.

f) Modulation frequency display window

Displays the selected modulation source frequency in the first part of the 16 character alphanumeric modulation functions field, with data displayed as entered.

g) Modulation level display window

The selected modulation level is displayed in the second part of a 16 character field. The full field also serves as the SINAD and external level indication displays.

h) Auxiliary information LED's

These provide the user with additional information on the status of the instrument.

i) Carrier function keys

Select either the CARR FREQ or CARR LEVEL key followed by numeric data. This data is displayed on entry, with a prompt line in the appropriate window. Data entry is completed by pressing one of the units termination keys.

j) Modulation function keys

Choose either the MOD FREQ or MOD LEVEL key followed by numeric data. This data is displayed on entry, with a prompt line in the appropriate window.

k) Data entry keys

These allow entry of data. There is a BACK SPACE key for deletion of the last digit displayed if required.

l) Units termination keys

Dual purpose keys for carrier and modulation function units termination.

m) Local/clear key

This clears the keyboard buffer when in the local mode (i.e. no activity on GPIB). It returns the unit to local mode after GPIB operation (unless GPIB local lockout command is active).

n) Modulation source display key

This permits the modulation frequency and level settings of the three possible sources to be viewed sequentially in the modulation functions display window.

o) Modulation on keys

These keys allow modulation of the carrier either with a single source, or any combination of the three possible sources.
This arrangement permits the generation of simultaneous AM + FM modulation, and complex modulation tones (e.g. CTCSS). See section 6.6 Applications, part e).

p) Modulation off key

This disables any selected modulation from reaching the carrier.

q) DC coupled modulation key

This allows the external modulation input isolating capacitor to be shorted out for zero phase shift amplitude modulation, and low rate digital frequency modulation.
See section 6.6 Applications, part c).

r) SINAD key

This selects the modulation window to display the SINAD dB noise ratio, at 1kHz, for a signal present at the SINAD input connector.
See section 6.6 Applications, part a).

s) External level key

Selects the modulation window to display the rms value of an external signal present at the modulation input connector.
See section 6.6 Applications, part c).

t) Memory function keys

These keys allow front panel data to be stored and recalled in non volatile memory. There are 100 available stores, with store location 00 reserved for the current instrument setting, which is always saved following a power break.
The MEMORY STEP key permits the user to access the store locations under cursor up/down or rotary control, with the current store location briefly annunciated in the display. Store location 00 is recalled after store location 99.

u) External reference key

The RF synthesizer may be phased locked to an external 10MHz high stability timebase, via the external reference input/output connector located on the rear panel of the instrument.
Warning! When EXT REF is selected and the external signal is of low level or not present, the auxiliary information LED "NO REFERENCE" will illuminate and the instrument RF output will not be valid.

v) Cursor/rotary control keys

These are used for incrementing data with the desired digit located by an underline bar.
Selecting carrier or modulation functions assign the cursor to the desired display window.
The displayed data may be incremented using the UP/DOWN keys, or more conveniently, by using the rotary control when selected.
With the cursor deselected, displayed data may be incremented in fixed step sizes, entered by using the STEP SIZE key.

w) Step size and step on keys

These keys allow displayed data to be incremented in any resolvable step size.

x) Sweep setting keys

These keys allow digital sweep of displayed data by setting start and stop points in memory locations 01 and 02 respectively.
The parameter to be swept is identified by the cursor position.
On entering the desired total sweep time, the sweep may be started or stopped by using the SWEEP ON key.
See section 6.1 First Time Operation, part k).

y) Secondary commands

All secondary commands are entered by using the # key together with the data keys.

The LOCAL/CLEAR key exits the secondary command mode.

Key sequence	Command action
#00	Displays software version number and date. See section 9 for software upgrade instructions.
#01	Display test (1 to action): exercises all the front panel displays. Press any key to clear.
#03	Selects the warning beeper on/off (1 to toggle)
#04	Displays the most recent message i.e. last error or warning.
#05	Displays GPIB address and prompts for new address. Abort if LOCAL/CLEAR is pressed.
#11	Allows alteration of display brightness(1-4), prompts for new setting.
#12	Blanks the carrier frequency display, (1 to toggle on/off).
#13	Blanks the carrier level display, (1 to toggle on/off).
#14	Blanks the modulation frequency display, (1 to toggle on/off).
#15	Blanks the modulation level display, (1 to toggle on/off).
#16	Set sweep step time (ms).
#17	Carrier level display in emf. Units of V, mV, μV, (1 to toggle on/off).
#18	Selects duration of the error message display, (0-9 Seconds), prompts for new setting.
#19	Assigns the back panel remote step foot switch to operate cursor up, cursor down or off.

Key sequence	Command action
#20	Selects the AGC range extension mode for glitch free alteration of carrier level, (1 to toggle on/off). See section 6.6, Applications, part i).
#21	Selects RF OFF on power up, (1 to toggle on/off).
#22	Allows certain error limits to be relaxed, (1 to toggle on/off). See section 6.6, Applications, part l).
#23	Allows selection of a wide band filter or P53A bandpass filter for SINAD noise measurements, (1 to toggle). See section 6.6, Applications, part a).
#24	Allows adjustment of the software averaging for the digital SINAD noise ratio and external level displays. Prompts for new setting.
#25	Selects sine/square wave modulation for source 1, (1 to toggle).
#26	Selects sine/square wave modulation for source 2, (1 to toggle).
#27	Selects fixed/variable [mod level/volts] AF output level at the modulation IN/OUT connector, (1 to toggle).
#28	Selects the wideband FM mode, (1 to toggle on/off).
#29	Monitors the battery/DC level when an external DC source is connected to the instrument.

Key sequence	Command action

Note: #30 to #66 display current setting and prompt for new setting. Press LOCAL/CLEAR to return to normal display.

#30	User defined tone frequency, for digit 0
#31	User defined tone frequency, for digit 1
#32	User defined tone frequency, for digit 2
#33	User defined tone frequency, for digit 3
#34	User defined tone frequency, for digit 4
#35	User defined tone frequency, for digit 5
#36	User defined tone frequency, for digit 6
#37	User defined tone frequency, for digit 7
#38	User defined tone frequency, for digit 8
#39	User defined tone frequency, for digit 9
#40	User defined tone frequency, for digit A
#41	User defined tone frequency, for digit B
#42	User defined tone frequency, for digit C
#43	User defined tone frequency, for digit D
#44	User defined tone frequency, for digit E
#45	User defined tone frequency, for digit F
#49	User defined tone preamble blank period duration.
#50	User defined tone gap duration between all tones.
#51	User defined tone duration, for 1st tone
#52	User defined tone duration, for 2nd tone
#53	User defined tone duration, for 3rd tone
#54	User defined tone duration, for 4th tone
#55	User defined tone duration, for 5th tone
#56	User defined tone duration, for 6th tone
#57	User defined tone duration, for 7th tone
#58	User defined tone duration, for 8th tone
#59	User defined tone duration, for 9th tone
#60	User defined tone duration, for 10th tone
#61	User defined tone duration, for 11th tone
#62	User defined tone duration, for 12th tone
#63	User defined tone duration, for 13th tone
#64	User defined tone duration, for 14th tone
#65	User defined tone duration, for 15th tone
#66	User defined tone duration, for 16th tone

Key sequence	Command action
#70	Enter tone sequence to be stored. [0123456789ABCDEF] with "." key to terminate.
#71	Sends continuous tone sequence, (1 to toggle on/off).
#72	Selects CCIR SELCALL system, (1 to action).
#73	Selects EEA SELCALL system, (1 to action).
#74	Selects ZVE1 SELCALL system, (1 to action).
#75	Selects DZVEI SELCALL system, (1 to action).
#76	Selects EIA SELCALL system, (1 to action).
#77	Selects NATAL SELCALL system, (1 to action).
#78	Selects DTMF tone sequence, (1 to action).
#79	Selects User tone sequence, (1 to action).
#90	Memory write protect, prompts for store number. Aborts if LOCAL/CLEAR is pressed.
#91	Removes memory write protect, prompts for store number. Aborts if LOCAL/CLEAR is pressed.
#95	The power on instrument setting is from user set stored values. Prompts for store number. **Note:** Enter store number 00 to power on from last setting.
#96	Resets instrument to default setting status, (1 to action)
#97	Instrument memory clear out keeping the instrument's current setting and any write protected stores, (1 to action).
#99	Instrument memory clear out returning the default setting, (1 to action).

6.3 REFERENCE TABLES.

The tables below show the default instrument state, states which can be stored, states initialised on power on, and user message output to the display.

Default instrument state.

The secondary command #96 can be used to force the instrument into the default state.
Note: #99 can be used to force the instrument into the default state but this command also clears the non-volatile store contents.

The default parameters are:-

Carr freq function	On
Carrier frequency	100.000000MHz
Carr level function	Off
Carrier level	-30dBm
Mod freq function	Off
Mod level function	Off
Source one	On
Modulation frequency	1.000kHz
Modulation level	10.0kHz (FM)
Mod on one	Off
Source two	Off
Modulation frequency	1.000kHz
Modulation level	50%AM
Mod on two	Off
External	Off
Modulation Level	10kHz (FM)
Mod on ext	Off
Mod off	Off
Step size	
Step on	Off
Carr freq function	On
Carrier frequency step	5.000kHz
Carr level function	Off
Carrier level step	10.00dB

Mod freq function	Off
Source 1 freq	1.000kHz
Source 2 freq	1.000kHz
Mod level function	Off
Source 1 mod level step	0.10kHz (FM)
Source 2 mod level step	10.00%AM
Sweep on	Off
Sweep time	10s (seconds)
Local/clear	Local
Memory step	Off
RF off	On
Ext ref	Off
#	Off
Cursor	Off
Rotary	Off
DC FM	Off
SINAD	Off
Ext Level	Off
GPIB address	09
Display intensity	2
CF display blank	Off
CL display blank	Off
MF display blank	Off
ML display blank	Off
Warning Beeper	On
Carrier level units	dBm
Level in Volts emf	Off
Duration of error message display	4
AGC range extension	Off
Relaxed limits	Off
SINAD filter is	P53A
SINAD noise software averaging	2
Audio mode	Mod level
Wide band FM mode	Off
Source 1 shape	Sine
Source 2 shape	Sine

User tone frequency for digit 0	100.0Hz
User tone frequency for digit 1	200.0Hz
User tone frequency for digit 2	300.0Hz
User tone frequency for digit 3	400.0Hz
User tone frequency for digit 4	500.0HZ
User tone frequency for digit 5	600.0Hz
User tone frequency for digit 6	700.0Hz
User tone frequency for digit 7	800.0Hz
User tone frequency for digit 8	900.0Hz
User tone frequency for digit 9	1.000kHz
User tone frequency for digit A	1.100kHz
User tone frequency for digit B	1.200kHz
User tone frequency for digit C	1.300kHz
User tone frequency for digit D	1.400kHz
User tone frequency for digit E	1.500kHz
User tone frequency for digit F	1.600kHz
Preamble duration	0ms
Tone gap duration	0ms
1st user tone duration	100ms
2nd user tone duration	100ms
3rd user tone duration	100ms
4th user tone duration	100ms
5th user tone duration	100ms
6th user tone duration	100ms
7th user tone duration	100ms
8th user tone duration	100ms
9th user tone duration	100ms
10th user tone duration	100ms
11th user tone duration	100ms
12th user tone duration	100ms
13th user tone duration	100ms
14th user tone duration	100ms
15th user tone duration	100ms
16th user tone duration	100ms
Tone sequence	0123456789ABCDEF
Continuous send	Off

Non-volatile storage.

The following parameters are saved in the numbered front panel stores on request. They are also automatically saved and recalled on power down and power up except where noted otherwise.

Selected function (Carr freq, carr level, mod freq, mod level)
Carrier frequency
Carrier level
Carrier level units
Modulation frequency
Modulation level
Modulation source
Cursor mode
Mod off
Step size
Step on
Sweep on
Sweep time
RF off
Ext ref
DC FM
SINAD
Ext level
Store write protect flag

The following parameters are not stored in user numbered stores, the current value only is non-volatile.

GPIB address
Display intensity
Carrier frequency display blanking.
Carrier level display blanking
Mod frequency display blanking
Mod level display blanking
Warning beeper
Level in Volts emf
Duration of error message display
AGC range extension
SINAD filter response
SINAD noise averaging
Audio mode
Wide band FM mode
Source 1 shape
Source 2 shape
User tone frequency, digits 0 to F
Preamble duration
Tone gap duration
User tone duration, tones 1 to 16

Tone sequence
Continuous send
Preferential store recall

The following parameters are volatile and are set to the default state on power on:

Remote/local (Local/clear key)	set to local.
Relaxed error limits	set to off.

User messages.

Displayed message	Comment
"Farnell Instruments PSG2400A"	----
"04 UHF loop out of lock"	Hardware fault: return unit to local service centre. See section 10.
"05 Reference absent"	Check presence of external reference signal in EXT REF mode. Possible hardware fault with internal 10MHz ref. in internal ref. mode.
"06 AGC out of lock"	Hardware fault: return unit to local service centre. See section 10.
"07 External reference still present"	Remove external reference input before selecting internal reference input.
"20 Inconsistent units."	Terminating units for data entry string do not match the selected function.
"22 Ext.mod.frequency not settable"	Cannot select mod. frequency function with **external** selected as the mod source display.
"25 Carrier frequency 100kHz<F<2.4GHz"	Carrier frequency data entry out of limits.
"26 Carrier frequency step 1Hz<FS<1GHz"	Carrier frequency step data entry out of limits.
"27 Carrier level -143dBm<L<16dBm 0.016µV<L<1.41V -36 dBµV<L<123dBµV"	Carrier level data entry out of limits.

Displayed message	Comment
"28 Carrier level step 0.05dB<LS<100dB 0.002μV<LS<1V"	Carrier level step data entry out of limits.
"29 Source 1 frequency 0.1Hz<F<500kHz"	Source 1 frequency data entry out of limits.
"30 Source 1 freq. step 0.1Hz<FS<250kHz"	Source 1 frequency step data entry out of limits.
"31 Source 2 freq 0.1Hz<F<500kHz"	Source 2 frequency data entry out of limits.
"32 Source 2 freq. step 0.1Hz<F<250kHz"	Source 2 frequency step data entry out of limits.
"33 Modulation level 0.1%AM<L<**%AM 10Hz<L<**kHz 0.01rad<L<9.99rad"	Modulation level data entry out of limits.**-Refers to specification for maximum AM/carrier level, FM/carrier frequency relationship.
"34 Mod. level step 0.1%AM<LS<50%AM 10Hz<LS<1MHz 0.01rad<LS<5rad"	Modulation level step data entry out of limits. **Note:** max FM level step accepted is 1MHZ but the max. step executed is dependent on the carrier frequency selected.
"35 Audio level 0<L<1V"	Variable output level data entry, in the audio mode (volts) after #27, out of limits.
"36 Audio level step 0<LS<0.5V"	Variable output level step data entry, in the audio mode (volts) after #27, out of limits.
"40 Step units inconsistent"	Stored step units do not match the displayed units being incremented.

Displayed message	Comment
"41 No simultaneous freq. and phase mod."	Frequency modulation and phase modulation can be set on separate sources but not selected together.
"42 Multi tone mod 0.1%AM<L<**%AM 10Hz<L<**kHz 0.01rad<L<9.99rad "	Combined modulation level from more than one modulation source exceeds the modulation level limits. **- refer to specification for max mod level-carrier freq/level relationship.
"43 AM bandwidth 0Hz<F<50kHz"	AM bandwidth data entry out of limits.
"44 AC FM or PM bandwidth 50Hz<F<500kHz"	FM/PM bandwidth data entry out of limits.
"45 External mod level/type as source 2"	An attempt to change the external mod level/type with mod source 2 selected.
"50 Store write protected"	New data cannot be stored at this location until write protect is removed.
"51 Store not in use"	Recalled store location is empty.
"52 Cannot store with relaxed limits"	Relaxed error limits set with secondary function #22. Reselect #22 and remove relaxed limits to store.
"53 Non-volatile memory corrupted"	Memory corruption detected on either power up or memory recall. The instrument is reset to default condition for power on fault and flagged but ignored for corrupted store.

Displayed message	Comment
"54 End of used stores"	Warning of memory stepped to either the last or first used store location.
"55 Sweep limits not set"	Sweep limits not set in either store 01 or store 02.
"61 Wrong number of tones"	Number of tones do not match the system selected.
"62 No tones with mod off"	Turn mod on to send the tone sequence.
"63 Not allowed in audio source mode"	MOD ON EXT key invalid in audio mode (volts). #27 to change to audio mode (mod level) before selection.
"64 Not allowed in wideband FM mode"	Selection of MOD ON TWO is not allowed in wideband FM mode.
"70 Reverse power overload"	Remove the source of reverse power overload and reset using the RF OFF key.
"75 Command not recognised"	GPIB command not recognised.
"76 Data incomplete"	GPIB bus command requires more data.
"77 Excess data"	Excess data for the received GPIB command.
"No error since reset"	Displayed, as a result of selecting secondary command #04, if no error message has been acknowledged since a power on/reset.
"External mod level/type as source 2"	Selecting modulation source 2, with external, forces the external modulation level and type to be the same as source 2.

Displayed message	Comment
"FM set to maximum at new CF"	Change in carrier frequency causing the current setting of FM level to be out of limits. The FM level is set to the maximum allowed for the carrier frequency selected.
"PM set to maximum at new CF"	Change in carrier frequency causing the current setting of PM level to be out of limits. The PM level is set to the maximum allowed for the carrier frequency selected.
"AM set to maximum at new CL"	Change in carrier level causing the current setting of AM level to be out of limits. The AM level is set to the maximum allowed for the carrier level selected.
"Recalling memory location"	-----
"CL reduced to maximum at new CF"	New carrier frequency setting not compatible with current carrier level. Carrier level is reduced to maximum specified value.
"CL returned to set value"	Carrier level returned to previous setting if carrier frequency is reduced such that the two settings are again compatible.
" FM / PM / AM restored to set value"	Modulation level returned to previous setting if carrier function is changed such that the two settings are again compatible.
"External DC input is **.*V"	Displays external DC input level as a result of #29 command.

Displayed message	Comment
"Write protecting store"	Control system write protecting a store as a result of #90 command.
"Removing write protect on store"	Control system removing write protect from a store as a result of #91 command.
"Restoring default values"	Control system setting the instrument to default values as a result of #96 command.
"Resetting non-volatile stores"	Control system clearing the non-volatile stores and setting the instrument to default values as a result of #99 command.

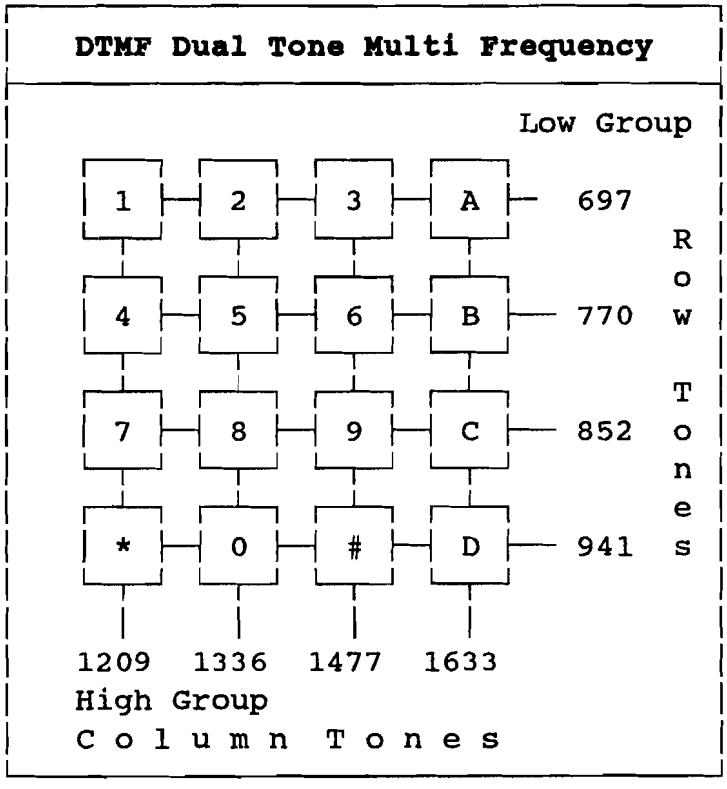
Selcall Tone Frequencies.

SEQUENTIAL SYSTEMS						
TONE	CCIR	EEA	ZVEI	DZVEI	EIA	NATEL
0	1981		2400	2200	600	1633
1	1124		1060	970	741	631
2	1197		1160	1060	882	697
3	1275		1270	1160	1023	770
4	1358		1400	1270	1164	852
5	1446		1530	1400	1305	941
6	1540		1670	1530	1446	1040
7	1640		1830	1670	1587	1209
8	1747		2000	1830	1728	1336
9	1860		2200	2000	1869	1477
Repeat	2110		2600	2400	459	1805
Group	2400	1055	2800	885	2010	1995
Alarm	-	2400	-	-	-	-
Tone length	100ms	40ms	70ms	70ms	33ms	70ms

Note:

The group and alarm tones are not incorporated in the standard five tone sequence software, but may be generated using the user defined tone sequence capability.

Dual Tone Multi Frequency (DTMF)



Note: Frequencies paired as shown in matrix.

6.4 REMOTE OPERATION USING GPIB (IEEE 488.2)

The IEEE 488.1 bus standard and the IEEE 488.2 code standard are fully supported. The use of IBM-PC or compatible computers with IEEE 488.2 interface cards and software drivers supplied by National Instruments Corporation (also available from Farnell) is recommended. A LabWindows driver is available for this instrument.

IEEE 488.1 functions supported:

SH1 Source handshake
AH1 Acceptor handshake
T6 Basic talker, serial poll, on talk only, untalk on MLA
TEO No talker with secondary addressing
L4 Basic listener, no listen only, unlisten on MTA
LEO No listener with secondary addressing
SR1 Full service request
DC1 Full device clear
RL1 Full remote/local
PPO No parallel poll
DT0 No device trigger
CO No controller
E2 Tri state driver

a) String Formats and Protocol

When addressed to listen, a new line character and/or the EOI line asserted will be recognised by the instrument as a terminator. When addressed to talk, the instrument response message is terminated with the assertion of the EOI line coincident with the New Line character on the data bus.

The instrument command interpreter is case insensitive. There must be at least one space character between any command header and the following data and any following terminator.

If multiple commands are sent all together, they must be separated by a semi-colon as shown on the example below:

CF 1.6789543E+8 HZ ; M1L 35.8 %AM ; M1F 1 kHz ; M1-ON ; MOD-ON

The total message length must not exceed the instrument input buffer size which is 80 bytes.

The user can only change the GPIB address from the front panel. Pressing the keys #05 displays the current address and prompts for a new address. Change the address if required and use the LOCAL/CLEAR key to exit the secondary command. The GPIB address is non-volatile.

b) Listen Functions

Commands requiring no data:

CSR-ON	Set cursor on
CSR-OFF	Set cursor off. Note CSR-OFF does not inhibit up or down increment.
STEP-ON	Sets step function on.
STEP-OFF	Sets step function off but does not inhibit the following step commands.
CFU	Carrier frequency step up.
CFD	Carrier frequency step down.
CLU	Carrier level step up.
CLD	Carrier level step down.
M1FU	Modulation frequency, source 1, step up.
M1FD	Modulation frequency, source 1, step down.
M2FU	Modulation frequency, source 2, step up.
M2FD	Modulation frequency, source 2, step down.
M1LU	Modulation level, source 1, step up.
M1LD	Modulation level, source 1, step down.
M2LU	Modulation level, source 2, step up.
M2LD	Modulation level, source 2, step down.
EXTLU	External modulation level step up.
EXTLD	External modulation level step down.

ROTY-ON	Set rotary on.
ROTY-OFF	Set rotary off.
INT-REF	Select internal 10MHz reference.
EXT-REF	Select external reference.
RF-ON	Set RF on.
RF-OFF	Set RF off.
DCFM-ON	Set DC FM on.
DCFM-OFF	Set DC FM off.
MOD-ON	Set modulation on.
MOD-OFF	Set modulation off.
M1-ON	Set modulation source 1 on.
M1-OFF	Set modulation source 1 off.
M2-ON	Set modulation source 2 on.
M2-OFF	Set modulation source 2 off.
EXT-ON	External modulation source on.
EXT-OFF	External modulation source off.
SWP-ON	Set sweep on.
SWP-OFF	Set sweep off.
MEMSTEP-ON	Set memory step on.
MEMSTEP-OFF	Set memory step off.
BLEEP-ON	Set the bleeper on.
BLEEP-OFF	Set the bleeper off.
CF-BLANK	Carrier frequency display blank.
CF-VIEW	Carrier frequency display view.

CL-BLANK	Carrier level display blank.
CL-VIEW	Carrier level display view.
MF-BLANK	Modulation frequency display blank.
MF-VIEW	Modulation frequency display view.
ML-BLANK	Modulation level display blank.
ML-VIEW	Modulation level display view.
VEMF-ON	Carrier level units to V, mV, μV emf.
VEMF-OFF	Carrier level units to V, mV, μV pd.
AGCEXTENDED	Selects AGC range extension mode for glitch free alteration of carrier level.
AGCNORMAL	Removes the AGC range extension.
RELAXLIM-ON	Allows certain error limits to be relaxed.
RELAXLIM-OFF	Removes relaxed error limits.
SINAD-ON	Sets SINAD on.
SINAD-OFF	Sets SINAD off.
SFIL-WB	Sets wide band filter for SINAD measurement.
SFIL-P53A	Sets P53A filter for SINAD measurement.
M1SINE	Sets sine wave modulation for source 1.
M1SQR	Sets square wave modulation for source 1.
M2SINE	Sets sine wave modulation for source 2.
M2SQR	Sets square wave modulation for source 2.
AFMODE-ON	Sets variable AF level at the modulation output.
AFMODE-OFF	Sets fixed AF level at the modulation output.
WBFM-ON	Sets wide band FM mode.
WBFM-OFF	Deselects wide band FM mode.

EXTLEV-ON	Sets External level on to monitor the volts RMS at the modulation input.
EXTLEVEL-OFF	Sets external level off returning the display to show modulation source.
CTONES-ON	Sends continuous tone sequence.
CTONES-OFF	Deslects continuous tone sequence.
LOCAL	Go to local state (deselects GPIB control).
CLEAR	Instrument is returned to last valid setting.
*RST	Resets instrument to the default setting, (same as #96).
CLRMEM	Instrument memory clear out keeping the instrument's current setting and any write protected stores, (same as # 97).
TOTAL-RESET	Instrument memory clear out returning the default setting, (same as #99).

Commands requiring data:

Note the syntax used below: [ ] means the enclosed entry is optional, < > means the enclosed data must be provided and ... means repeat as required.

CF <n...>	[GHz] [MHz] [kHz] [Hz]	To change the carrier frequency as required. Floating point data is acceptable. Valid range is 10kHz to 2.4GHz.
M1F <n...>	[MHz] [kHz] [Hz]	To change the modulation frequency on source 1 as required. Floating point data is acceptable. Valid range is 10Hz to 500.0kHz. **Note:** MR <n...> ≡ M1F <n...>
M2F <n...>	[MHz] [kHz] [Hz]	To change the modulation frequency on source 2 as required. Floating point data is acceptable. Valid range is 10Hz to 500.0kHz.

CL <n...>	[dBm] [dBuv] [V] [mv] [uv]	To change the carrier level as required. Floating point data is acceptable. Valid range is -143.0dBm to +16.0dBm.
M1L <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level on source 1 as required. Floating point data is acceptable. Valid range is 0kHz to 2.0MHz FM, 0 to 99.9 %AM and 0 to 9.99 rad PM. note: ML <n...> ≡ M1L <n...>
M2L <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level on source 2 as required. Floating point data is acceptable. Valid range is 0kHz to 2.0MHz FM, 0 to 99.9 %AM and 0 to 9.99 rad PM.
EXTL <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level on the external source as required. Floating point data is acceptable. Valid range is 0kHz to 2.0MHz FM, 0 to 99.9 %AM and 0 to 9.99 rad PM.

Note: The commands CF, CL, M1F, M2F, M1L, M2L, and EXTL can be followed by no data. This enables the cursor in the selected function window.

CF-SS <n...>	[GHz] [MHz] [kHz] [Hz]	To change the carrier frequency step size as required. Floating point data is acceptable. Valid range is 1Hz to 1GHz.
M1F-SS <n...>	[MHz] [kHz] [Hz]	To change the modulation frequency step size, on source 1 as required. Floating point data is acceptable. Valid range is 0.1Hz to 250kHz. **Note:** MR-SS <n...> ≡ M1F-SS <n...>
M2F-SS <n...>	[MHz] [kHz] [Hz]	To change the modulation frequency step size, on source 2 as required. Floating point data is acceptable. Valid range is 0.1Hz to 250kHz.

CL-SS <n...>	[dBm] [dBuv]	To change the carrier level step size as required. Floating point data is acceptable. Valid range is +/-0.05dB to +/-100dB.
M1L-SS <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level step size on source 1 as required. Floating point data is acceptable. Valid range is 10Hz to 1MHz FM, 0.1 to 50 %AM and 0.01 to 5.0 rad PM. **Note:** ML-SS <n...> ≡ M1L-SS <n...>
M2L-SS <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level step size on source 2 as required. Floating point data is acceptable. Valid range is 10Hz to 1MHz FM, 0.1to 50 %AM and 0.01 to 5.0 rad PM.
EXTL-SS <n...>	[MHz] [kHz] [%AM] [rad]	To change the modulation level step size on the external source as required. Floating point data is acceptable. Valid range is 10Hz to 1MHz FM, 0.1 to 50 %AM and 0.01 to 5.0 rad PM.
SWPT <n...>	[s] [ms]	Set sweep time as required. Floating point data is acceptable. Valid range is 1 to 999 seconds.
*STO <nn>		Store a front panel setting in store nn. Valid range is 01 to 99.
*RCL <nn>		Recall a front panel setting from store nn. Valid range is 00 to 99.
WP <nn>		Write protect store nn. Valid range is 01 to 99.
UNWP <nn>		Remove write protection of store nn. Valid range 01 to 99.
BRIGHT <n>		Sets display brightness. Valid range is n = 0 to 4.
MDUR <n>		Sets duration of error message display. Valid range is n = 0 to 9 seconds.
AVERAGE <n>		Sets the number of software averages for the digital SINAD noise ratio display. Valid range is n = 0 to 7.

Commands for defining standard 5 tone sequences:

CCIR	Sends CCIR tone sequence.
EEA	Sends EEA tone sequence.
ZVEI	Sends ZVEI tone sequence.
DZVEI	Sends DZVEI tone sequence.
EIA	Sends EIA tone sequence.
NATEL	Sends NATEL tone sequence.
DTMF	Sends DTMF tone sequence.
USER	Sends user defined tone sequence.

Commands for user defined tones:

TF0 <n...>	[kHz]	To change the tone frequency sequence as required.
TF1	[Hz]	Floating point data is acceptable.
TF2		Valid range 10Hz to 500.0kHz.
.		**Note:** 0Hz is used to select a blank period.
.		**Note:** TFA <n...> ≡ TF10 <n...> etc.
TFE		
TFF		
TL1 <n...>	[s]	To change the tone length sequences as required
TL2	[ms]	Floating point data is acceptable.
TL3		Valid range 1ms to 999ms.
.		
TL15		
TL16		
GAP <n...>	[s]	Sets gap duration between all the tones.
	[ms]	Valid range is 0 to 999msec.
PREAMB <n...>	[s]	Sets preamble blank period duration.
	[ms]	Valid range is 0 to 999msec.
TSEQ <"c...">		Defines the tone sequence. Valid characters are:- 0123456789ABCDEF. Number of tones accepted are 1 to 16. Data sent as quoted string. e.g. TSEQ"37AB4"

When entered data is not followed by a units termination, the default settings are:

CF	[Hz]	CF-SS	[Hz]
M1F	[Hz]	M1F-SS	[Hz]
M2F	[Hz]	M2F-SS	[Hz]
CL	[dBm]	CL-SS	[dBm]
M1L	[Hz]	M1L-SS	[Hz]
M2L	[Hz]	M2L-SS	[Hz]
EXTL	[Hz]	EXTL-SS	[Hz]
SWPT	[s]		
TF0---TFF	[Hz]	TL1---T16	[s]

c) Talk Functions

The commands listed below will cause the instrument to transmit data:

CF?	Returns carrier frequency to a resolution of 1Hz in Hz as floating point data e.g. 6.78000000E8 = 678MHz
M1F? M2F?	Returns modulation frequency to a resolution of 0.1Hz in Hz as floating point data. e.g. 2.540E2 = 254Hz **Note:** MR? ≡ M1F?
CL?	Returns carrier level to a resolution of 0.01dB as floating point data. e.g. -107.00E0 = -107.00dBm
M1L? M2L? EXTL?	Returns AM to a resolution of 0.1% when in the AM mode, the deviation in Hz when in the FM mode, and the deviation in rads when in the PM mode as floating point data. e.g. 56.00E0 can equal 56.00%AM. **Note:** ML? ≡ M1L?

BATT?	Returns the battery level.
READ?	Triggers a SINAD or external level reading with averaging and returns data.
*TST?	Performs self test and returns integer 1 for pass and integer 0 for fail.
*IDN?	Returns the message "Farnell PSG2400A Ver" where Ver is replaced by the software version number and date.

d) The Status Byte Register

The status byte register has the format specified in IEEE 488.2. Bit 5 is the Event Status bit. Bit 4 is the message available bit, set whenever the PSG2400A wants to talk. Bit 6 is the Master Summary bit, set whenever the PSG2400A needs to request service, although it is not sent when the controller performs a serial poll.

The Service Request Enable register is an 8 bit register set with the *SRE command. This register is used to mask the Status Register such that whenever anything changes in the Status Register, if the corresponding bit is set in the *SRE register, then a service request is issued.

The Event Status register is implemented except for the user request and request control bits. The command error bit is set whenever an illegal command, or out of range data value is detected. The execution error bit is set when a command cannot be executed (e.g. Mod level stepping in the AM mode with an FM step set) or syntactically incorrect data is detected.

The Event Status Enable register is supported. This is a mask register written using the *ESE command which functions as follows. Whenever a bit goes high in the Event register, if the corresponding bit is set in the ESE register, then the Event Status bit in the status register will be set.

The following IEEE 488.2 status commands are implemented:

*CLS	Clear status register and associated status data structures.
*ESE <n...>	Set the standard Event Status Enable register bits, with n ranging from 0 to 255.
*SRE	This command sets the Service Request Enable register. This register determines which bits in the status byte will cause a Service Request from the device.
*ESE?	Returns the current contents of the Standard Event Status Enable register as an integer in the range 0 to 255.
*ESR?	Returns the current contents of the Standard Event Status register as an integer in the range 0 to 255. Reading this register clears same.
*SRE?	Returns the current contents of the Service Request Enable register as an integer in the range 0 to 63 and 128 to 191.
*STB?	Returns the current contents of the status byte with the Master Summary bits as an integer in the range 0 to 255. Bit 6 represents Master Summary Status rather than Request Service.

6.5 BACK PANEL FACILITIES.

Lower case letters below refer to the annotated drawing adjacent to this page.

a) Combined AC power inlet, RFI filter, voltage selector and fuse.

b) Combined AC and DC power input on/off switch.

c) Three pin DC input socket.

d) DC input fuse.

e) Internal 10MHz reference output/external reference input connector. Signal levels are:-
0.6 Volts pk-pk output level into 50Ω and
0.3 to 3 Volts pk-pk input level.

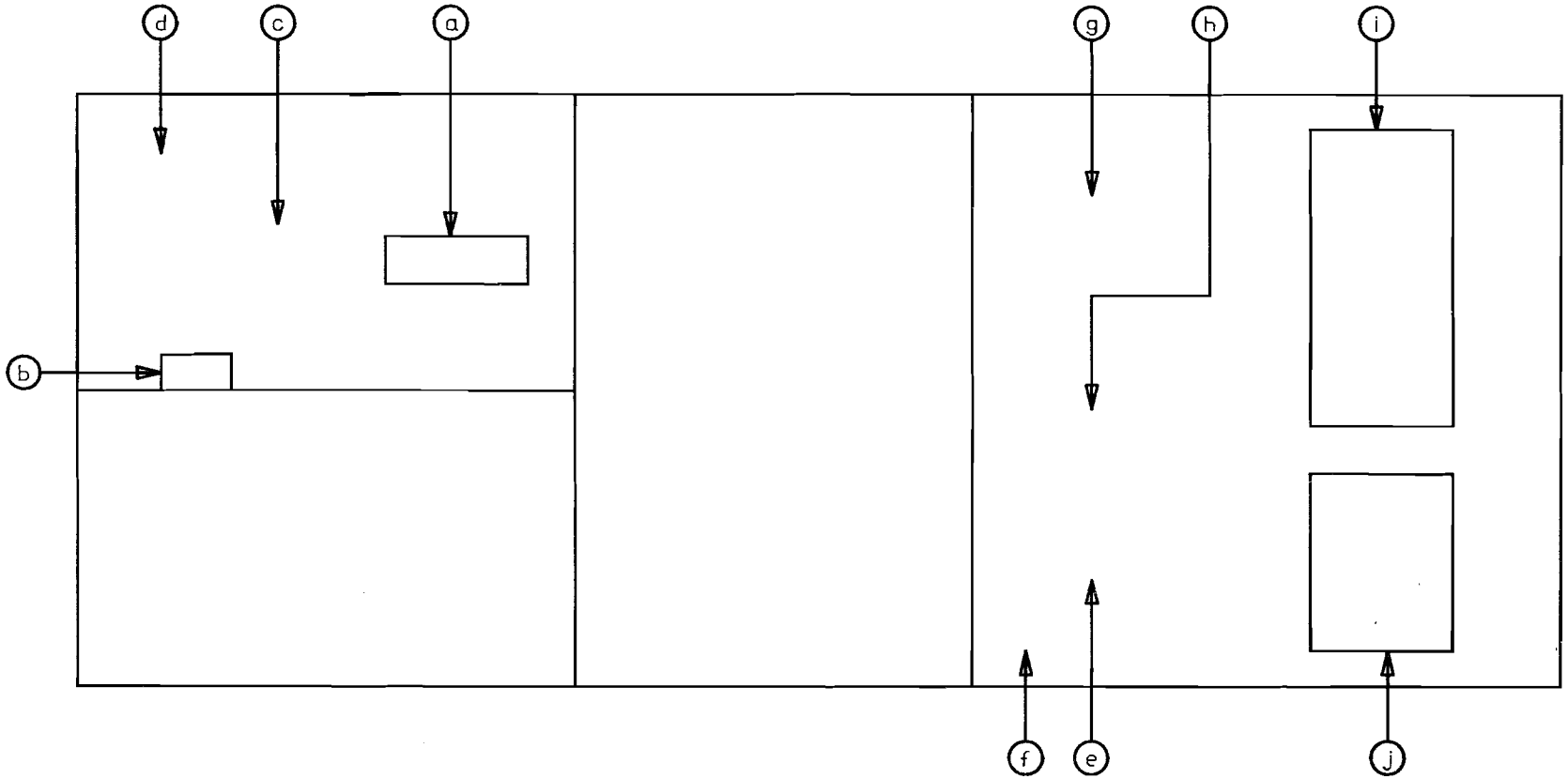
f) Internal reference frequency adjustment. See section 9, Calibration Procedure, for details.

g) Rear panel RF output option (if fitted). Blanking plug fitted as standard.

h) Pulse modulation option input connector (if fitted). Blanking plug fitted as standard.
See section 6.6, Applications, part n).

i) GPIB (IEEE-488) connector.

j) Nine way auxiliary connector for access to the sweep sync ramp output, analogue SINAD indication and remote stepping functions.
See section 6.6, Applications, part m).



ISS	A									USED ON: PSG2400A	UNLESS OTHERWISE STATED: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.
DATE	23.4.92										
MOD. NO.	-										
CHK'D											
DRWN	ST										

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: BACK PANEL CONNECTIONS AND CONTROLS

DRAWING NO. 3SZX0743

SHEET OF SHEETS

6.6 APPLICATIONS.

a) SINAD measurement.

The maximum usable sensitivity of a receiver is the minimum level of signal at the receiver input, at the nominal frequency of the receiver and with normal test modulation, which will produce an audio output signal having a:-

$$\frac{\text{Signal + Noise + Distortion}}{\text{Noise + Distortion}}$$ ratio of 12dB. (the SINAD ratio)

Normal test modulation is 30% AM or 60% of maximum FM deviation at 1.000kHz rate.
This test is simply performed using the PSG2400A by connecting the instrument RF output to the receiver RF input and connecting the receiver audio output (across the speaker or dummy load) to the SINAD input.
The SINAD input has a dynamic AGC range of 30mV to 3V rms. (-40dB), which will cope with most receiver audio output stages.
With a high level RF signal of 1mV (-47dB) supplied to the receiver, adjust the volume control to 50% of maximum.
Press the SINAD key and observe the displayed SINAD ratio which will be typically 30dB or greater.

Now reduce the RF level supplied to the receiver, observing the SINAD reading, until the 12dB ratio is reached. The indicated RF level on the PSG2400A is the maximum usable sensitivity of the receiver under test.

There are two selectable SINAD noise measurement filters, either wideband (60Hz to 6kHz) or CCITT P53A (300Hz to 3kHz) bandpass filters. Using the secondary command #23 selects the desired bandwidth. For optimum results the CCITT P53A filter is recommended.

To reduce measurement errors with high noise levels, true rms detection is employed and the secondary command #24 allows user defined software averaging of the displayed SINAD ratio.

b) Modulation output.

The modulation output connector provides a fixed level signal of 1Volt rms into 50Ω and may be used to view the internal modulation applied to the carrier. This output is DC coupled with a nominal source impedance of 50Ω and is designed to drive impedances of 50Ω.

Note:- The application of reverse signals in excess of +/-5V may result in permanent damage to the AF output stage.
When both internal sources are selected the signals are summed together before the modulation DACS, hence the output will be a composite signal of up to 2V rms amplitude.

The instrument may be used as a 500kHz synthesized audio source by selecting either source one or source two and entering the desired frequency as modulation frequency. By selecting the secondary command #27 the modulation DAC output is routed to the AF output stage thus enabling the output level to be adjusted in 1mV steps up to 1.0V rms.
If desired the two internal sources may be mixed together to produce a composite signal with independently adjustable levels. Additionally source one or source two may be selected to produce a square wave output by utilising the secondary commands #25 and #26. In this mode the amplitude of the square wave is the pk-pk equivalent of the displayed audio level.
ie. 1.0V rms = 2.82V pk-pk square wave.

c) External modulation.

When MOD ON EXT is selected the carrier may be modulated by an external signal applied to the front panel modulation in/out connector. To preserve the instrument modulation calibration this external level must be adjusted to 1.00V peak (0.707V rms) by selecting the EXT LEVEL key and adjusting the external source level for the correct reading in the modulation display window.
The external level detector is true rms sensing and is calibrated for sine wave inputs, with a typical bandwidth of >2MHz.
The external modulation input is normally AC coupled but may be DC coupled by selecting the DCFM key. This is essential for zero phase shift AM and low rate digital FM signals.

Note: For DC coupled AM the external signal must not contain a DC offset as this would alter the RF level setting. In the DC coupled FM mode the unlocked carrier frequency will be subject to drift dependent upon carrier frequency range and ambient temperature fluctuations. To reduce errors it is recommended that DCFM should only be selected for the duration of the DC coupled test. With FM selected a DC input of +1.0V will give the indicated peak positive frequency deviation and correspondingly -1.0V will give a peak negative frequency deviation.

d) Wideband FM.

When using the external modulation input, with high data rates,the normal 500kHz modulation bandwidth may be extended to 10MHz by utilising the secondary command #28. In this mode the modulation signal is applied directly onto the UHF oscillator resulting in a minimum usable rate of 50kHz and giving a typical response of -3dB at 10MHz rate.
The modulation sensitivity is 1V peak (2V pk-pk), for maximum peak deviation, with no provision for internal modulation level adjustment. See section 4, Specification.

e) Complex modulation.

The two internal synthesized modulation sources may be enabled together to produce simultaneous amplitude/frequency modulation of the carrier or to produce complex dual tone modulation.
To display the selected modulation parameters of each source, toggle the MOD SOURCE DISP key. Selecting the desired MOD ON key then allows single or complex modulation tones to be generated.

When both the MOD ON ONE and MOD ON TWO keys are selected the modulation source levels are independently adjustable to produce any combination of amplitude/frequency/phase modulation or any ratio of single type dual modulation.

For example to set up modulation for a continuous tone controlled squelch system (CTCSS) with 2.5kHz deviation at 1kHz rate and a tone of 88.5Hz with a tone ratio of 20% :-

Select the MOD SOURCE DISP key to display source one. Enter a modulation frequency of 1.000kHz and a modulation level of 2.5kHz.
Toggle the MOD SOURCE DISP key to display source two and enter a modulation frequency of 88.5Hz with a modulation level of 500Hz (20% of 2.5kHz).
Now select the MOD ON ONE and MOD ON TWO keys to generate the CTCSS modulation signal.

If required, an external modulation source may be used separately by only selecting MOD ON EXT, or it can be used in any combination with sources one and two. The external source is mixed with source two before the modulation level DAC, thus when the sources are mixed together the modulation levels cannot be independently set. When this is a problem the external level can be adjusted at the source and the level monitored by selecting the EXT LEVEL key. The resulting modulation level is then:-

$$\text{(indicated modulation level)} \times \text{(external level} \times \sqrt{2})$$

Note: External level = 1V pk for calibration (i.e. $1/\sqrt{2}$V rms).
When multiple modulation sources are selected the combined modulation level is not allowed to exceed the maximum permissible depth or deviation.

f) Amplitude modulation.

In the normal mode of operation full AM depth is available for carrier levels of <+10dBm. For carrier levels of ≥+10dBm a limited AM depth is allowed (with unspecified accuracy and distortion) according to the table below.

CARRIER LEVEL dBm	AM DEPTH %
+10.0	90.0
+11.0	70.0
+12.0	60.0
+13.0	40.0
+14.0	30.0
+15.0	10.0
+15.9	1.0

g) DTMF.

The use of two internal synthesized modulation sources allows DTMF signals to be generated in accordance with the standard format. Refer to section 6.3, Dual Tone Multi Frequency chart.

For correct operation the modulation type and level for source 1 and source 2 should be set identically.

If required, a preamble blank period or gap between tones may be programmed by selecting the secondary functions #49, #50 respectively. A continuous tone burst send may also be initiated by selecting the secondary command #71.

By selecting external modulation, an external tone may be mixed onto the DTMF signal but this signal will be of the same modulation type and level as selected for source 2.

h) SELCALL tones.

The standard 5 tone SELCALL system sequences are generated internally with allowance made for a preamble blank period preceding the tone burst. This preamble period may be set using the secondary command #49, with a minimum recommended duration equal to the complete tone burst duration. If this preamble period is too short, any modulation present previous to the tone burst, may result in false triggering of the radio tone decoder.

A gap between the tones may also be programmed by selecting the secondary command #50.

To aid fault finding on the radio tone decoder, a continuous tone send may be programmed by selecting the secondary command #71.

For sequential systems not covered by the standard 5 tone sequences, user defined tones bursts may be assembled with up to 16 tones allowed.
Refer to section 6.1, part m), First Time Operation.

If required another modulation signal may be mixed continuously with the tone burst by selecting either source 2 or external modulation. In this mode the additional modulation signal is not blanked during the preamble period. To avoid false triggering of the radio tone decoder this modulation tone frequency must not lie within acceptable limits of the SELCALL tones.
Refer to section 6.3 SELCALL Tone Frequencies.

i) Attenuator level glitches.

The instrument RF level setting is obtained by a combination of fixed 6dB step attenuators switched by relays and 0.05dB steps obtained from the output AGC loop.
At the attenuator change points of +3.95dBm, -2.05dBm etc. the RF output would be momentarily undefined for a period of approximately 3ms as the relays change over. During this period the AGC level is set to zero and then reinstated at the new value, resulting in level switching glitches which have a defined low to high transition.
To eliminate this level glitch over a 12dB RF level change, it is possible to extend the normal range of AGC loop so that the fixed step attenuator change points occur at intervals of 12dB instead of 6dB.
This AGC range extension mode is selected by utilising the secondary command #20. The front panel auxiliary information LED, AGC RANGE EXTENSION, will be illuminated in this mode.

j) Crystal reference input/output.

For synchronising two sources together the internal 10MHz crystal reference signal is available on the back panel BNC connector.

This square wave output has a nominal level of 0.6V pk-pk and is designed to drive load impedances of 50Ω. With large capacitive loads excessive ringing of the waveform edges may occur resulting in false triggering. It is recommended that connecting cables should be as short as possible.

When EXT REF is selected the instrument may be referenced from an external 10MHz frequency standard with an input level of 0.3 to 3V pk-pk required for reliable operation. The external reference signal must be removed before it is possible to revert to internal reference.

Warning! When EXT REF is selected and the external signal is of low level or not present, the front panel auxiliary information LED "NO REFERENCE" will illuminate and the instrument RF output will not be valid.

k) Using sweep.

By utilising the secondary command #16 it is possible to define the duration between consecutive steps (the "dwell" time), with a minimum value of 68msec allowed.
This allows the step increment to be calculated which is useful for setting integer steps.

If D = dwell time (ms) and T = total sweep time (ms)

$$\text{The number of steps per sweep } (X) = \frac{T}{D}$$

$$\text{and the step increment} = \frac{\text{Total sweep}}{X}$$

For example: to set a frequency step increment of 1MHz over a total sweep of 50MHz:-

$$X = \frac{\text{Total sweep}}{\text{step increment}} = \frac{50}{1} = \frac{T}{D}$$

If the dwell time is set at 400ms, the total sweep time required is:-

50 x 400ms = 20 seconds.

For carrier frequency sweeps unavoidable frequency and level glitches will occur at the main range change points as the UHF synthesizer relocks and range dividers are switched in. These change points are located at 37.5, 75, 150, 300, 600 and 1200MHz. Additional range change points also occur on the UHF oscillator and the VHF loops resulting in typical glitches of 100ms duration.

In applications where these glitches are a problem, it is preferable to choose sweep start and stop frequencies which do not include a main range change boundary, or alternatively define a dwell time which is >5 times the glitch period.

Similarly for carrier level sweeps level glitches will occur at the attenuator change points, starting at +3.95dBm as the level is reduced and repeating every 6dB. See part i) of this section.

The sweep values in store 01 may be lower or higher than the values in store 02, thus enabling sweep up or sweep down functions to be performed.

For sweep synchronisation an analogue ramp is provided on the back panel auxiliary socket. See part m) of this section.

l) Relaxed error limits.

For the functions of carrier level, carrier frequency and FM deviation it is possible to relax the normal error limits by using secondary command #22, thus providing an extended unspecified region of operation. In this mode the front panel LED indicating LIMITS RELAXED will be illuminated.

1) With carrier level the normal limit of +16dBm, for carrier frequencies ≥600MHz, may be increased to allow settings to +19.0dBm. The typical maximum RF level available is +19dBm up to 1.0GHz and +18dBm above.

2) For carrier frequency the normal limits are 100kHz to 2.4GHz. The allowable extended range is from 50kHz to 2.5GHz with the RF level response typically -1dB at 50kHz and 2.5GHz.

3) The normal FM deviation limit of 2MHz peak for carrier frequencies ≥1.2GHz may be extended to 9.99MHz peak indication with a proportional increase for lower carrier frequencies.

m) Auxiliary Connections.

A 9 way "D" type auxiliary connector is located on the back panel and provides access to 3 standard functions.

1) Remote step (pin 7).
   By setting the secondary command #19, the remote step can be assigned to operate cursor up, cursor down or switched off. In this mode connecting pin 7 to 0V (pin 6) will be identical to the cursor up/down key selection. This enables any selected front panel function to be altered but is probably most useful with memory step selected so that predetermined front panel set ups can be accessed remotely.
   For remote step operation a foot switch accessory, complete with 2 metres of cable and a "D" type connector, is available. Refer to section 4, Order Codes/Options/Accessories.

   Warning: Pin 7 is a logic level input. Signals outside the range of 0 to +5V should not be applied.

2) Auxiliary DVM (pin 8)
   This output allows an external analogue meter to be used as a monitor for SINAD measurements. The source impedance is 2.5kΩ nominal, with FSD equivalent to +2.5V nominal.

3) Sweep synchronisation (pin 9).
   In the sweep mode an analogue ramp is produced on this output with 0V corresponding to the start of the sweep and +10Volt nominal to the end of the sweep. This output is not designed to drive load impedances of <5kΩ.

n) Pulse Modulation.

When this option is fitted it is located in the RF output path of the instrument and provides high carrier on/off ratio (>60dB) with fast switching characteristics (<25ns). To account for the modulator insertion loss all carrier level specifications are reduced by 3dB, giving a maximum carrier level of +13dBm (overrange to +16dBm, carrier frequency <600MHz) and spectral purity/AM performance specified to <+7dBm.

The modulator is controlled via the back panel pulse mod BNC connector, which has a TTL switching characteristic with a nominal threshold of +2V. With no control signal applied this input is referenced to +5V internally, corresponding to carrier on. When a TTL low signal is applied the carrier will be turned off.

o) Operation From a DC Power Source.

When the instrument is operating from an external DC source the input level may be monitored by using secondary command #29, which sets the display to read "External DC input" with a resolution of 0.1V.

For the standard 12V input the valid DC range is +11.5V to +15V DC (+23.0V to +30.0V DC for the 24V DC option). The nominal supply current is 3 Amps for the standard 12V unit (1.5 Amps for the 24V option).

A chassis earth pin is provided in the DC input socket which can be left unterminated for floating systems.

For operation from a vehicle electrical system the chassis earth pin should be linked to the appropriate DC negative/positive pin to match the vehicle negative/positive earth system.

An external rechargeable 12V battery pack accessory, which attaches to the side of the instrument, is also available. Refer to section 4, Order Codes/Options/Accessories.

p) Reverse Power Protection.

To reduce the possibility of the reverse power protection circuit self triggering on internal carrier levels up to +19dBm, the internal trip level is increased proportionately for carrier levels >+4dBm, thus preserving the maximum damage protection over a wide range of carrier level settings.

Under exceptional conditions where the RF attenuator VSWR is >>1 (ie. RF output open circuit) the reverse power protection may self trip at some carrier frequencies, when a voltage peak occurs at the reverse power detector diode.
If this condition arises the RF output must be terminated in a 50Ω load before it is possible to reset the protection circuit.

7. OVERALL BLOCK DIAGRAMS AND THEORY OF OPERATION.

7.1 INTRODUCTION.

The design of a synthesized signal generator to cover the frequency range 100kHz to 2.4GHz could be based upon multiple RF oscillators, but the resulting complexity would be prohibitive both to the physical size and the reliability of the instrument.

The PSG2400A uses an octave range UHF oscillator operating from 600MHz to 1200MHz, with further ranges derived by successive binary division. The frequency range is then further extended by frequency mixing and doubling techniques.

Two further synthesizer loops improve the frequency resolution to 10Hz and allow the carrier to be frequency modulated. Incorporating an AGC loop in the RF output path allows the carrier to be amplitude modulated, improves the level accuracy and enables the carrier level to be incremented in 0.1dB steps.

The addition of two 500kHz audio synthesizers provides more versatility than the usual spot frequencies and allows the carrier to be modulated with single or dual tones and simultaneous AM/FM modulation.

7.2 FUNCTIONAL DESCRIPTION OF THE PSG2400A CIRCUIT BOARDS.

Refer to the RF Output and Synthesizer block diagrams

a) Crystal Reference Board.

This board determines the accuracy of the carrier frequency by providing reference signals for the various loops.
A 10MHz temperature compensated crystal oscillator provides a 5MHz reference signal for the Control Board and a 10MHz signal for the Coarse Step Board.
This board also generates a 160MHz local oscillator signal for the RF Output Board mixer, when carrier range 0 (0.1MHz to <37.5MHz) is selected.
Provision for the use of an external 10MHz reference is catered for with a back panel BNC socket.

b) VHF Coarse Step Loop Board.

A VCO of range 118.0MHz to 122.75MHz is phased locked to a 50kHz signal, derived from the main 10MHz reference, thus producing frequency steps of 50kHz. The loop division ratio is set by data provided by the Control Board. Frequency modulation is also added to this loop.

c) VHF Fine Step Loop Board.

This board provides a 2.0MHz to 2.05MHz reference frequency, in 1Hz to 2Hz steps, for the heterodyne loop. The loop VCO operates from 100MHz to 102.5MHz with the programmable counters enabling frequency steps of 50Hz to 100Hz. After division by 50 the signal passes to the heterodyne loop. This loop utilises a programmable logic device to reduce component count.

d) VHF Heterodyne Loop Board.

The VHF Heterodyne Loop Board combines together the coarse step and fine step loops to produce a signal with a resolution of 1Hz to 2Hz. This loop VCO operates from 120MHz to 124.8MHz and is phase locked to the 2.0MHz to 2.05MHz reference signal from the Fine Step Board. The Coarse Step Board output is applied to one input of the loop mixer thus transferring 50kHz frequency steps onto the heterodyne loop VCO. The output signal then forms the reference signal for the UHF step loop.

e) UHF Step Loop Board.

The UHF Step Loop Board phase locks the main UHF oscillators, located on the Range Divider Board, to a reference frequency, from the VHF heterodyne loop, to produce a synthesized signal of range 600MHz to <1200MHz in 10Hz steps. Frequency modulation is also applied to this loop, enabling the FM bandwidth to be extended up to 500kHz rate.

f) Range Divider Board.

This board converts the 600MHz to <1200MHz UHF oscillator range into four additional ranges, by successive binary division, to produce an output of 37.5MHz to <1200MHz. Tracking filters are included for each range ensuring low harmonic distortion output signals. The wide band FM signal is applied directly on to the UHF oscillator tune line enabling the FM bandwidth to be extended up to 10MHz rate.

g) RF Output Board.

The RF Output Board enhances the frequency range of the generator to cover 0.1MHz to 2.4GHz, utilising frequency mixing and doubling techniques. Amplitude modulation of the carrier is also performed on this board. Further amplification combined with a wide range of RF attenuator results in a carrier level range of +16/19dBm to -143.0dBm with a resolution of 0.05/0.1dB.

h) Control Board Digital Section and Front Panel.

Refer to the Control Block Diagram.

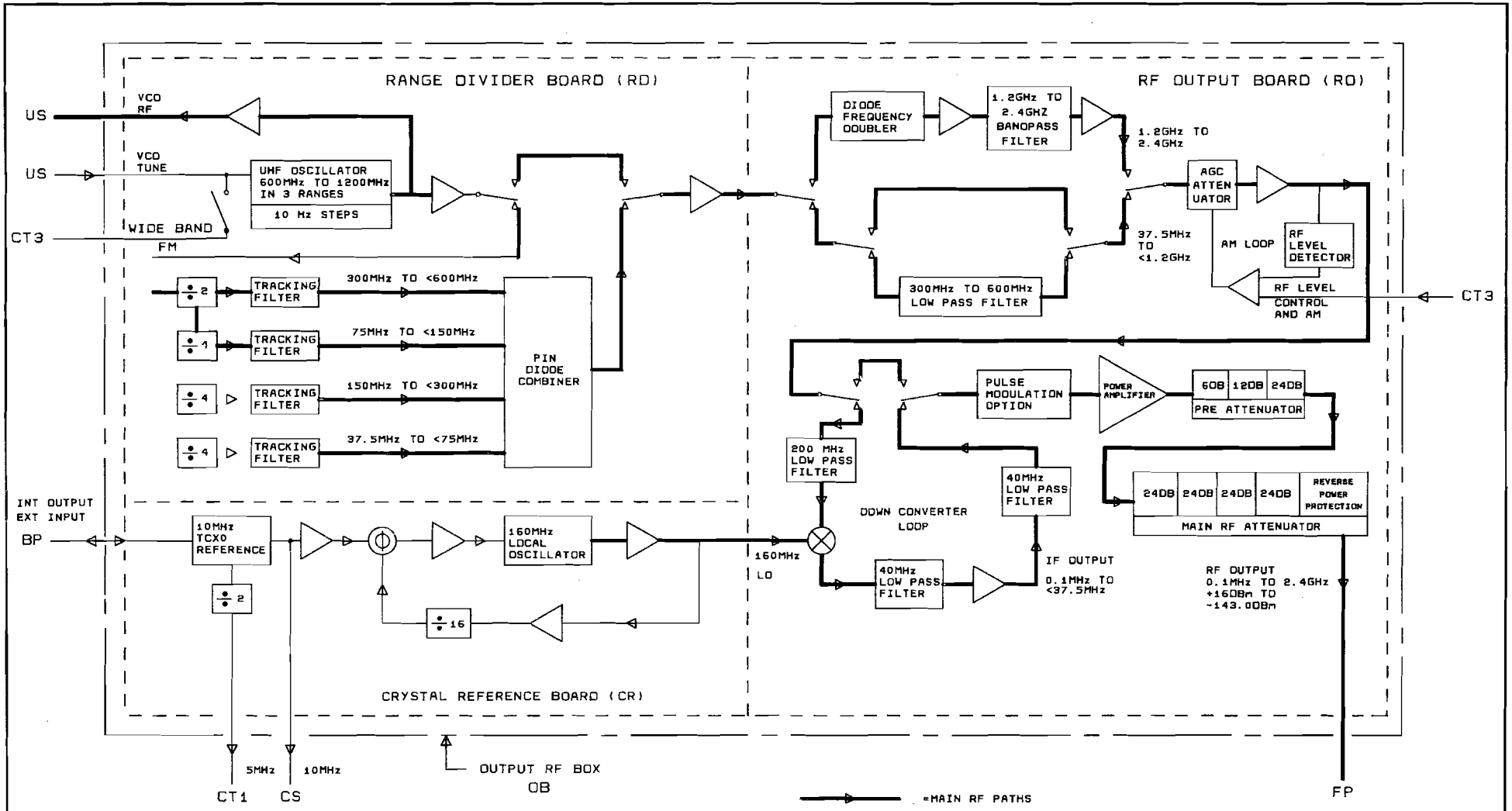
The Control Board communicates with the user via the Front Panel or GPIB interface. Commands sent to other boards are sent bit serially to reduce connections between boards. The 5MHz CPU clock is phase locked to the reference board crystal to eliminate potential in band interference products being formed by mixing of these signals.

i) Control Board Audio Section.

Refer to the Audio Block Diagram.

This part of the Control Board is composed of four sections, two identical 0.1Hz to 500kHz modulation synthesizers, modulation control and the SINAD measurement circuit. Programmable logic devices are utilised for the modulation synthesizers to reduce component count and improve reliability.

7.3 BLOCK DIAGRAMS.



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MOD. NO.	-									
CHK'D	SD									
NAME	JEC									

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: RF OUTPUT BLOCK DIAGRAM

DRAWING NO. 3SZX0597

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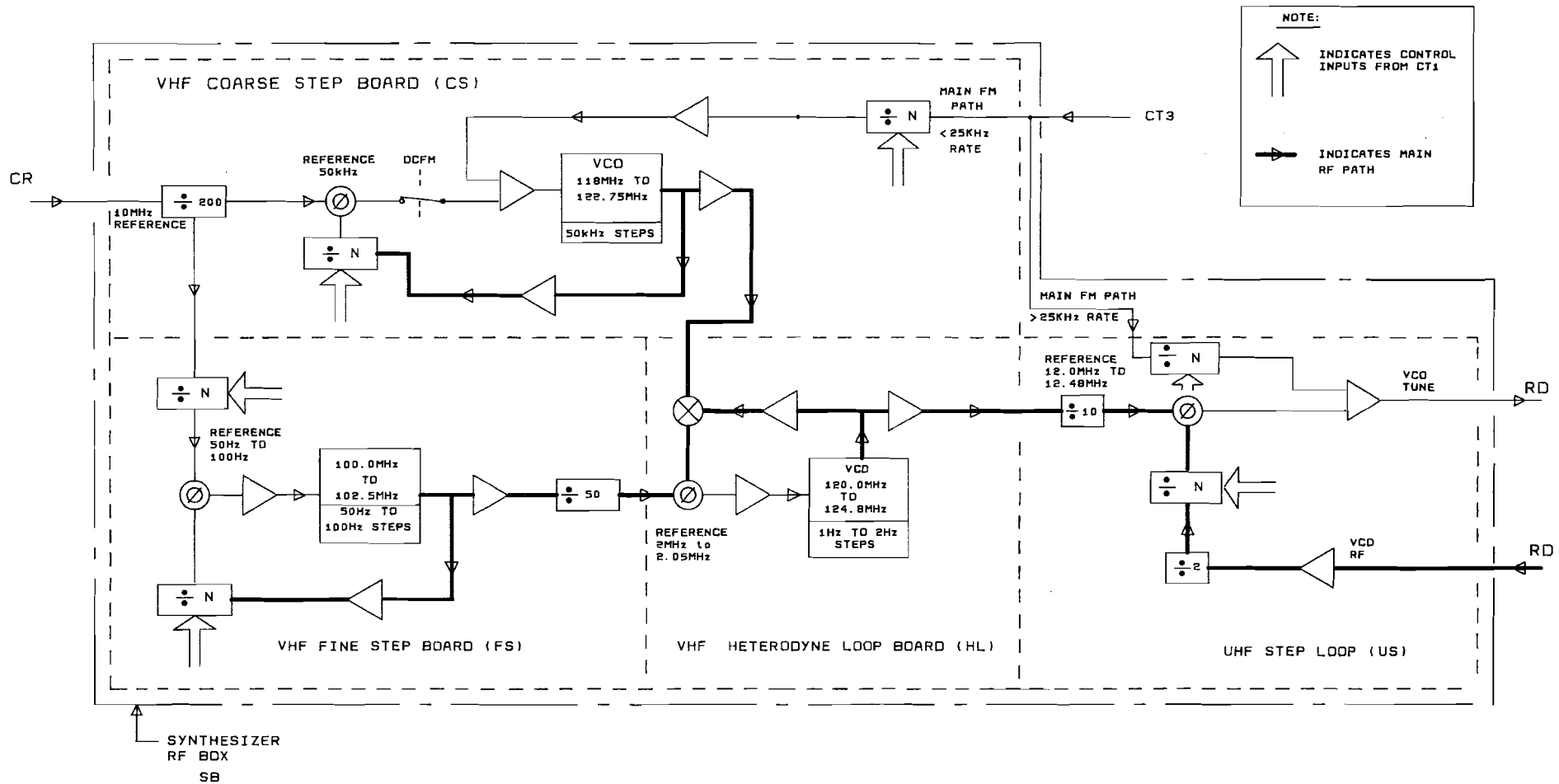

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USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: SYNTHESIZER BLOCK DIAGRAM

DRAWING NO. RSZX0598

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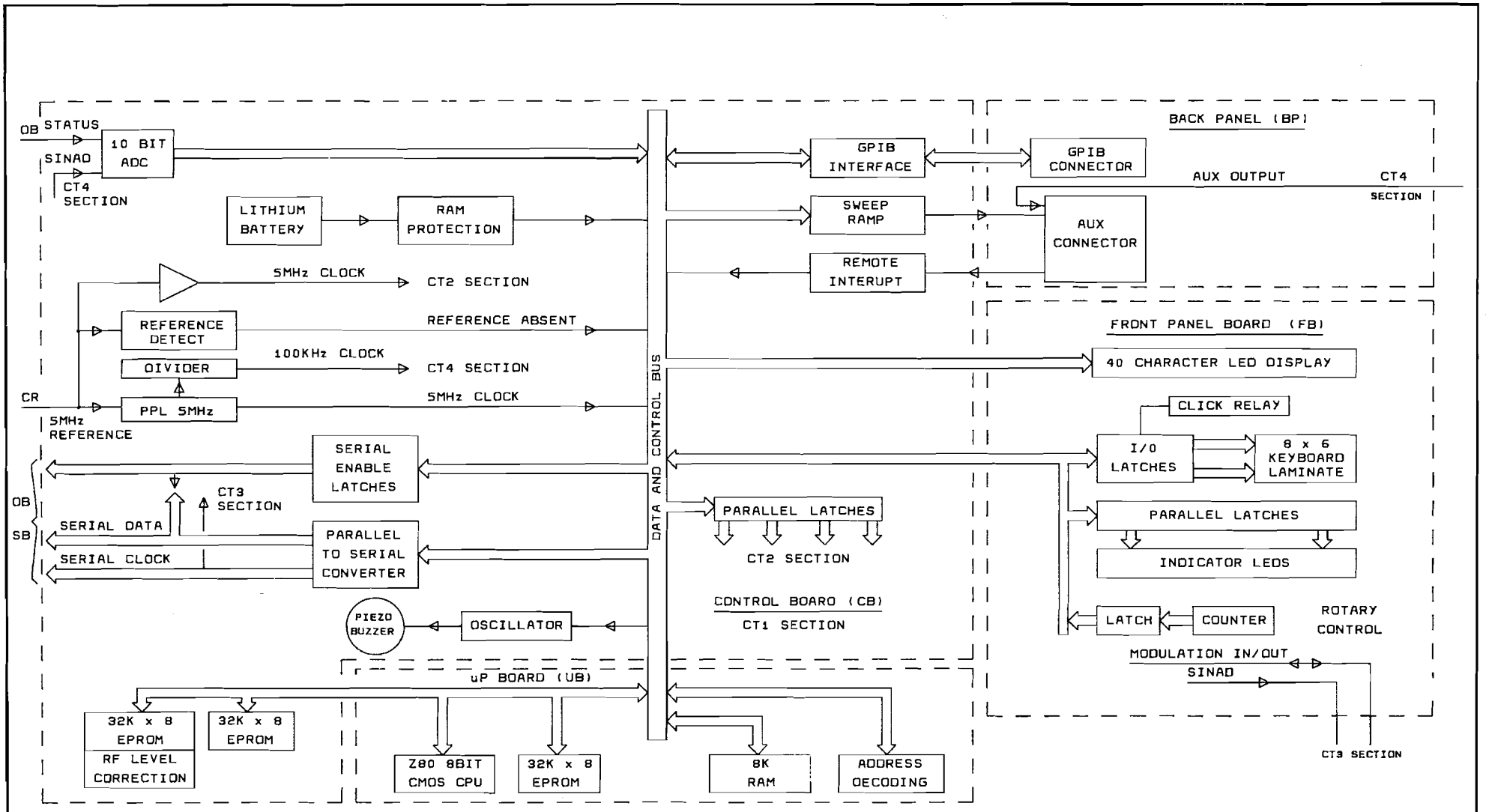

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USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: CONTROL BLOCK DIAGRAM

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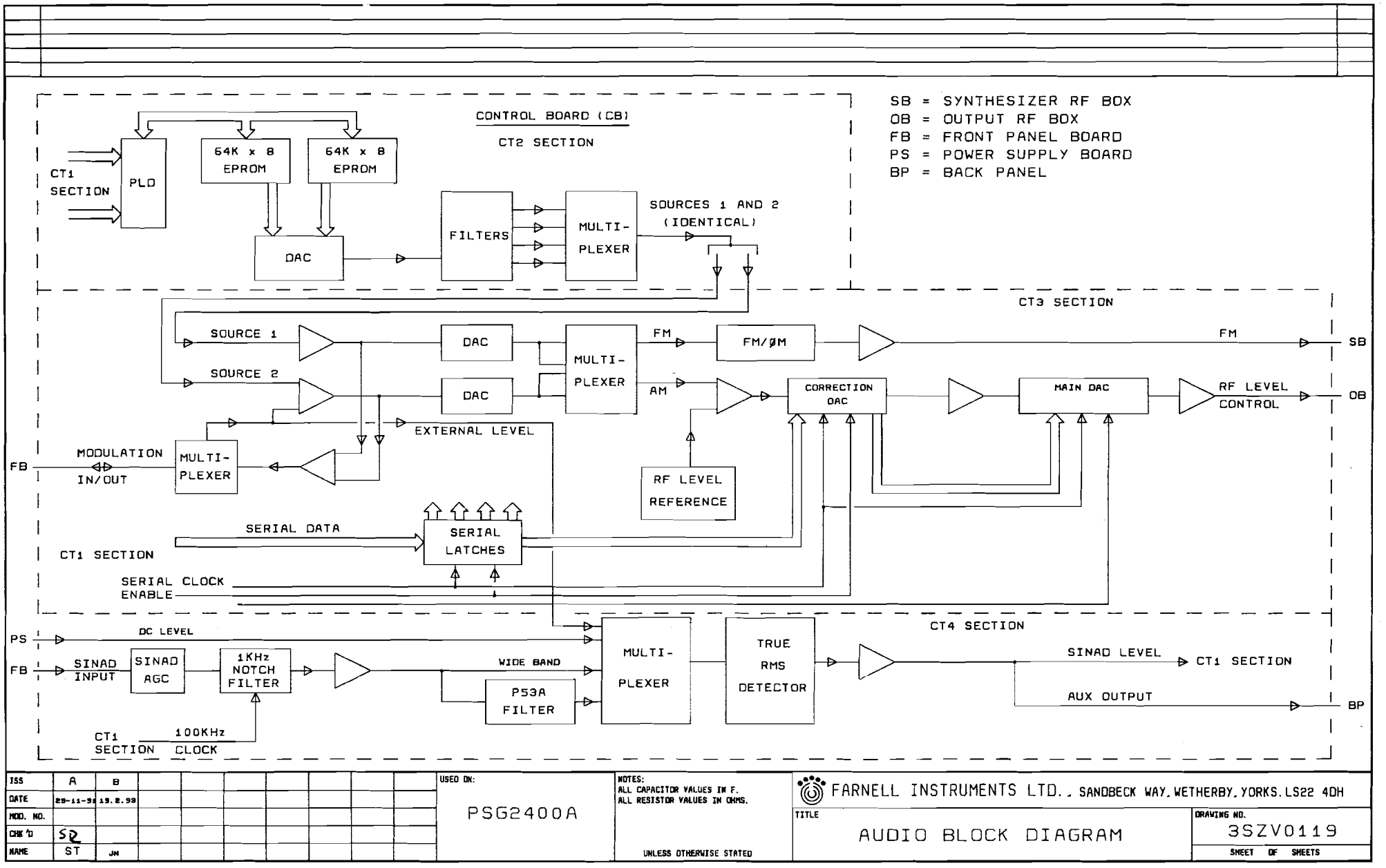

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MOD. NO.											UNLESS OTHERWISE STATED	DRAWING NO. 3SZV0119
CHK'D	SR											SHEET OF SHEETS
NAME	ST	JM										

8. CIRCUIT DESCRIPTION AND FAULT FINDING CHARTS.

8.1 POWER SUPPLY BOARD PS.

Mains power is passed to the primary of the transformer TX1 via the integral mains filter/voltage selector, power switch SW1, and relay RL1 which ensures the mains input is isolated for DC power input.

There are two secondary outputs of TX1 to provide low voltage power for the full wave rectifiers D1, BR1. A schottky barrier diode is utilised for D1, ensuring maximum efficiency. After smoothing of the rectified signals, linear voltage regulators are used to provide stable low noise supplies of +5v, +12v, and -12v for the instrument.

Regulators U1 and U2 provide +5V outputs and U3 +12V output. These devices are low drop-out types, again ensuring maximum efficiency. Unregulated +7V supplies are taken from D1 output to the front panel and control circuit boards, where local regulators provide +5V supplies. The -12V regulator is an adjustable design with P1 setting the output voltage.

When DC Power of the correct range and polarity is applied to the instrument, relay RL1 coil is energised via protection diode D6. This connects switching power MOSFETS Q3 and Q4 to a separate inverter winding of TX1. Drive for Q3 and Q4 is provided by a 70Hz nominal frequency astable multi-vibrator comprising transistors Q1, Q2 and associated circuitry. This drive level is routed to the control circuit board to provide DC power level indication.

8.2 CONTROL BOARD CB.

The Control Board is composed of the four main sections: Microprocessor Control CT1A, CT1B; Modulation Synthesizers CT2A, CT2B; Modulation Control CT3 and the SINAD Section, CT4.

Refer to diagrams CT1A and CT1B.

The microprocessor module U101 communicates with the peripheral devices via an 8 bit data and address bus. This bus is routed to the Front Panel Board via the interface circuit U135, U137.

Buffer gates U106A, B provide a 5MHz clock for CT2 sections and the phase locked loop circuit U105, which ensures a microprocessor clock signal is present even with no 5MHz reference from the Crystal Reference Board.
Reference detector circuit D101 provides warning of a reference failure when the front panel "NO REFERENCE " LED is illuminated.

The main system software is contained in two 32k EPROMS, U2 on the PCM80 Board, and U102 on the Control Board. Calibration data for correction of the RF level, FM accuracy and frequency response is stored in EPROM U143. Interim data stored in the RAM is protected during a power break by the RAM protection chip U104 and lithium back up battery BT10.

Control data to section CT3, the Synthesizer RF box and the Output RF box is transmitted serially via the parallel to serial converter circuit U116, U117, U145. Isolation buffering is provided by inverter gates, U150. The serial enable lines are decoded by U144 and buffered by the gates U120, U121.

Control data for the two Audio Synthesizers is decoded by the latches U107-U111 and routed to sections CT2A, B. During the sweep mode an analogue ramp signal for sweep synchronisation is generated by the DAC U151 and smoothed by the active filter circuit U152.

For the measurement of External Level and the SINAD ratio an ADC circuit comprising U139 is utilised.

The user is alerted to an attempted erroneous data entry or a reverse power RF overload condition by the buzzer circuit of U115 and SP10.

Refer to Modulation Synthesizer diagram CT2A.

The two modulation sources are of identical design and are based upon a direct digital synthesizer technique to obtain high resolution (0.1Hz), fast switching speed and low total harmonic distortion.

On power up the programmable logic device, U1, is configured by EPROMS U2 and U3. This device contains the control latches, clock division counters and the phase accumulator.

The sine wave look up table is stored in memory (U1, U2) while DAC U4 converts the discrete digital amplitude information into the required sine wave.

Three range filters are provided, to remove the clock signal component, thus ensuring low distortion signals. Multiplexer U9 selects the required range before routing to the Modulation Control section CT3.

Refer to the Modulation Control circuit diagram CT3.

The internal modulation sources follow separate paths via buffers U302, U306 and modulation level DACS U303, U307. This arrangement allows individual modulation levels to be set for source 1 and source 2 enabling complex modulation tones to be generated.
For external modulation the signal is routed via U301 to be summed with source 2. When DCFM is selected the AC coupling capacitors C301, C302 are shorted out allowing DC coupled modulation. For wideband FM the modulation signal is routed through RL301 directly to the Range Divider Board, bypassing the modulation control circuits. This allows the external modulation bandwidth to be extended to 10MHz rate.

The internal modulation output is buffered by amplifier U316, and may be configured as a fixed level or variable level output by the routing gate U322.
Frequency or amplitude modulation is selected by the switches U310 and U311 which allows simultaneous combinations of both AM and FM.
When phase modulation is selected the pre-emphasis circuit C316, R320 is switched in by gate U315-B. The FM drive signal is then buffered by U313-B and routed to the synthesizer RF box.

For amplitude modulation the signal is summed with the RF level control DC reference in amplifier U317. This ensures any following RF level changes alters both the DC and modulation signals thus preserving the modulation accuracy. Enhanced RF level accuracy is achieved by software correction with correction DAC U318 altering the AM drive signal. Normal AGC level steps are performed by DAC U321, with U320-B buffering the AM drive signal before routing to the RF Output circuit board.

Refer to the SINAD circuit diagram CT4.

The 1kHz SINAD input signal of varying amplitude, 30mV to 3V rms, is converted to a fixed level by AGC amplifier U401. U402 is a digital 1kHz notch filter which removes the 1kHz signal, leaving the noise and distortion component. This residual component is buffered by U403 which limits the bandwidth to 10kHz, and passed to the multiplexer U405. A parallel signal path is via the P53A bandpass filter (300Hz to 3kHz), U404.

True rms detector U407 detects the noise and distortion component with the resulting DC signal buffered by U406-B and routed to CT1B section.

An auxiliary output is provided on the rear panel for connection to an external analogue meter.

8.3 FRONT PANEL BOARD FB.

Unregulated power enters the board at S4 where the local regulator U15 provides a +5V supply, which is split into two paths, +5VA and +5VB. To reduce clock pulse conducted interference Pi section filters R4, R5, C24, C25 are incorporated.

The eight character intelligent display modules U1- U5 form the main annunciation. These modules are equivalent to memory locations so address and data information is sent to alter a specific character.
Function indicator LEDS are illuminated via the control latches U12-U14, U21.

When a front panel key is pressed U8 generates an interrupt pulse for the control section, which operates the click relay RL1 and initiates a scan of the keyboard matrix via U10 and U11 to determine which key has been pressed.

Rotary control pulses from P1 are gated via U17 to produce clock wise or counter clock wise pulses dependent upon the direction of rotation of P1. These pulses trigger the binary up/down counter U16, with the count data monitored by the control section via latch U7.

Modulation input/output and SINAD signals are routed from the front panel BNC connectors via the Front Panel Board to the Control Board.

8.4 FINE STEP LOOP BOARD FS.

The phase locked loop (PLL) circuit provides frequencies in the range 2MHz to 2.05MHz in steps of 1Hz to 2Hz. The output of this loop, when multiplied up by the following sections of the synthesizer provides the minimum step size in output frequency.

U2 is a Programmable Gate Array (PGA) containing a custom synthesizer design. This includes a serial data interface for frequency setting data from the Control Board. U1 is an EPROM which contains configuration information for U2. Due to speed and space restrictions within the PGA two external high speed dividers U3 and U4 are required to complete the digital section of the circuit.

The remainder of the board consists of the analogue sections of the PLL,including a 100MHz to 102.5MHz voltage controlled oscillator (VCO). The VCO is enclosed within its own shielded enclosure.

Power and data to the board enter on connector S1, while a 50kHz reference signal from the Coarse Step Board enters via X2. The output at 2MHz to 2.05MHz leaves via X3 for the Heterodyne Loop Board.

8.5 COARSE STEP LOOP BOARD CS.

This VHF loop generates frequency steps of 50kHz and allows frequency modulation (both AC and DC) to be applied to the oscillator.

The loop reference of 50kHz is derived from the main 10MHz reference by U23 (divide by 100) and U24 (divide by 2). A 50kHz buffered reference signal for the fine step loop is also generated.

A varactor tuned oscillator comprising L102 and diodes D101-D108, is voltage tuned by the loop integrator U10. Phase detector U9, counters U6, U7 and prescaler U3 complete the phase locked loop.

Amplifier U1 buffers the RF output which is routed to the Heterodyne Loop. To prevent a possible out of synchronisation condition of the Heterodyne Loop and Coarse Step Loop oscillators, the tuning voltage is buffered by U13 and fed to the Heterodyne Loop.

Frequency modulation is applied to the oscillator by summing the modulation signal with the tune voltage in amplifier U12. To account for RF range division on the Range Divider Board, the modulation signal is attenuated in DAC U19. This DAC also provides adjustment of the modulation signal over the tuning range of the loop oscillator, for enhanced FM accuracy.

The coarse step loop bandwidth allows modulation rates to approximately 25kHz, before being filtered off. For higher rates the main modulation path is on the UHF Step Loop.

When DCFM is selected the output of the DCFM control DAC (U22) is adjusted until it is the same value as the tuning voltage, when comparator U14 changes state. This holds the control DAC voltage and changes over the oscillator tune line from the loop integrator U10 to this control DAC via relays RL3, RL4. Now the control loop has been disabled frequency modulation, down to DC, may be applied to the oscillator whilst maintaining carrier frequency accuracy.

8.6 HETERODYNE LOOP BOARD HL.

The Heterodyne Loop Board combines the outputs of the Coarse and Fine Step Loops in order to generate the reference signal for the UHF Step Loop.

The loop is designed to maintain a frequency separation between it's oscillator and that of the Coarse Step Loop equal to the output frequency of the Fine Step Loop. This is achieved by mixing the Coarse Step and the Heterodyne Loop oscillator outputs together to generate a difference signal (U4). This signal is then compared with the signal from the Fine Step Loop by the phase detector U7. From the output of U7 a signal is derived by U8 to control the voltage controlled oscillator (Q102, Q103, L102, D101-108 and associated components).

It is possible that under exceptional circumstances, such as immediately after power up that the two oscillators will be in the wrong sense. That is to say that the Coarse Step oscillator will be at a higher frequency than the Heterodyne Loop oscillator. If left uncorrected this would result in failure to lock, since the Heterodyne Loop would be driven the wrong way. In order to prevent this condition occurring the control voltage to the two oscillators are monitored by U6, which if the error condition is detected, turns off the signal from the Coarse Step Loop to the mixer for a short time. This forces the Heterodyne Loop back into normal operation.

8.7 UHF STEP LOOP US.

This loop controls the UHF oscillator located on the Range Divider Board and enables carrier frequency resolution down to 10Hz via the reference signal from the Heterodyne Loop Board.

The loop reference enters the board at X1 and is divided by ten in U17, to form the reference signal for phase detector U5. The UHF oscillator signal is buffered by Q8 and divided by two in prescaler U12. Dual modulus prescaler U2 and programmable counters U3, U4 divide the clock signal to phase detector U5. The phase locked loop is completed by pulse amplifier Q1, Q2, Q5, Q6 and integrator U8, which tunes the UHF oscillator.

The gain correction DAC (U7) controls the phase detector correction pulse amplitude via pulse amplifier Q5, Q6 thus ensuring minimal loop gain variations over the full UHF oscillator range.

Frequency modulation is also applied to this loop, onto the tune line via amplifier U16. At modulation rates of <25kHz the modulation is removed by the loop (but passed by the Coarse Step Loop). By utilising this two port FM technique the FM bandwidth is extended to >500kHz rate.

Correction DAC U9 provides FM range adjustment and compensates for the UHF oscillator slope variations over its tuning range, thus enhancing the modulation accuracy.

8.8 CRYSTAL REFERENCE BOARD CR.

The main reference frequency for the instrument comprises XTL1, a 10MHz temperature compensated crystal oscillator featuring high stability, low power consumption and fast power-up stabilisation. Correction for crystal aging effects is by means of the back panel Reference Adjust potentiometer.

When the internal reference is selected, pin 2 of U1 is set high allowing the 10MHz signal through to buffer gates U1-B and U2-B. Transistors Q1, Q2, Q3 provide drive for the internal reference output signal, while gate U2-B provides the 10MHz reference for the RF synthesizer. Further division by 2 in counter U3 provides a 5MHz signal for the Control Board microprocessor and Audio Synthesizer reference frequency.

The remainder of the crystal reference circuitry provides a 160MHz local oscillator reference signal for the down converter loop. The 160MHz oscillator comprising Q7, L2 and D4 is phase locked to the main 10MHz reference, with divider U7, phase detector U6 and integrator U5 forming the main loop components. The oscillator output is buffered by amplifiers Q8 and U4 to a final level of +14dBm.

To eliminate spurious interference effects and reduce the power consumption the +5V and +12V power rails for this loop are switched via transistors Q6 and Q5 and are only enabled for carrier frequencies of <37.5MHz.

8.9 OUTPUT DISTRIBUTION BOARD OD.

This board transfers power and data signals from the Output RF box feedthroughs to the Range Divider and RF Output Boards, via connectors S1 and S2.

Pi section filters comprising inductors L1 to L3 ensure high attenuation for power supply conducted interference.

For fault finding purposes, connector S3 on the RF Output Board is provided to aid isolation of a power track short circuit.

8.10 RANGE DIVIDER BOARD RD.

Refer to UHF Oscillator Board circuit diagram.

The main UHF Oscillator covers the range from 600MHz to 1200MHz in three independent ranges, with bias applied separately to the transistors Q1 to Q3 which eliminates spurious signals from unselected ranges. Varactor diodes D3, D6 and D9 provide the tuning element for each range. The selected range RF output is routed via isolating PIN diodes D1, D4 and D7 to the Range Divider section.

Refer to Range Divider Board circuit diagram.

The oscillator RF output at X7 is terminated with a 10dB attenuator before splitting into two paths, buffered by amplifiers U1 and U2. U1 provides a signal of approximately 0dBm at X8 for the UHF Step Loop, whilst U2 ensures a buffered signal for the digital dividers.

Tuning information enters the board at X6, from the UHF Step Loop, thus completing the phase lock loop. This design provides high isolation between the synthesizer circuits and the main UHF oscillator, thus ensuring good spurious signal performance.

The oscillator tuning signal of nominal range -8V to +8V is converted to a full range of 0.1V at 600MHz to +4.5V at 1199MHz by amplifiers U3 and U4, thus providing a signal for the voltage tuned filters.

Latched data for the board is generated from serial control data clocked into register U13.

For carrier range 5 (600MHz to <1.2GHz) relay RL1 is energised routing the oscillator signal through to amplifier U12.
Carrier ranges 4 (300MHz to <600MHz), 3 (150MHz to <300MHz), 2 (75MHz to <150MHz), 1 (37.5MHz to <75MHz) are generated by successive binary division of the UHF oscillator range with U5 (÷2), U7 (÷4), U5 & U6 (÷8) and U7 & U8 (÷16) respectively.
Each divider is only switched on when required minimising spurious signals and power consumption.

The digital divider output of each range is followed by a tracking low pass filter, voltage tuned by amplifiers U4-A and U4-B, to produce low harmonic distortion output signals. These four divider range outputs are then summed together by a PIN diode combiner comprising D7, D12, D17 and D24.

Broadband amplifier U12 provides gain of 22dB, boosting the signal to a level of +8dBm to +12dBm at X14. The resulting 37.5MHz to <1.2GHz synthesized signal is then passed to the RF Output Board.

8.11 RF OUTPUT BOARD RO.

This board houses the four RF modules, frequency doubler, amplitude modulator, power amplifier, RF attenuator and provides control for these functions. Serial control data is clocked into registers U12 and U13, which provides latched data for the board.

The range divider signal enters the board at X15 and is routed either through RL3 to a low pass filter, or to the frequency doubler RF input. For carrier range 5 (600MHz to <1.2GHz) relay RL2 is energised routing the RF signal through to RL1.
When RL2 is not selected the RF path is via the 300MHz to 600MHz voltage tuned filter comprising L13, L14, D17, D18 with amplifier U5-B providing the tuning signal.

This arrangement of switched filters ensures optimum rejection of the range divider harmonic products. After filtering the RF signal is passed through to the amplitude modulator module via relay RL1.

Refer to the Frequency Doubler circuit diagram.

For carrier range 6 (1.2GHz to 2.4GHz) the frequency doubler module is switched in by relays RL1 and RL3. A diode bridge full wave rectifier design comprising T201, BR201 is used to generate frequencies to 2.4GHz. With an RF input drive level of +13dBm and doubler conversion loss of 13dB, the resulting output level is approximately 0dBm. The diode doubler also results in the generation of unwanted frequency products principally at 1/2, 3/2 and twice the output frequency. By optimising the diode doubler balance with transformer T201, the sub-harmonic output products are reduced.

The diode doubler output is amplified to a level of +10dBm by GaAs FET Q201, whose bias is set by the feedback amplifier U11. This amplifier adjusts the negative gate voltage of Q201 until the drain voltage equals the reference voltage on pin 2 of U11, thus stabilising the operating point of Q201.

The signal is then passed through a 2.5GHz printed circuit low pass filter to the band pass tracking filter comprising D201 to D206 and associated printed circuit inductors. This filter rejects unwanted sub-harmonics and is tuned, by a voltage derived from the main UHF oscillator, through buffer amplifier U10-A. This tuning voltage is approximately -1V at 1.2GHz and +10V for 2.4GHz. The resulting band pass filter loss of 8dB is overcome by FET amplifier Q202 with a gain of 10dB, whose bias point is set by feedback amplifier U11-B. A further 2.5GHz low pass filter at the output of Q202 reduces higher order harmonic products. The resulting 1.2GHz to 2.4GHz signal is then routed through relay RL1 to the amplitude modulator RF input.

Refer to the Amplitude Modulator circuit diagram.

The amplitude modulator circuit is a closed loop design composed of a PIN diode RF attenuator, wide band linear RF amplifier, broadband detector diode and feedback AGC amplifier. By adjustment of the feedback amplifier reference signal, fine RF level control in increments of 0.05dB is achieved. When a modulating signal is added to this reference, the loop follows the reference producing amplitude modulation of the RF carrier.

RF input signals in the range 37.5MHz to 2.4GHz are passed through a four stage PIN diode attenuator comprising D301-D303, D306 whose attenuation is controlled by the bias current through R301. The adjustment range is approximately 46dB which allows modulation depths to 95% and 20dB of fine carrier level range.

The RF signal is boosted by 18dB with a two stage GaAs FET amplifier Q301, Q302 and associated bias circuitry U3-A, U3-B which provide a negative gate control voltage to stabilise the FET drain voltages at a preset level. Potential excessive drain voltages are clamped with diodes Z301, Z302 and de-coupled with C319, C320 .

A broadband RF detector circuit comprising R313, C308, D304 provides a DC output directly proportional to the carrier level, and also produces a highly linear demodulated output when amplitude modulation is applied to the carrier. The detector dynamic range is enhanced by supplying a small forward bias current through the constant current source network Q6 and Q7. Schottky diode D306 has identical temperature characteristics to the RF detector diode D304, thus minimising carrier level changes due to ambient temperature variations.
Potentiometer P2 allows for correction of the detector diode linearity at low AGC levels.

The detector output is buffered by amplifier U4-A with the clamping network D4, D5 providing AM linearity correction at high modulation depths. Amplifier U4-B completes the AGC loop, with the output voltage on pin 7 controlling the PIN diode attenuator. Improved modulation bandwidth is achieved by summation of the inverted loop modulation signal with the fixed +8V bias in amplifier U5-A thus producing a push-pull effect.

The amplitude modulator RF output level follows the loop reference signal on pin 6 of U4-B, with D9, D13 providing additional AM linearity correction. This composite RF level reference signal is composed of a DC level with the modulation signal (when AM is selected) superimposed, and is generated on the control circuit board, section CT3. When AM is not selected FET switches Q19, Q20 are enabled thus reducing the AGC loop bandwidth for improved intermodulation distortion performance.

For carrier range 0 (0.1MHz to <37.5MHz) an RF signal in the range 160.1MHz to <197.5MHz is mixed with a fixed 160MHz local oscillator signal to produce the desired IF output. With this technique the RF level control and modulation applied to the mixer RF input is transferred directly on to the IF output.

When range 0 is selected relay RL301 on the amplitude modulator is de-energised allowing the RF signal through to the mixer U1 via a 10dB attenuator and 200MHz low pass filter comprising L4, L5, C5 to C7. A high level mixer is used thus ensuring minimal degradation of the amplifier noise floor performance. With a local oscillator signal of +14dBm at X1 and 10dB of input attenuation, the resultant conversion loss is approximately 18dB.

The mixer IF output is passed through a diplexing 40MHz low pass filter R18, C4, L1 to L3 which produces high attenuation for mixer spurious products whilst maintaining a good 50 ohm termination for the mixer IF output.

A two stage amplifier comprising Q1, Q2 and associated components provides a gain of 18dB to overcome the mixer conversion loss, with P1 setting the IF level. The collector bias of Q2 is stabilised to the preset reference voltage by the adjustable base bias from feedback amplifier U2. A further 40MHz low pass filter L8, C77 ensures high rejection of mixer products before the IF signal is passed through RL301 .

The resulting levelled signal of 0.1MHz to 2.4GHz complete with amplitude modulation (when enabled) is then passed via relay RL301 to the power amplifier module.

Refer to the Power Amplifier circuit diagram.

The power amplifier module boosts the RF signal to a maximum level of +22dBm, which overcomes the RF attenuator loss to provide output drive up to +16dBm normal, with an over range capability to +19dBm for carrier frequencies of <600MHz.

Amplifier Q401 has a broadband gain of 7dB and is a GaAs FET design featuring high linearity and flat gain characteristics. A stabilised bias point for Q401 is ensured by feedback amplifier U6, which provides a negative gate control voltage to stabilise the FET drain voltage to a preset value. Potential excessive drain voltages are clamped by diode Z401 and decoupled by C412.

After the amplifier, switched RF attenuators of 6dB, 12dB and 24dB provide 42dB of signal attenuation in 6dB steps. For RF level steps of <6dB the amplitude modulator AGC loop reference voltage is adjusted producing RF level increments of 0.05dB. With this combination of fixed 6dB attenuators and fine AGC level control the entire RF output range can be covered with high resolution.

The RF attenuator relays are energised by transistors Q8 to Q10 with coil pulse circuitry R65, C41 which reduces the coil voltage to a holding value after approximately 10mS, thus ensuring improved power efficiency. For carrier frequencies of <1.3GHz PIN diode D405 is selected switching in C414 to provide additional low pass filtering for higher order harmonics.

To protect the power amplifier against over load during the 2.5mS operate time of the reverse power protection relay, a PIN diode clamp circuit is utilised. Diode D404 is normally reversed biased, adding minimal shunt capacitance to the circuit. When an excessive reverse voltage is detected, Q18 is driven hard on forcing D404 into a low impedance state, thus shorting out the overload until the reverse power protection relay opens to provide long term protection. The power amplifier output is then passed through to the main RF attenuator.

Refer to the RF Attenuator circuit diagram.

The main RF attenuator is housed in a fully shielded enclosure and provides a further 96dB of signal attenuation arranged in four 24dB switched sections. When combined with the power amplifier a total range of 138dB in 0.05 / 0.1dB steps is obtained. With AGC range extension the resultant RF output range is then +19dBm to -143.0dBm.

The RF attenuator relays are energised by transistors Q11 to Q14, with associated pulse circuitry which reduces the coil voltage to a holding value after approximately 10mS, thus ensuring improved power efficiency.

To protect the instrument against excessive reverse voltages, a reverse power protection circuit, comprising relay RL505 and detector D501, is utilised. The RF output is normally open circuit until RL505 is energised, ensuring the instrument is protected even when switched off. Capacitor C515 protects against DC and low frequency reverse signals.

When the detector output exceeds the reference voltage on pin 2 of U7, latch U8 is set HIGH on pin 3, thus removing coil power to RL505. The latch is reset by data line SR 37 which is toggled by the front panel RF OFF button. To prevent the reverse power circuit self triggering on high carrier levels the trip level voltage on pin 2 of U7 is composed of a fixed reference summed with the AGC level control reference which provides maximum reverse power protection over a wide range of carrier levels.

The RF attenuator insertion loss is frequency dependent, varying by approximately 3dB over the carrier frequency range. This is partly compensated for by the response of the amplitude modulator AGC loop. More accurate level calibration is accomplished by software correction of the RF level control signal which also corrects for gain variations in the power amplifier. The RF output level flatness is thus maintained to within +/- 0.5 dB at +16dBm output. Further software correction allows enhancement of the RF attenuator accuracy to +/- 1.5/2.5dB for carrier levels of >127dBm.

Multiplexer U9 allows monitoring of the filter tune line, reverse power protection latch, AGC line and the pulse modulation option link LK1, with the resultant status signal buffered by U10-B before routing to the control board.

The RF attenuator signal is then routed out of the output RF box, via an SMA connector, to the front panel N type RF output connector.

8.12 PULSE MODULATION OPTION.

When fitted, this option is located between the amplitude modulator and power amplifier modules providing rapid switching of the carrier amplitude with a high ON-OFF ratio.

The switching devices U1-U3 are fabricated using the latest GaAs FET technology thus ensuring wide bandwidth, low insertion loss and nano-second switching speed.

The external TTL control pulse from the back panel pulse input connector is fed to line driver U4, which provides complementary output pulses with minimal skew. These pulses are level translated by Q1, Q2 circuitry and passed to the control inputs of switches U1 to U3.

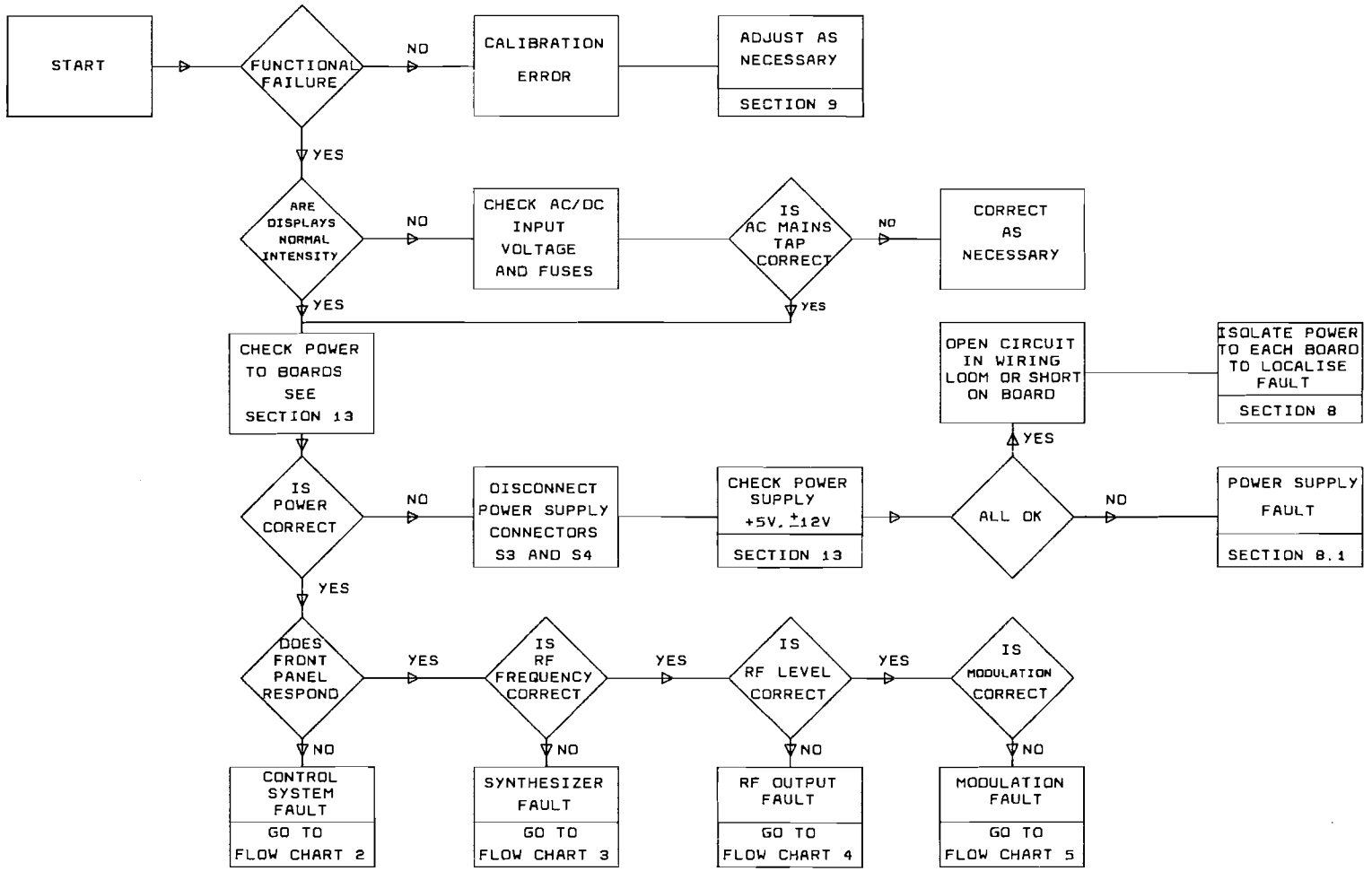
To account for the pulse modulation insertion loss of approximately 3dB the instrument carrier level specifications are reduced by 3dB. This gives a maximum level of +13dBm (overranged to +16dBm, carrier < 600MHz), maximum AM depth to <+7dBm and harmonic/spurious responses specified to <+7dBm.

8.13 RECHARGEABLE BATTERY PACK OPTION.

The complete battery pack and charger is housed in a separate module which is designed to be fixed to the instrument's right hand side handles (See section 5.4, battery pack).

In the charge mode the battery plug is connected to the charger output socket, SK2. Mains power is rectified via TX1 and BR1 with R1 providing current limit for a completely flat battery.

To run the instrument from the battery pack, the battery plug PL1 is connected to the instrument DC input socket on the rear panel.



ISS	A									
DATE	4.8.93									
MOD. NO.	-									
CHK'D	SQ									
NAME	JN									

USED ON: PSG2400A

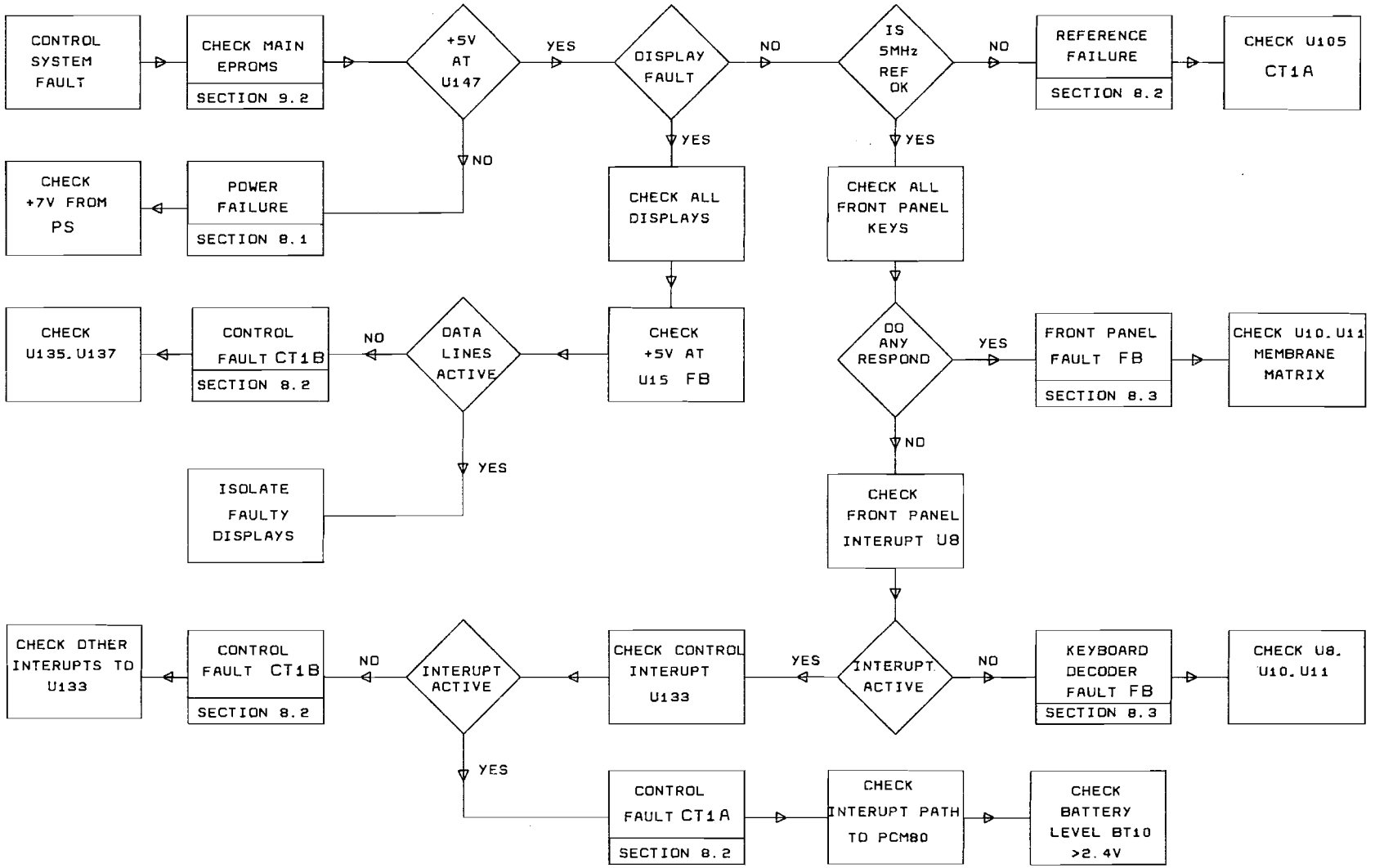
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: FAULT FINDING FLOW CHART 1

DRAWING NO. 4SZV0159

SHEET 1 OF 5SHEETS



ISS	A									
DATE	8.3.93									
MOD. NO.	-									
CHK'D	SD									
NAME	JN									

USED ON:
PSG2400A

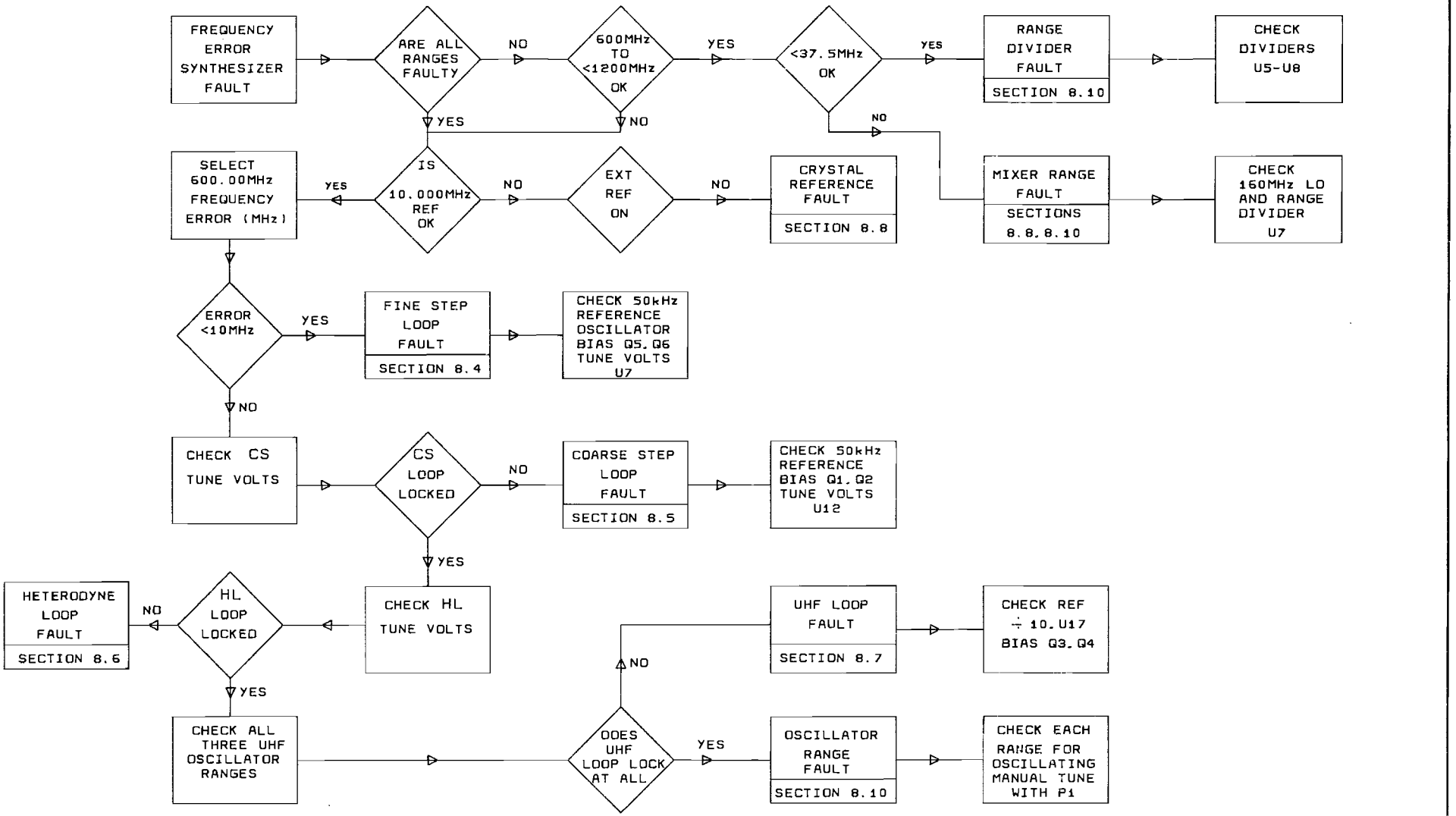
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE
FAULT FINDING
FLOW CHART 2

DRAWING NO.
3SZV0159

SHEET 2 OF 5SHEETS



ISS	A									
DATE	5.3.93									
MOD. NO.	-									
CHK'D	SD									
NAME	JM									

USED ON: PSG2400A

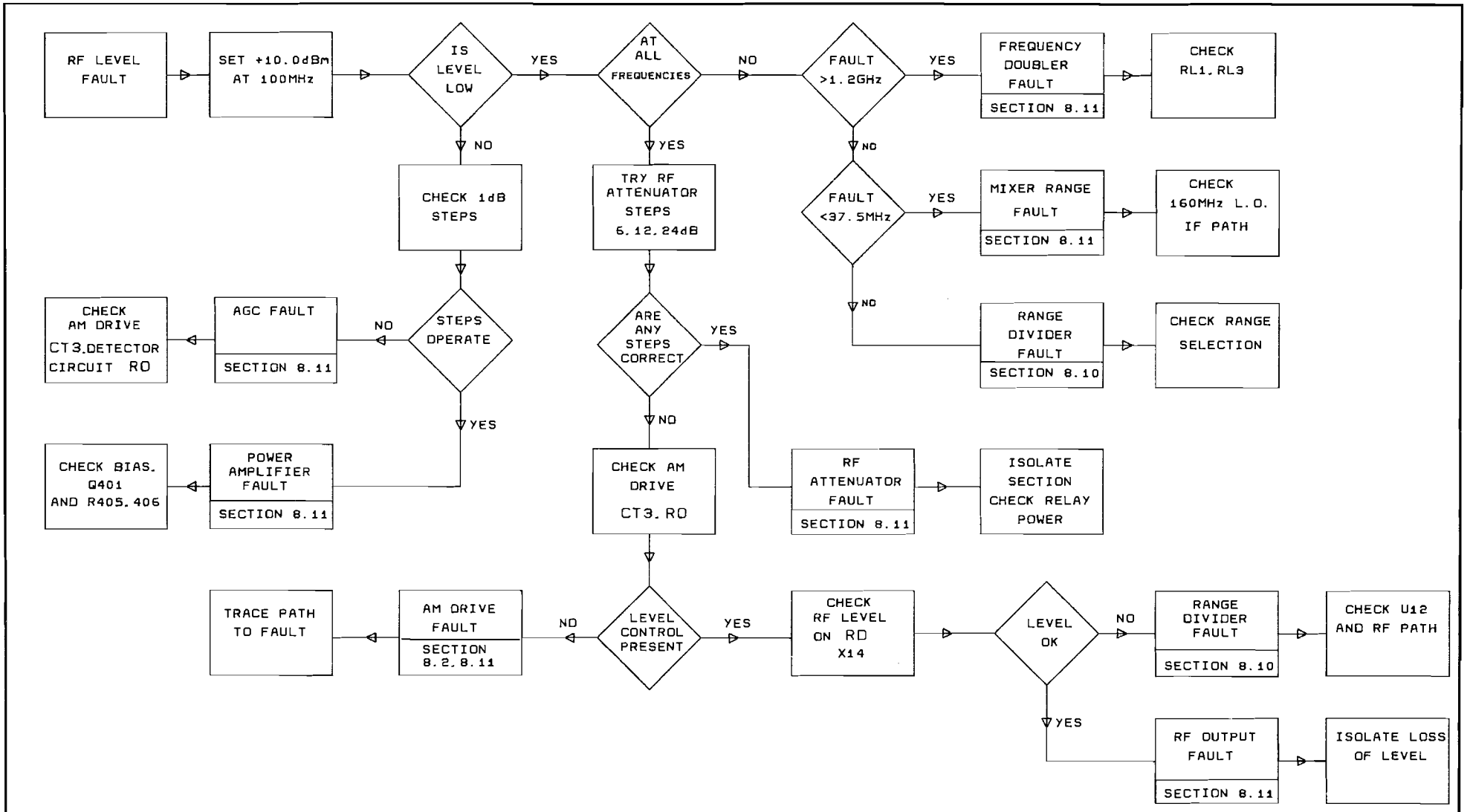
NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: FAULT FINDING FLOW CHART 3

DRAWING NO. 3SZV0159

SHEET 3 OF 5SHEETS



ISS	A									
DATE	8.8.93									
MOD. NO.	-									
CHK'D	SQ									
NAME	JN									

USED ON: PSG2400A

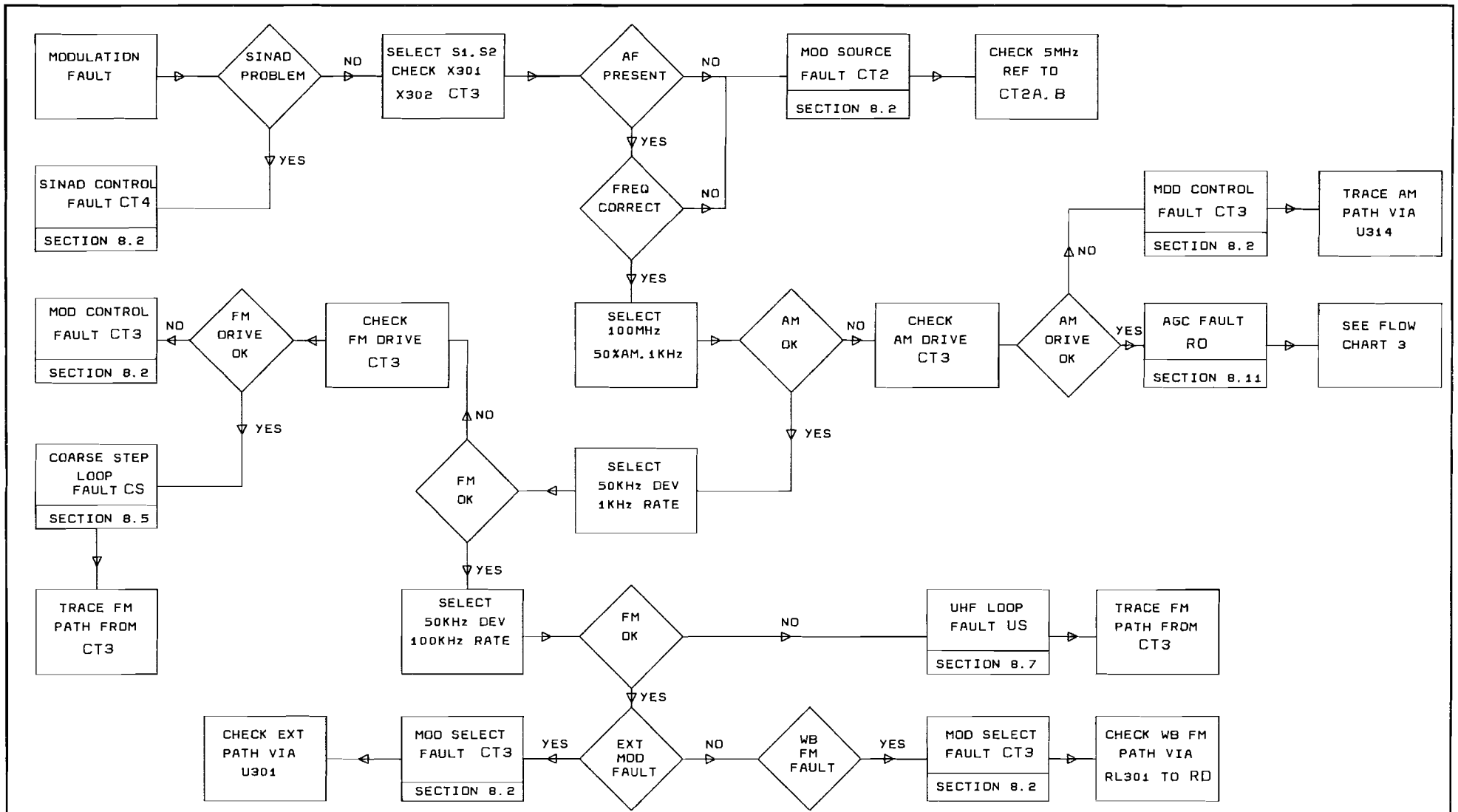
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: FAULT FINDING FLOW CHART 4

DRAWING NO. 3SZV0159

SHEET 4 OF 5SHEETS



ISS	A									
DATE	8.9.93									
MOD. NO.	-									
CHK'D	SR									
NAME	JM									

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: FAULT FINDING FLOW CHART 5

DRAWING NO. 3SZV0159

SHEET 5 OF 5SHEETS

9. CALIBRATION PROCEDURE.

9.1 ACCESS

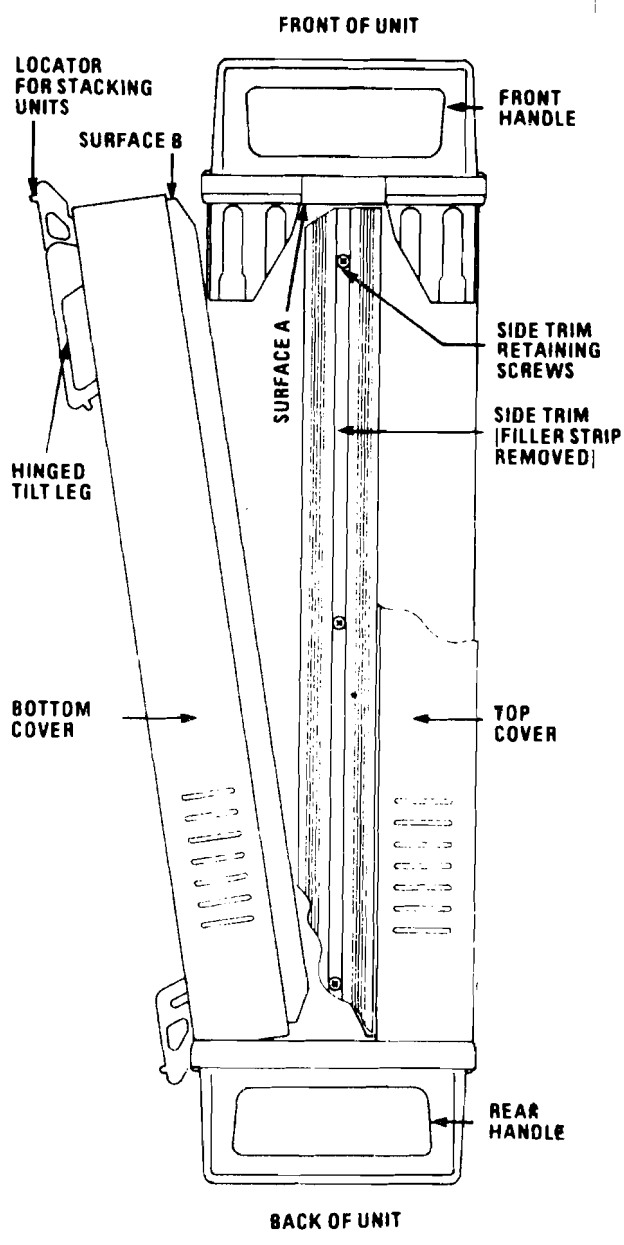


FIGURE 1

TO REMOVE COVERS (FIGURE 1)

1) Remove side trim retaining screws (6 screws). Remove side trims.

2) Working from the front, for each cover, slide backwards to clear recess in the front handles. Widen the front to clear the front handles. Hinge the cover away from the unit to just clear the front handles and pull forwards.

9.2 SOFTWARE UPGRADES.

Warning: Refer to the safety section at the start of the manual which details handling precautions for static sensitive parts if it is intended to change the system software.

There are a total of eight EPROMS in the PSG2400A, seven located on the Control Board and one on the Fine Step Loop Board.

To access the Control Board remove the bottom cover of the unit as described in section 9.1. To access the Fine Step Loop Board remove the bottom cover, as section 9.1, unscrew the two pozi-drive screws at the front of the control tray and hinge the tray upwards. Undo the six quick release fasteners on the synthesizer RF box and remove the lid. The Fine Step Loop Board (FS) is located in the middle-rear section of the RF box (refer to section 12, location diagram).

All EPROMS should have a unique label showing the date, the unit (PSG2400A), the location (CB U102) and the version or issue number.

Two of the Control Board EPROMS, one located on a small surface mount board identified by U101 and the other identified by U102 contain the main system control software. These two EPROMS should show the same version number and be changed as a pair. The version number and date can be checked from the front panel by using the secondary command #00.

U143 on the Control Board contains calibration information unique
to the host instrument. It is identified by an "ISSUE *1" number eg. ISSUE A1, up issuing changing the "*" letter only.

Note: If this EPROM is replaced it will be necessary to return the unit to the manufacturer for recalibration. It may also be necessary to contact the manufacturer to check for compatibility between issue *1 numbers and version numbers.

The remaining EPROMS hold the configuration information associated with the programmable gate arrays (PGA).

U2 and U3 configure U1 on the Control Board (CB).
U11 and U12 configure U10 on the Control Board.
U1 configures U2 on the Fine Step Loop Board (FS).
The issue numbers for these EPROMS are:
CB U2 issue *2, eg. issue A2, issue B2 etc.
CB U3 issue *3
CB U11 issue *4
CB U12 issue *5
FS U1 issue *6

When replacing these devices ensure that the replacement EPROM identification label markings match the idents on the control board and the pin orientation is correct as identified by the semicircles as shown on the Control Board and Fine Step Loop Board idents
(refer to section 14).

9.3 TEST EQUIPMENT.

1GHz Frequency Counter.
Frequency Standard with error not exceeding 1 part in 10E9.
Hewlett Packard 339A Distortion Measurement Set.
LS30-10 (DC Power Source).
RF Power Meter, Hewlett Packard 436A + 8482A detector head.
Modulation Analyser, Farnell AMM2000.

9.4 AUDIO CALIBRATION.

To access the Control Board, remove the outer covers as described in section 9.1 and view the under side of the unit.

a) Source 1:

Check modulation output is in the fixed AF level output mode by selecting #27 and selecting Audio mode [Mod Level]. The CLEAR key exits this mode.
Select SOURCE ONE with MOD SOURCE DISP key.
Select MOD FREQ 1kHz.
Deselect MOD OFF.
Monitor the Modulation output on a true RMS voltmeter with 50Ω load impedance.
Adjust P1 on the Control Board (CT2 section) for 1.000V RMS +/- 10mV.

b) Source 2:

Check modulation output is in the fixed AF level output mode by selecting #27 and selecting Mod Level. The CLEAR key exits this mode.
Select SOURCE TWO with MOD SOURCE DISP key.
Select MOD FREQ 1kHz.
Deselect MOD OFF.
Monitor the Modulation output on a true RMS voltmeter with 50Ω load impedance.
Adjust P2 on the Control Board (CT2 section) for 1.000V RMS +/- 10mV.

c) External level:

Select EXT LEVEL.
Select MOD ON EXT.
Input a 1kHz sinewave, 0.707V RMS to the modulation input from an external calibrated source.
Adjust P404 on the Control Board (CT4 section) for a reading of 0.707V on the front panel display.

d) SINAD Input:

Set the modulation output to the variable AF level output mode by selecting #27 and selecting Audio mode [Volts]. The CLEAR key exits this mode.
Select SOURCE ONE with the MOD SOURCE DISP key.
Select MOD ON ONE.
Deselect MOD OFF.
Set MOD FREQ to 1kHz.
Set MOD LEVEL to 1V RMS.

Select SOURCE TWO with the MOD SOURCE DISP key.
Select MOD ON TWO.
Set MOD FREQ to 1.25kHz.
Set MOD LEVEL to 250mV RMS.
Monitor the Modulation output on an RMS voltmeter, set to relative level and adjusted for FSD.
Deselect MOD ON ONE.
Adjust MOD LEVEL (SOURCE TWO) on the generator for 1/4 FSD on the RMS voltmeter.
Select MOD ON ONE.
Select SINAD.
Select #23, "Sinad filter is [P53A]".
Connect the Modulation output to the SINAD input.
Adjust P402 on the Control Board (CT4 section) for 12.0dB SINAD reading on the front panel.

e) Battery level Display:

Power the instrument from a suitable DC Source, setting the voltage for 13.5V (27.0V for the +24V DC option).
Select #29 to display the battery potential.
Adjust P403 on the Control Board (CT4 Section) for a reading of 13.5V on the front panel display (27.0V for the +24V option).

9.5 FREQUENCY CALIBRATION.

Set CARR FREQ to 1GHz.
Set CARR LEVEL to 0dBm.
Select MOD OFF.
Monitor the RF output on a frequency counter referenced from an external frequency standard.
Alter the back panel reference adjust control for 1.0GHz +/-10Hz.

If there is not enough frequency adjustment range on the back panel then the coarse frequency adjust potentiometer on the Crystal Reference Board should be altered.
The Crystal Reference Board is located in the top RF box enclosure.

To access the Crystal Reference Board (CR) remove the outer covers as described in section 9.1 and remove the RF box lid by releasing the six quick release fasteners. Refer to the location diagram (section 12) for the position of the circuit board.

Set the back panel frequency adjust potentiometer to mid position.
Monitor the RF output frequency as above.
Adjust P1 on the Crystal Reference Board for 1GHz +/-100Hz.
Replace the RF box lid, leave the unit powered on for 10 minutes to allow the temperature to stabilise and repeat the adjustment of the back panel frequency adjust as above.

RF LEVEL CALIBRATION.

Remove the outer covers as described in section 9.1.
For adjustments on the Control Board view the under side of the unit.
Note: For accurate calibration the unit must be powered up for at least 30 minutes with the RF covers fitted. After adjustments in the RF Output Box allow 5 minutes for the temperature to stabilise, with the RF Box covers fitted.

To access the RF Output Board remove the RF box lid, on the top side of the unit, by releasing the six fasteners. Refer to the location diagram (section 12) for the position of the circuit board.

Set CARR FREQ to 100MHz.
Set CARR LEVEL to +10dBm.
Monitor the RF output level on a power meter.
Adjust P305 on the Control Board (CT3 section) for +10.0dBm on the power meter.

Set CARR FREQ to 10.0MHz.
Set CARR LEVEL to +10dBm.
Adjust P1 (IF LEVEL), on the RF Output Board (RO), for +10.0dBm on the power meter.
Set CARR FREQ to 37.4MHz.
Adjust C77 for a reading of +9.7dBm.
Note the level at 25.0MHz, 37.4MHz and 37.5MHz.
If the flatness error is >0.5dB readjust C77 fot optimum response.

AM CALIBRATION.

Remove the outer covers as described in section 9.1.
For adjustments on the Control Board view the under side of the unit.
Note: For accurate calibration the unit must be powered up for at least 30 minutes with the RF covers fitted. After adjustments in the RF Output Box allow 5 minutes for the temperature to stabilise, with the RF Box covers fitted.

Set CARR FREQ to 100MHz.
Set CARR LEVEL to +9.9dBm.
Select SOURCE ONE with MOD SOURCE DISP key.
Set MOD FREQ to 1kHz.
Set MOD LEVEL to 80.0% AM.
Deselect MOD OFF.
Monitor the RF output on a modulation analyser.

9.8 FM CALIBRATION.

Remove the outer covers as described in section 9.1.
For adjustments on the Control Board view the under side of the unit.
To access the UHF Step and the Coarse Step Boards:
View the under side of the unit.
Undo the two screws holding the control tray in position and hinge the tray upwards.
Remove the RF box lid, by releasing the six quick release fasteners.
Refer to the location diagram (section 12) for the position of the circuit board.

Set CARR FREQ to 150MHz.
Set CARR LEVEL to +7dBm.
Select MOD SOURCE ONE with the MOD SOURCE DISP key.
Select MOD ON ONE.
Deselect MOD OFF.
Set MOD FREQ to 1kHz.
Monitor the RF output on a modulation analyser (50Hz to 15kHz Bandwidth).

Calibrate the FM in the following sequence:

Set MOD LEVEL to 100.0kHz.
Adjust P1 on the Coarse Step Board for 100.0kHz on the modulation analyser.
Set MOD LEVEL to 99.0kHz.
Adjust P2 on the Coarse Step Board for 99.0kHz on the modulation analyser.
Set MOD LEVEL to 9.9kHz.
Adjust P303 on the Control Board (CT3 section) for 9.9kHz on the modulation analyser.

Change CARR FREQ to 839MHz.
Change MOD FREQ to 100kHz.
Change the modulation analyser to 300kHz bandwidth.
Set MOD LEVEL to 100kHz.
Adjust P2 on the UHF Step Board for 100kHz on the modulation analyser.
Select MOD OFF.
Note the residual FM reading.
Deselect MOD OFF.
RE-adjust P2 for 100kHz deviation excluding residual FM.

Change MOD LEVEL to 99.0kHz.
Adjust P3 on the UHF step Board for 99.0kHz FM deviation excluding the residual FM figure.

10. MAINTENANCE

10.1 GUARANTEE

The equipment supplied by Farnell Instruments Limited is guaranted against defective material and faulty manufacture for a period of twelve months from the date of despatch. In the case of material or components employed in the equipment but not manufactured by us we allow the customer the period of any guarantee extended to us.

The equipment has been carefully inspected and submitted to comprehensive test at the factory prior to despatch. If, within the guarantee period, any defect is discovered in the equipment in respect of material or workmanship and reasonably within our control, we undertake to make good the defect at our own expense subject to our standard conditions of sale. In exceptional circumstances and at the discretion of the Service Manager, a charge for labour and carriage costs incurred may be made.

Our responsibility is in all case limited to the cost of making good the defect in the equipment itself the guarantee does not extend to third parties, nor does it apply to defects caused by abnormal conditions of working, accident, misuse, neglect or wear and tear.

10.2 MAINTENANCE

In the event of difficulty or apparent circuit malfunction, it is advisable to telephone (or telex) the Service Department or your local Sales Engineer or Agent (if overseas) for advice before attempting repairs.

For repairs and recalibration it is recommended that the complete instrument be returned to:-

The Service Department
Farnell Instrument Limited
Osborn House
Sandbeck Way
Wetherby
West Yorkshire
LS22 4DH

Overseas Dialling	Tel.	+44 937 581961	Fax	+44 937 586907
UK Dialling	Tel.	0937 581961	Fax	0937 586907
	Telex	557294 Farist G		

When returning the instrument please ensure adequate care is taken with packing and arrange insurance cover against transit damage or loss. If possible re-use the original packing box, following the instruction below:-

Wrap the instrument in anti-static polystyrene and tape up then place into primary box ensuring the feet are next to the polystyrene supports. Wrap up accessories and instruction/service manual and place into the primary box in the space left between the polystyrene supports. Seal the primary box, fit the corner blocks and place into the outer box ensuring the corner blocks are positioned correctly. Finally, seal the outer box.

11. OPTIONS.

23 to 30V External DC Input. Order Code 1ERPSG2400A/A

A factory fitted option that allows the DC power supply to accept a voltage of +23V to +30V DC rather than the standard +11.5V to +15V.

Rear Panel RF Output. Order Code 1ERPSG2400A/F

A factory fitted option, moving the RF output to the back panel, particularly useful for rack mounting applications.

Pulse Modulation. Order Code 1ERPSG2400A/M

A factory fitted option allowing the RF output to be pulse modulated.
Refer to section 4 for the specification.

High Stability Frequency Reference. Order Code 1ERPSG2400A/O

A factory fitted option providing improved short and long term stability.
Refer to section 4 for the improved specification.

Rechargeable 4Ah Battery Pack. Order Code 1EXA10120

For fitting instructions and operation see section 5.4

Rack Mounting Kit. Order Code 15A20100

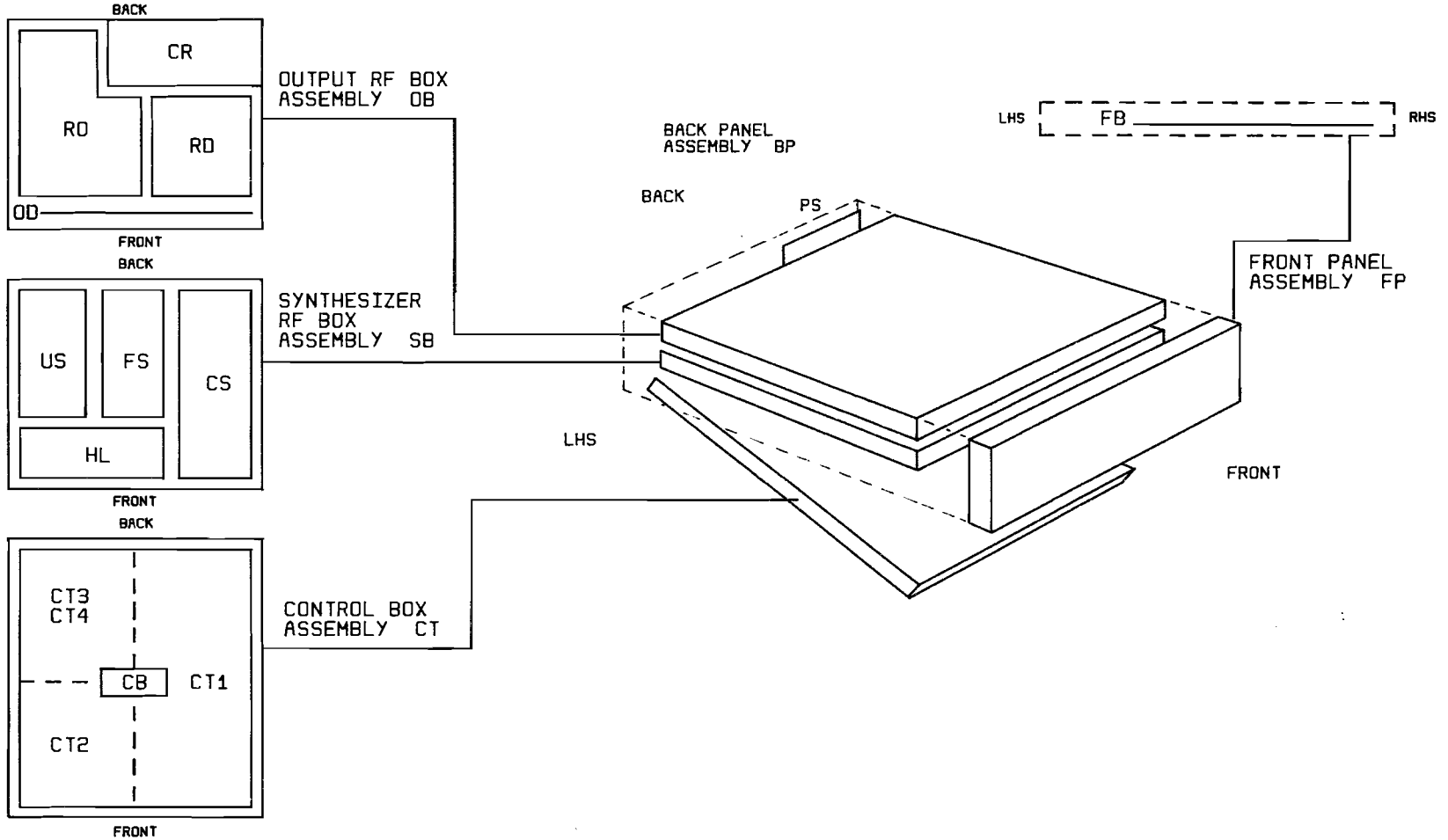
For mounting instructions see section 5.3. See section 15 for parts supplied.

Protective Carrying Case. Order Code 1EXA20180

This is a padded protective carrying case with a shoulder strap.

Foot Switch. Order Code 1ERA30320

For remote operation, see section 6.6 applications, part m.



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NAME	D.G.H									

USED ON PSG2400

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE
PSG2400 ASSEMBLY AND
BOARD LOCATION DIAGRAM

DRAWING NO.
RSZX0595

SHEET 1 OF 1 SHEETS

13. CONNECTION LISTS.

13.1 POWER SUPPLY (PS).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	DC -VE	I	-	S5	
S1-2	INVERTER	O	-	RL1	
S1-3	INVERTER	O	-	RL1	
S1-4	RELAY COIL	I	-	RL1	
S1-5	DC +VE	I	-	S5	
S1-6	+5V SECONDARY	I	-	TX1	
S1-7	+5V SECONDARY	I	-	TX1	
S1-8	0V	I	-	TX1	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1	N/C	-	-	-	
S2-2	0V	I	-	TX1	
S2-3	12V SECONDARY	I	-	TX1	
S2-4	12V SECONDARY	I	-	TX1	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S3-1	+7V UNREGULATED	O	-	FB S4-1	YP1602 (RED)
S3-2	0V	O	-	FB S4-2	YP2402 (BLACK)
S3-3	0V	O	-	CHASSIS STAR EARTH	YP2402 (BLACK)
S3-4	+5V	O	F	US S1-7	YP1602 (RED)
			F	CS S1-3	YP702
			F	CS S2-1	YP702
			F	HL S1-1	YP702
			F	FS S1-3	YP702
S3-5	+5V	O	F	OD X3	YP1602 (RED)
			F	CR S1-1	YP702 (RED)
S3-6	+7V UNREGULATED	O	-	CB S102-2	YP1602 (RED)

Power Supply cont'd.

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S4-1	REFERENCE ADJ	I	F	CR S1-3	YP702
S4-2	-12V	O	F	CS S1-1	YP702 (GREY)
			F	FS S1-1	YP702
			F	HL S1-3	YP702
			F	US S1-6	YP702
S4-3	-12V	O	F	OD X5	YP702 (GREY)
S4-4	-12V	O	-	CB S301-3	YP702 (GREY)
S4-5	+12V	O	F	CS S1-2	YP702 (ORANGE)
			F	FS S1-2	YP702
			F	HL S1-2	YP702
			F	US S1-8	YP702
S4-6	+12V	O	F	OD X4	YP702 (ORANGE)
			F	CR S1-2	YP702 (ORANGE)
S4-7	+12V	O	-	CB S301-4	YP702 (ORANGE)
S4-8	DC LEVEL	O	-	CB S103-1	YP702

13.2 CONTROL BOARD (CB).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S101-1	SCREEN	-	-	OB CHASSIS	├ COAX/YX178
S101-2	5MHz REF	I	L	CR S1-4	┘

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S102-1	0V DIGITAL	I	-	CHASSIS STAR EARTH	YP2402 (BLACK)
S102-2	+7V UNREGULATED	I	-	PS S3-6	YP1602 (RED)

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S103-1	DC LEVEL	I	-	PS S4-8	YP702
S103-2	STATUS 1	I	F	OD X2	YP702
S103-3	EN4	O	F	OD X8	YP702
S103-4	SERIAL DATA	O	F	OD X6	YP702
S103-5	CLOCK	O	F	OD X7	YP702
S103-6	EN3	O	F	US S1-3	YP702
S103-7	EN2	O	F	CS S1-4	YP702
S103-8	EN1	O	F	FS S1-4	YP702
S103-9	SERIAL DATA	O	F	FS S1-5	YP702
			F	CS S1-7	YP702
			F	US S1-2	YP702
S103-10	CLOCK	O	F	FS S1-6	YP702
			F	CS S1-6	YP702
			F	US S1-1	YP702

Control Board cont'd

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S104-1	-	-	-	-	
S104-2	-	-	-	-	
S104-3	0V	-	-	GPIB 24	24 WAY IDC
S104-4	GND	-	-	GPIB 12	RIBBON CABLE
S104-5	0V	-	-	GPIB 23	
S104-6	ATN	I	-	GPIB 11	TO BACK
S104-7	0V	-	-	GPIB 22	PANEL GPIB
S104-8	SRQ	O	-	GPIB 10	CONNECTOR
S104-9	0V	-	-	GPIB 21	
S104-10	IFC	I	-	GPIB 9	
S104-11	0V	-	-	GPIB 20	
S104-12	NDAC	IO	-	GPIB 8	
S104-13	OV	-	-	GPIB 19	
S104-14	NRFD	IO	-	GPIB 7	
S104-15	OV	-	-	GPIB 18	
S104-16	DAV	IO	-	GPIB 6	
S104-17	REN	I	-	GPIB 17	
S104-18	EOI	IO	-	GPIB 5	
S104-19	D108	IO	-	GPIB 16	
S104-20	D104	IO	-	GPIB 4	
S104-21	D107	IO	-	GPIB 15	
S104-22	D103	IO	-	GPIB 3	
S104-23	D106	IO	-	GPIB 14	
S104-24	D102	IO	-	GPIB 2	
S104-25	D105	IO	-	GPIB 13	
S104-26	D101	IO	-	GPIB 1	

Control Board cont'd

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S106-1	A0	O	-	FB S1-1	26 WAY IDC
S106-2	A1	O	-	FB S1-2	RIBBON CABLE.
S106-3	A2	O	-	FB S1-3	
S106-4	A3	O	-	FB S1-4	
S106-5	A4	O	-	FB S1-5	
S106-6	A5	O	-	FB S1-6	
S106-7	A6	O	-	FB S1-7	
S106-8	A7	O	-	FB S1-8	
S106-9	A8	O	-	FB S1-9	
S106-10	A9	O	-	FB S1-10	
S106-11	BD0	IO	-	FB S1-11	
S106-12	BD1	IO	-	FB S1-12	
S106-13	BD2	IO	-	FB S1-13	
S106-14	BD3	IO	-	FB S1-14	
S106-15	BD4	IO	-	FB S1-15	
S106-16	BD5	IO	-	FB S1-16	
S106-17	BD6	IO	-	FB S1-17	
S106-18	BD7	IO	-	FB S1-18	
S106-19	BRD	IO	-	FB S1-19	
S106-20	BWR	IO	-	FB S1-20	
S106-21	Y14	O	-	FB S1-21	
S106-22	Y15	O	-	FB S1-22	
S106-23	KEY	O	-	FB S1-23	
S106-24	KNOB	O	-	FB S1-24	
S106-25	8K0	O	-	FB S1-25	
S106-26	RST	O	-	FB S1-26	

Control Board cont'd.

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S107-1	N/C	-	-	-	-
S107-2	N/C	-	-	-	-
S107-3	N/C	-	-	-	-
S107-4	N/C	-	-	-	-
S107-5	REMOTE STEP	I	-	BP S1-7	YP702
S107-6	AUX DVM	O	-	BP S1-8	YP702
S107-7	SWEEP SYNC	O	-	BP S1-9	YP702
S107-8	DCFM MONITOR	I	-	CS S2-2	YP702

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S301-1	WIDE BAND FM	O	L	OD X9	├ COAX/YX178
S301-2	SCREEN	-	-	OB CHASSIS	┘
S301-3	-12V	I	-	PS S4-4	YP702 (GREY)
S301-4	+12V	I	-	PS S4-7	YP702 (ORANGE)
S301-5	SCREEN	-	-	FB S3-3	├ COAX/YX178
S301-6	SINAD INPUT	I	-	FB S3-4	┘
S301-7	SCREEN	-	-	OB CHASSIS	├ COAX/YX178
S301-8	RF LEVEL	O	F	OD X1	┘
S301-9	SCREEN	-	-	SB CHASSIS	├ COAX/YX178
S301-10	FM MOD	O	L	CS S1-5	┘
			L	US S1-4	YP702
S301-11	SCREEN	-	-	FB S3-1	├ COAX/YX178
S301-12	MOD IN/OUT	IO	-	FB S3-2	┘

13.3 FRONT PANEL BOARD (FB).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1		I	-	KEYBOARD	16 WAY
↓				LAMINATE	BERG IDC
S2-16		I	-		

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	A0	I	-	CB S106-1	26 WAY IDC
S1-2	A1	I	-	CB S106-2	RIBBON CABLE
S1-3	A2	I	-	CB S106-3	
S1-4	A3	I	-	CB S106-4	
S1-5	A4	I	-	CB S106-5	
S1-6	A5	I	-	CB S106-6	
S1-7	A6	I	-	CB S106-7	
S1-8	A7	I	-	CB S106-8	
S1-9	A8	I	-	CB S106-9	
S1-10	A9	I	-	CB S106-10	
S1-11	BD0	IO	-	CB S106-11	
S1-12	BD1	IO	-	CB S106-12	
S1-13	BD2	IO	-	CB S106-13	
S1-14	BD3	IO	-	CB S106-14	
S1-15	BD4	IO	-	CB S106-15	
S1-16	BD5	IO	-	CB S106-16	
S1-17	BD6	IO	-	CB S106-17	
S1-18	BD7	IO	-	CB S106-18	
S1-19	BRD	IO	-	CB S106-19	
S1-20	BWR	IO	-	CB S106-20	
S1-21	Y14	I	-	CB S106-21	
S1-22	Y15	I	-	CB S106-22	
S1-23	KEY	I	-	CB S106-23	
S1-24	KNO	I	-	CB S106-24	
S1-25	8K0	I	-	CB S106-25	
S1-26	RST	I	-	CB S106-26	

Front Panel Board cont'd.

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S3-1	SCREEN	-	-	CB S301-11	├ COAX/YX178
S3-2	MOD IN/OUT	IO	-	CB S301-12	┘
S3-3	SCREEN	-	-	CB S301-5	├ COAX/YX178
S3-4	SINAD INPUT	I	-	CB S301-6	┘

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S4-1	+7V UNREGULATED	I	-	PS S3-1	YP1602 (RED)
S4-2	0V	I	-	PS S3-2	YP2402 (BLACK)

13.4 FINE STEP LOOP BOARD (FS).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	-12V	I	F	PS S4-2	YP702 (GREY)
S1-2	+12V	I	F	PS S4-5	YP702 (ORANGE)
S1-3	+5V	I	F	PS S3-4	YP702 (RED)
S1-4	EN1	I	F	CB S103-8	YP702
S1-5	SERIAL DATA	I	L	CB S103-9	YP702
S1-6	CLOCK	I	L	CB S103-10	YP702

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X2	50kHz REF	I	-	CS X5	YX85
X3	REF OUT	O	-	HL X5	YX85

13.5 COARSE STEP LOOP BOARD (CS).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	-12V	I	F	PS S4-2	YP702 (GREY)
S1-2	+12V	I	F	PS S4-5	YP702 (ORANGE)
S1-3	+5V	I	F	PS S3-4	YP702 (RED)
S1-4	EN2	I	F	CB S103-7	YP702
S1-5	FM MOD	I	L	CB S301-10	YP702
S1-6	CLOCK	I	L	CB S103-10	YP702
S1-7	SERIAL DATA	I	L	CB S103-9	YP702
S1-8	N/C	-	-		

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X3	10MHz REF	I	-	CR X1	YX85
X5	50kHz REF	O	-	FS X2	YX85
X1	RF OUTPUT	O	-	HL X3	YX85

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1	+5V	I	-	PS S3-4	YP702
S2-2	DCFM MONITOR	O	-	CB S107-8	YP702

13.6 HETERODYNE LOOP BOARD (HL).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	+5V	I	F	PS S3-4	YP702 (RED)
S1-2	+12V	I	F	PS S4-5	YP702 (ORANGE)
S1-3	-12V	I	F	PS S4-2	YP702 (GREY)

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X3	RF INPUT	I	-	CS X1	YX85
X4	RF OUTPUT	O	-	US X1	YX85
X5	REF INPUT	I	-	FS X3	YX85

13.7 UHF STEP BOARD (US).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	CLOCK	I	L	CB S103-10	YP702
S1-2	DATA	I	L	CB S103-9	YP702
S1-3	EN3	I	F	CB S103-6	YP702
S1-4	FM MOD	I	L	CB S301-10	├COAX/YX178
S1-5	SCREEN	-	-	SB CHASSIS	┘
S1-6	-12V	I	F	PS S4-2	YP702 (GREY)
S1-7	+5V	I	F	PS S3-4	YP702 (RED)
S1-8	+12V	I	F	PS S4-5	YP702 (ORANGE)
S1-9	N/C	-	-	-	-
S1-10	N/C	-	-	-	-

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X1	REF INPUT	I	-	HL X4	YX85
X2	VCO TUNE	O	-	RD X6	YX85
X3	VCO RF	I	-	RD X8	YX85

13.8 CRYSTAL REFERENCE BOARD (CR).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	+5V	I	F	PS S3-5	YP702 (RED)
S1-2	+12V	I	F	PS S4-6	YP702 (ORANGE)
S1-3	REFERENCE ADJ	O	F	PS S4-1	YP702
S1-4	5MHz REF	O	L	CB S101-2	TP702

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1	LO SELECT	I	F	RO S2-1	YP702 (RED)
S2-2	REF SELECT	I	F	RO S2-2	YP702

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X1	10MHz REF	O	-	CS X1	YX85
X3	10MHz REF	IO	-	BP BNC	YX188
X2	160MHz REF	O	-	RO X1	YX85

13.9 OUTPUT DISTRIBUTION BOARD (OD)

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	FILTER TUNE	I	-	RD S1-1	THE "OD" BOARD
S1-2	+5V	O	-	RD S1-2	INTERCONNECTS
S1-3	+12V	O	-	RD S1-3	DIRECTLY ONTO
S1-4	-12V	O	-	RD S1-4	THE "RD" BOARD
S1-5	SERIAL DATA	I	-	RD S1-5	
S1-6	SERIAL DATA	O	-	RD S1-6	
S1-7	CLOCK	O	-	RD S1-7	
S1-8	EN4	O	-	RD S1-8	
S1-9	N/C	-	-	-	
S1-10	N/C	-	-	-	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1	N/C	-	-	-	
S2-2	RF LEVEL	O	-	RO S1-2	THE "OD" BOARD
S2-3	STATUS 1	I	-	RO S1-3	INTERCONNECTS
S2-4	EN4	O	-	RO S1-4	DIRECTLY ONTO
S2-5	CLOCK	O	-	RO S1-5	THE "RO" BOARD
S2-6	SERIAL DATA	O	-	RO S1-6	
S2-7	+5V	O	-	RO S1-7	
S2-8	-12V	O	-	RO S1-8	
S2-9	+12V	O	-	RO S1-9	
S2-10	FILTER TUNE	O	-	RO S1-10	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X1	RF LEVEL	I	F	CB S301-8	24 SWG-TCW
X2	STATUS 1	O	F	CB S103-2	24 SWG-TCW
X3	+5V	I	F	PS S3-5	24 SWG-TCW
X4	+12V	I	F	PS S4-6	24 SWG-TCW
X5	-12V	I	F	PS S4-3	24 SWG-TCW
X6	SERIAL DATA	I	F	CB S103-4	24 SWG-TCW
X7	CLOCK	I	F	CB S103-5	24 SWG-TCW
X8	EN4	I	F	CB S103-3	24 SWG-TCW
X9	WIDE BAND FM	I	F	CB S301-2	24 SWG-TCW
X10	WIDE BAND FM	O	-	RD S3-1	YX178

13.10 RANGE DIVIDER BOARD (RD).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	FILTER TUNE	O	-	OD S1-1	THE "RD" BOARD
S1-2	+5V	I	-	OD S1-2	INTERCONNECTS
S1-3	+12V	I	-	OD S1-3	DIRECTLY ONTO
S1-4	-12V	I	-	OD S1-4	THE "OD" BOARD
S1-5	SERIAL DATA	O	-	OD S1-5	
S1-6	SERIAL DATA	I	-	OD S1-6	
S1-7	CLOCK	I	-	OD S1-7	
S1-8	EN4	I	-	OD S1-8	
S1-9	N/C	-	-	-	
S1-10	N/C	-	-	-	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S3-1	WIDE BAND FM	I	-	OD X10	├COAX/YX178
S3-2	0V	-	-	OD	┘

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X6	VCO TUNE	I	-	US X2	YX85
X8	VCO RF	O	-	US X3	YX85
X14	RF OUTPUT	O	-	RO X15	YX85

13.11 RF OUTPUT BOARD (RO).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	N/C	-	-	-	
S1-2	RF LEVEL	I	-	OD S2-2	THE "RO" BOARD
S1-3	STATUS 1	O	-	OD S2-3	INTERCONNECTS
S1-4	EN4	I	-	OD S2-4	DIRECTLY ONTO
S1-5	CLOCK	I	-	OD S2-5	THE "OD" BOARD
S1-6	SERIAL DATA	I	-	OD S2-6	
S1-7	+5V	I	-	OD S2-7	
S1-8	-12V	I	-	OD S2-8	
S1-9	+12V	I	-	OD S2-9	
S1-10	FILTER TUNE	I	-	OD S2-10	

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S2-1	LO SELECT	O	F	CR S2-1	YP702
S2-2	REF SELECT	O	F	CR S2-2	YP702

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
X1	160MHz REF	I	-	CR X2	YX85
X15	RF INPUT	I	-	RD X14	YX85

13.12 BACK PANEL CONNECTOR (BP).

CONNECTOR	TITLE	I/O	F/L	TERMINATION	COMMENT
S1-1	N/C	-	-	-	
S1-2	N/C	-	-	-	
S1-3	N/C	-	-	-	
S1-4	N/C	-	-	-	
S1-5	N/C	-	-	-	
S1-6	0V	-	-	BP CHASSIS	YP702
S1-7	REMOTE STEP	I	-	CB S107-5	YP702
S1-8	AUX DVM	O	-	CB S107-6	YP702
S1-9	SWEEP SYNC	O	-	CB S107-7	YP702

Note:
For the Back panel GPIB connector wiring see section 13.2, Control Board, S106.

13.13 KEYBOARD LAMINATE.

16 way BERG connector connects to Front Panel Display Board (FB-S2).

Key descriptions in the table below indicate the appropriate source and return pin number used for each key.

PIN NO.	9	10	11	12	13	14	15	16
1	CARR FREQ	MOD FREQ	STORE	RF OFF	MOD SOURCE DISP	MOD ON EXT	EXT LEVEL	NC
2	CARR LEVEL	MOD LEVEL	RECALL	EXT REF	NC	MOD ON TWO	SINAD	NC
3	STEP SIZE	SWEEP TIME	MEMORY STEP	#	NC	NC	NC	NC
4	7	4	1	0	NC	MOD ON ONE	DC FM	NC
5	8	5	2	.	↑	↓	MOD OFF	NC
6	9	6	3	+/-	→	NC	SWEEP ON	NC
7	GHz dB(m)	MHz V	kHz mV	BACK SPACE	←	NC	STEP ON	NC
8	Hz μV	%AM dBμV	RAD (m) SEC	LOCAL CLEAR	CURSOR	ROTARY	NC	NC

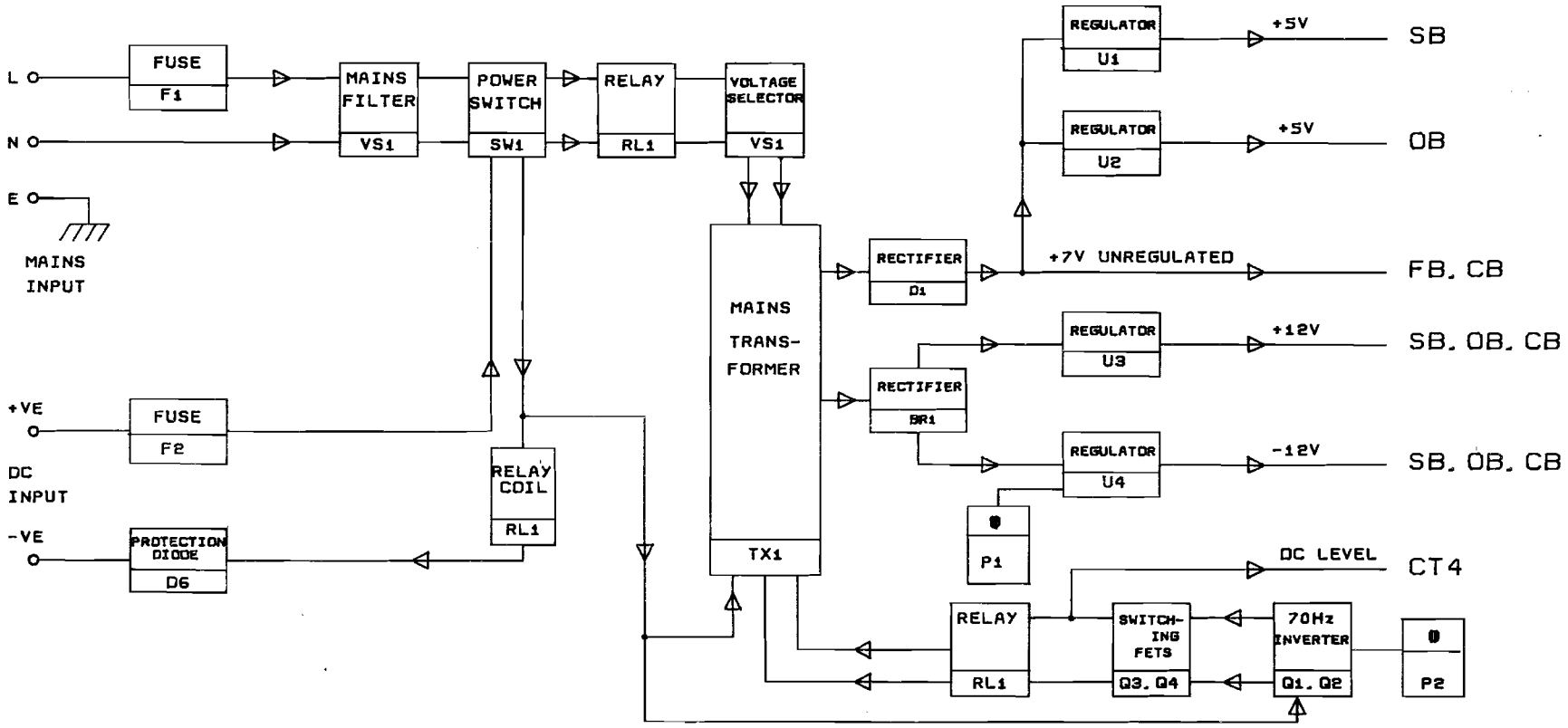
NC - NO CONTACT

13.14 ABBREVIATIONS USED.

PS	Power supply board
CB	Control board
FB	Front panel board
FS	Fine step loop board
CS	Coarse step loop board
HL	Heterodyne loop board
US	UHF step loop board
CR	Crystal reference board
OD	Output distribution board
RD	Range divider board
RO	RF output board
BP	Back Panel

I	Signal input.
O	Signal output.
IO	Bi-directional data.
F	Via feedthrough capacitor type CI41N00V2 (1000pf).
L	Via feedthrough capacitor type CI3100PJM (100pf).
N/C	No contact.
YP702	7 strand 0.2mm flexible wire.
YP1602	16 strand 0.2mm flexible wire.
YP2402	24 strand 0.2mm flexible wire.
YX85	PTFE dielectric solid coaxial cable.
YX178	PTFE dielectric flexible coaxial cable.
YX188	PTFE dielectric flexible coaxial cable.

14. CIRCUIT DIAGRAMS.



ISS	A			USED ON: PSG2400A
DATE	19.2.93			
MOD. NO.	-			
CHK'D	SR			
NAME	JN			

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

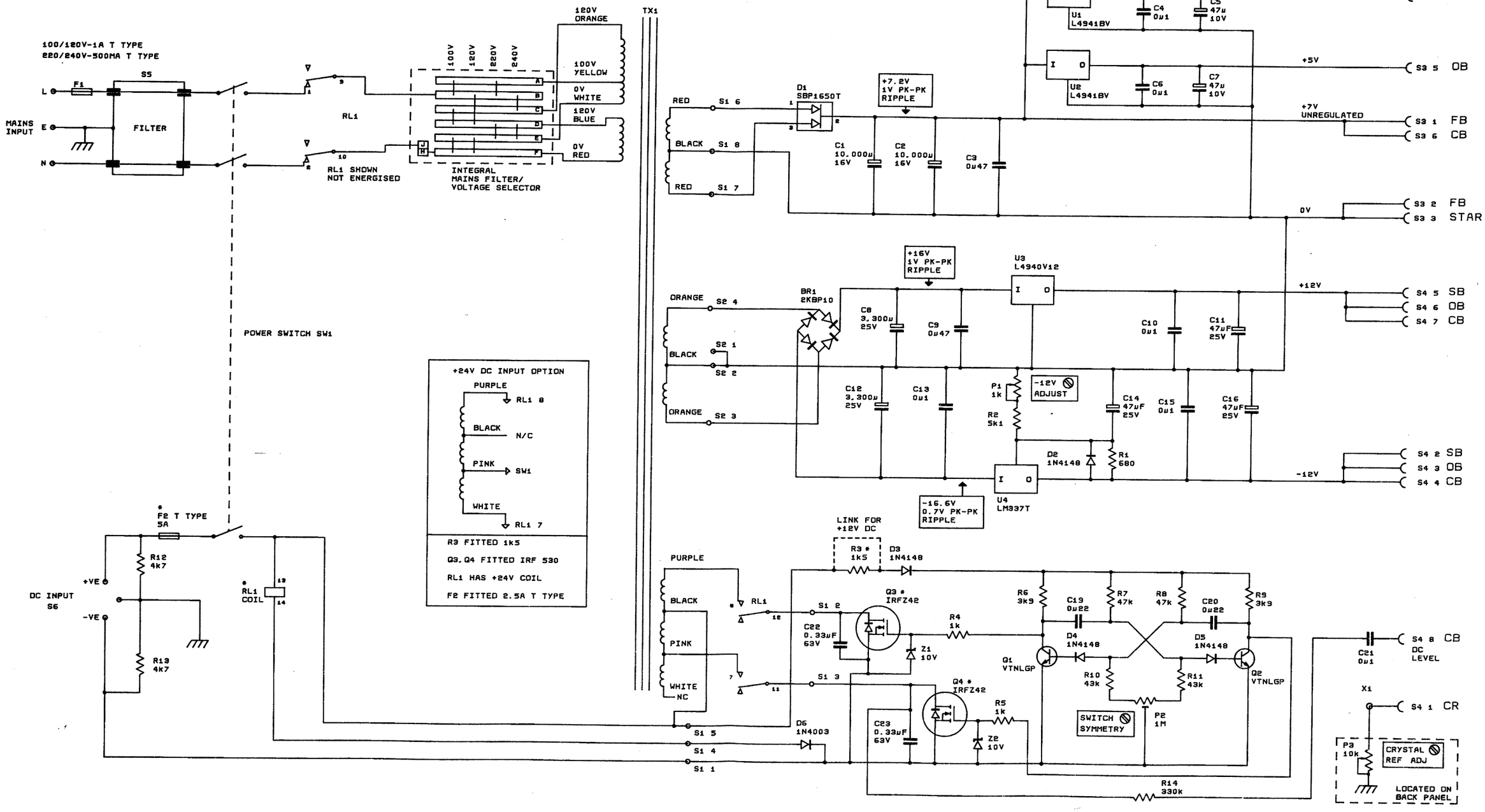
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE: POWER SUPPLY BLOCK DIAGRAM PS

DRAWING NO. 4SZV0125

SHEET 1 OF 1 SHEETS



ISS	A	B	C							
DATE	29/8/90	19-9-91	7.12.92							
MOD. NO.	—	—	15721							
CHK'D	SD	SD	SD							
MADE	ST	ST	L.A.S							

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
* SEE TABLE FOR +24V DC OPTION
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: POWER SUPPLY CIRCUIT DIAGRAM

DRAWING NO. 2SZX0704

SHEET 1 OF 1 SHEETS

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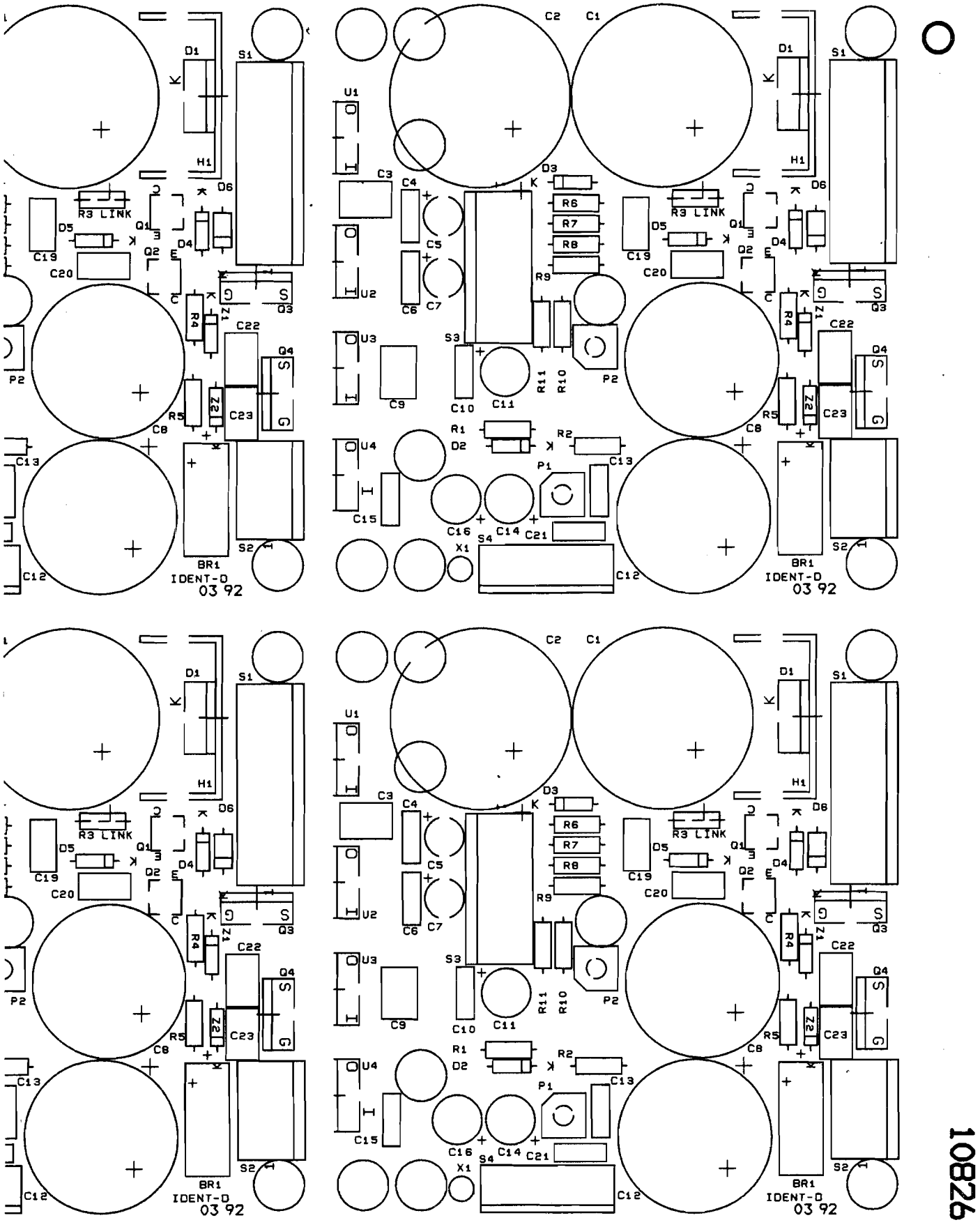
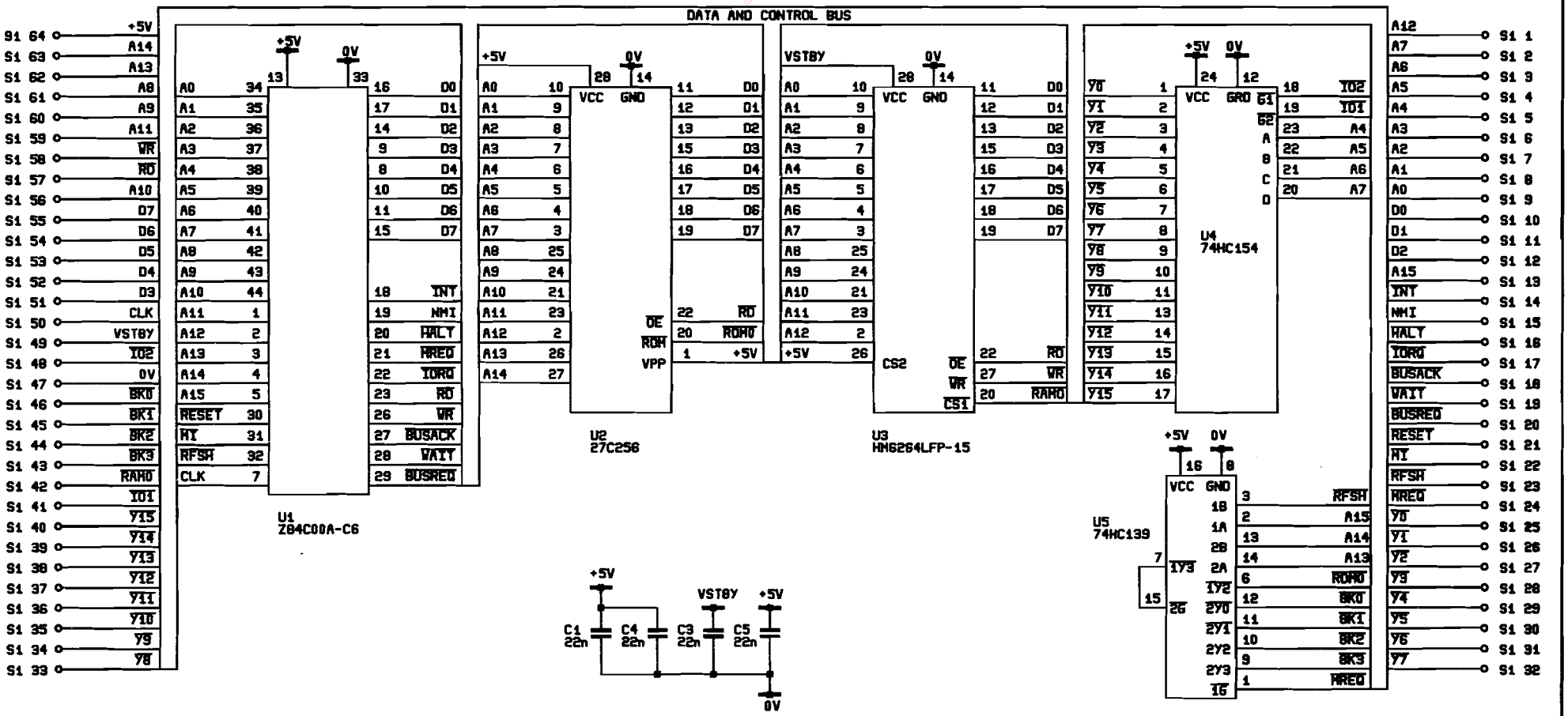


ARTEK MEDIA



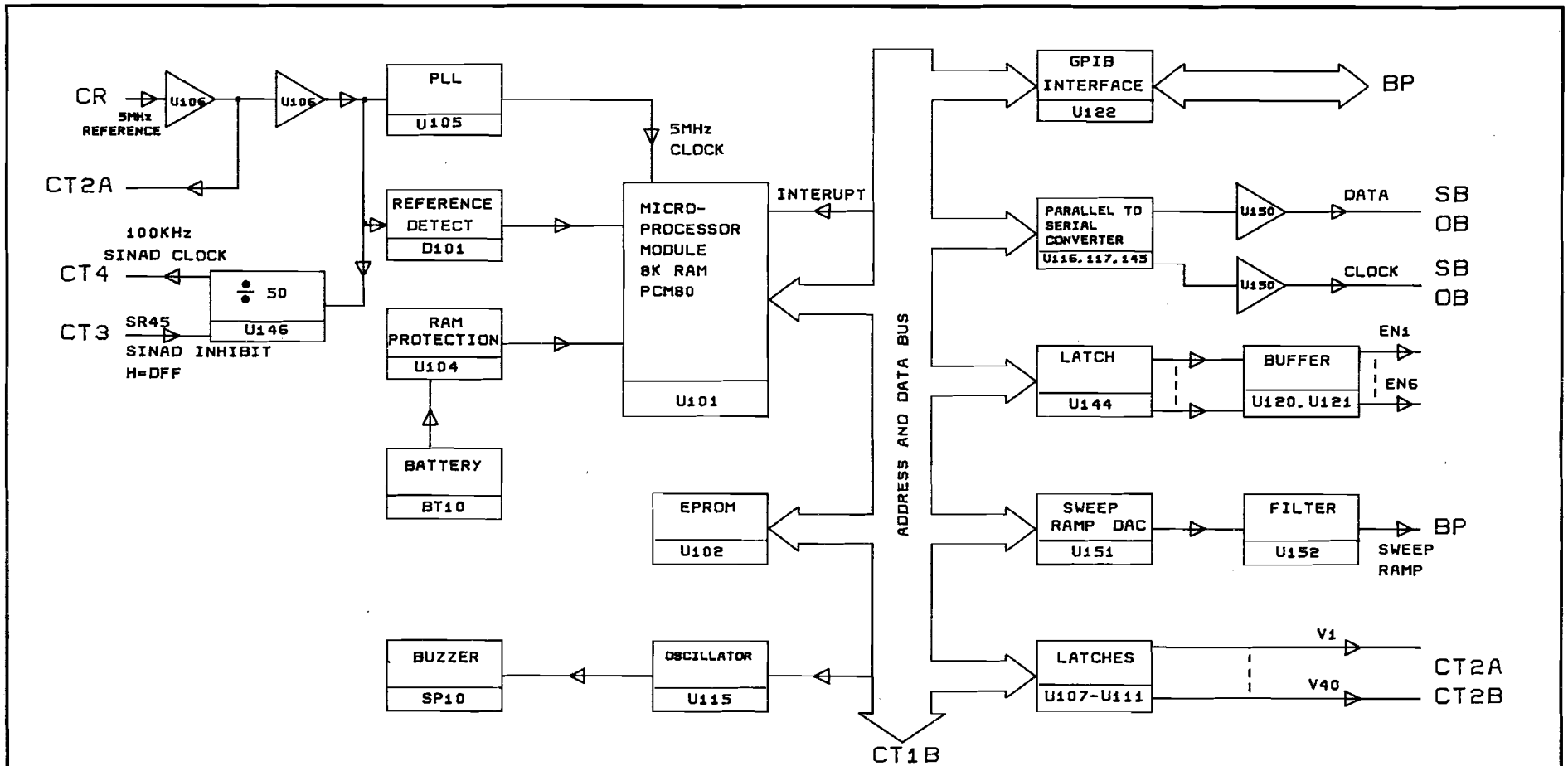
ISS	A									USED ON:	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED
DATE	23.2.90										
MOD. NO.											
CHK'D	DQ										
NAME	LAS										

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

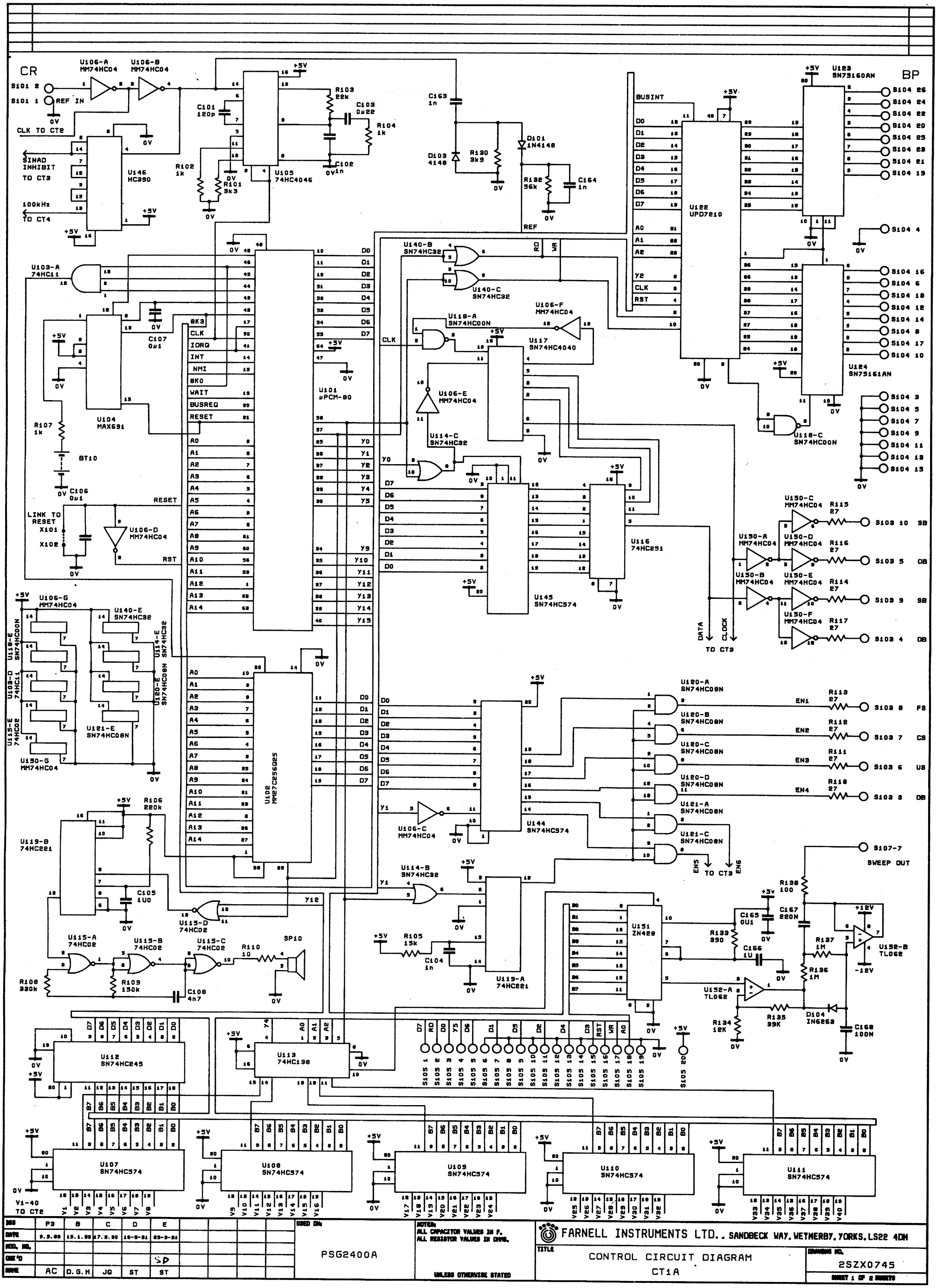
TITLE: PCM80 BOARD CIRCUIT DIAGRAM

DRAWING NO. RSZX0323

SHEET OF SHEETS



ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH
DATE	25.2.93					TITLE: CONTROL BLOCK DIAGRAM CT1A
MOD. NO.	-					DRAWING NO. 4SZV0156
CHK'D	SB					SHEET 1 OF 1SHEETS
NAME	JN					



ISS	P3	B	C	D	E					
DATE	9.9.99	19.1.99	17.9.99	16-8-91	23-9-91					
MOD. NO.										
CHK'D						SD				
NAME	AC	D.G.H	JG	ST	ST					

USED ON: PSG2400A

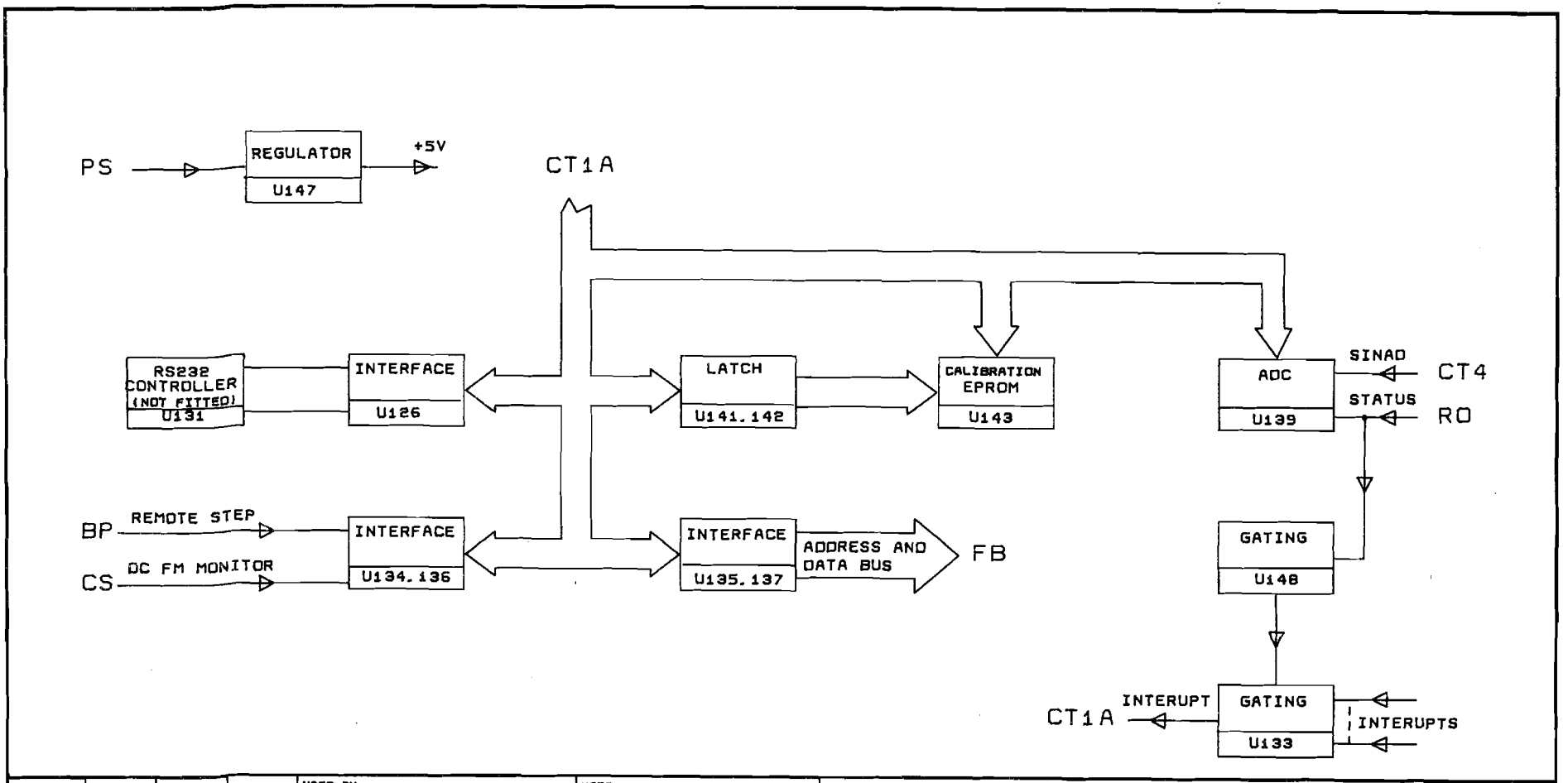
NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: CONTROL CIRCUIT DIAGRAM CT1A

DRAWING NO. 2SZX0745

SHEET 1 OF 2 SHEETS



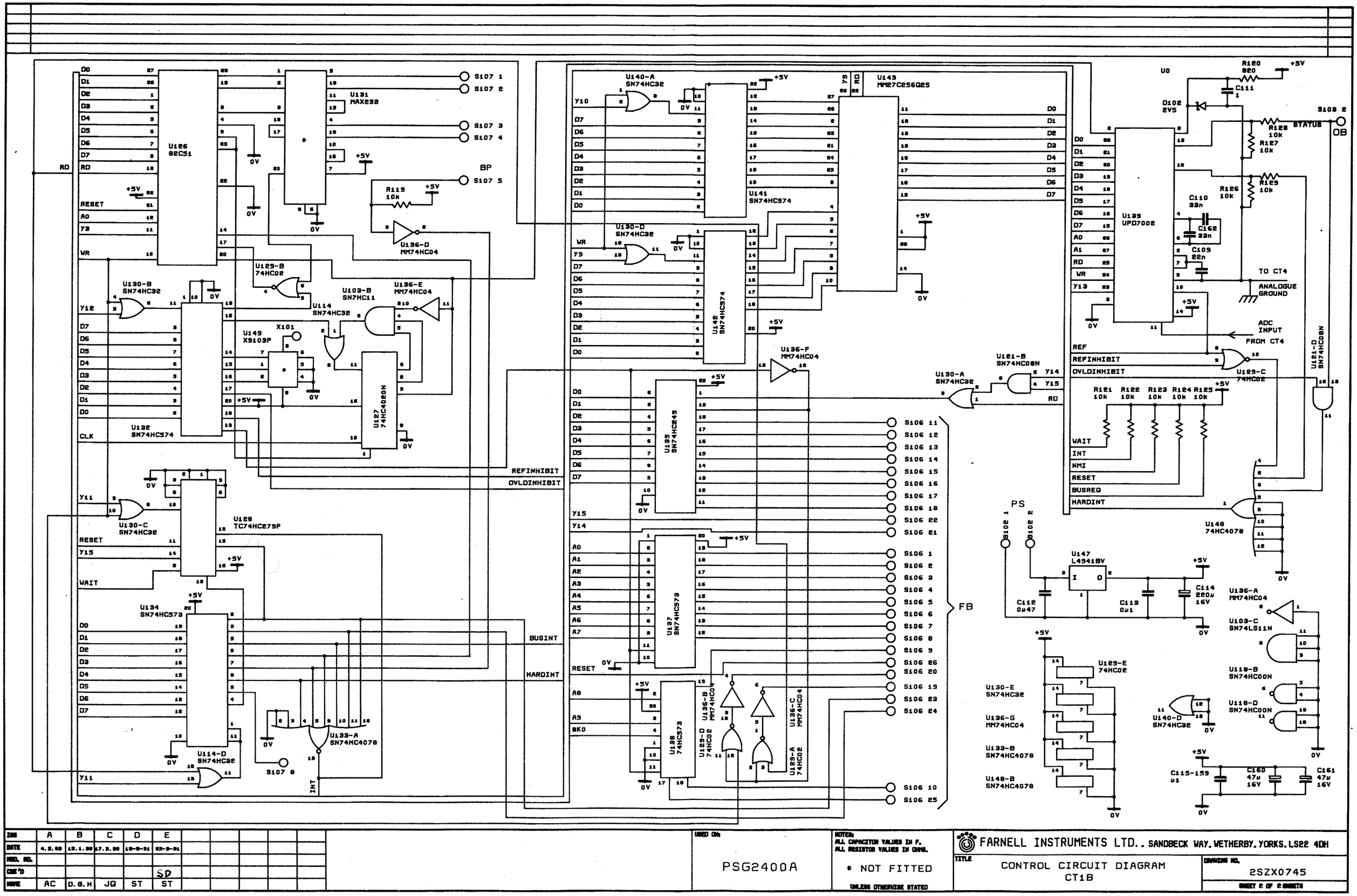
ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED
DATE	25.2.93				
MOD. NO.					
CHK'D	SR				
NAME					

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE: CONTROL BLOCK DIAGRAM CT1B

DRAWING NO. 4SZV0157

SHEET 1 OF 1SHEETS



ISS	A	B	C	D	E					
DATE	4.5.93	15.1.96	17.2.96	18-8-21	25-9-21					
MOD. NO.										
CHK'D					SD					
NAME	AC	D.G.H	JQ	ST	ST					

USED ON: PSG2400A

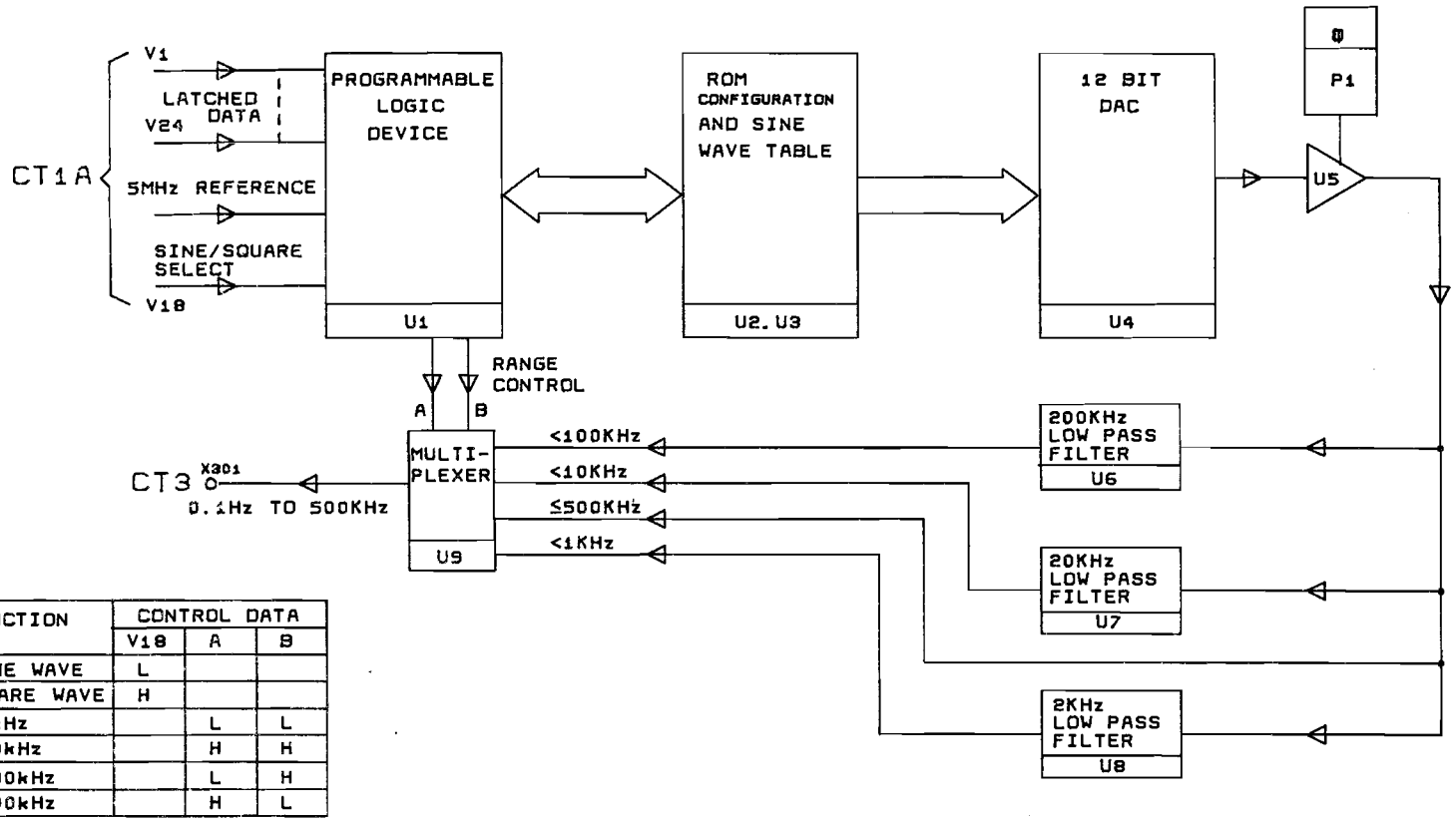
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
* NOT FITTED
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: CONTROL CIRCUIT DIAGRAM CT1B

DRAWING NO. 2SZX0745

SHEET 2 OF 2 SHEETS



FUNCTION	CONTROL DATA		
	V18	A	B
SINE WAVE	L		
SQUARE WAVE	H		
<1kHz		L	L
<10kHz		H	L
<100kHz		L	H
≤500kHz		H	L

ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED
DATE	24.2.93				
MOD. NO.	-				
CHK'D	SR				
NAME	JN				

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE: MODULATION SOURCE 1 BLOCK DIAGRAM CT2A

DRAWING NO. 4SZV0152

SHEET 1 OF 1 SHEETS

CT1

+5V

R1 10k

U1 XC2018PC68-70

V8 V7 V6 V5 V4 V3 V2 V1 V16 V15 V14 V13 V12 V11 V10 V9 V24 V23 V22 V21

1S15 1S14 1S13 1S12 1S11 1S10 1S9 1S8 1S7 1S6 1S5 1S4 1S3 1S2 1S1 1S0

1D0 1D1 1D2 1D3 1D4 1D5 1D6 1D7

CT2B LOAD

U113 13

CT2B 5MHZ

U106 2

RESET

U109 PIN 13

U2 27C512

U3 27C512

C3 1µ

C4 1µ

C1 1µ

C2 1µ

+12V

C5 1µ

U4 AD767KN

R6 510

P1 200

R4 1k

C7 22p

R5 1k

U5 UAF356TC

-12V

C6 1µ

R2 100

R3 100

R43 100

R44 100

SOURCE 1 CAL

C21 in

U6-A LF353N

C20 in5

C22 SOT

C18 100p

R11 1k

R10 1k

C17 150p

C19 SOT

U6-B LF353N

C15 330p

C14 in

C16 SOT

R8 1k

R7 1k

C12 10p

R9 1k

C9 47p

C11 330p

C13 39p

C8 in

C10 SOT

C36 10n

U7-A LF353N

C35 15n

C37 2n2

C33 330p

R16 1k

R15 1k

C32 2n2

C34 SOT

U7-B LF353N

C27 3n3

C26 10n

C28 SOT

R13 1k

R12 1k

C30 100p

R14 1k

C29 3n3

C31 SOT

C24 4n7

C23 4n7

C25 SOT

C48 33n

U8-A LF353N

C47 0µ22

C49 47n

C51 10n

R21 1k

R20 1k

C50 10n

C52 4n7

U8-B LF353N

C42 33n

C41 100n

C43 SOT

R17 1k

C45 2n2

R19 1k

R18 1k

C39 3n3

C44 33n

C46 SOT

C38 100n

C40 SOT

9V PK-PK

X301

CT3

0.1Hz TO 500KHz

C506 1µ

U9 CD4052B

<100KHZ

<10KHZ

≤500KHZ

<1KHZ

ISS	C	D	E	F
DATE	28.9.98	6-8-99	25-8-99	30/10/98
MOD. NO.				15721
CHK'D				SD
NAME	JG	ST	ST	JEC

USED ON:

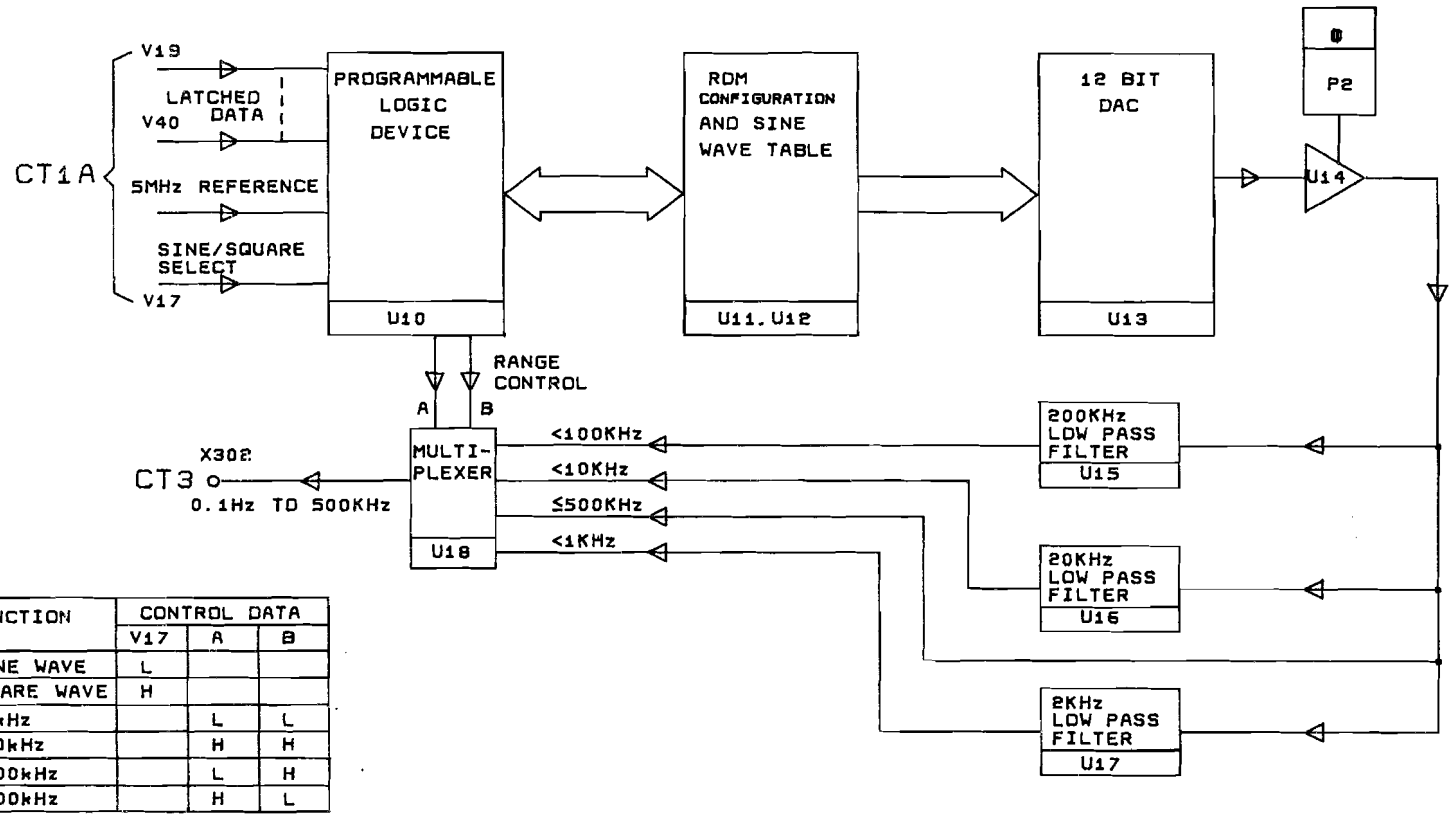
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: PSG2400A CONTROL CCT DIA CT2A

DRAWING NO. 2SZX0747

SHEET 1 OF 2 SHEETS



FUNCTION	CONTROL DATA		
	V17	A	B
SINE WAVE	L		
SQUARE WAVE	H		
<1kHz		L	L
<10kHz		H	H
<100kHz		L	H
≤500kHz		H	L

ISS	A			USED ON: PSG2400A
DATE	24.2.93			
MOD. NO.	-			
CHK'D	SC			
NAME	JN			

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

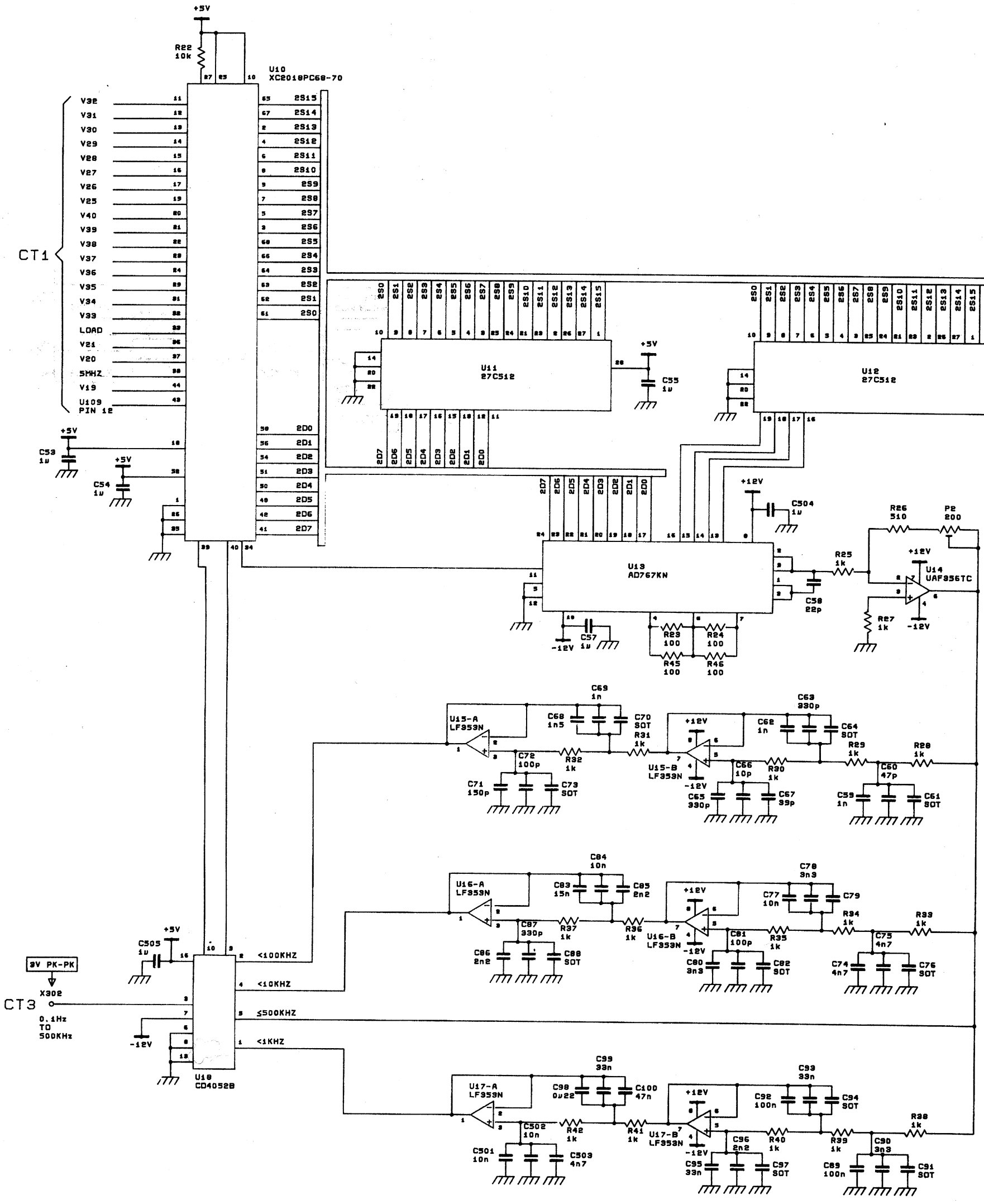
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

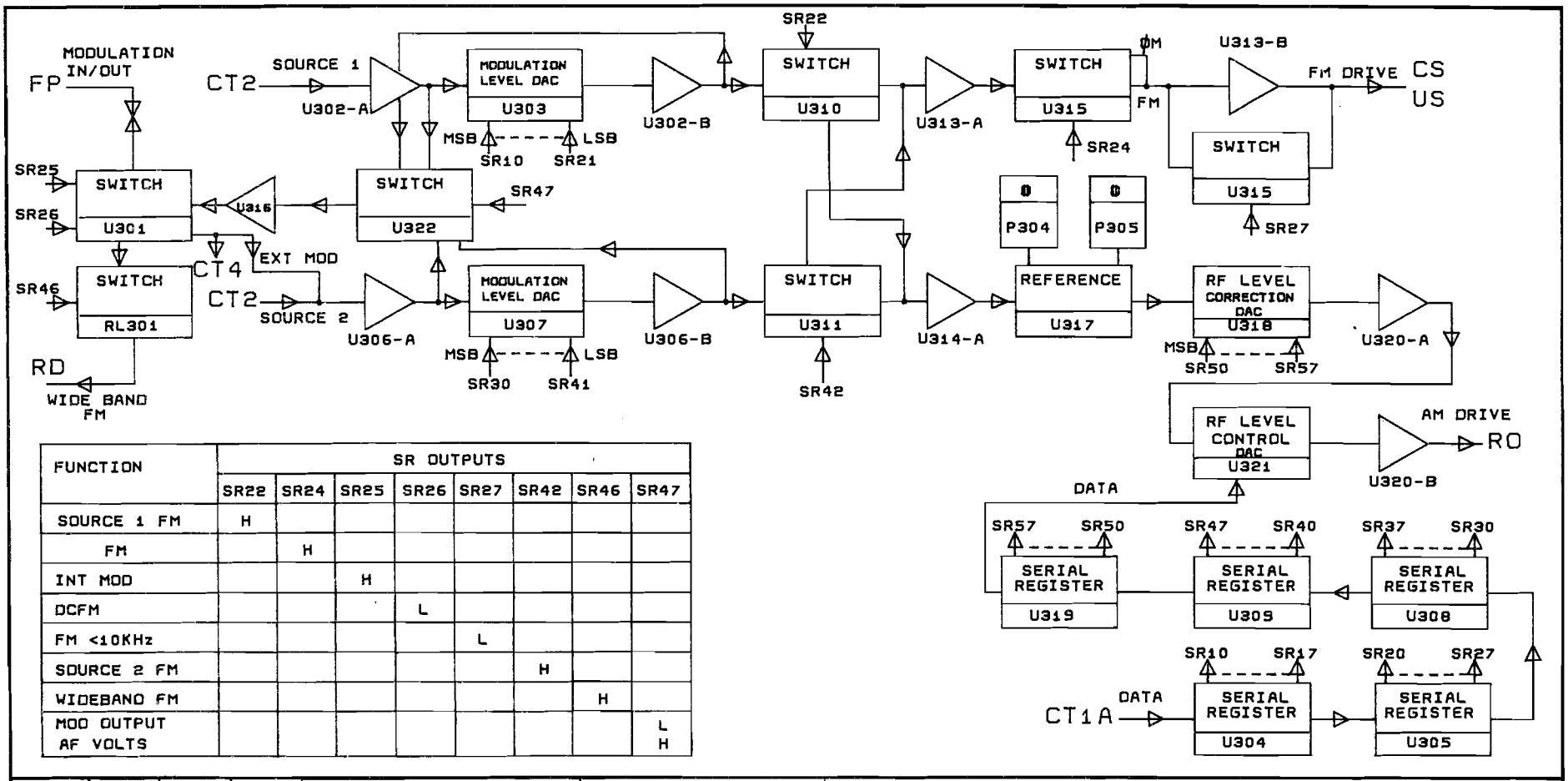
TITLE: MODULATION SOURCE 2 BLOCK DIAGRAM CT2B

DRAWING NO. 4SZV0153

SHEET 1 OF 1 SHEETS



ISS	C	D	E	F						USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH	
DATE	28.9.90	6-8-91	25-8-94	30/10/92						PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	TITLE: CONTROL CIRCUIT DIAGRAM CT2B	DRAWING NO. 2SZX0747
MOD. NO.				15721									SHEET 2 OF 2 SHEETS
CHK'D				SD							UNLESS OTHERWISE STATED		
NAME	JG	ST	ST	JEC									



FUNCTION	SR OUTPUTS							
	SR22	SR24	SR25	SR26	SR27	SR42	SR46	SR47
SOURCE 1 FM	H							
FM		H						
INT MOD			H					
DCFM				L				
FM <10KHz					L			
SOURCE 2 FM						H		
WIDEBAND FM							H	
MOD OUTPUT AF VOLTS								L H

ISS	A		
DATE	26.2.93		
MOD. NO.	-		
CHK'D	SR		
NAME	JN		

USED ON:
PSG2400A

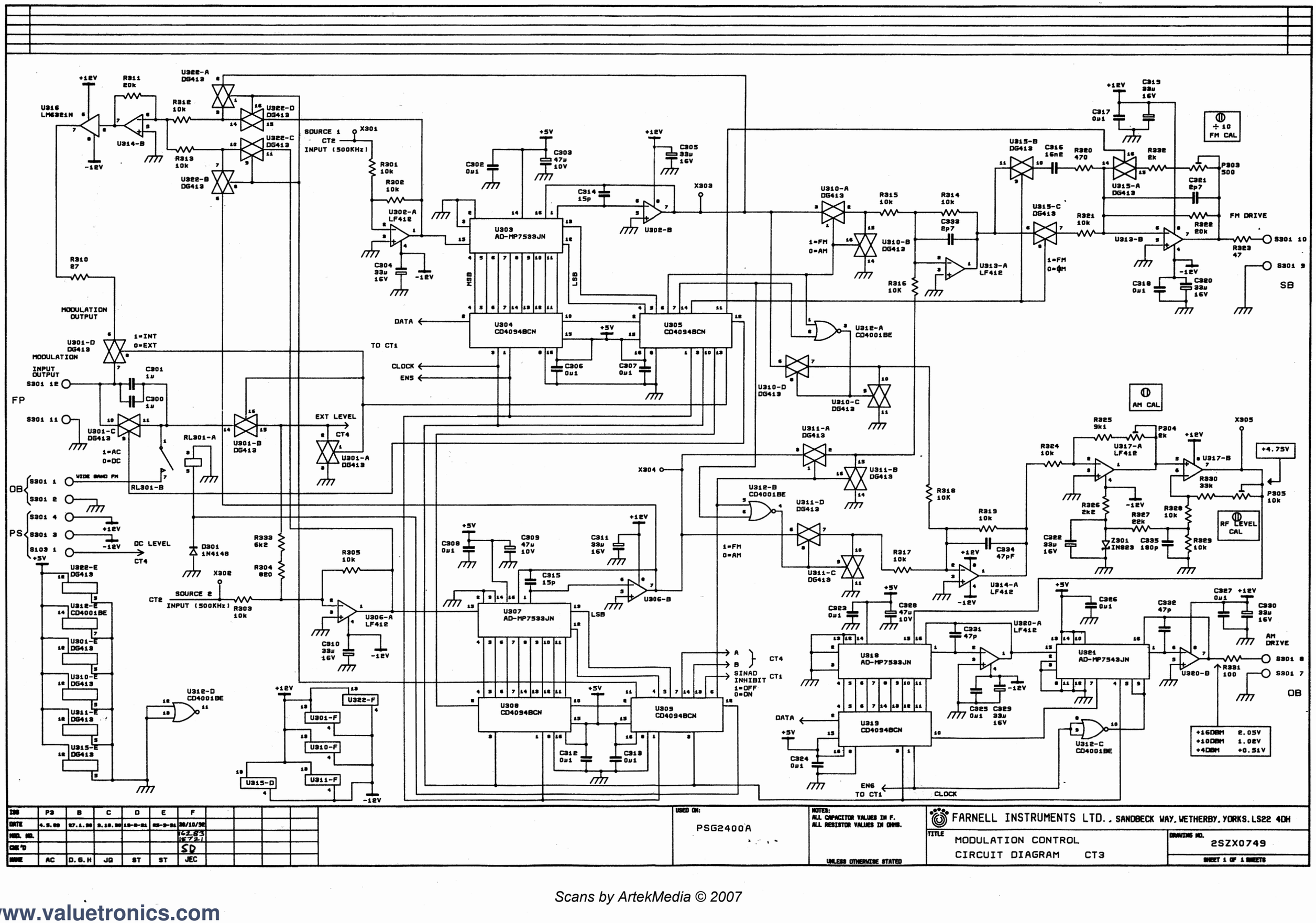
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE
MODULATION CONTROL
BLOCK DIAGRAM CT3

DRAWING NO.
4SZV0158

SHEET 1 OF 1 SHEETS



ISS	P3	B	C	D	E	F				
DATE	4.5.89	27.1.90	9.10.90	18-8-91	23-9-91	30/10/92				
MOD. NO.						14283 15721				
CHK'D						SD				
NAME	AC	D.G.H	JQ	ST	ST	JEC				

USED ON: PSG2400A

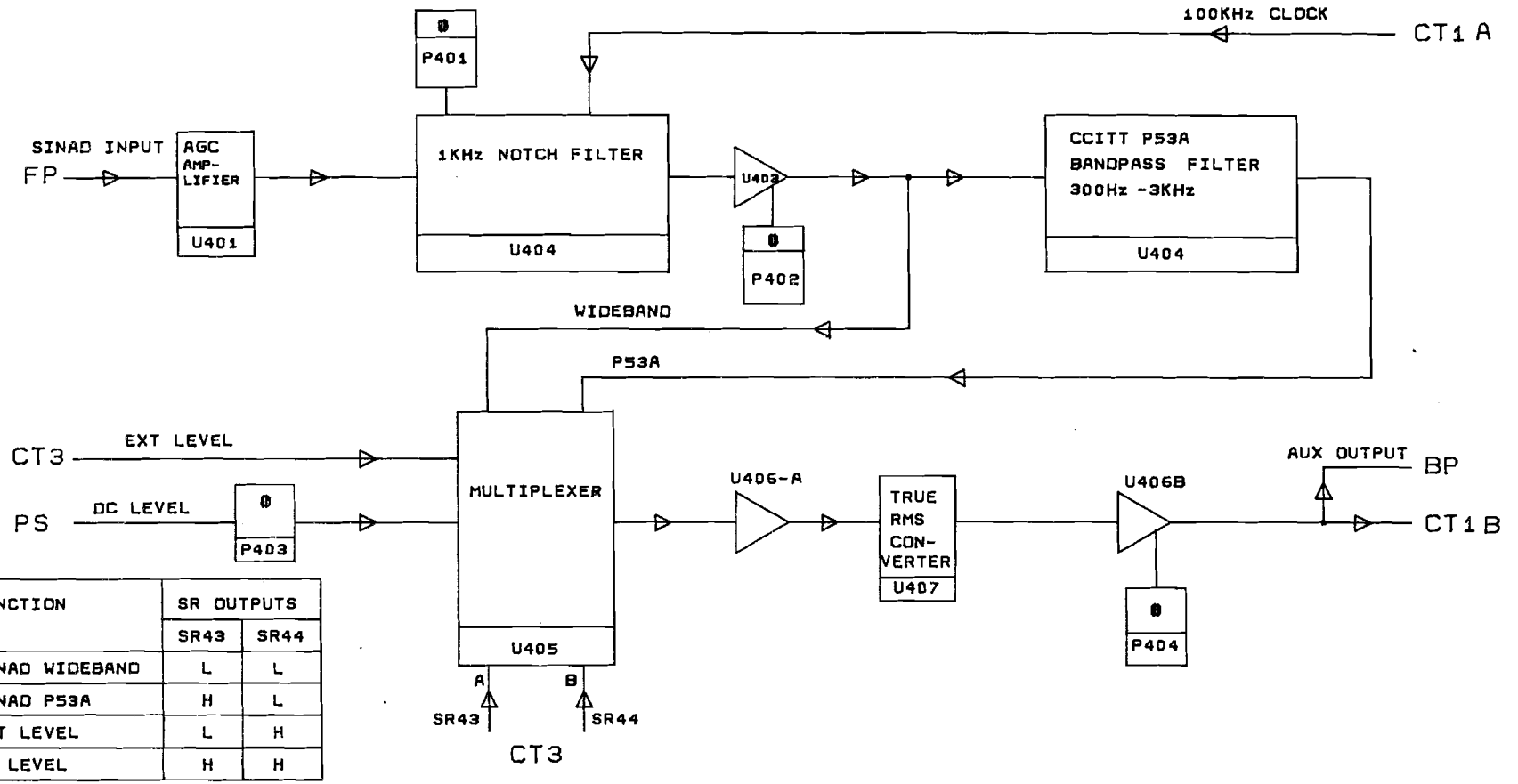
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: MODULATION CONTROL CIRCUIT DIAGRAM CT3

DRAWING NO. 2SZX0749

SHEET 1 OF 1 SHEETS



FUNCTION	SR OUTPUTS	
	SR43	SR44
SINAD WIDEBAND	L	L
SINAD P53A	H	L
EXT LEVEL	L	H
DC LEVEL	H	H

ISS	A			USED ON: PSG2400A
DATE	17.2.93			
MOD. NO.	-			
CHK'D	SE			
NAME	JN			

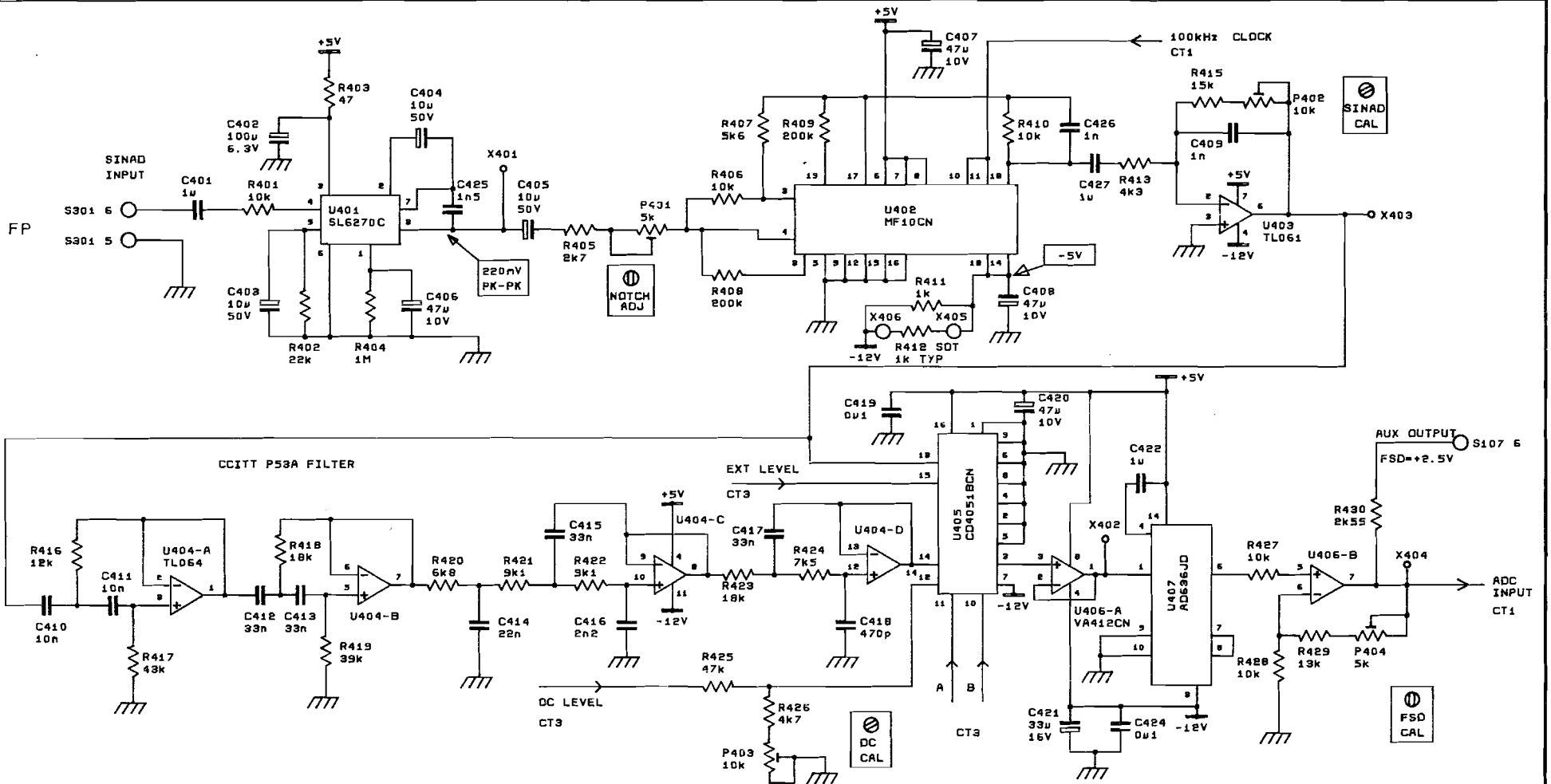
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE: SINAD CIRCUIT BLOCK DIAGRAM CT4

DRAWING NO. 4SZV0123

SHEET 1 OF 1 SHEETS



ISS	A	B	C	D	E				
DATE	4.9.89	24.1.90	9.10.90	25-9-91	30/10/92				
MOD. NO.					15721 16203				
CHK'D					SD				
NAME	AC	D.G.H.	JQ	S.T	JEC				

USED ON: PSG2400A

NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: SINAD CIRCUIT DIAGRAM CT4

DRAWING NO. 3SZX0750

SHEET 1 OF 1 SHEETS

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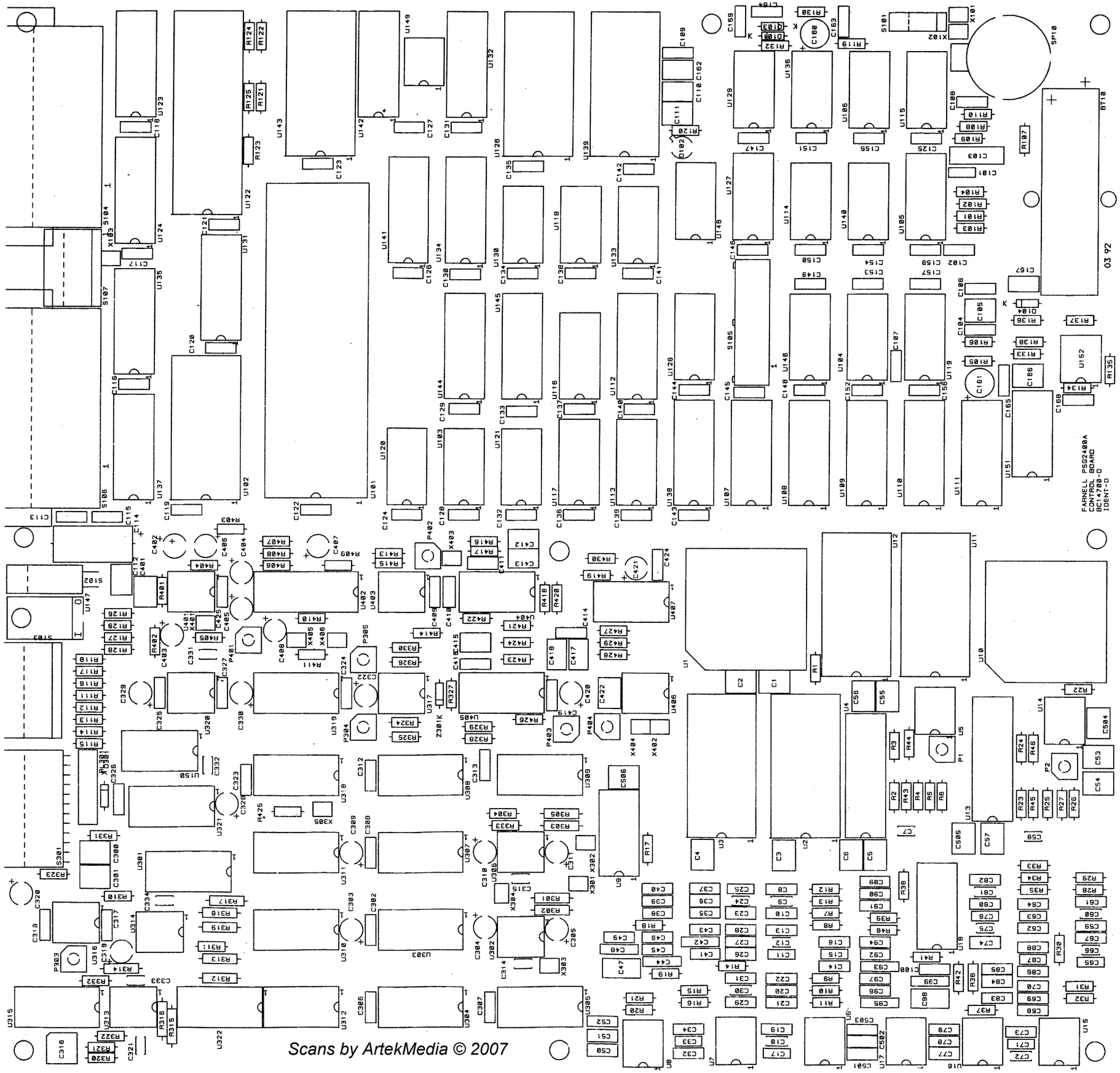
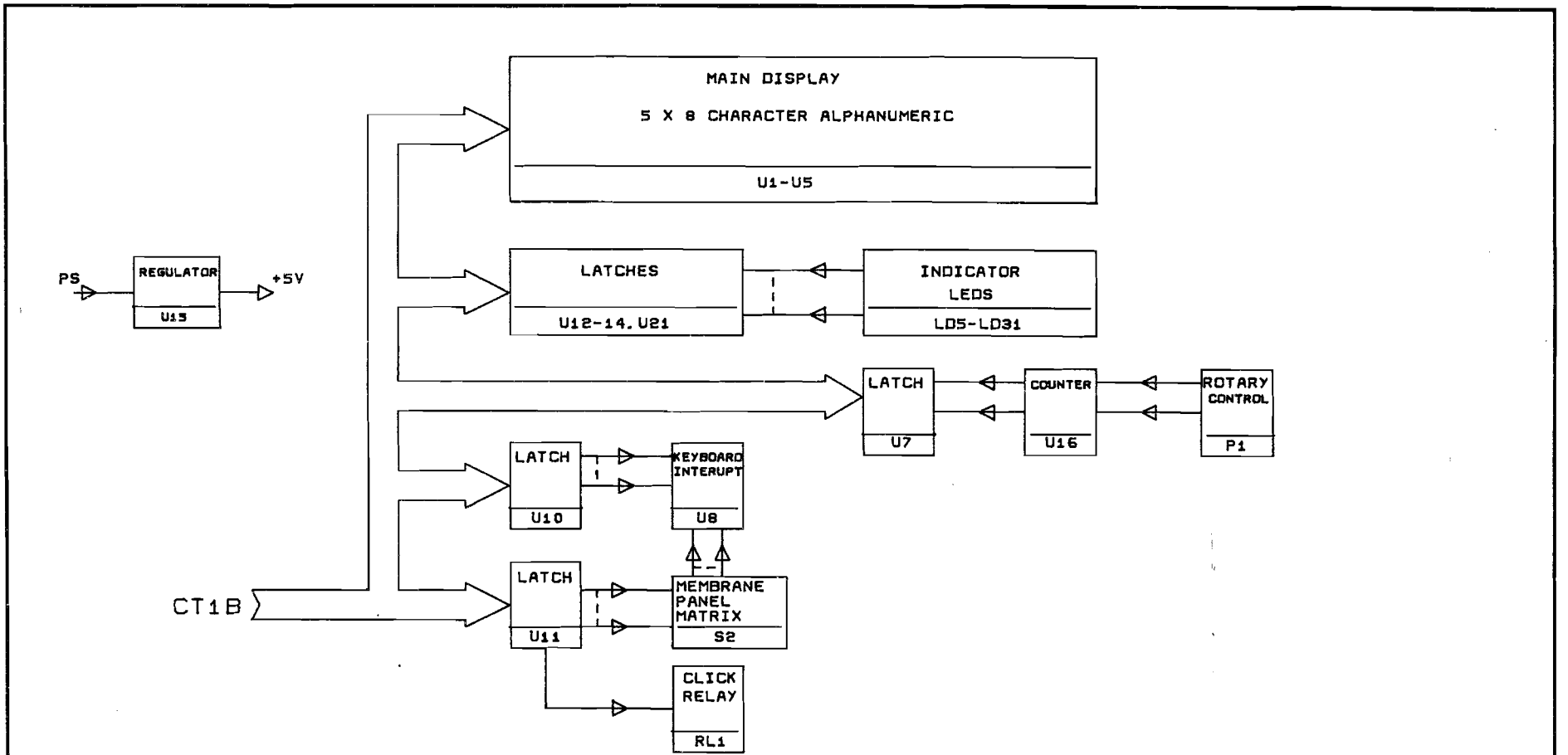
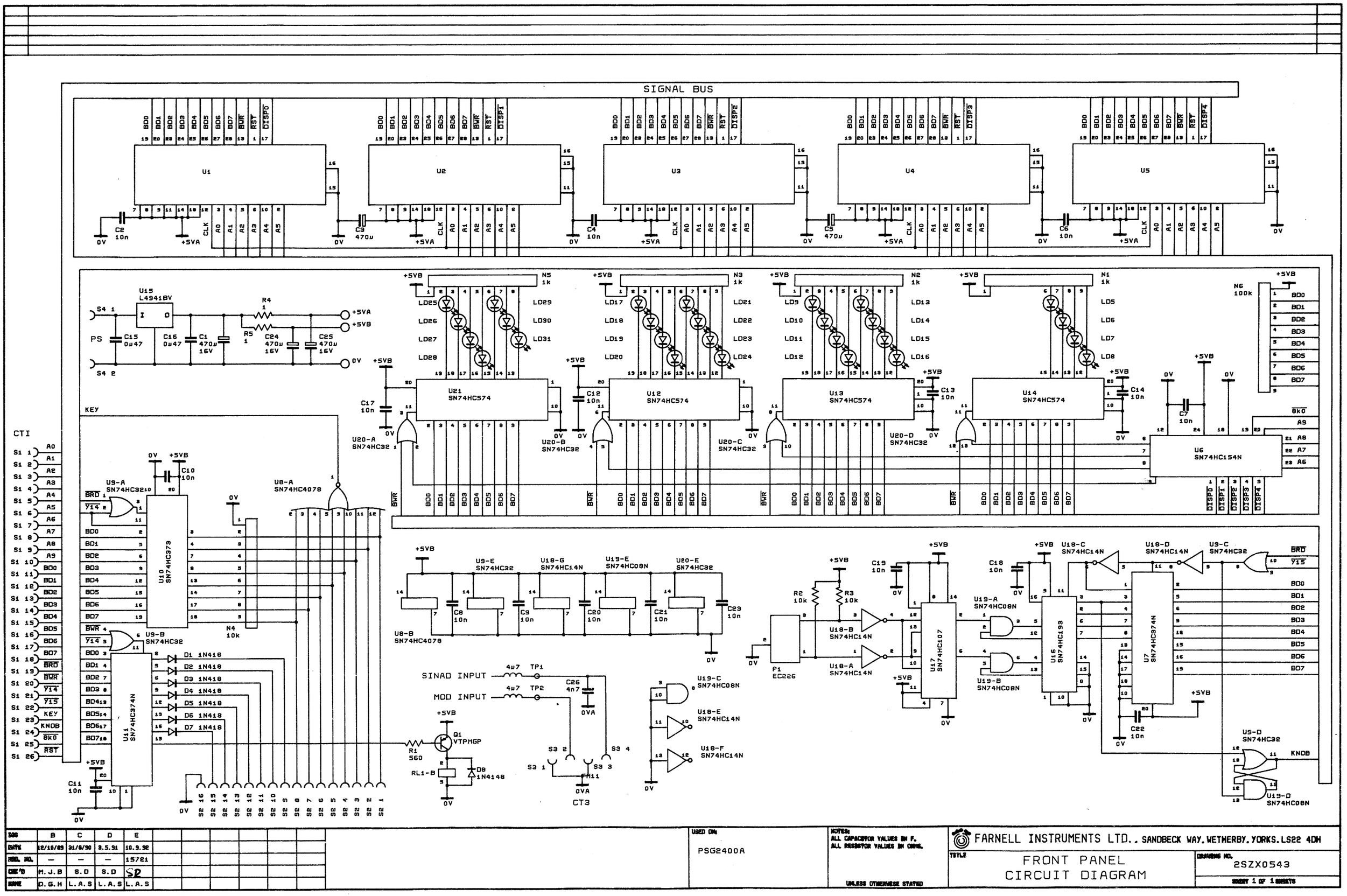




ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH
DATE	25.2.93					TITLE: FRONT PANEL BLOCK DIAGRAM
MOD. NO.	-					DRAWING NO. 4SZV0155
CHK'D	SR				UNLESS OTHERWISE STATED	SHEET 1 OF 1SHEETS
NAME	JN					



	B	C	D	E						
DATE	12/10/89	21/8/90	3.5.91	10.9.92						
MOD. NO.	—	—	—	15721						
CHK'D	M.J.B	S.D	S.D	SD						
NAME	D.G.H	L.A.S	L.A.S	L.A.S						

USED ON: PSG2400A

NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: FRONT PANEL CIRCUIT DIAGRAM

DRAWING NO. 2SZX0543

SHEET 1 OF 1 SHEETS

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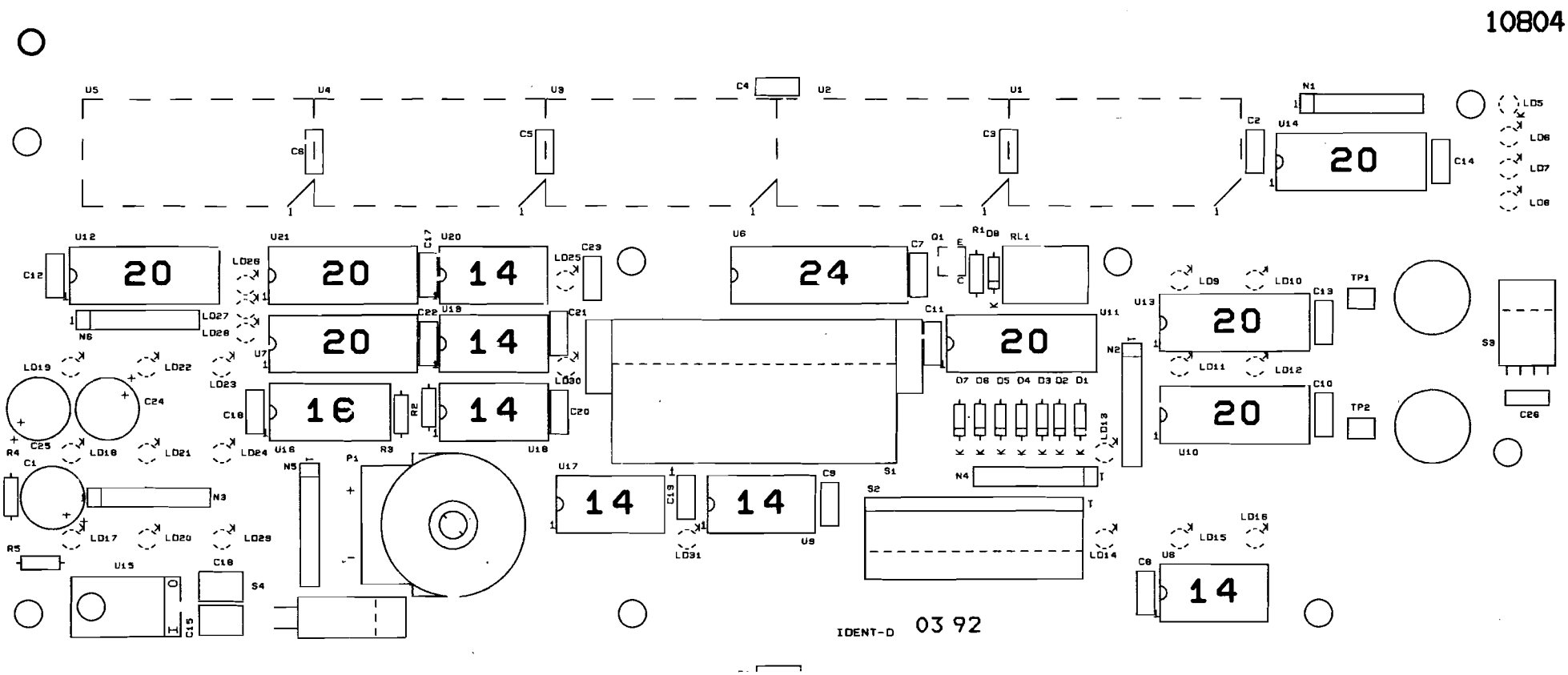
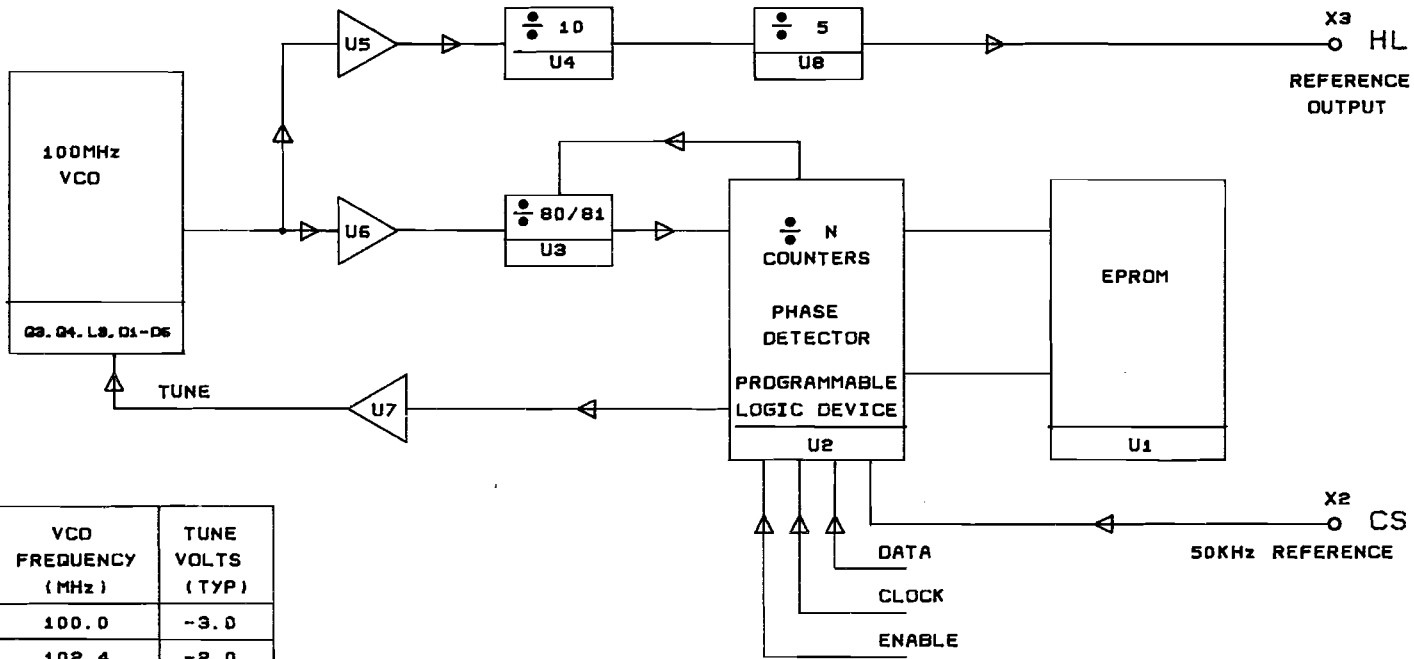




CARRIER FREQUENCY (MHz)	VCO FREQUENCY (MHz)	TUNE VOLTS (TYP)
600.00	100.0	-3.0
600.24	102.4	-2.0
600.25	100.0	-3.0

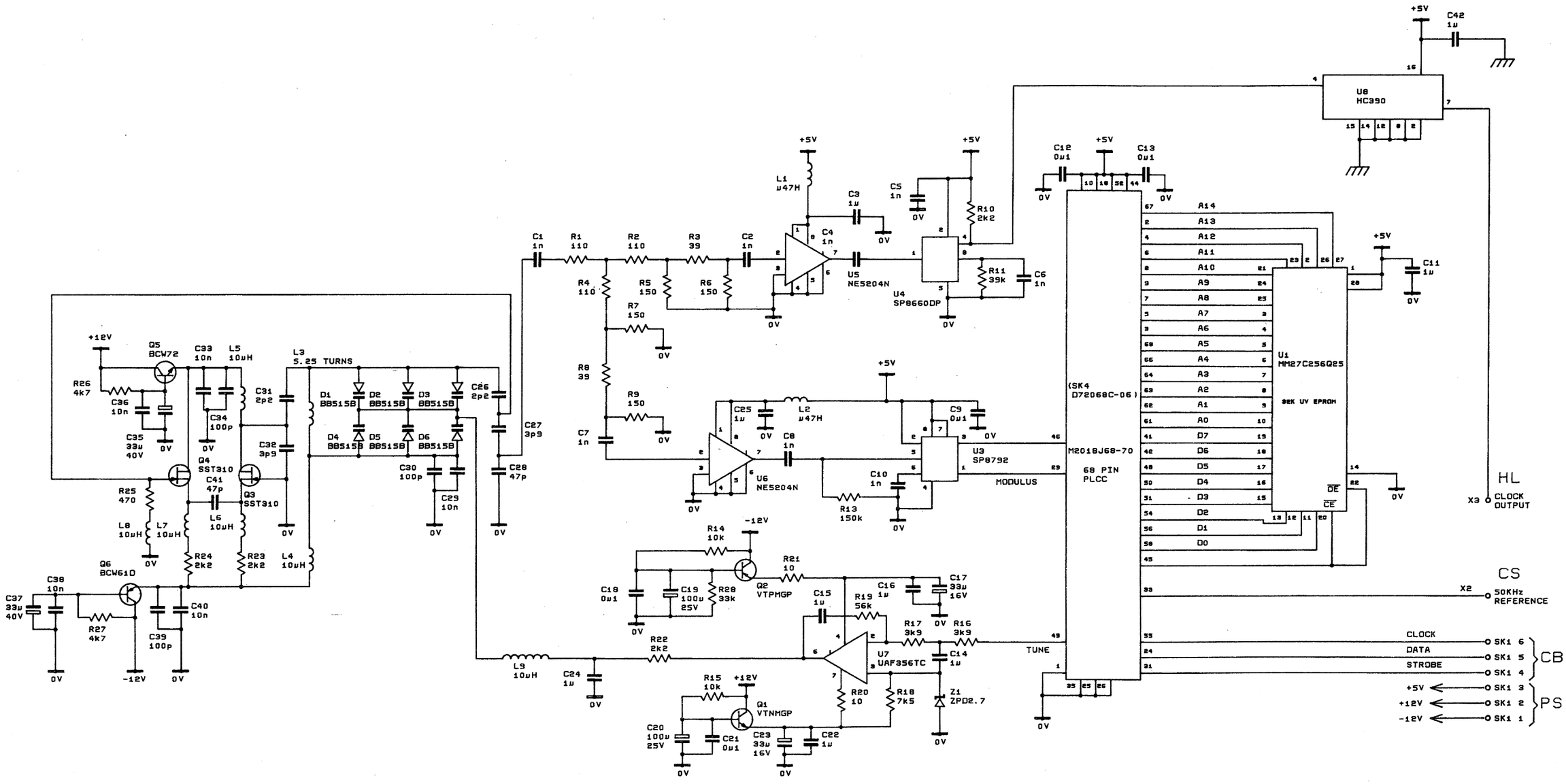
ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED
DATE	19.2.93				
MOD. NO.	-				
CHK'D	[illegible]				
NAME	JN				

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE: FINE STEP BLOCK DIAGRAM FS

DRAWING NO. 4SZV0126

SHEET 1 OF 1SHEETS



ISS	A	B	C	D						
DATE	28.9.89	28.6.90	29.8.90	18.11.92						
MOD. NO.	—	—	—	16883 15721						
CHK'D	P.T	P.T	P.T	SD						
NAME	D.G.H	L.A.S	L.A.S	L.A.S						

USED ON: PSG2400 A

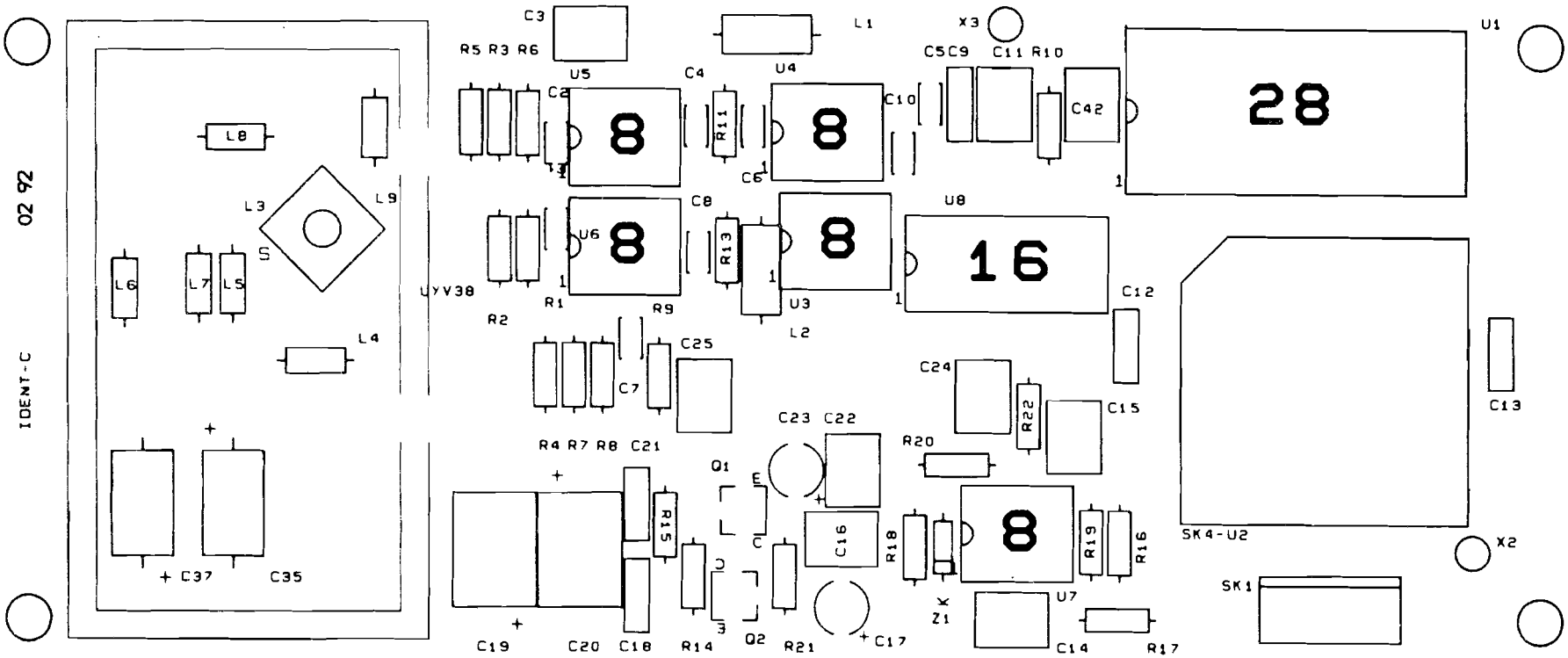
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

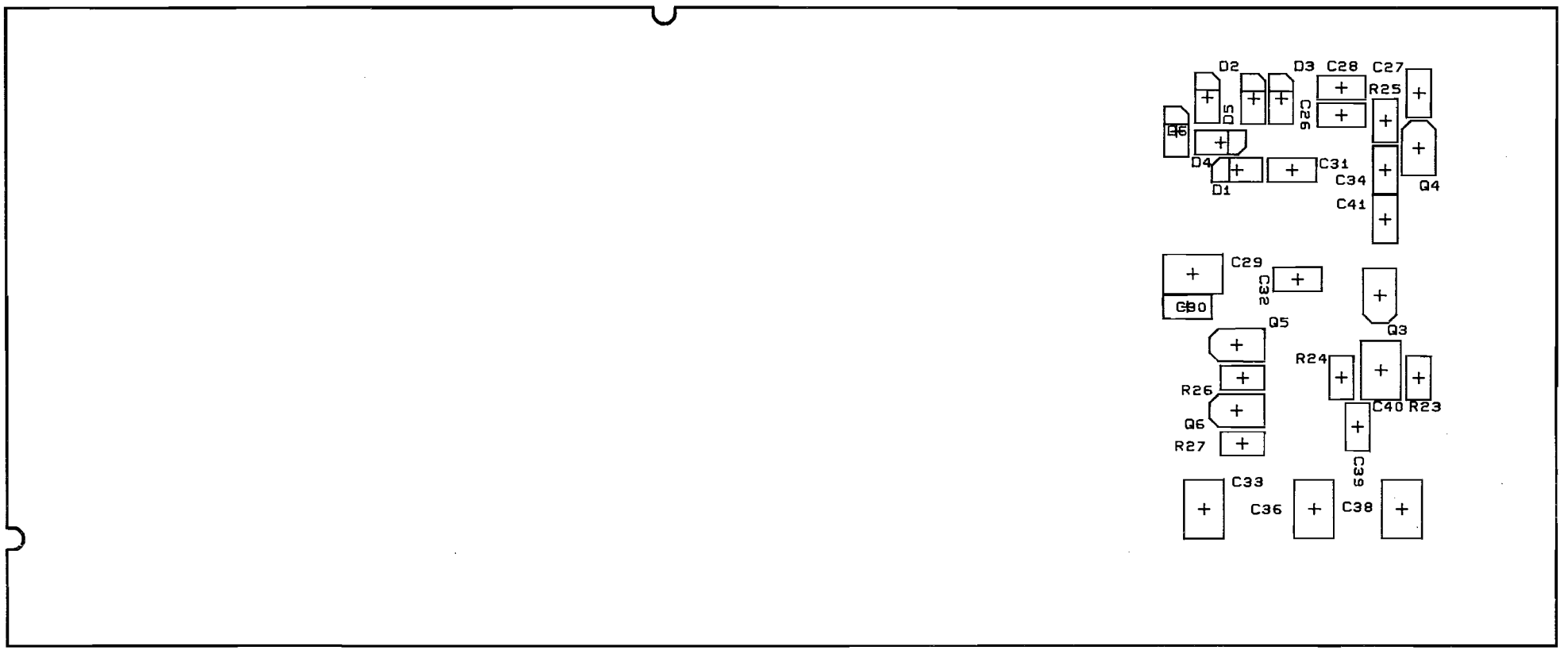
FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

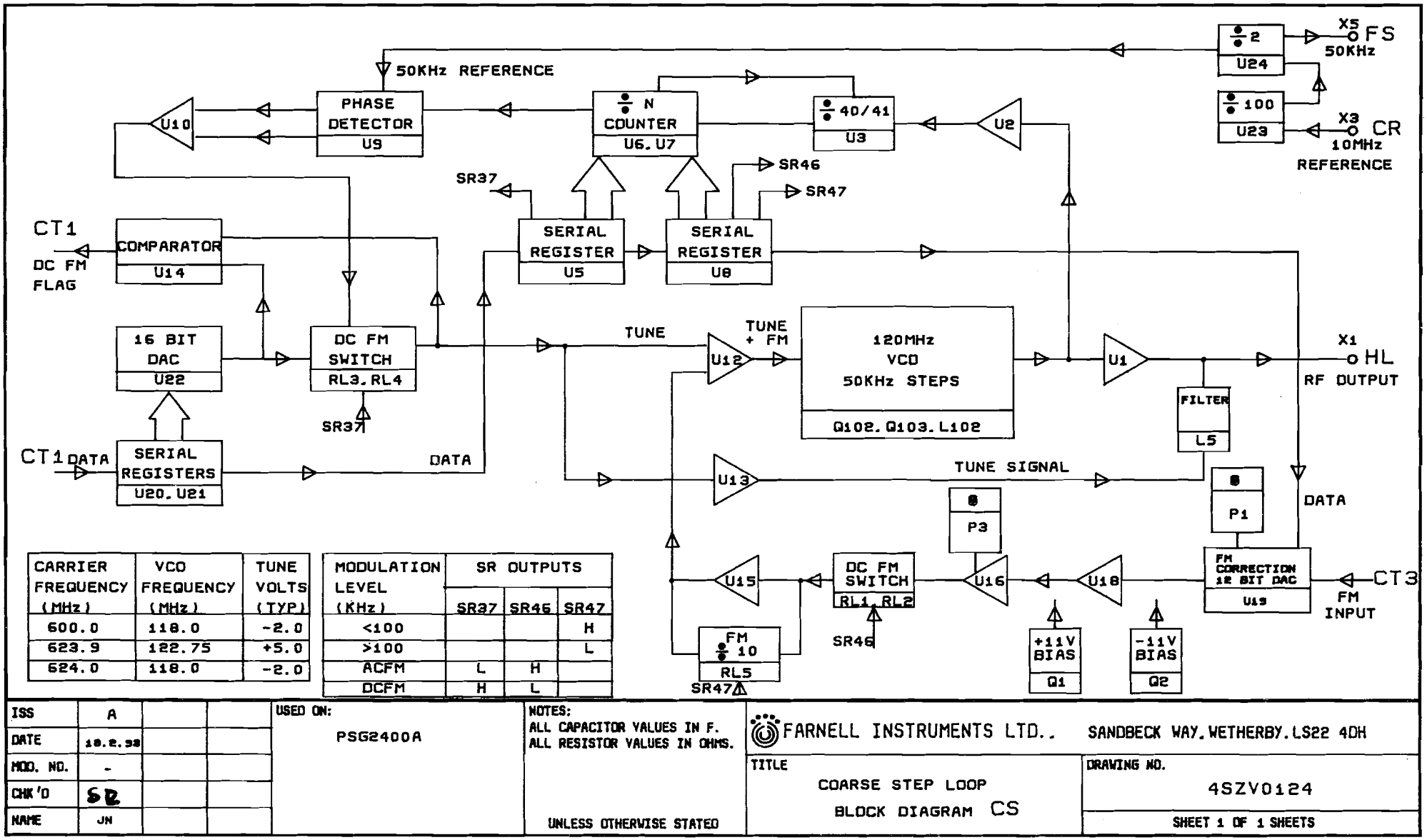
TITLE: PSG2400A FINE STEP LOOP BD CIRCUIT DIAGRAM

DRAWING NO. 2SZX0602

SHEET 1 OF 1 SHEETS







CARRIER FREQUENCY (MHz)	VCO FREQUENCY (MHz)	TUNE VOLTS (TYP)
600.0	118.0	-2.0
623.9	122.75	+5.0
624.0	118.0	-2.0

MODULATION LEVEL (KHz)	SR OUTPUTS		
	SR37	SR46	SR47
<100			H
>100			L
ACFM	L	H	
DCFM	H	L	

ISS	A		
DATE	18.2.98		
MOD. NO.	-		
CHK'D	SB		
NAME	JN		

USED ON:

PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

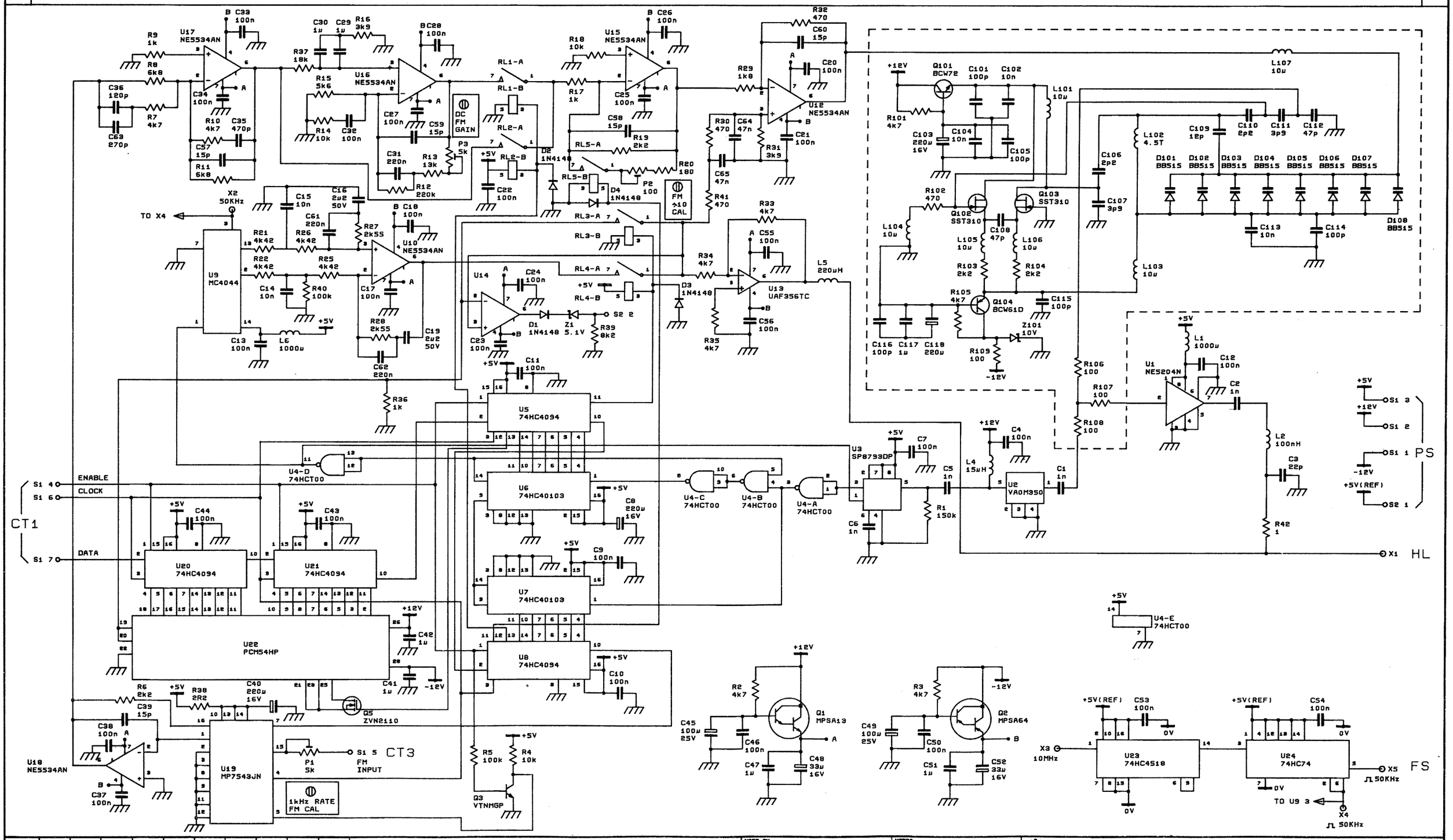
TITLE

COARSE STEP LOOP
BLOCK DIAGRAM CS

DRAWING NO.

4SZV0124

SHEET 1 OF 1 SHEETS



ISS	B	C								
DATE	10/1/92	7/12/92								
MOD. NO.	-	15721 16283								
CHK'D	SD	SD								
NAME	JEC	JEC								

USED ON:
PSG2400A

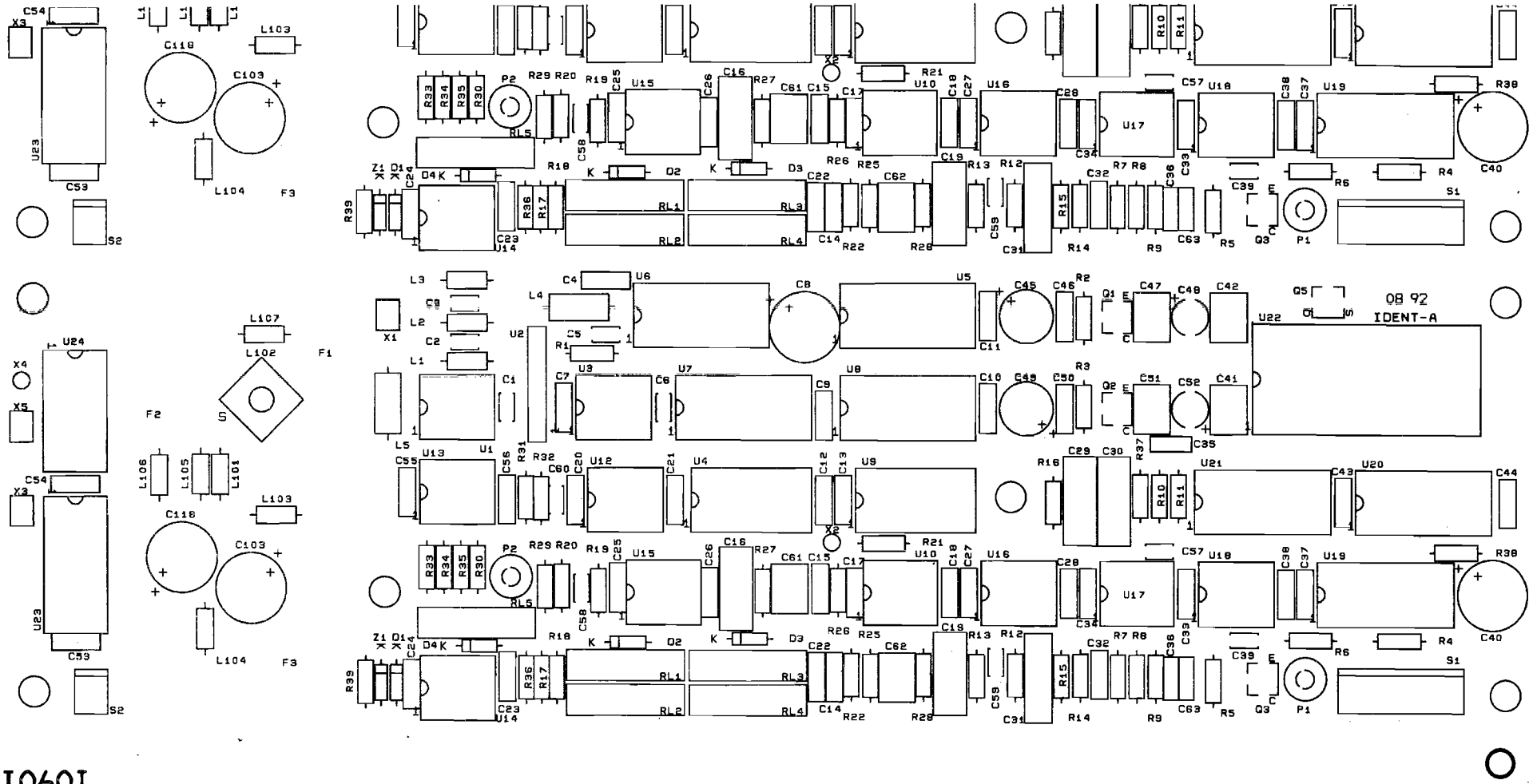
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

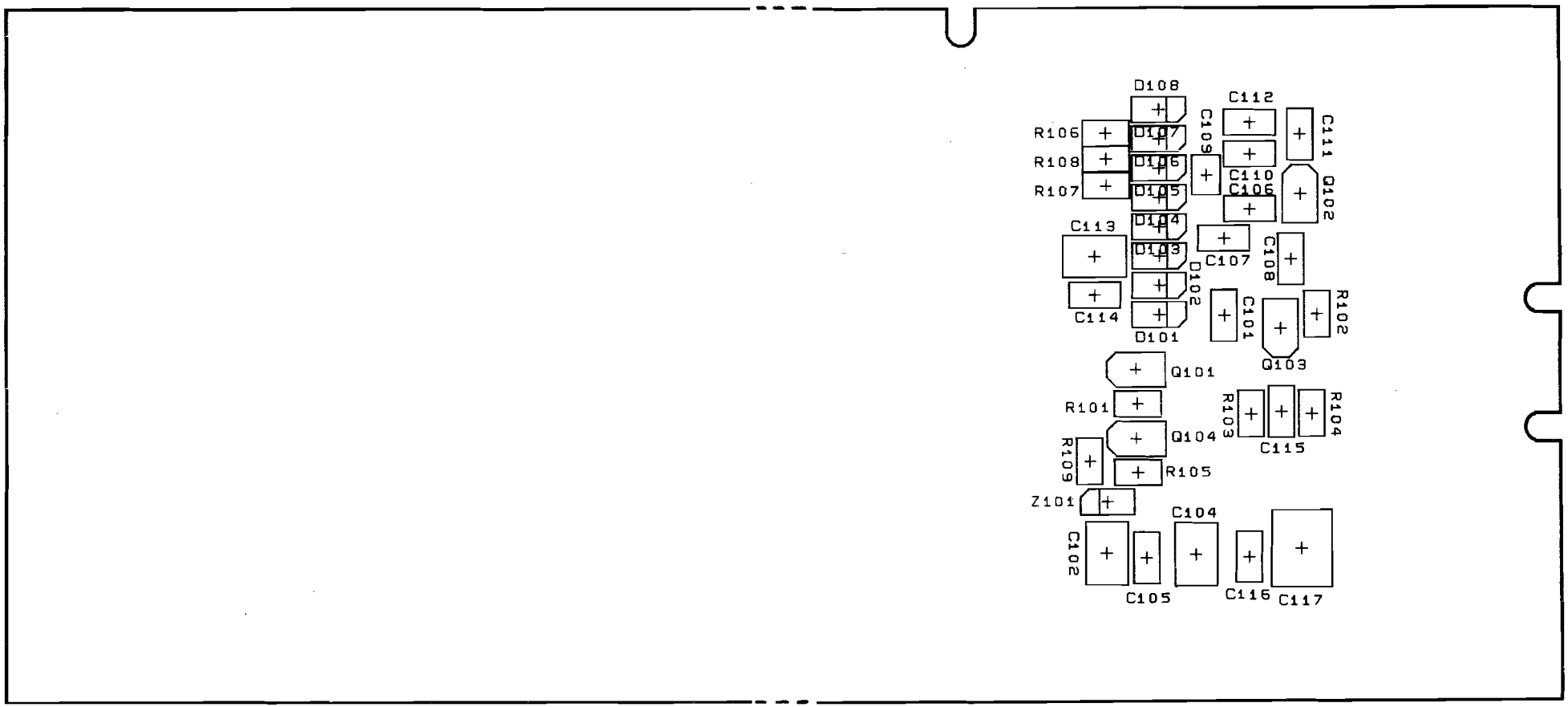
FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

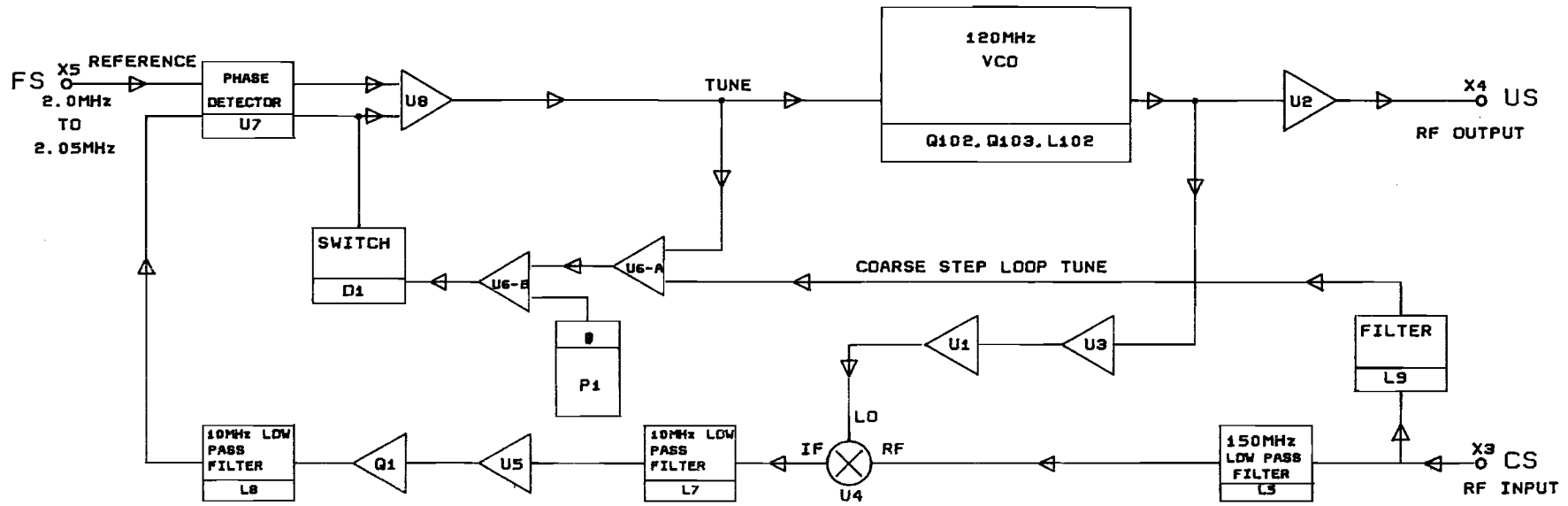
TITLE
COARSE STEP LOOP CIRCUIT DIAGRAM

DRAWING NO.
2SZX0625

SHEET 1 OF 1 SHEETS







CARRIER FREQUENCY (MHz)	VCO FREQUENCY (MHz)	TUNE VOLTS (TYP)
600.0	120.0	-1.0
623.9	124.78	+6.0
624.0	120.0	-1.0

ISS	A			USED ON: PSG2400A
DATE	18.2.93			
MOD. NO.	-			
CHK'D	SB			
NAME	JN			

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

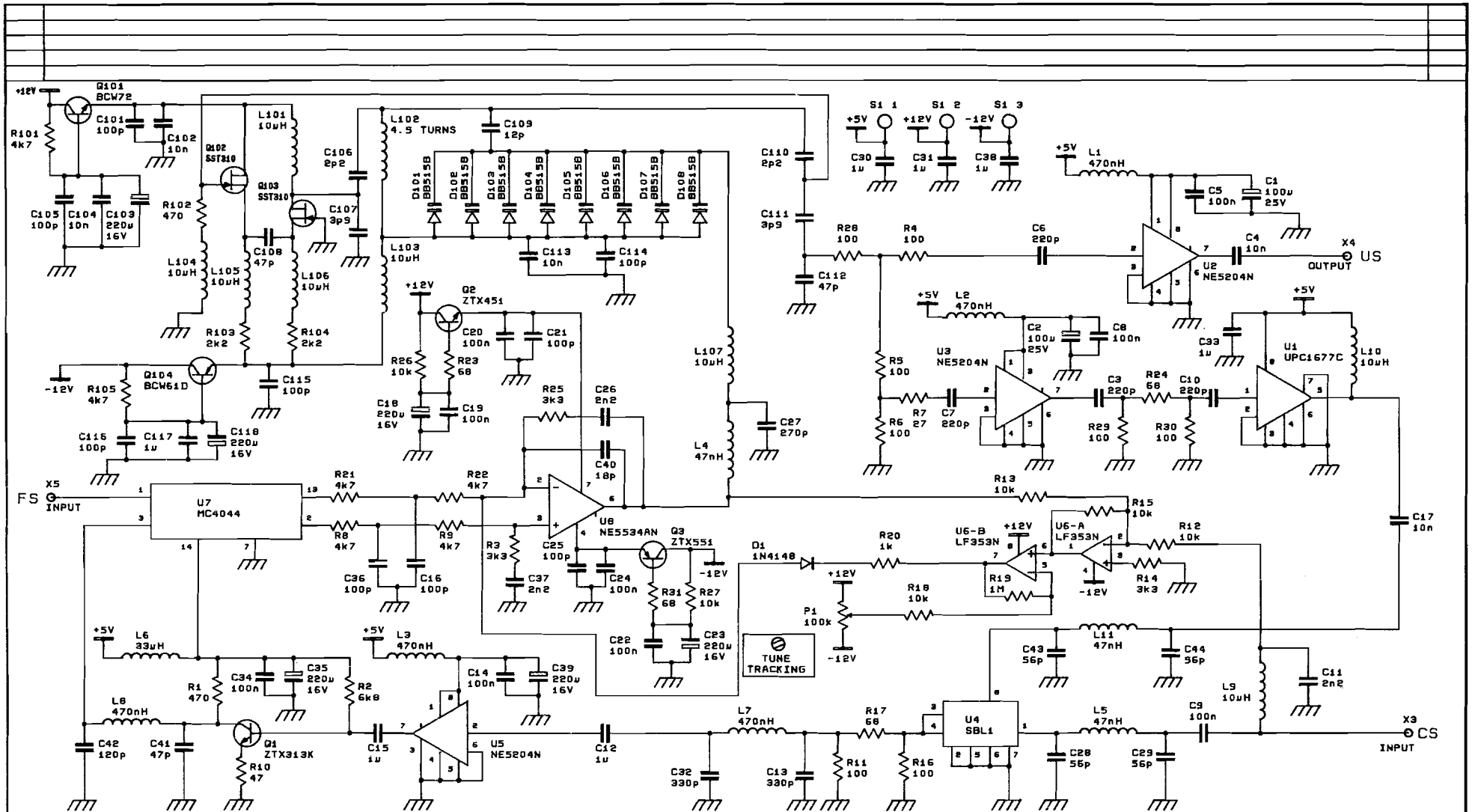
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE
HETERODYNE LOOP
BLOCK DIAGRAM HL

DRAWING NO.
4SZV0122

SHEET 1OF 1SHEETS



ISS	D	E								
DATE	21.11.91	13.11.92								
MOD. NO.	--	15761 16283								
CHK'D	S.D									
NAME	L.A.S	L.A.S								

USED ON: PSG2400A

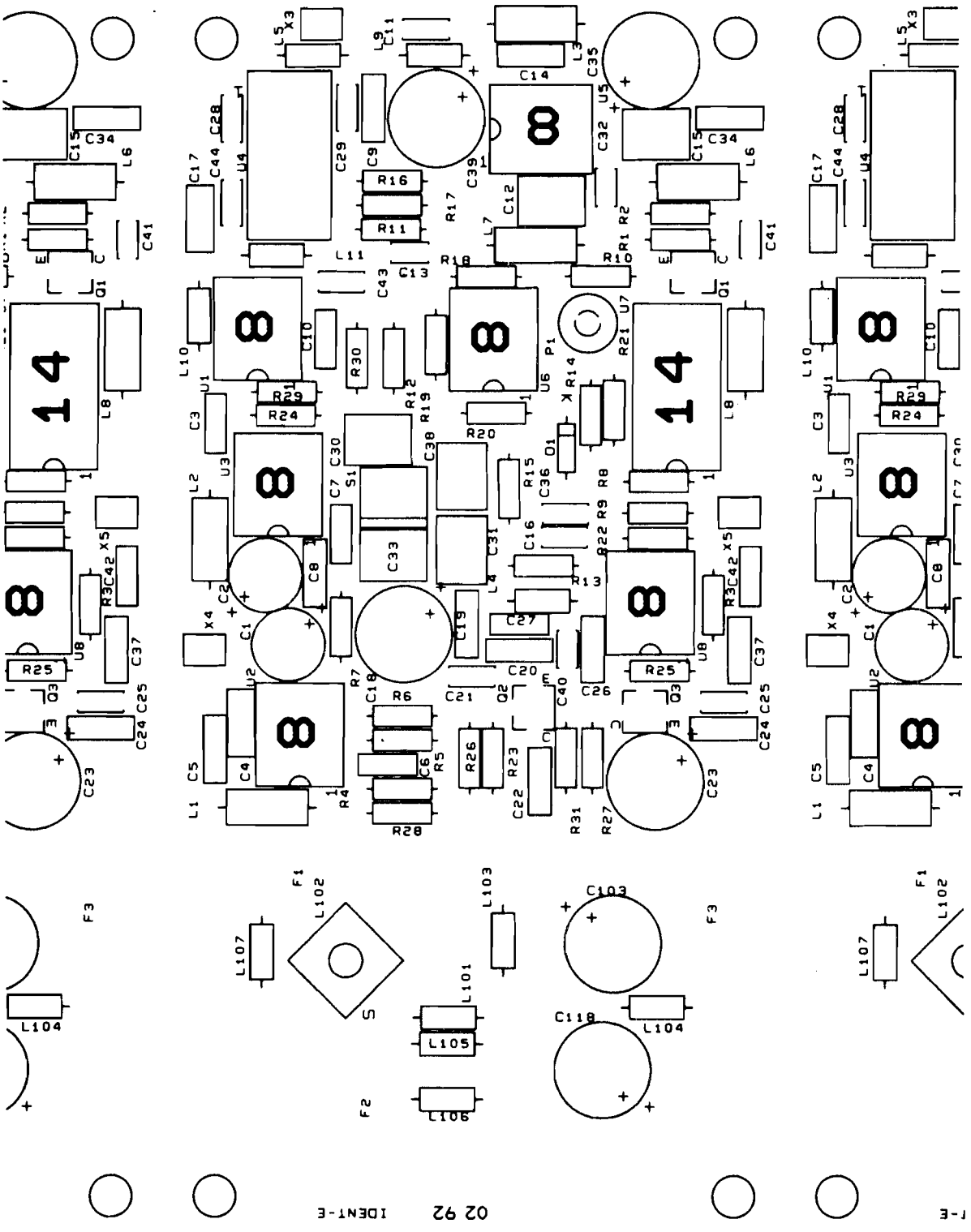
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

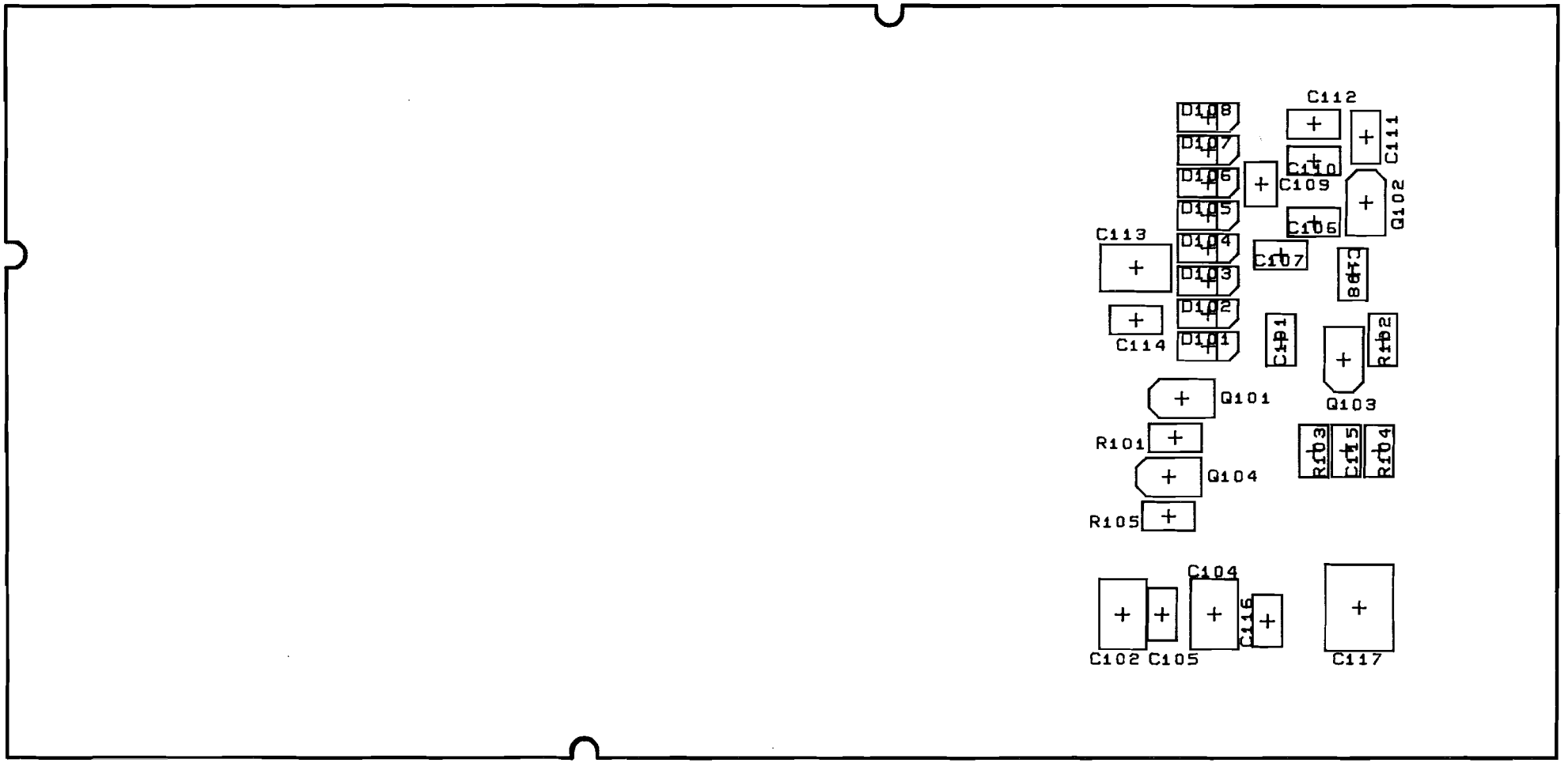
FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

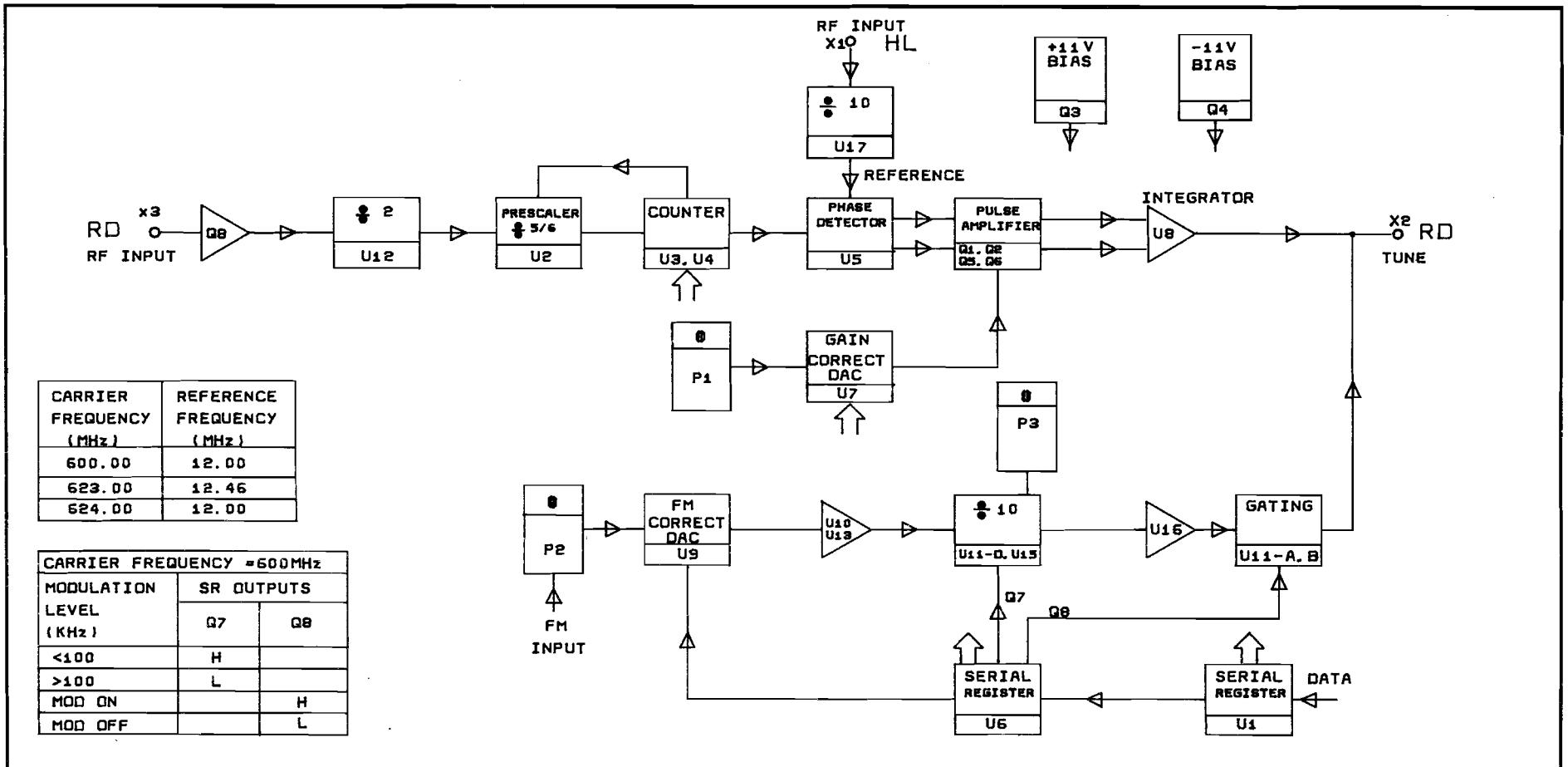
TITLE: HETERODYNE LOOP CIRCIUT DAIGRAM

DRAWING NO. 3SZX0792

SHEET 1 OF 1SHEETS







CARRIER FREQUENCY (MHz)	REFERENCE FREQUENCY (MHz)
600.00	12.00
623.00	12.46
624.00	12.00

CARRIER FREQUENCY =600MHz		
MODULATION LEVEL (KHz)	SR OUTPUTS	
	Q7	Q8
<100	H	
>100	L	
MOD ON		H
MOD OFF		L

ISS	A			USED ON: PSG2400A
DATE	22.2.93			
MOD. NO.	-			
CHK'D	SR			
NAME	JN			

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

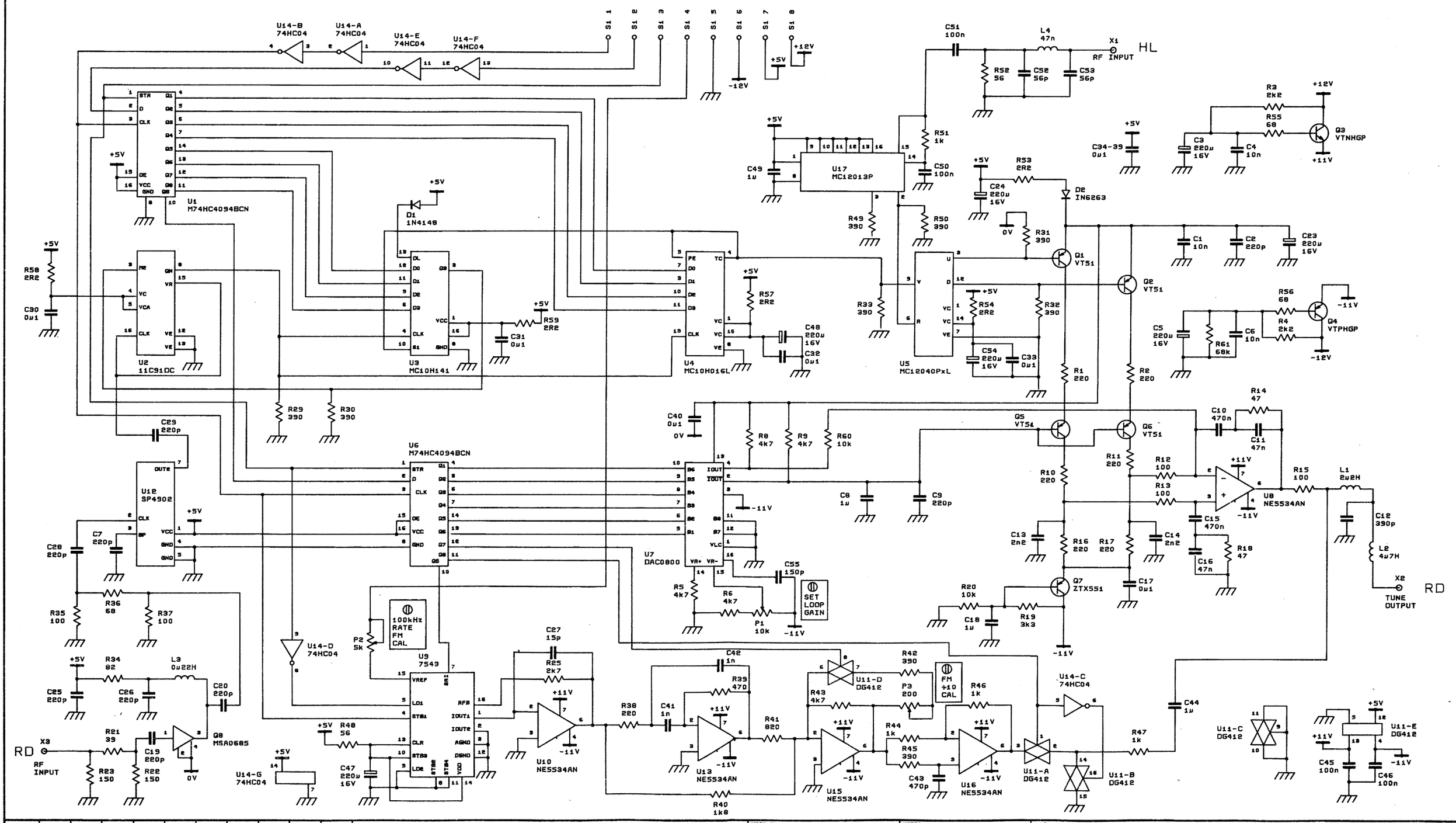
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE: UHF STEP LOOP BLOCK DIAGRAM US

DRAWING NO. 4SZV0127

SHEET 1 OF 1 SHEETS



ISS	B	C	D
DATE	23/3/91	11/11/91	23/12/92
MOD. NO.	-	-	MS3741 MS6889
CHK'D	MB	MB	SD
NAME	JEC	JEC	JEC

USED ON: PSG2400A

NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: UHF LOOP BOARD CIRCUIT DIAGRAM

DRAWING NO. 2SZX0686

SHEET 1 OF 1 SHEETS

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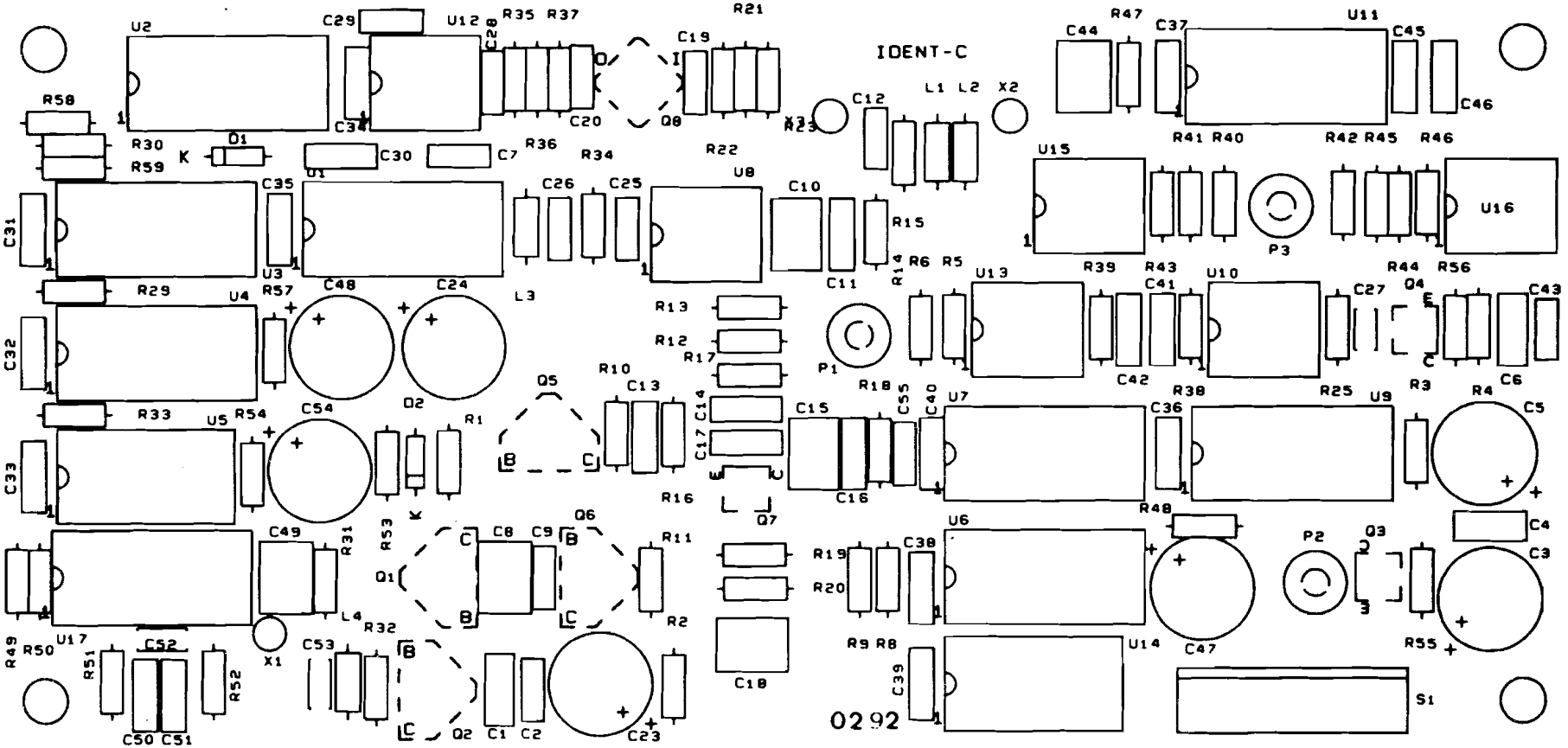
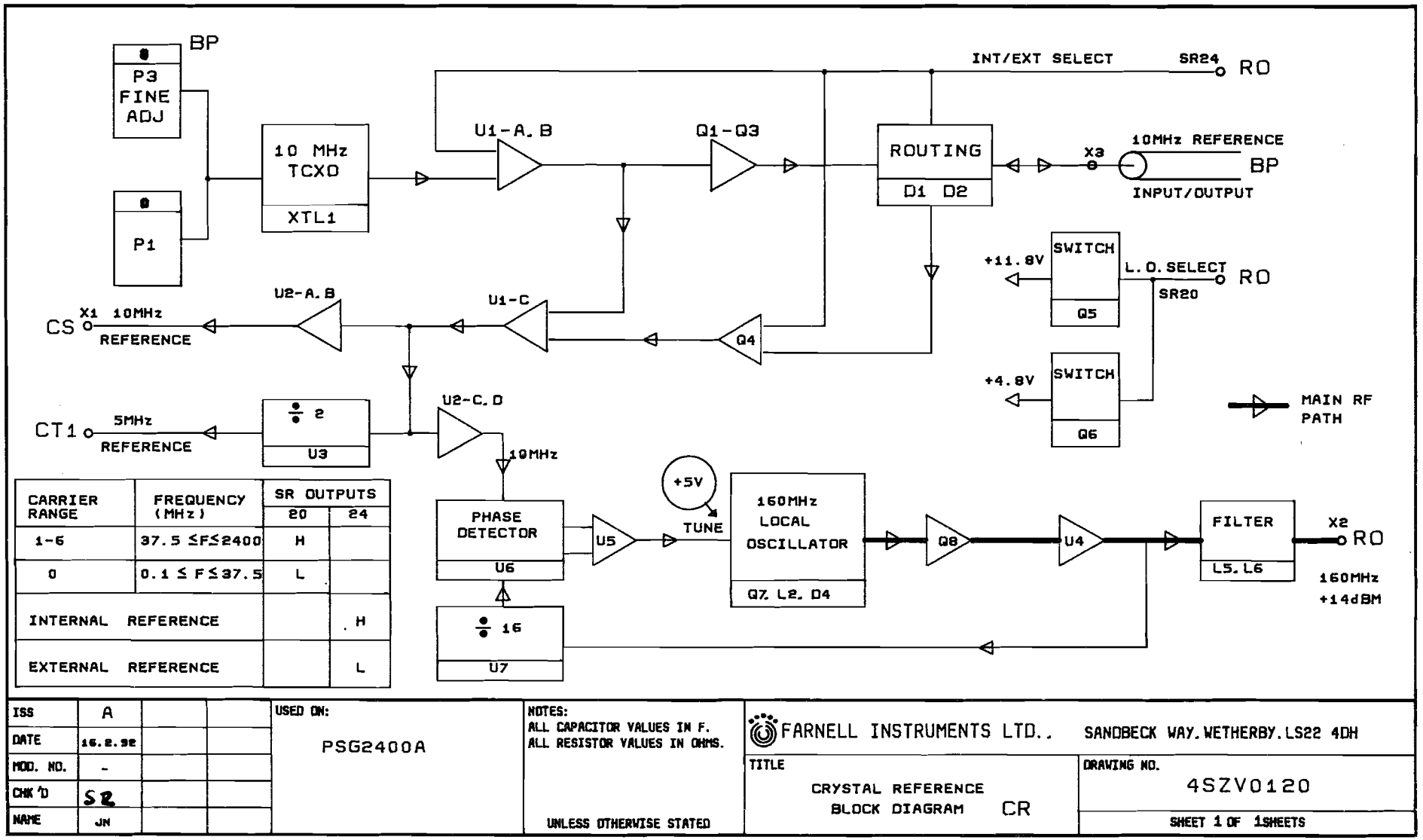




CARRIER RANGE	FREQUENCY (MHz)	SR OUTPUTS 20	24
1-6	37.5 ≤F≤2400	H	
0	0.1 ≤ F ≤ 37.5	L	
INTERNAL REFERENCE			H
EXTERNAL REFERENCE			L

ISS	A		
DATE	16.2.92		
MOD. NO.	-		
CHK'D	SR		
NAME	JN		

USED ON:
PSG2400A

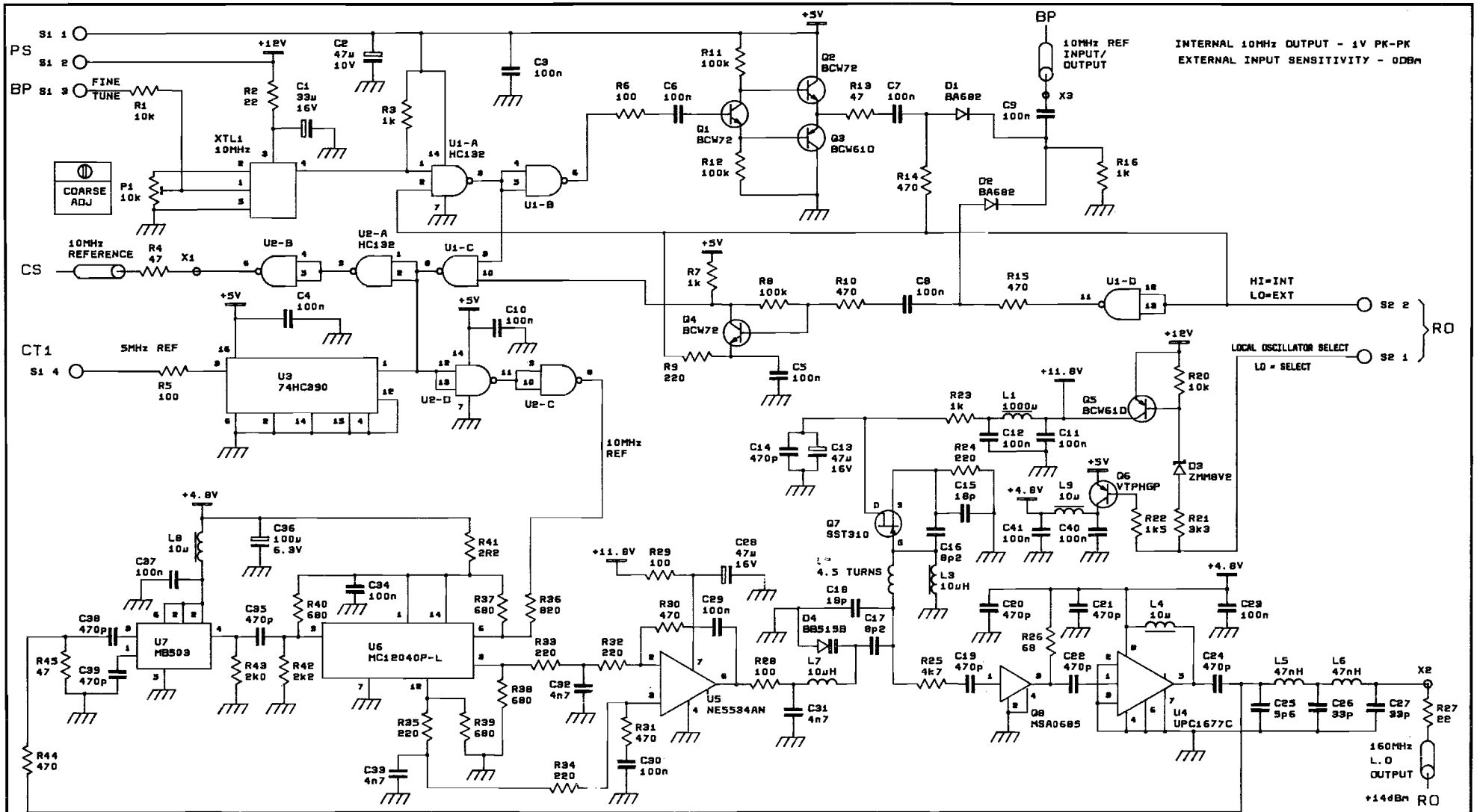
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

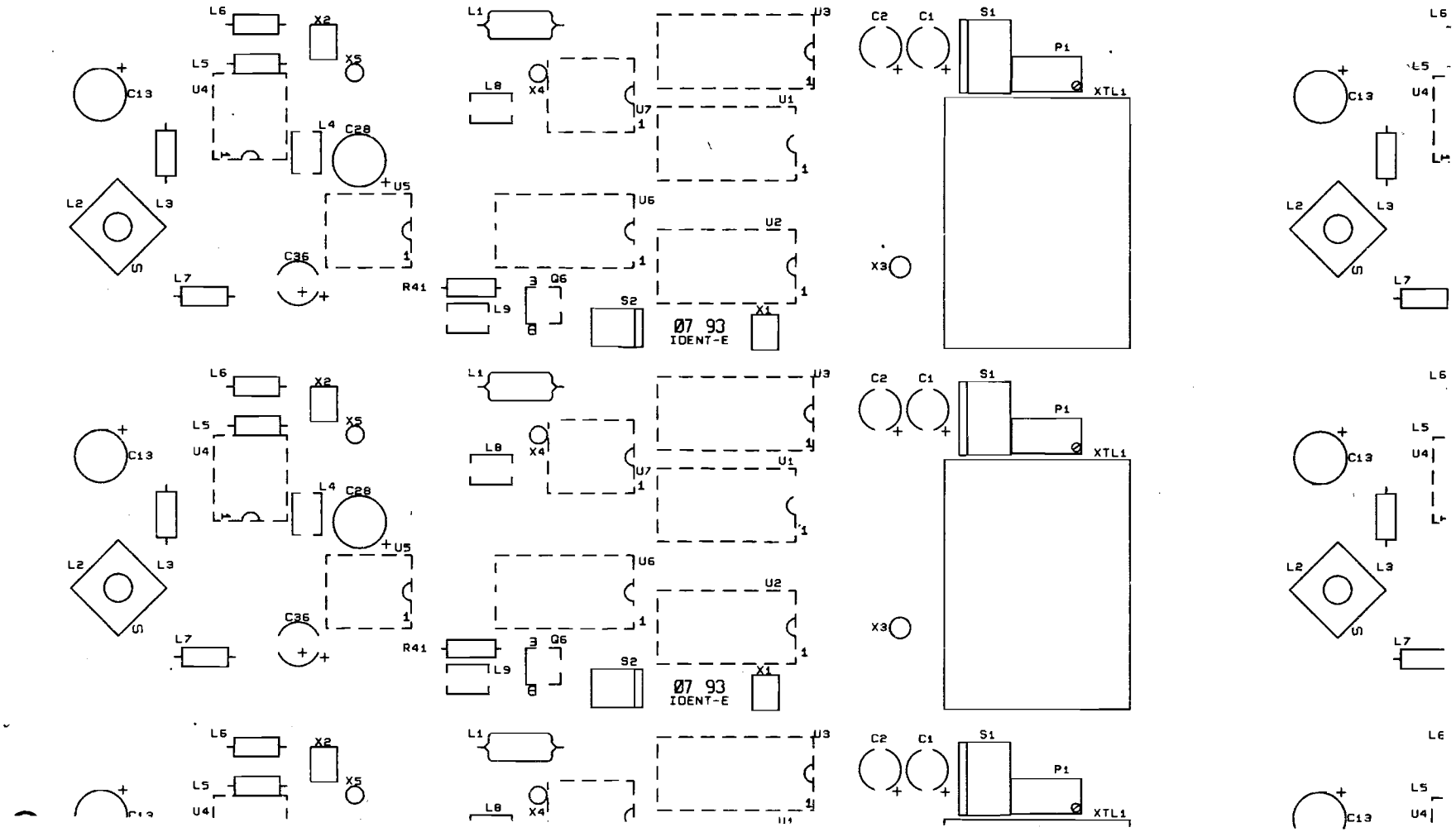
TITLE
CRYSTAL REFERENCE BLOCK DIAGRAM CR

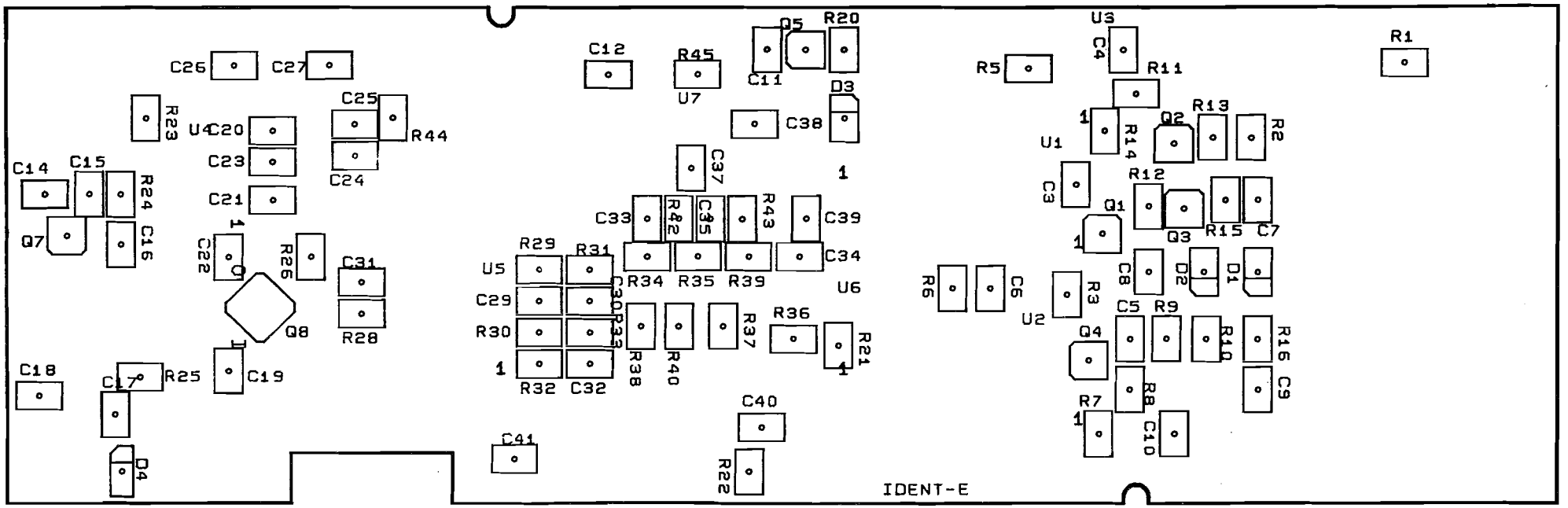
DRAWING NO.
4SZV0120

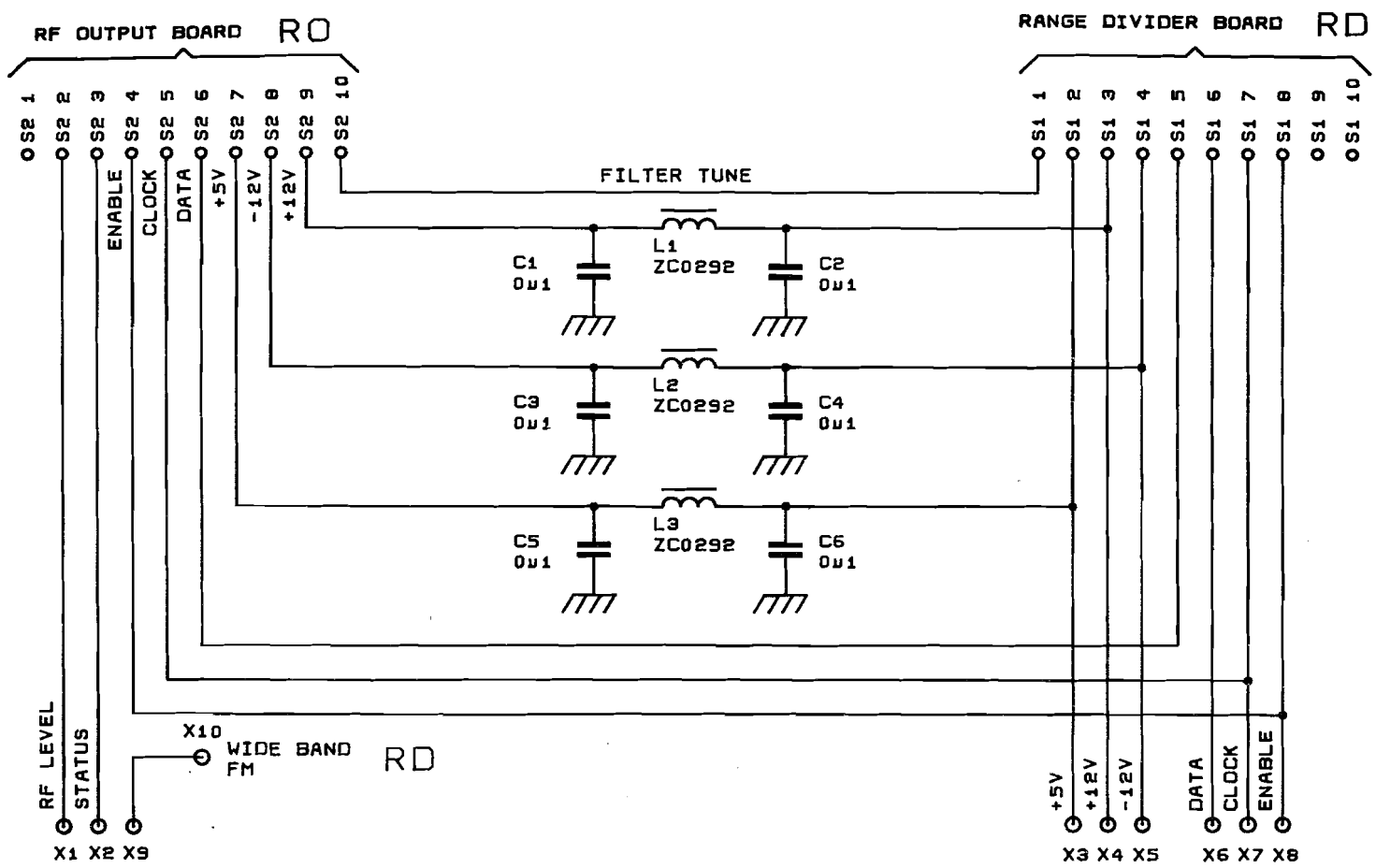
SHEET 1 OF 1SHEETS



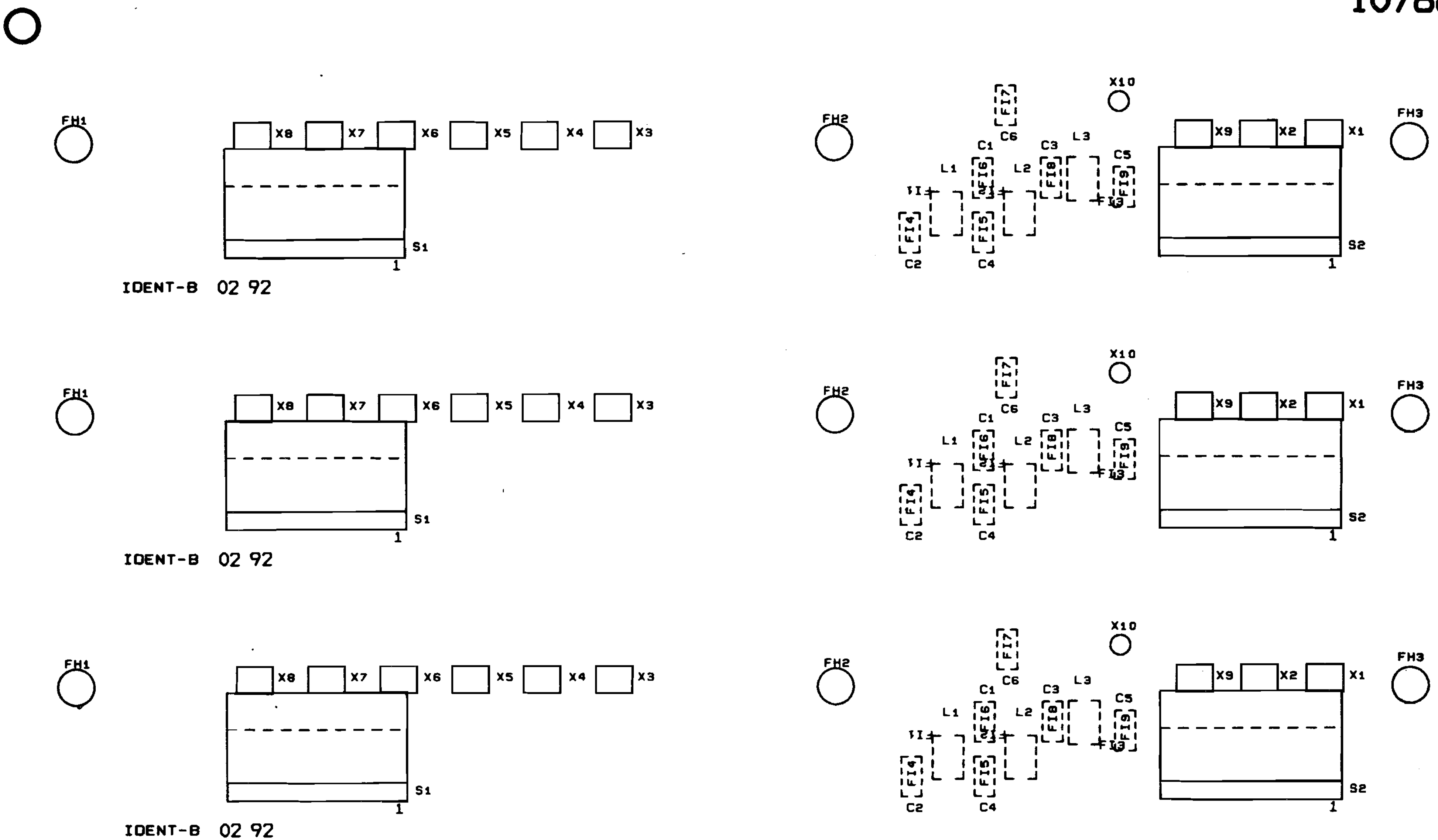
ISS	A	B	C	D						USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH	
DATE	6.3.89	29.9.90	1.8.91	7.1.93						PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. * PRINTED CCT INDUCTOR UNLESS OTHERWISE STATED	TITLE: CRYSTAL REFERENCE CCT DIA	DRAWING NO. 3SZX0626
MOD. NO.	—	—	—	[illegible]									SHEET 1 OF 1SHEETS
CHK'D	S.D	S.D	S.D	S.D									
NAME	AC	L.A.S	L.A.S	L.A.S									

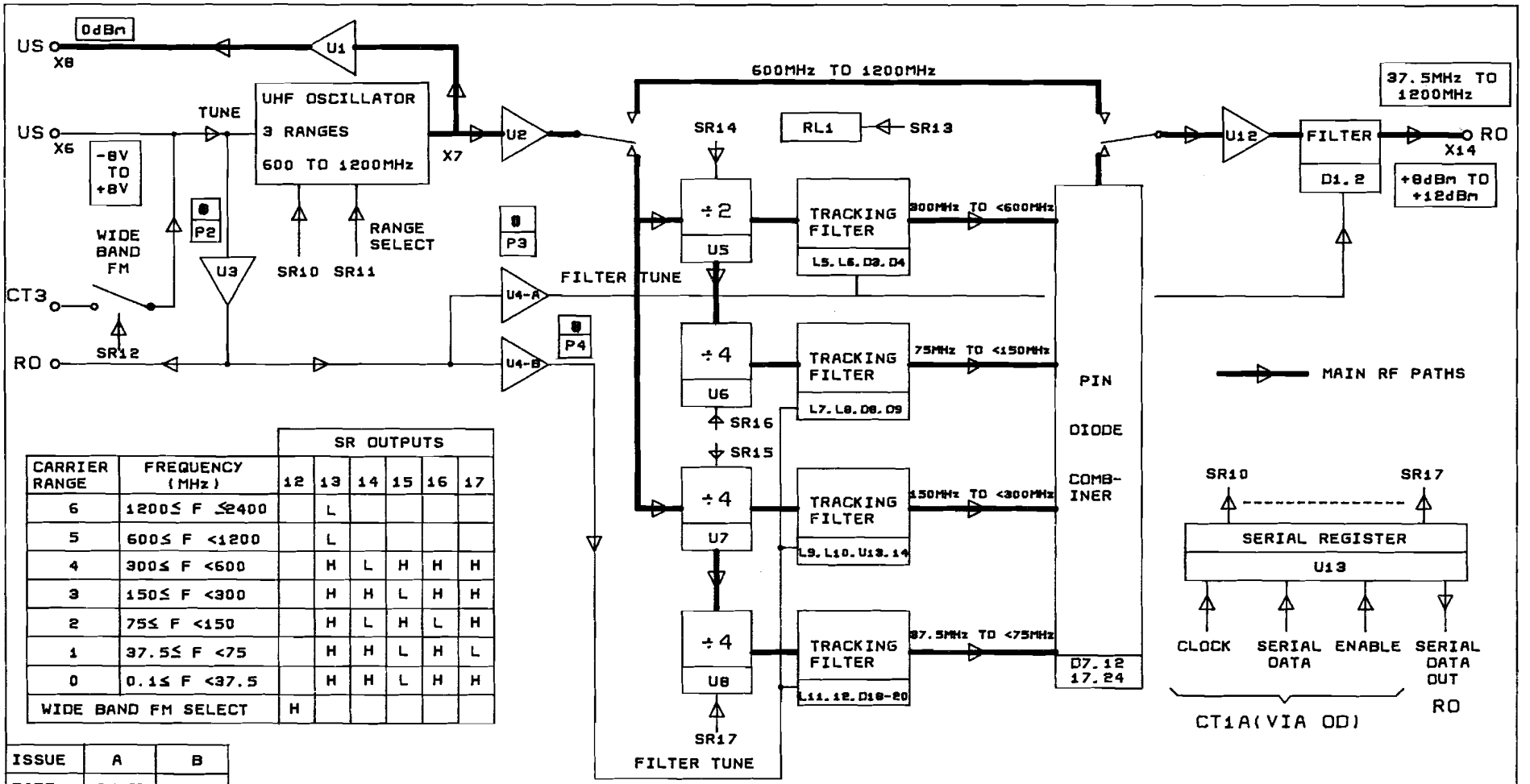






ISS	A	B		USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH
DATE	13/7/90	22/10/91		PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	TITLE: OUTPUT DISTRIBUTION CIRCUIT DIAGRAM
MOD. NO.	-					DRAWING NO. 4SZX0697
CHK'D	SD	SD				SHEET 1 OF 1 SHEETS
NAME	JEC	JEC			UNLESS OTHERWISE STATED	





CARRIER RANGE	FREQUENCY (MHz)	SR OUTPUTS 12	13	14	15	16	17
6	1200≤ F ≤2400		L				
5	600≤ F <1200		L				
4	300≤ F <600		H	L	H	H	H
3	150≤ F <300		H	H	L	H	H
2	75≤ F <150		H	L	H	L	H
1	37.5≤ F <75		H	H	L	H	L
0	0.1≤ F <37.5		H	H	L	H	H
WIDE BAND FM SELECT		H					

ISSUE	A	B
DATE	2.7.92	17.2.93
MOD NO	—	-
CHK D	SR	
NAME	L.A.S	JN

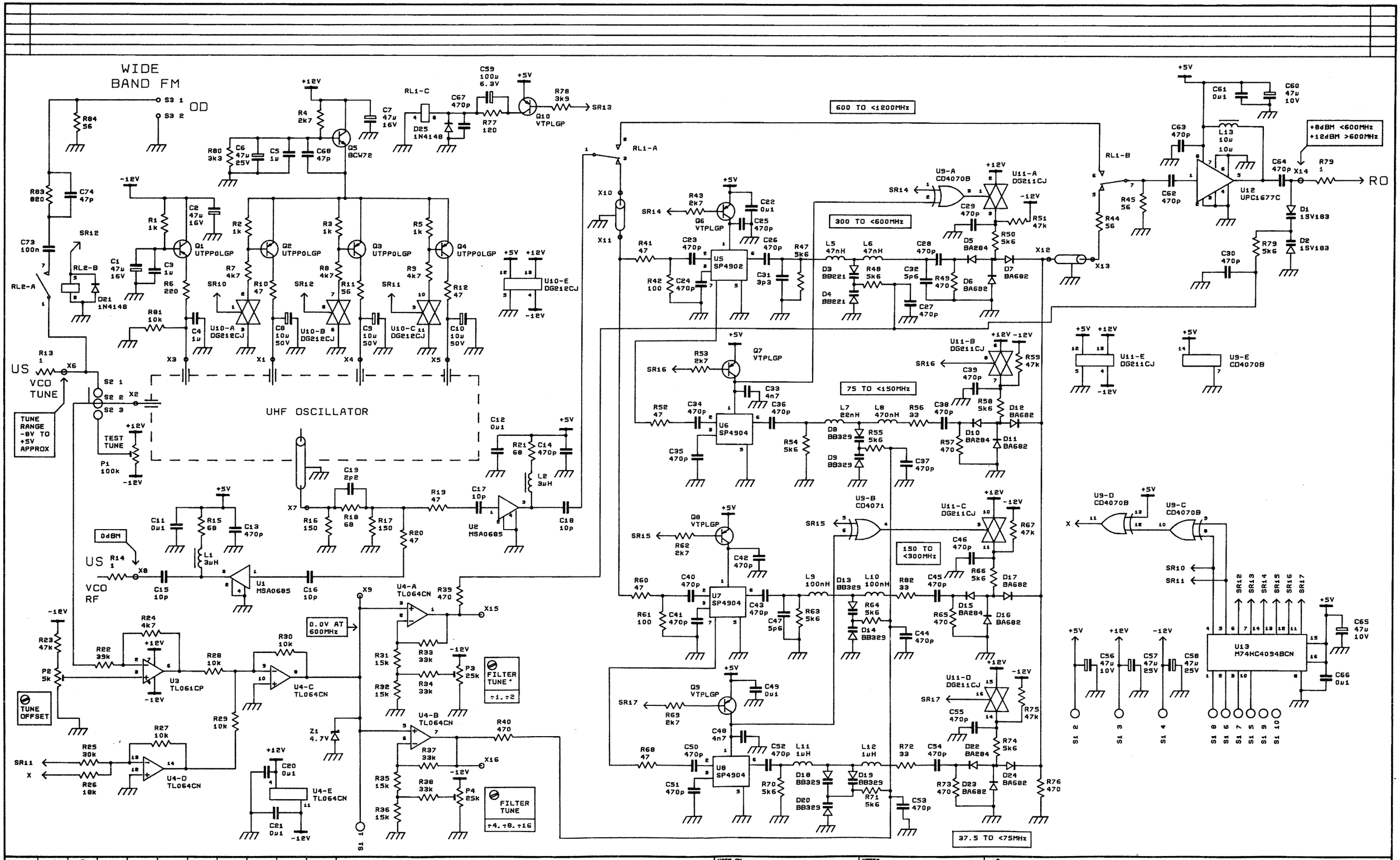
USED ON: PSG2400A

TITLE RD
RANGE DIVIDER
BLOCK DIAGRAM

FARNELL ISTRUMENTS LIMITED

DRAWING NO. 4SZX0893

SHEET 1 OF 1 SHEETS



ISS	A	B	C
DATE	17.10.89	14.6.90	18.11.92
MOD. NO.	-	-	16689 15781
CHK'D	SD	SD	SR
NAME	D.G.H	L.A.S	L.A.S

USED ON: PSG2400A

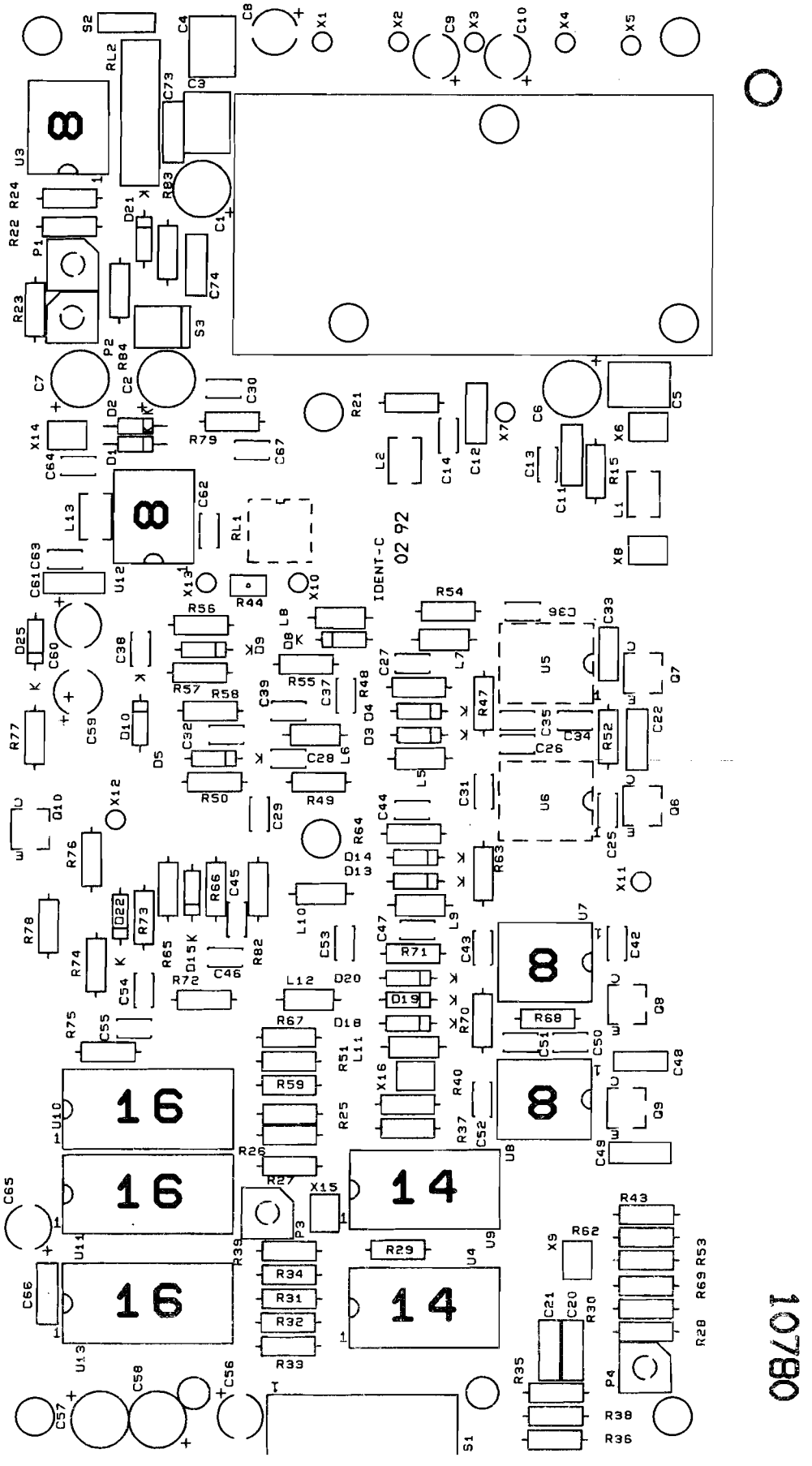
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

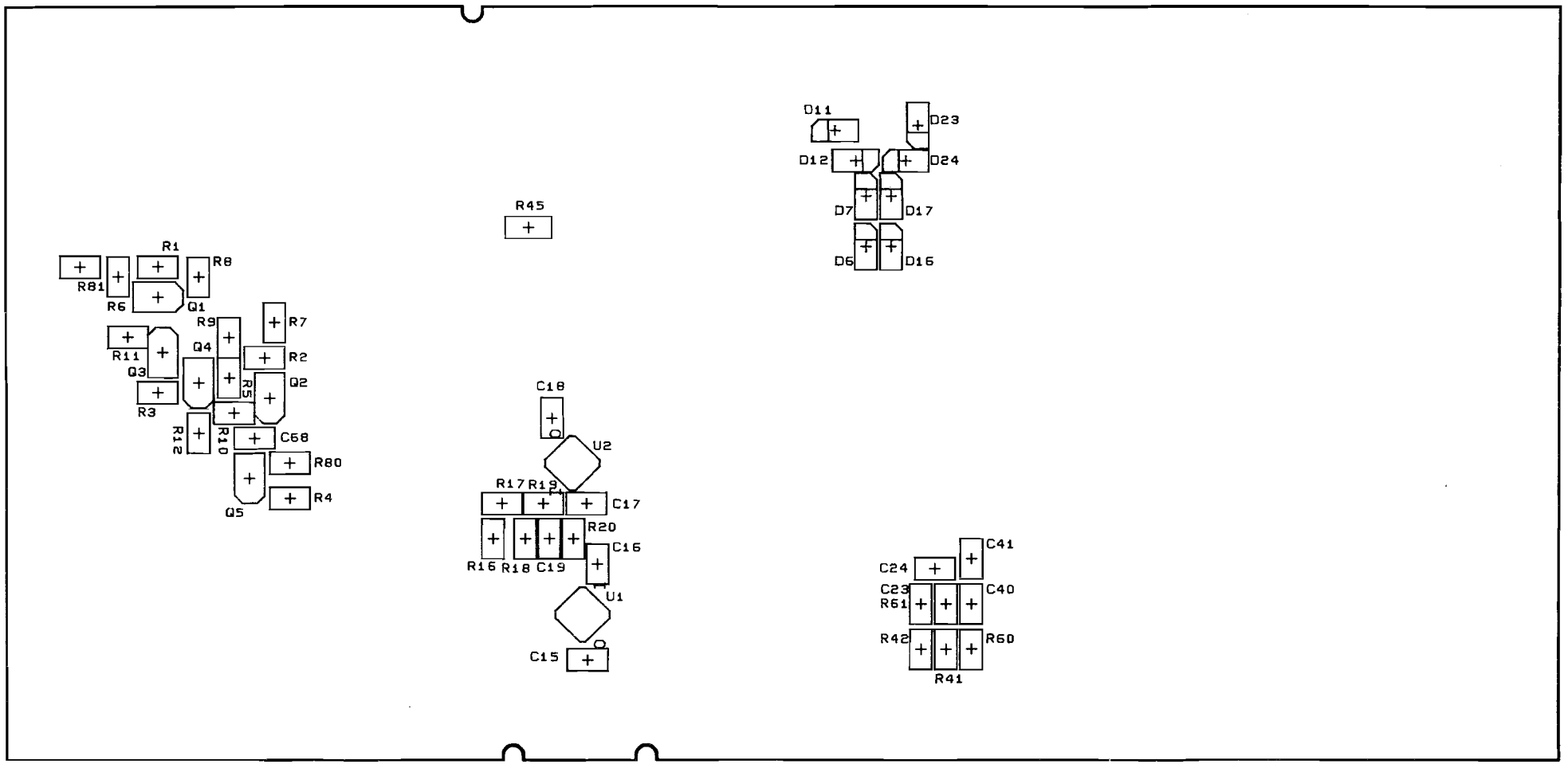
FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

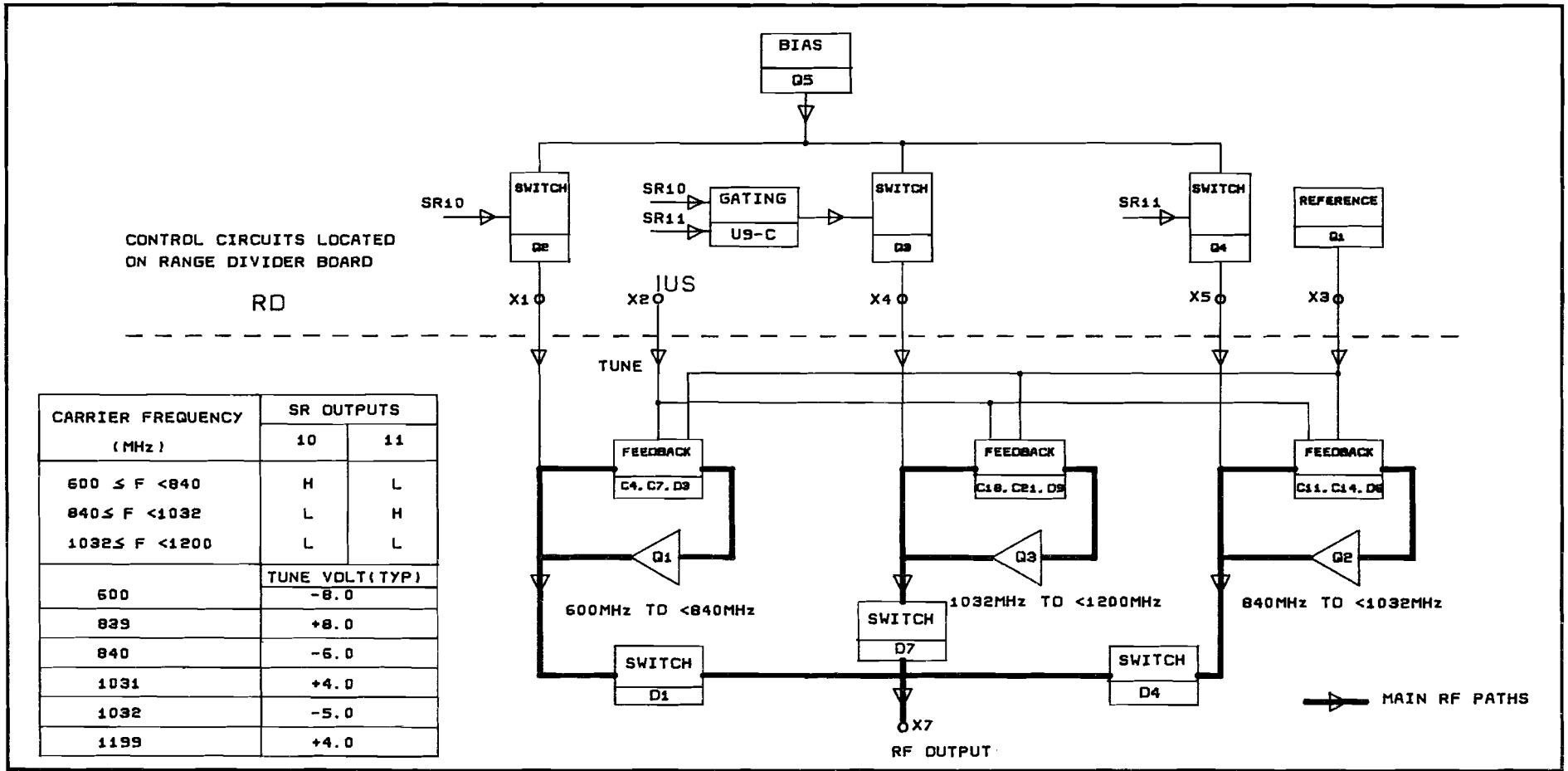
TITLE: RANGE DIVIDER BOARD CIRCUIT DIAGRAM

DRAWING NO. 2SZX603

SHEET 1 OF 1 SHEETS







CARRIER FREQUENCY (MHz)	SR OUTPUTS 10	11
600 ≤ F <840	H	L
840≤ F <1032	L	H
1032≤ F <1200	L	L

	TUNE VOLT(TYP)
600	-8.0
839	+8.0
840	-6.0
1031	+4.0
1032	-5.0
1199	+4.0

ISS	A		
DATE	17.2.93		
MOD. NO.	-		
CHK'D	SP		
NAME	JN		

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

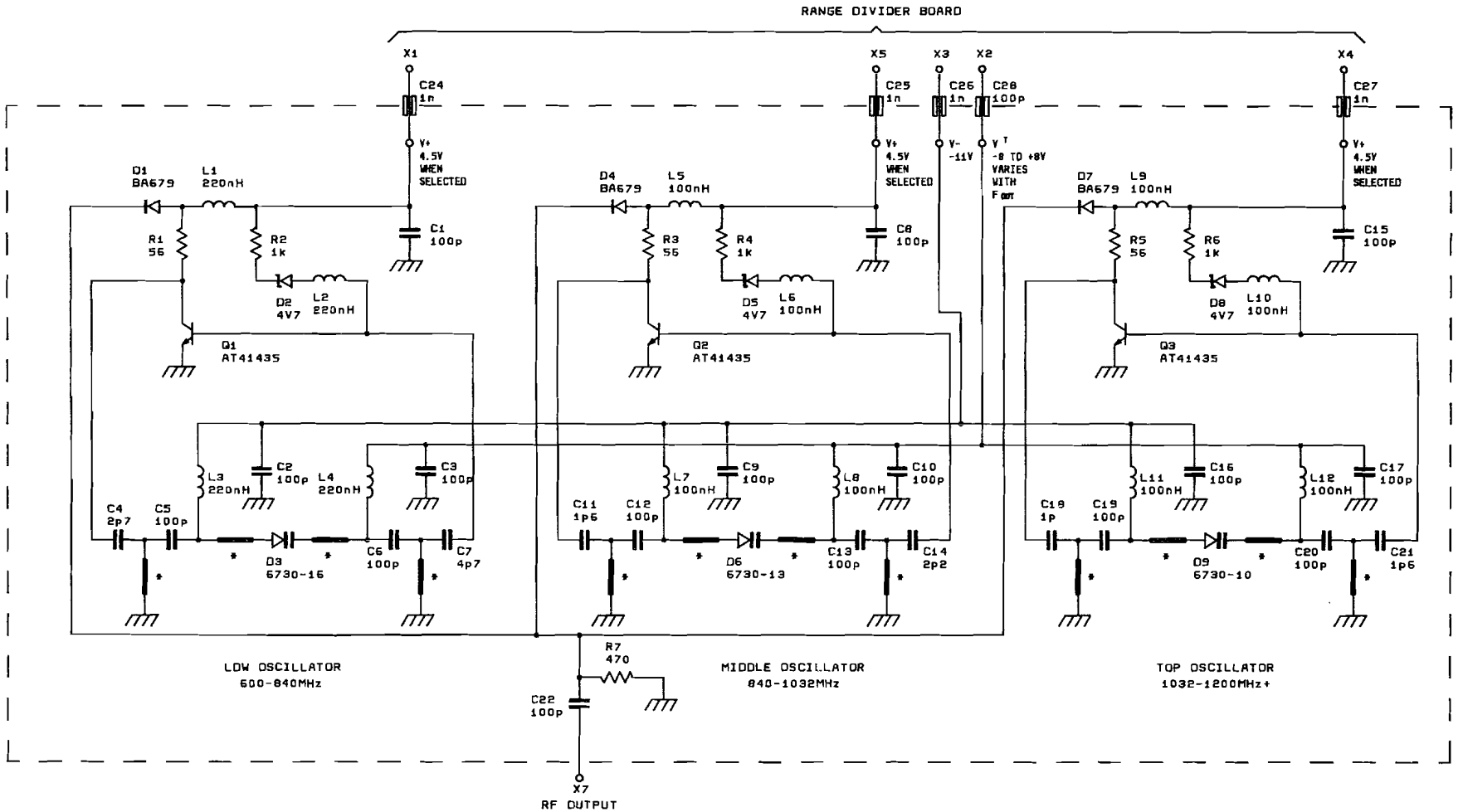
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE: UHF OSCILLATOR BLOCK DIAGRAM

DRAWING NO. 4SZV0121

SHEET 1 OF 1SHEETS



ISS	A	B
DATE	11/6/92	4/2/93
MOD. NO.	-	16469
CHK'D	MJB	SP
NAME	JEC	JEC

USED ON:

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
* PRINTED CIRCUIT COMPONENTS
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD. . SANDBECK WAY. WETHERBY. YORKS. LS22 4DH

TITLE: PSG2400 UHF OSCILLATOR BOARD CIRCUIT DIAGRAM

DRAWING NO. 3SZX0891

SHEET 1 OF 1 SHEETS

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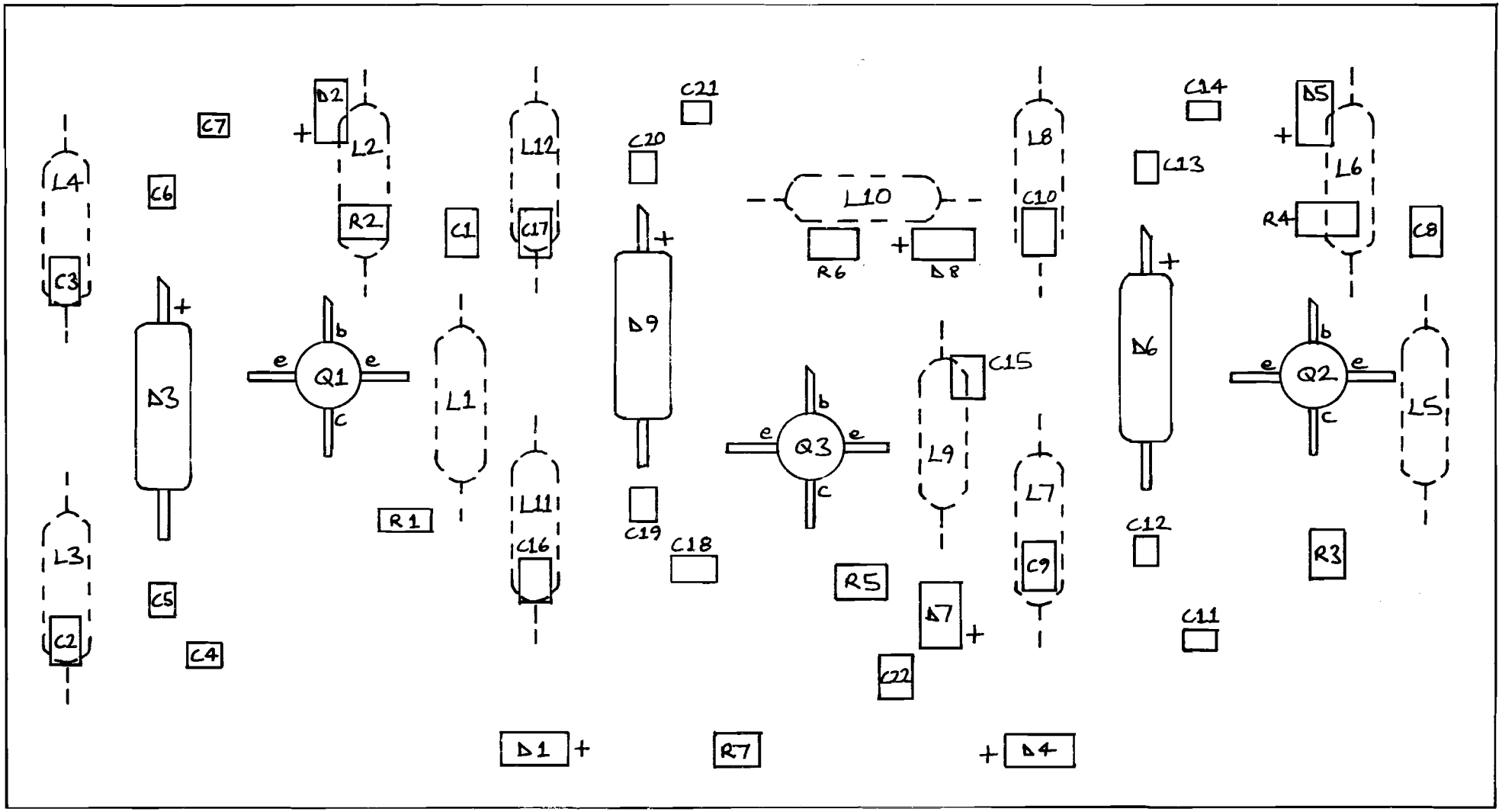
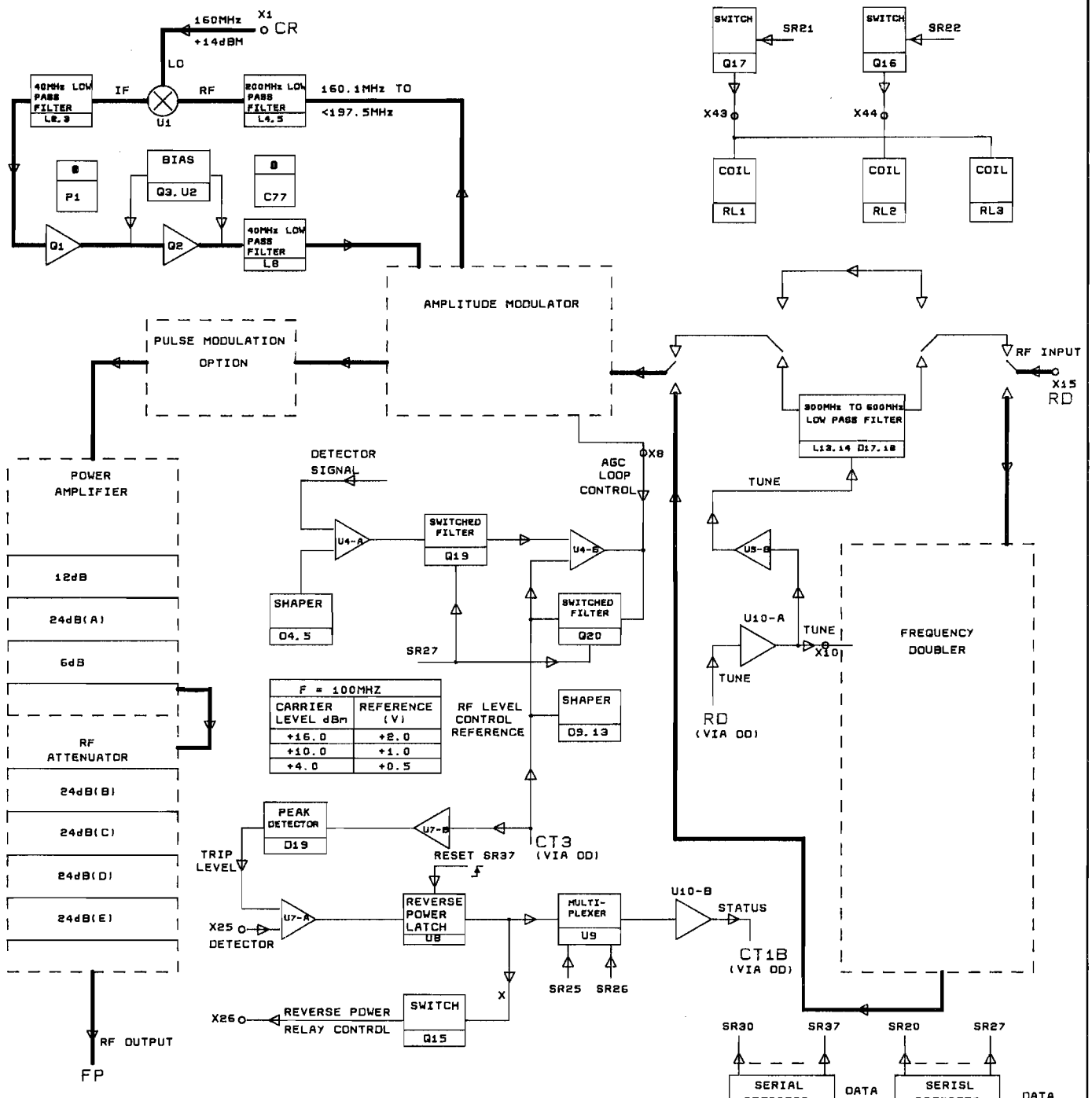




CARRIER LEVEL dBm	SWITCHED ATTENUATORS (dB)						
	6	12	24(A)	24(B)	24(C)	24(D)	24(E)
+3.95	✓						
-2.05		✓					
-8.05	✓	✓					
-14.05			✓				
-20.05	✓		✓				
-26.05		✓	✓				
-32.05	✓	✓	✓				
-38.05			✓	✓			
-62.05			✓	✓	✓		
-86.05			✓	✓	✓	✓	
-110.1			✓	✓	✓	✓	✓

CARRIER FREQUENCY (MHz)	SR OUTPUTS				
	21	22	25	26	27
F<1200	H				
1200≤F≤2400	L	H			
600≤F≤1200		L			
STATUS					
REVERSE POWER			L	L	
VCO TUNE			H	L	
AGC			L	H	
PULSE MOD			H	H	
MODULATION					
AM					L
FM OR CW					H

ISS	A		
DATE	22.2.93		
MOD. NO.	-		
CHK'D	SR		
NAME	JN		

USED ON: PSG2400A

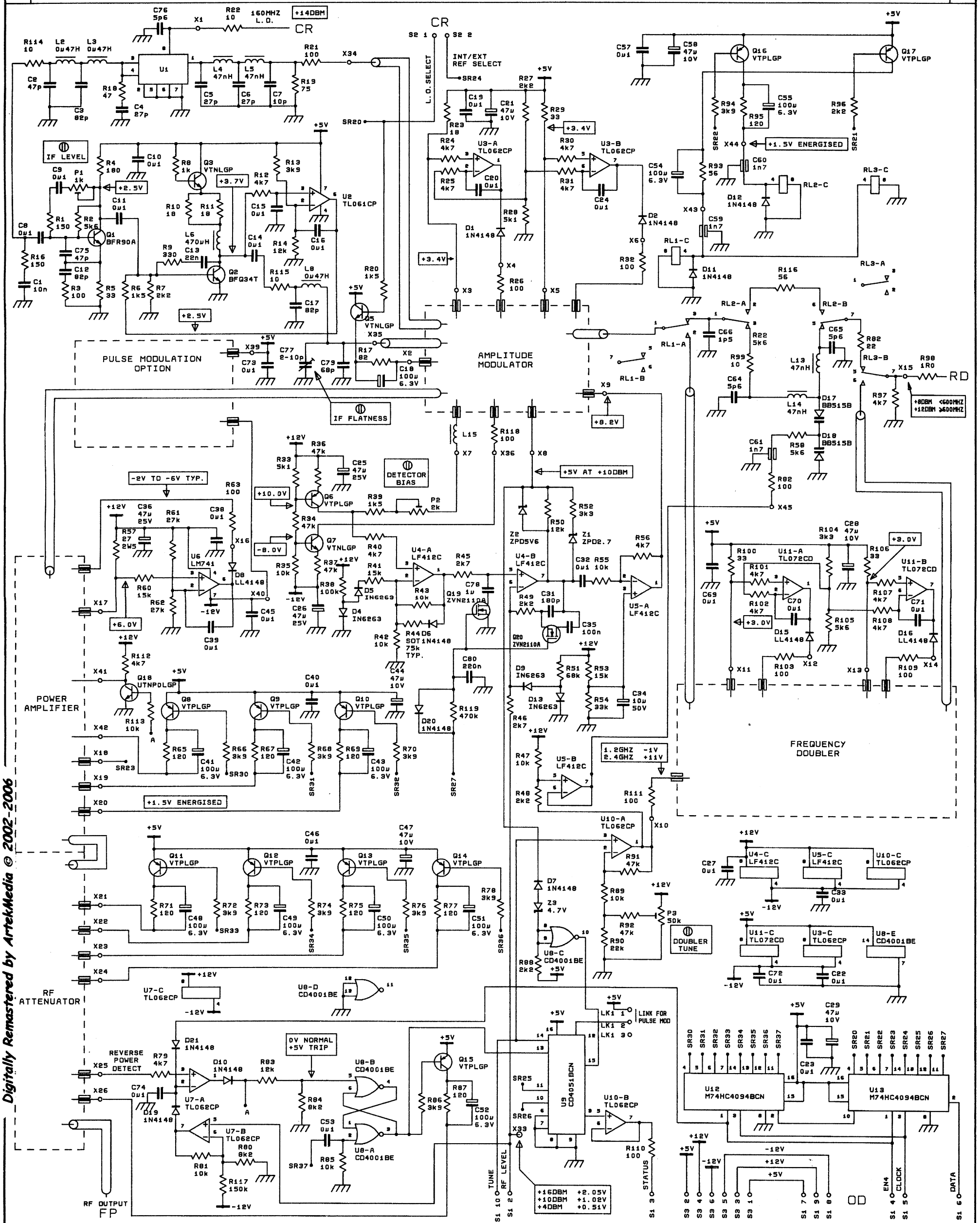
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

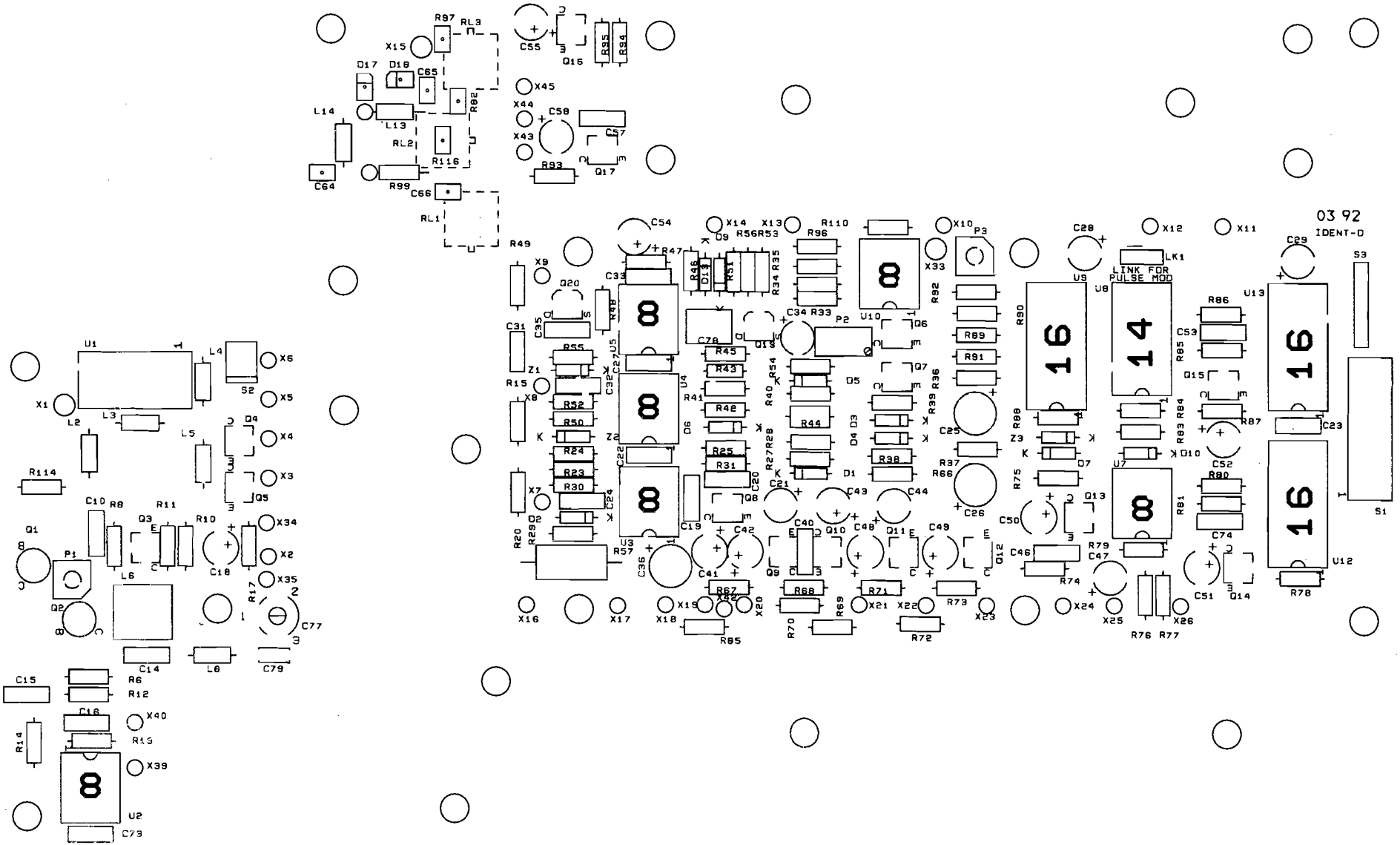
TITLE: RF OUTPUT BLOCK DIAGRAM RO

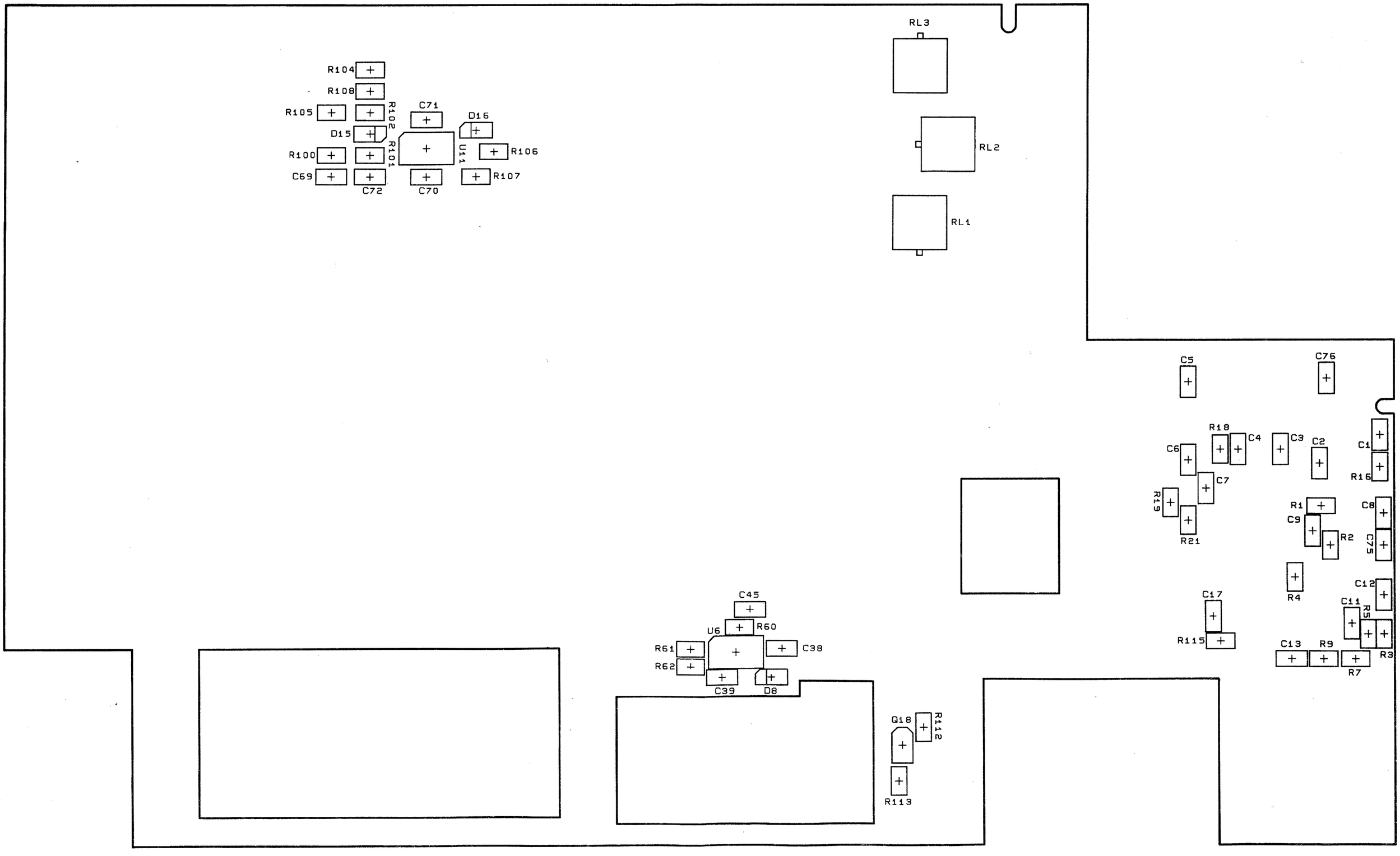
DRAWING NO. 3SZV0129

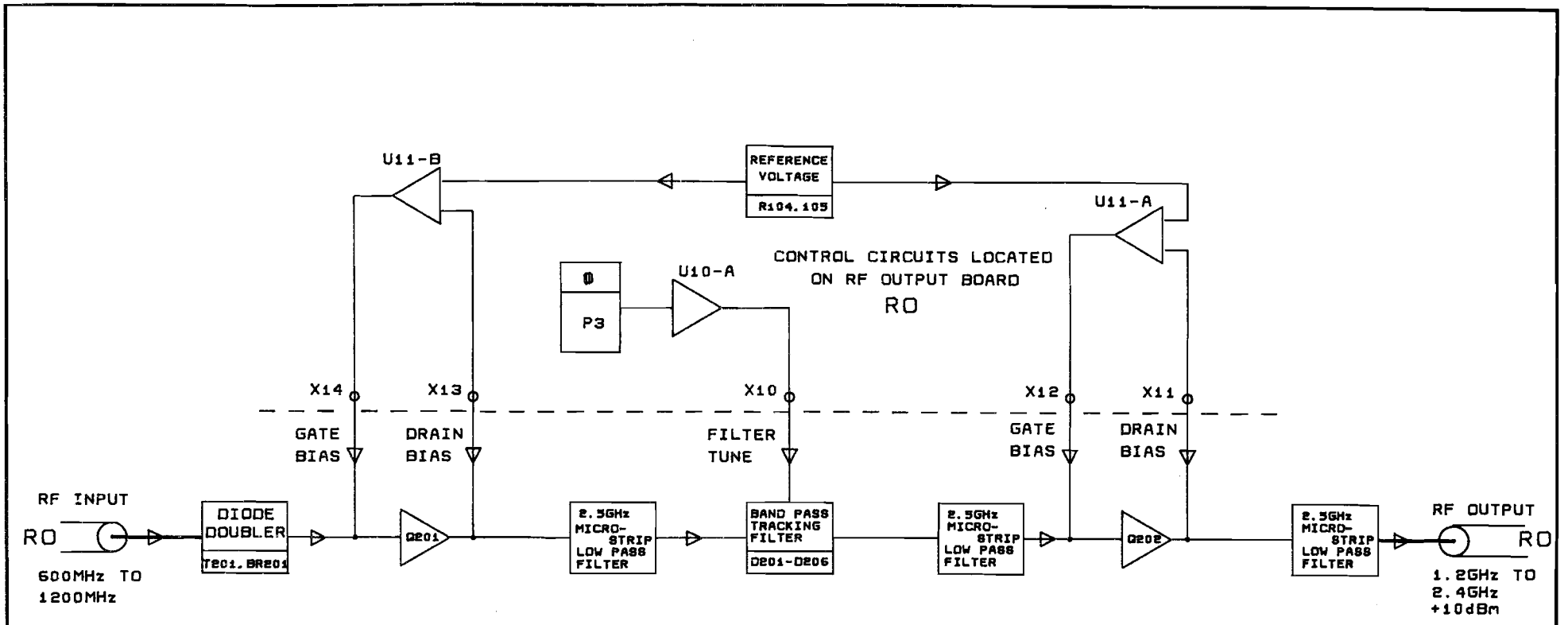
SHEET 1 OF 1 SHEETS



ISS	A	B	C	D	E					USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH
DATE	4/10/89	28/6/90	19/8/91	24/9/91	14/12/92					PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	TITLE: RF OUTPUT CIRCUIT DIAGRAM
MOD. NO.	-	-	-	-								DRAWING NO. RSZX0596
CHK'D	SD	SD	SD	SD							UNLESS OTHERWISE STATED	SHEET 1 OF 1 SHEETS







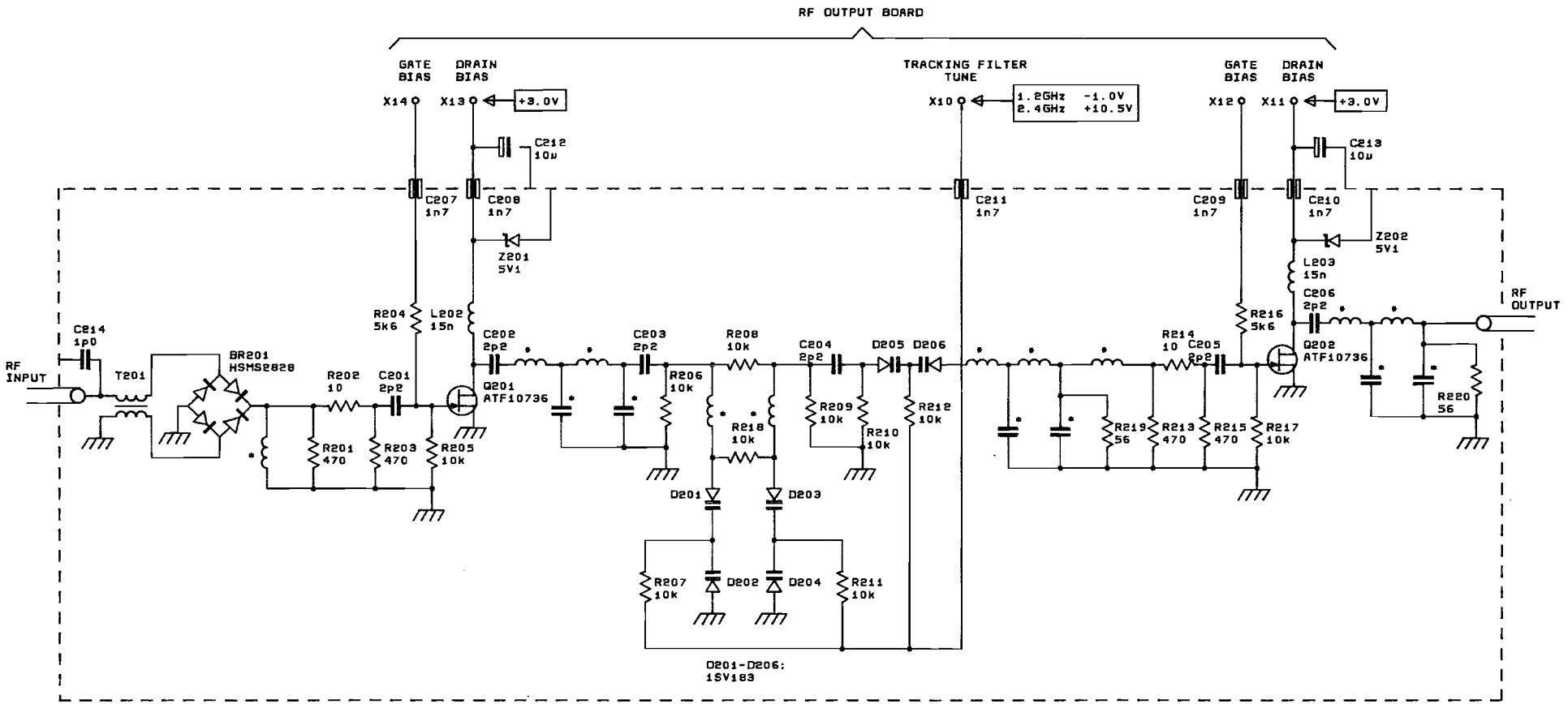
ISS	A			USED ON: PSG2400A	NOTES: ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS. UNLESS OTHERWISE STATED
DATE	24.2.93				
MOD. NO.	-				
CHK'D					
NAME	JN				

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE: FREQUENCY DOUBLER BLOCK DIAGRAM

DRAWING NO. 4SZV0130

SHEET 1 OF 1 SHEETS



ISS	A	B	C						
DATE	19/6/89	8/10/90	14/12/92						
MOD. NO.	-	-	M16283						
CHK'D	SD	SD	SD						
NAME	JEC	JEC	JEC						

USED ON:
PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
* PRINTED CIRCUIT COMPONENTS
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS, LS22 4DH

TITLE: FREQUENCY DOUBLER CIRCUIT DIAGRAM

DRAWING NO. 3SZX0541

SHEET 1 OF 1 SHEETS

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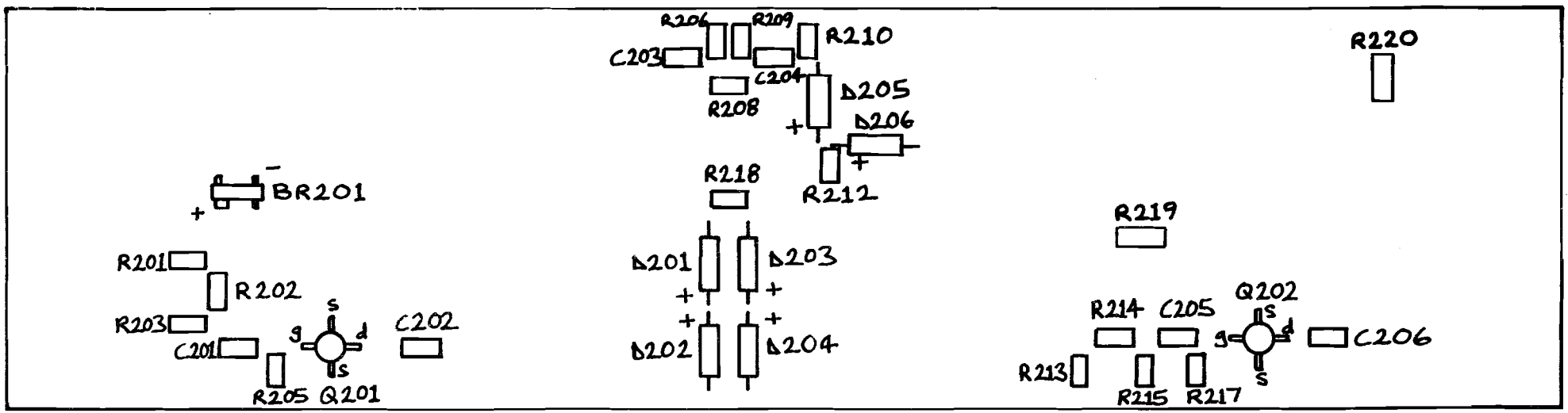
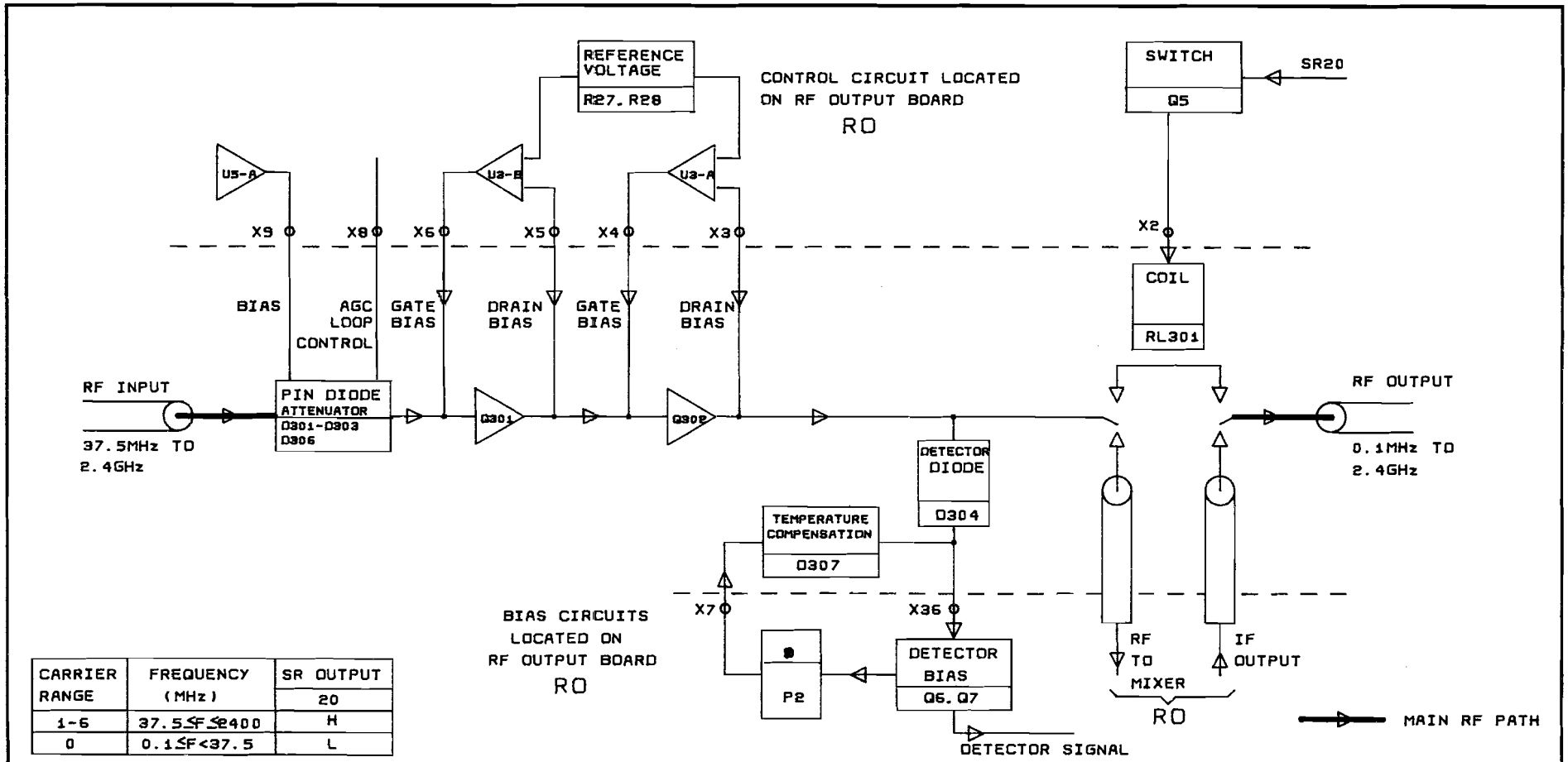




CARRIER RANGE	FREQUENCY (MHz)	SR OUTPUT
		20
1-6	37.5≤F≤2400	H
0	0.1≤F<37.5	L

ISS	A		
DATE	25.2.93		
MOD. NO.	-		
CHK'D	SR		
NAME	JN		

USED ON:
PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

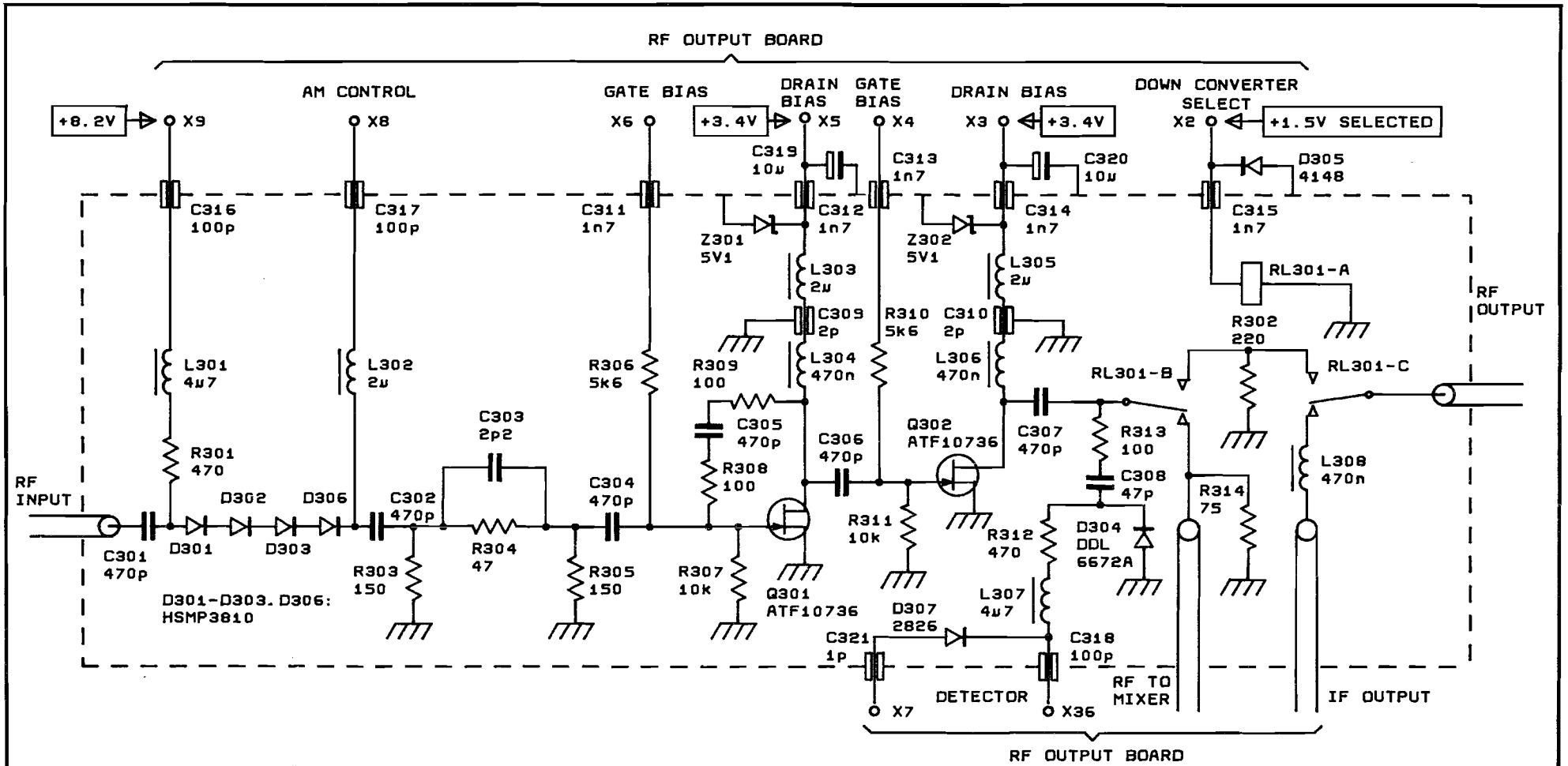
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE
AMPLITUDE MODULATOR
BLOCK DIAGRAM

DRAWING NO.
4SZV0154

SHEET OF SHEETS



ISS	B	C	D
DATE	17/5/90	22/8/91	8/1/93
MOD. NO.			16283
CHK'D	SD	SD	SD
NAME	JEC	JEC	JEC

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY. WETHERBY. LS22 4DH

TITLE: AMPLITUDE MODULATOR CIRCUIT DIAGRAM

DRAWING NO. 4SZX0540

SHEET 1 OF 1 SHEETS

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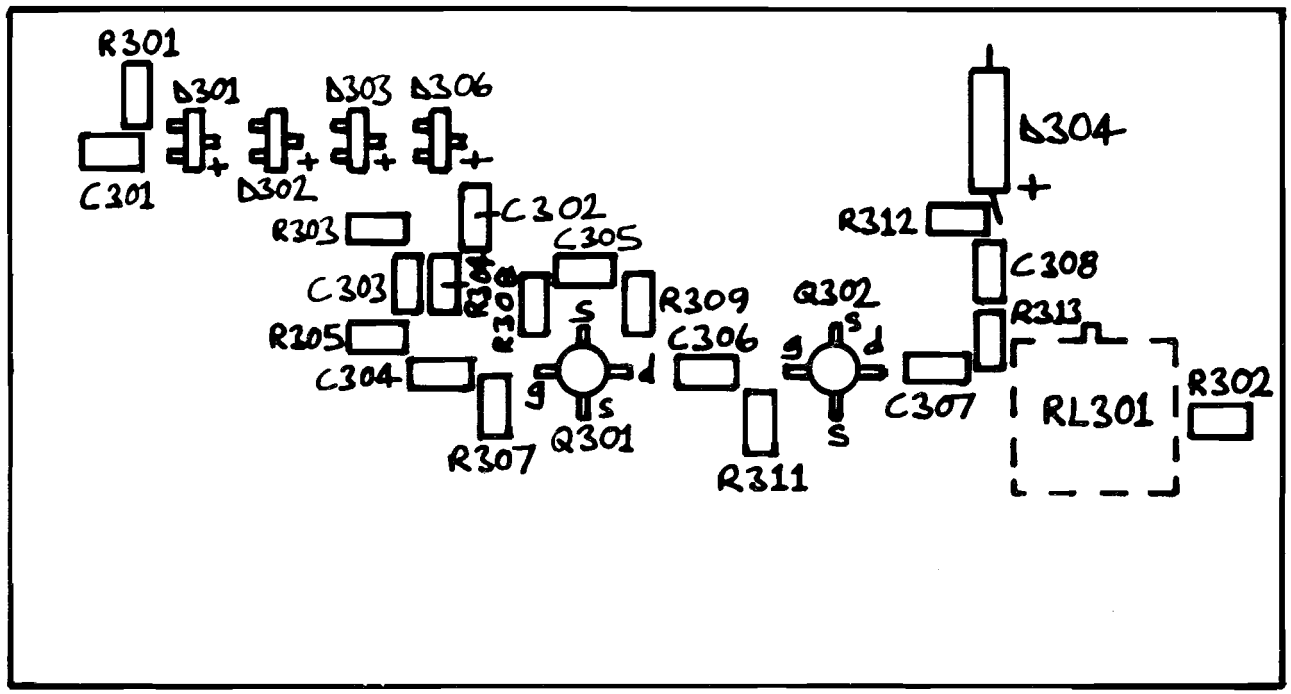
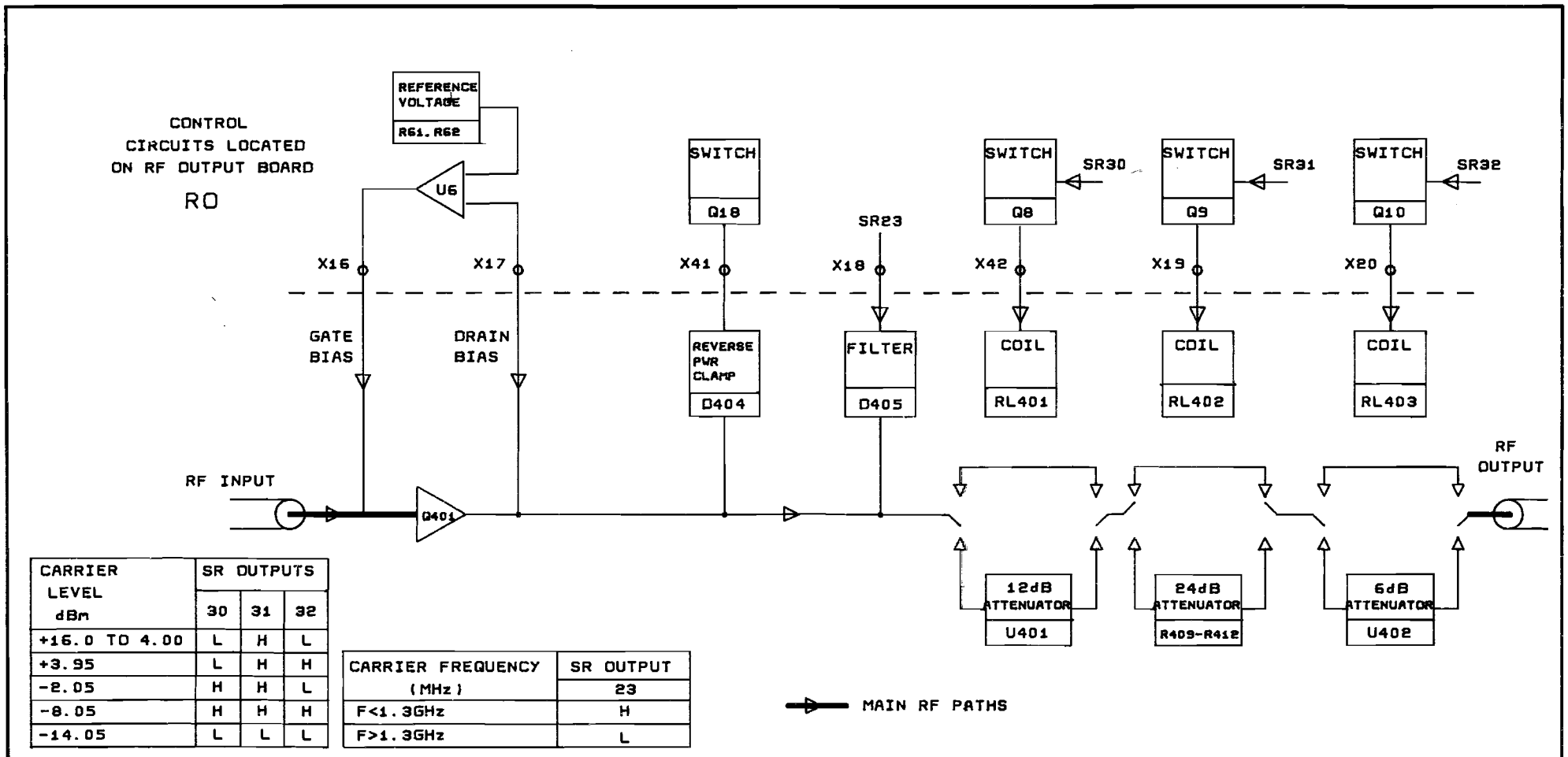
Artek Media





CARRIER LEVEL dBm	SR OUTPUTS 30	31	32
+16.0 TO 4.00	L	H	L
+3.95	L	H	H
-2.05	H	H	L
-8.05	H	H	H
-14.05	L	L	L

CARRIER FREQUENCY (MHz)	SR OUTPUT 23
F<1.3GHz	H
F>1.3GHz	L

ISS	A		
DATE	24.2.93		
MOD. NO.	-		
CHK'D	[redacted]		
NAME	JN		

USED ON:
PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

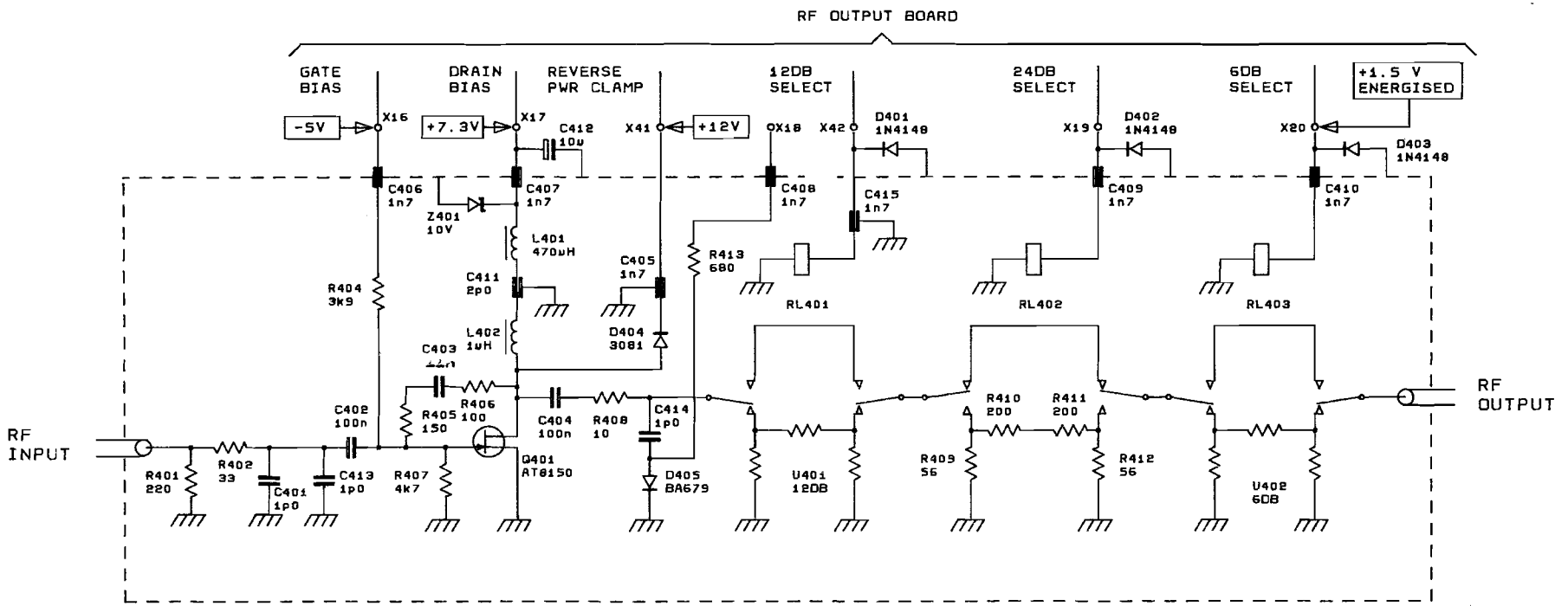
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE
POWER AMPLIFIER
BLOCK DIAGRAM

DRAWING NO.
4SZV0151

SHEET 1 OF 1 SHEETS



ISS	A	B	C	D					
DATE	17.8.89	23/5/90	22/8/91	30.3.93					
MOD. NO.				14283					
CHK'D			SR	SR					
NAME	D.G.H	JEC	JEC	JEC					

USED ON: PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH

TITLE: POWER AMPLIFIER CIRCUIT DIAGRAM

DRAWING NO. 3SZX0594

SHEET 1 OF 1 SHEETS

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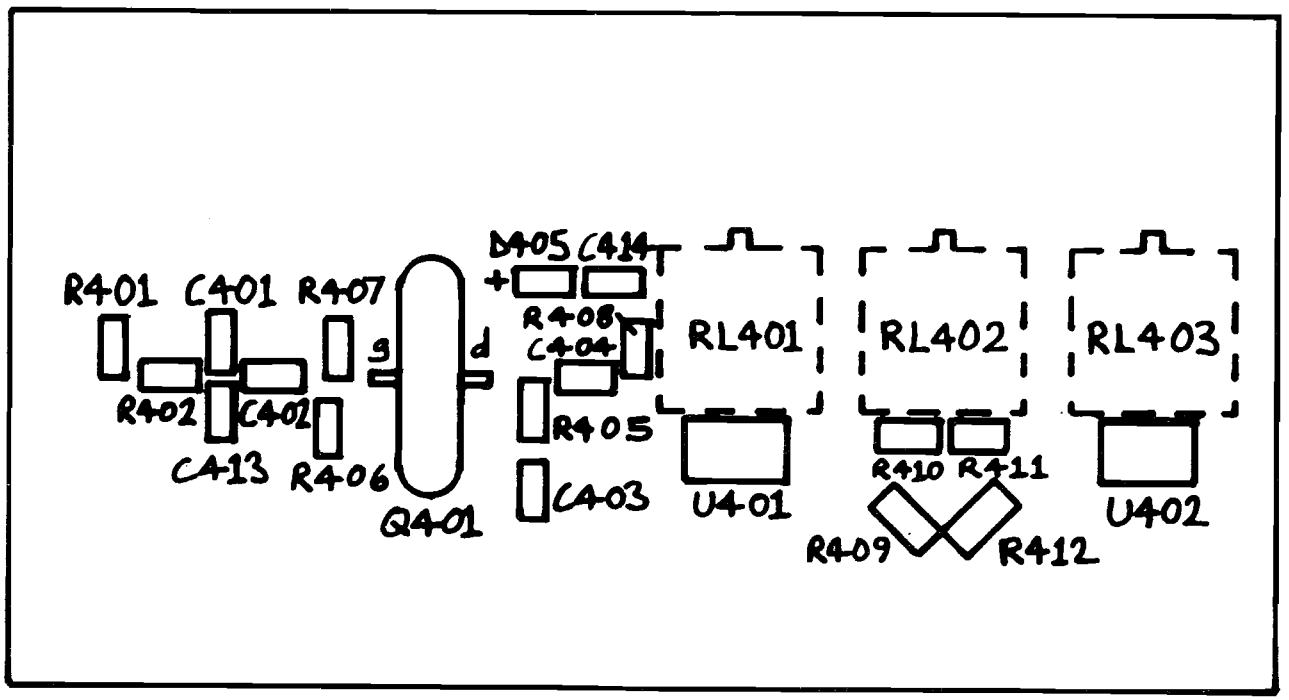
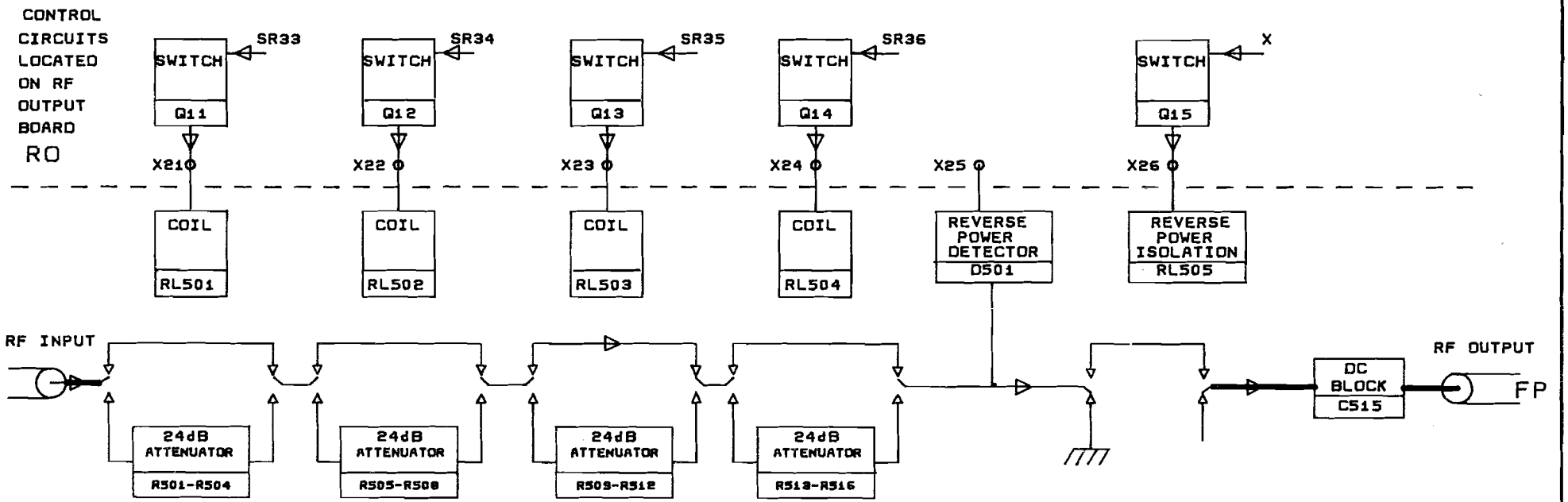
Artek Media





CARRIER LEVEL dBM	SR OUTPUTS			
	33	34	35	36
-30.00	H	H	H	H
-30.05	L	H	H	H
-62.05	L	L	H	H
-86.05	L	L	L	H
-110.1	L	L	L	L

RF OUTPUT	X
NORMAL	L
REVERSE POWER TRIP	H

ISS	A		
DATE	22.2.93		
MOD. NO.	-		
CHK'D	SB		
NAME	JN		

USED ON:
PSG2400A

NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.

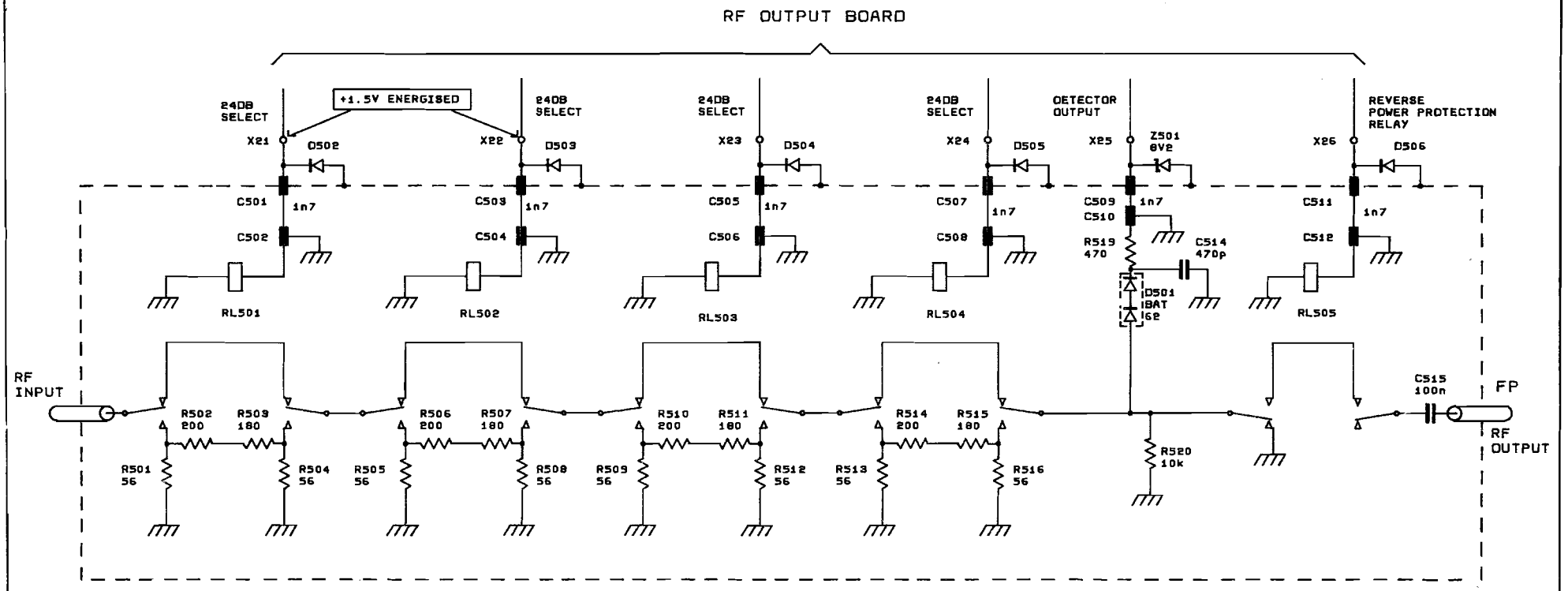
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

TITLE
RF ATTENUATOR
BLOCK DIAGRAM

DRAWING NO.
4SZV0128

SHEET 1 OF 1SHEETS



ISS	A	B	C							USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, YORKS. LS22 4DH	
DATE	17.8.89	9-10-90	17/6/92							PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	TITLE: PSG2400A RF ATTENUATOR CIRCUIT DIAGRAM	DRAWING NO. 3SZX0593
MOD. NO.	-	-	-										SHEET 1OF 1 SHEETS
CHK'D	SD	SD	SD								UNLESS OTHERWISE STATED		
NAME	D.G.H	ST	JEC										

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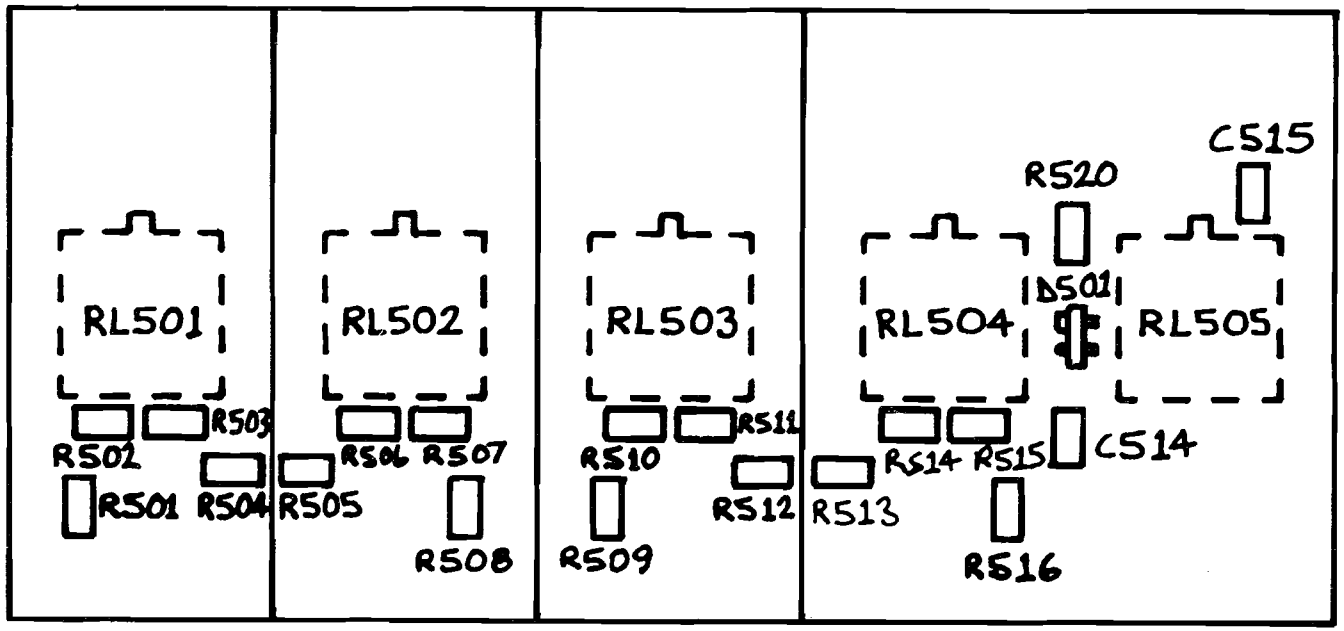
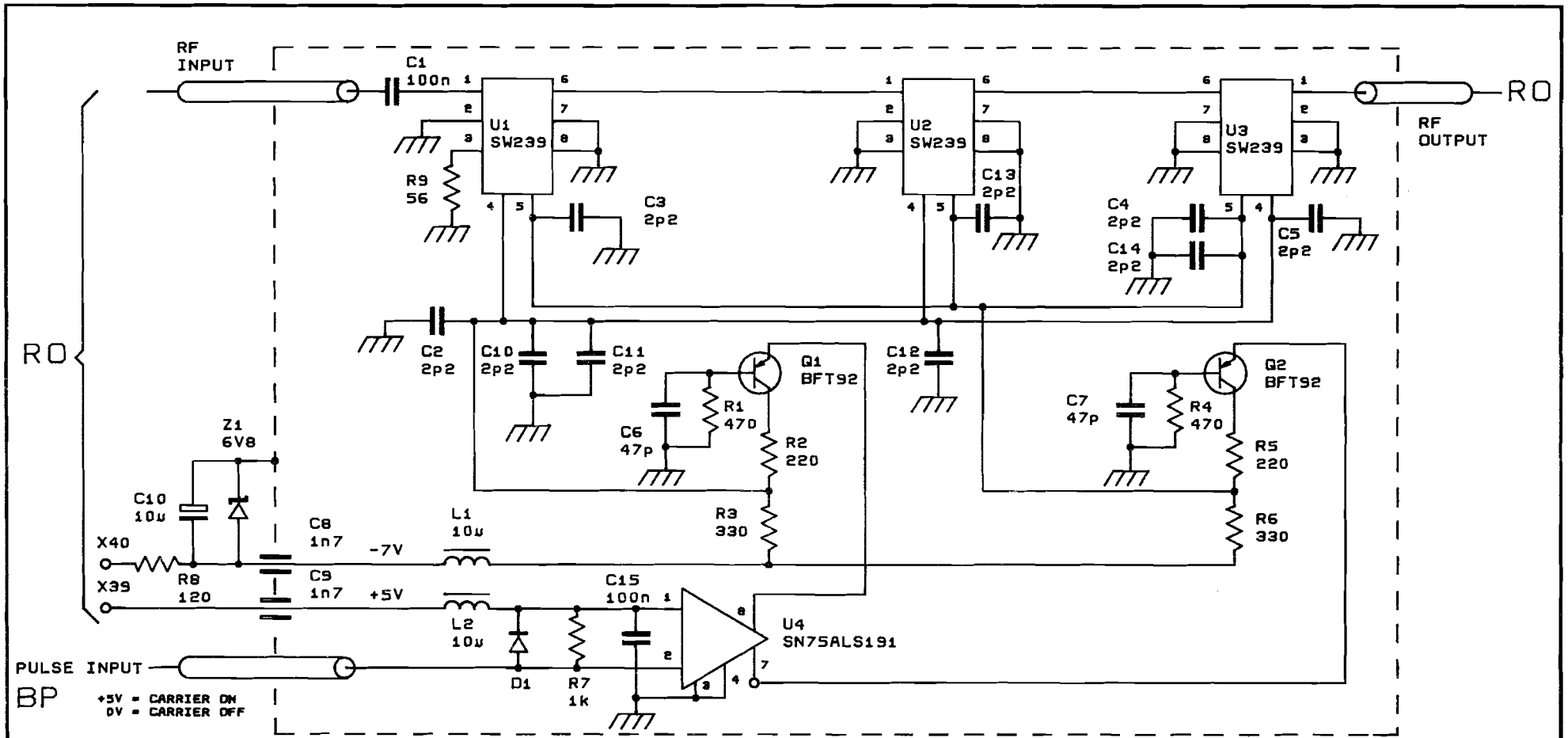
By
Artek Media





ISS	A	B	C
DATE	30.8.89	18/7/90	18/6/92
MOD. NO.	-	-	-
CHK'D	SD	SD	SD
NAME	D.G.H	JEC	JEC

USED ON: PSG2400A

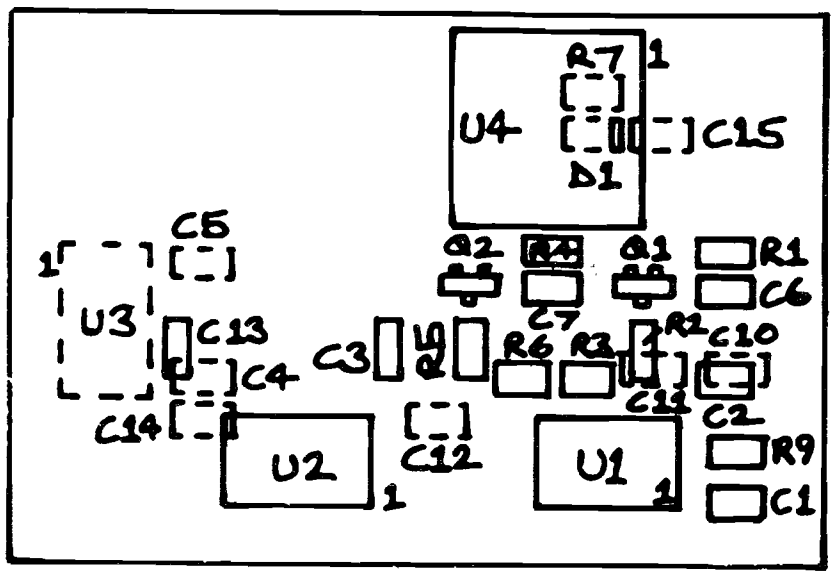
NOTES:
ALL CAPACITOR VALUES IN F.
ALL RESISTOR VALUES IN OHMS.
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH

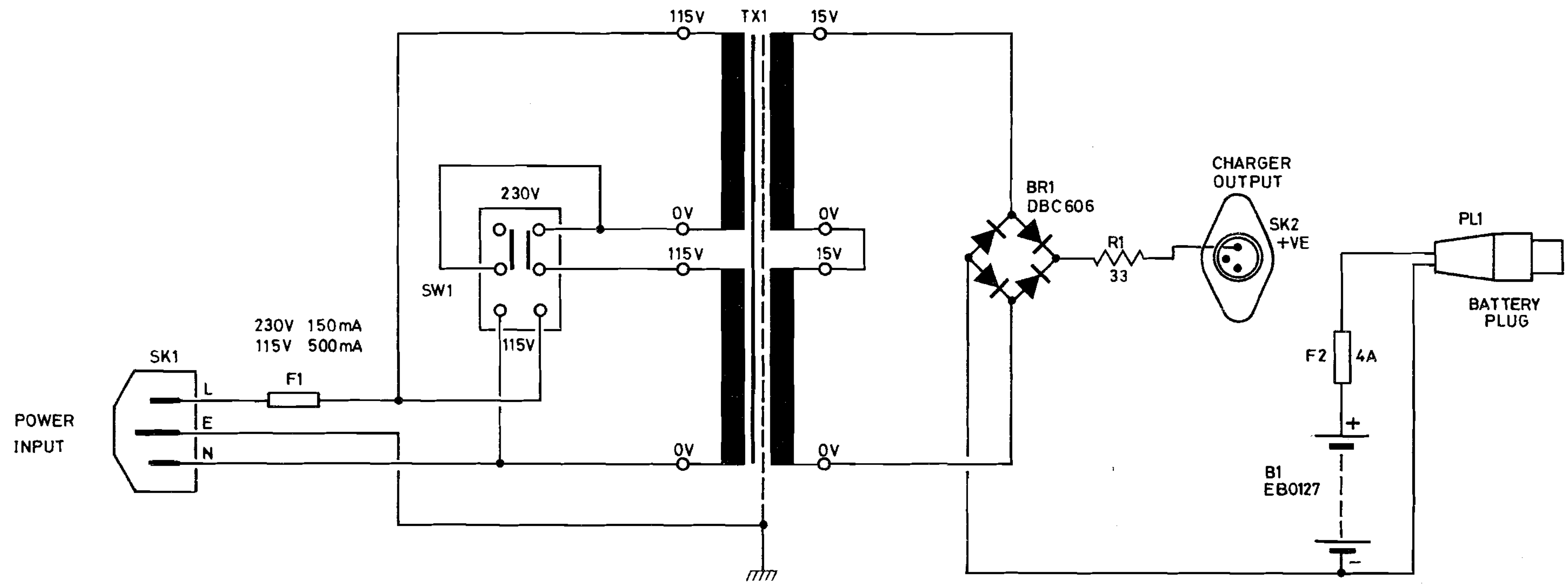
TITLE: PULSE MODULATION OPTION CIRCUIT DIAGRAM

DRAWING NO. 4SZX0599

SHEET 1 OF 1 SHEETS



R MISC	SK1	F1	SW1	TX1	BR1	R1 SK2 B1 F2	PL1



TRACED	ISS.	DATE	MOD. No.	ISS.	DATE	MOD. No.	USED ON
CHECKED SD							F10059
DRAWN AC.	A	7.12.87					

NOTE:
CAPACITOR VALUES GIVEN IN µF.
RESISTOR VALUES IN Ω
UNLESS OTHERWISE STATED.

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.

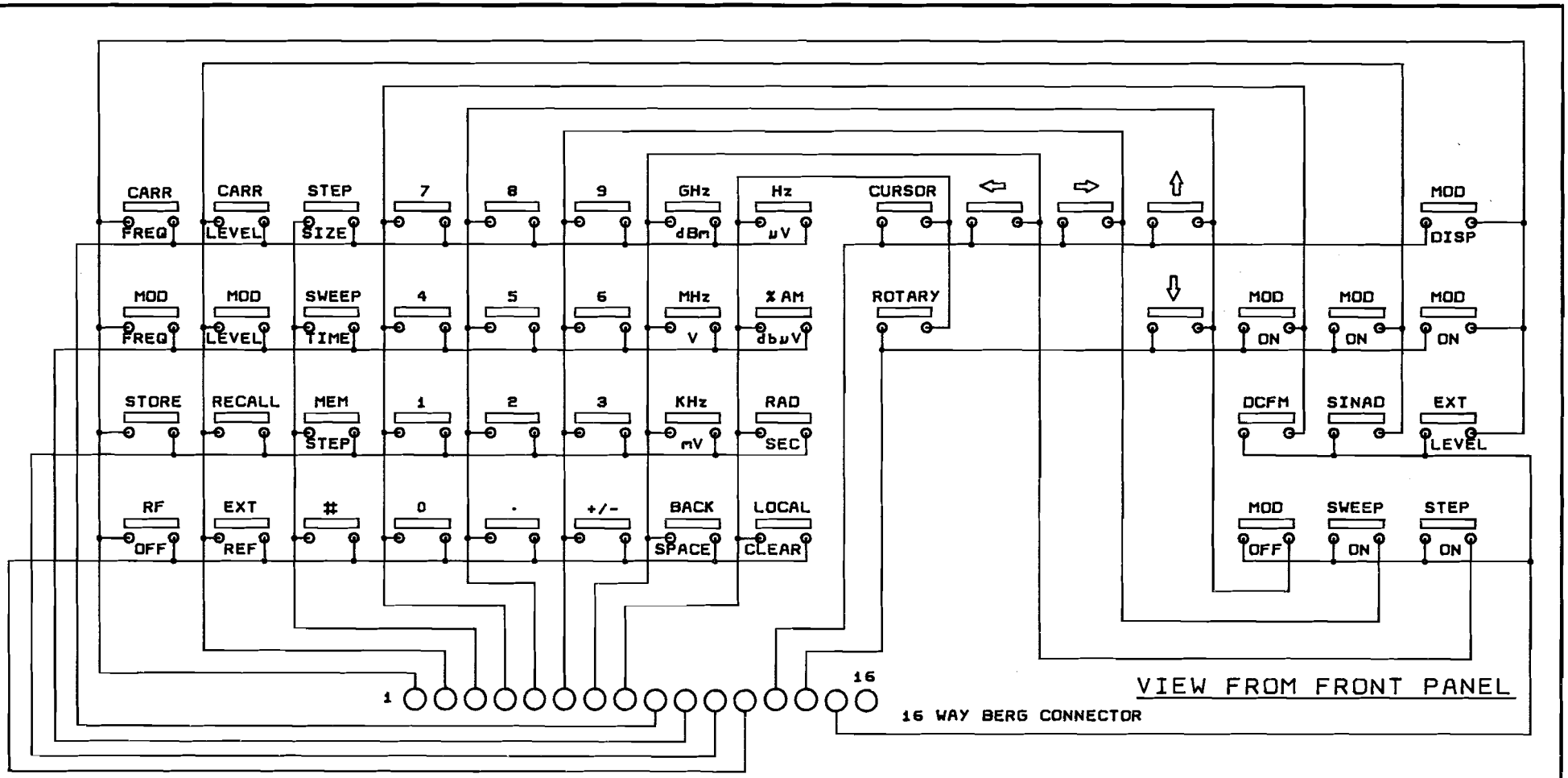
TITLE **RE CHARGEABLE BATTERY OPTION**

DRAWING No. **3ZX10059100**

SHEET 1 OF 1 SHEETS

FICO3

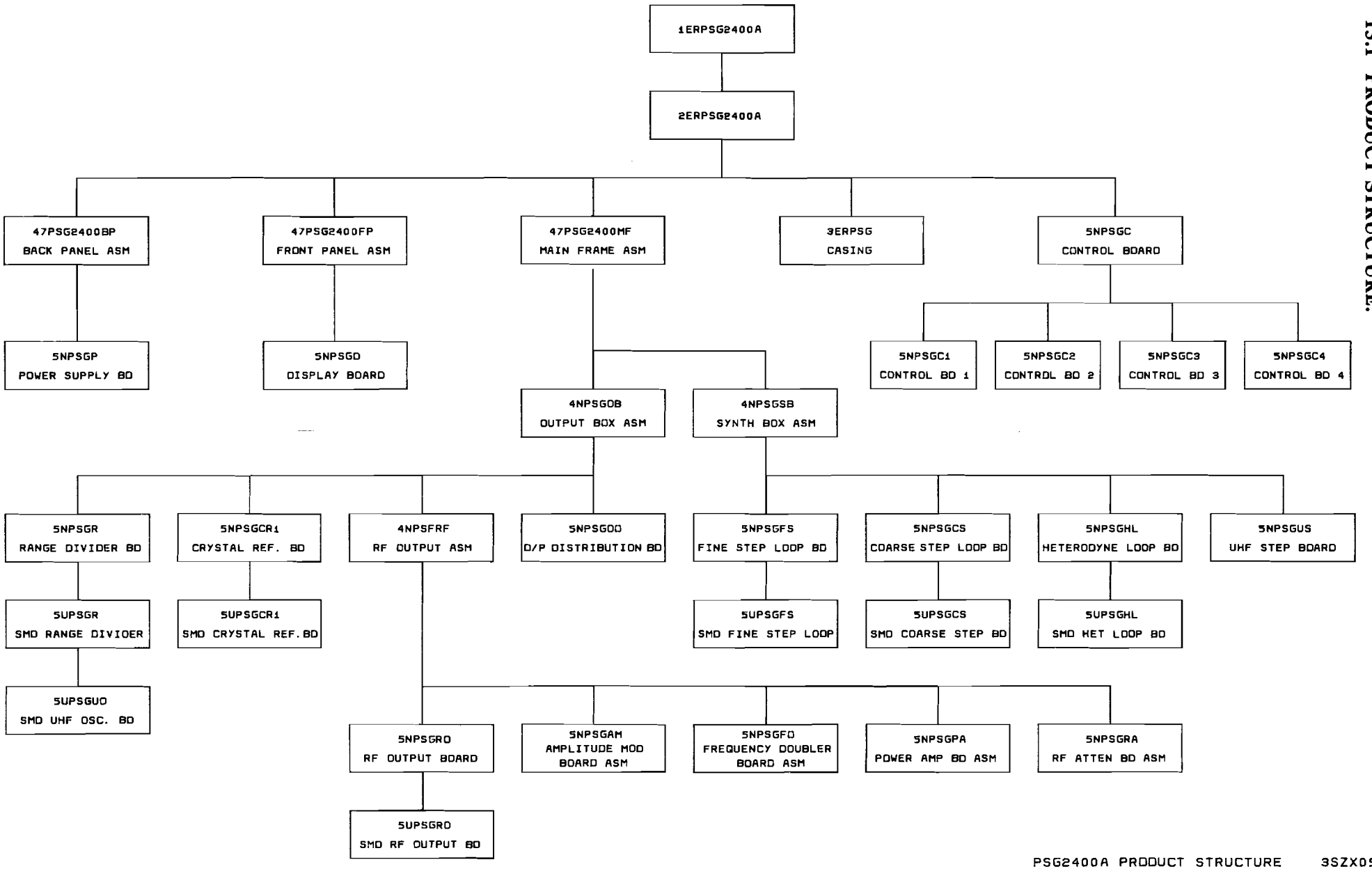
AARQUE 9256/84



ISS	B			USED ON:	NOTES:	FARNELL INSTRUMENTS LTD., SANDBECK WAY, WETHERBY, LS22 4DH
DATE	1.3.93			PSG2400A	ALL CAPACITOR VALUES IN F. ALL RESISTOR VALUES IN OHMS.	
MOD. NO.	-					TITLE: MEMBRANE SWITCH CONNECTIONS
CHK'D	SG					DRAWING NO. 4SC0193
NAME	JN				UNLESS OTHERWISE STATED	SHEET 6 OF 6 SHEETS

15. COMPONENT LISTING.

15.1 PRODUCT STRUCTURE.



PSG2400A PRODUCT STRUCTURE 3SZX0945
ISSUE A JEC 29/1/93

15.2 PARTS LIST EXPLANATION

Static sensitive parts

Before handling any parts, be sure to read the static electricity handling precautions detailed in the SAFETY section of this manual.

Spares Kit

A recommended list of spare parts is available for this instrument on request, and unless otherwise advised will assume a kit is required to cover maintenance over a minimum period of 2 years.

Parts ordering information

The parts list is grouped into separate printed circuit board assemblies and/or chassis assemblies. When ordering any of the parts listed for this instrument, ensure that the Farnell part number is quoted in full and indicate the quantity required. To order any part which is not listed, include instrument model number, serial number and a full description of the part together with the quantity required.

Where it is not practical to order parts from Farnell Instruments or a designated agent of the company, the parts list contains a manufacturer's code and part number to enable local sourcing. To extend the description of any item in the parts list, full use should be made of the implicit type descriptions contained in the part number and circuit reference prefixes. An index to these prefixes is given below. Manufacturers names are listed in section 15.4.

Circuit reference prefixes

B Battery
BR Bridge rectifier
C Capacitor
D Diode
F Fuse
FAN Fan
H Hardware
IC Integrated circuit
L Inductor
LK Link
LD Indicator
M Meter
N Network
P Potentiometer
PL Plug
Q Transistor
R Resistor
RL Relay
SK Socket
SW Switch
T Transformer
TR Transistor
TP Terminal pin/test point
U Integrated circuit
WH Wire hole
XTL Crystal
Z Zener diode

B...PRINTED CIRCUIT BOARD
BC Standard
BF Flexible

C...CAPACITOR
CA Hardware
CB Polycarbonate
CC Ceramic
CD Solid electrolytic
CE Electrolytic
CF Metallised film
CG Film
CI Feedthru
CL Polypropylene
CM Mica
CP Paper
CR Polyester
CS Polystyrene
CT Tantalum
CU Surface mount
CV Variable
CX X-type
CY Y-type

D...DIODE
DB Bridge
DG General
DS SCR/Triac
DT Stud
DU Surface mount
DV Vari-cap
DZ Zener

E...ELECTRO-MECHANICAL
EA Sounder
EB Battery
EC Encoder/converter
ED Software
EM Meter
EP Printer/plotter
ER Relay
ES Speaker
ET Transducer

F...FUSE
FA Accessory
FC HRC lug
FF Fast
FH Holder
FL Label
FP Pico
FS Shroud
FT Time delay

G...CABLE ACCESSORY
GC Cable clamp
GL Lacing tape
GR Grommet
GT Tyrap

Circuit reference prefixes continued.

H...HARDWARE
HA Handle
HB Bracket
HC Cable assembly
HD Dial
HE Lead frame
HF Foot
HG Spring
HK Knob
HL Label
HM Moulding
HR Retainer
HS Heatsink
HW Hardware

L...OPTO-ELECTRONIC
LC LCD
LD LED
LF Filament lamp
LH Bulb holder
LN Neon

M...INSULATOR
MB Insulating bush
MC Ceramic bead
MF Insulator
MH Heatshrink sleeve
MK Insulating kit
MM Insulating washer
MP Sleeving
MR Rubber sleeve
MT Adhesive tape

P...POTENTIOMETER
PA Hardware
PC Carbon
PL Locking
PM Metal film
PW Wirewound

R...RESISTOR
RA Hardware
RB Precision
RC Carbon
RF Fusible
RG Glaze
RM Metal film
RN Network
RS Shunt
RT Thermistor
RU Surface mount
RV Varistor
RW Wirewound
RX Metal oxide

S...SWITCH
SA Accessory
SB Push button
SC Micro
SF Foot
SL Thumbwheel
SM Thermal
SR Relay
SS Slide
ST Toggle
SW Wafer

T...TERMINAL/CONNECTOR
TA Accessory
TB Terminal block
TC Crimp
TG Plug
TI IDC
TK Socket
TL Terminal link
TM Terminal
TP Terminal pin
TR RF connector
TS Solder tag
TV Terminal cover

Circuit reference prefixes continued.

U...SURFACE MOUNT COMPONENT
UB PCB with SMT
UC Capacitor
UD Diode
UF Fuse
UI Integrated circuit
UR Resistor
UT Transistor

V...ACTIVE COMPONENT
VA Analogue integrated cct
VB Valve base
VD Digital integrated cct
VF Field effect transistor
VJ Junction FET
VN Darlington transistor
VP Transistor pad
VR Resonator
VS IC socket
VT Transistor
VV Valve/CRT
VX Crystal

Y...WIRE
YA Accessory
YB Copper braid
YC Copper strip
YD Ident
YE Enamelled
YL Link
YM Multicore cable
YP Equipment
YR Resistance
YT Tinned copper
YX Coaxial cable

Z...WINDING
ZA Accessory
ZB Bobbin
ZC Choke
ZD Tuning core
ZF Magnetic core
ZG Gapping piece
ZL Lamination
ZM Moulding
ZP Bobbin accessory
ZR Transformer
ZS Transformer
ZT Choke
ZU Transformer
ZV Choke
ZW Choke
ZX Filter choke
ZY Current transformer
ZZ Winding

Interpreting the circuit reference field

Due to limitations in the number of character spaces available, the information in the circuit reference field has been abbreviated and the following notes are provided as a guide to its interpretation:

Where a component is used more than once on an assembly the alphabetic portion of the circuit reference for its second and subsequent locations has been omitted e.g. the cicuit reference information for a component located at R1 and R6 will appear as R1 6

The cicuit reference numbers are presented in ascending decade blocks delimited by colons: second and subsequent numbers within a decade block represent only the unit value of the location (the tens and hundreds values being implied) e.g. for a component located at R54, R57, R59, R82, R87, R102, R110 and R112 the circuit reference entry will be R54 7 9:82 7:102:10 2

Where components are used in a series of neighbouring circuit reference locations the circuit reference numbers are represented as inclusive blocks using a hyphen e.g. a component located at R16, R19, R21, R24, R25, R26, R31, R37, R38, R39, R40, R44 and R46 will be represented as R16 9:21 4-6:31 37-40 4 6 (an exception to the rule occurs when a series crosses a decade block in which case the tens value is inserted).

15.3 COMPONENT LISTING

2ERPSG2400A SIG GEN 100KHZ TO 2.4GHZ

3ERPSG CASING PSG2400A

CASING

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
JPAP500	PACKING BOX	51A	AP500W		1	
7SU4611	FOOT RETAINER	00F	2SUDF4611	A	2	
7SU4994	TOP COVER	00F	1SUDE4994	A	1	
7SU4995	BOTTOM COVER	00F	1SUDE4995	A	1	
7SX4603	SIDE TRIM	00F	2SUDF4603	A	2	
HC0264	CABLE ASSY BNC MALE-BNC MALE	04Q	4SC0264	A	1	
HC22V2	PLUG & LEAD 22/V/2	50C	22-V-2		1	
HF0019	FOOT & FOLDING LEG ASSY DK GRY	14K	2SV000139+&+40	A	2	
HF0070	FOOT INSERT	14K	4SV000070	A	6	
HF0139	FOOT DARK ADMIRALTY GREY	14K	2SV000139	A	2	
HW3114003	EXTRACTOR	11C	4SU003114003	A	1	
TG212	MINIATURE PLUG 3 POLE 5AMP	05D	RPC212P3S		1	
TR201A	N-BNC ADAPTOR	10R	UG201A/U		1	

47PSG2400BP BACK PANEL PSG2400A
5NPSGP POWER SUPPLY PSG2400A

BACK PANEL ASSEMBLY

Power Supply Board.

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU4145	REG HEATSINK	00F	3SUBA4145	B	1	
BC1378	POWER SUPPLY PSG2400A	01K	1N7PAT13780	D	1	B
CEB47U0DM	47UF 20% 10V FC +5MM	134N	KMVB		2	C5 7
CEB47U0EM	47UF 20% 16V FC +5MM	134N	KMVB		3	C11 4 6
CED3M30GM1	3.3MF 20% 25V S100	92B	ALC20A332AB025		2	C8:12
CEE10M0EM	10MF 20% 16V S125	92B	ALS20B1123XX		2	C1 2
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		6	C4 6:10 3 5:21
CR6220NKK	220NF 10% 63V R050	159W	MKS2		2	C19:20
CR6330NKK	330NF 10% 63V R050	159W	MKS2		2	C22 3
CR6470NKK	470NF 10% 63V R050	159W	MKS2		2	C3 9
DB10	BRIDGE RECTIFIER	10I	2KBP10		1	BR1
DG4003	DIODE	11G	1N4003		1	D6
DG4148	DIODE	23N	1N4148		4	D2-5
DGD1650	DOUBLE SCHOTTKY DIODE	11G	MBR1560CT/SBP1650T		1	D1
DZ210V0E	10V 5% 0W50	31I	ZPD10		2	Z1 2
HST0220	H/SINK TO220	53S	TO220+PB136CB		1	
MB2840	M3 TOP HAT BUSH	14W	BQ2840		1	U4
MMT0220S	SIL-PAD INSULATOR TO220	14W	K228NA464		1	U4
PM41K00MV	1K00 20% PRESET VERT STURN	02S	75H		1	P1
PM71M00KV3	1M00 10% PRESET VERT STURN	02S	75H		1	P2
RALINK	TINNED COPPER LINK 24 SWG	99F	RALINK		1	R3
RM3680RFF	680R 1% 0W60 50PPM 250V	18P	MRS25		1	R1
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		2	R4 5
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		2	R6 9
RM45K10FF	5K10 1% 0W60 50PPM 250V	18P	MRS25		1	R2
RM543K0FF	43K0 1% 0W60 50PPM 250V	18P	MRS25		2	R10 1
RM547K0FF	47K0 1% 0W60 50PPM 250V	18P	MRS25		2	R7 8
RM6330KFF	330K 1% 0W60 50PPM 250V	18P	MRS25		1	R14
TBA3904PSS	4W PIN WAFER FRICTION LOCK SQU	07A	640445-4		1	S2
TBA3906PSS	6WAY FRICTION LOCK SQUARE	07A	640445-6		1	S3
TBA3908PSS	8W PIN WAFER FRICTION LOCK SQU	07A	640445-8		1	S1
TBM2508PS	STRAIGHT PIN HEADER 8 WAY 2.54	23M	6410+22-27-2081		1	S4
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		1	X1
VA337T	INT CCT LM337T NAT	23N	LM337T		1	U4
VA4940V12	VOLTAGE REGULATOR 12V	29S	L4940V12		1	U3
VA4941	VOLTS REG L4941BV	29S	L4941BV		2	U1 2
VFZ40	FET IRFZ40-Z44 "STATIC"	10I	IRFZ40-Z44		2	Q3 4
VTNLGP	40V A6 W5 (3SC0146)	03Z	BC337PK35(3SC0146)	A	2	Q1 2

Back Panel Assembly Components

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU2436	SWITCH BRACKET KA	00F	3SUCB2436	B	1	
7SU4146	TRANSFORMER COVER	00F	2SUCR4146	B	1	
7SU4147	TRANSFORMER BRACKET	00F	2SURR4147	B	1	
7SU4148	BACK PANEL	00F	2SURR4148	B	1	
7SX4142	REAR CROSS MEMBER BOTTOM	00F	3SUBA4142	A	1	
7SX4143	REAR CROSS MEMBER TOP	00F	3SUBA4143	A	1	
7SX4144	PSU HEATSINK	00F	3SUDJ4144	A	1	
FH2002	FUSE HOLDER 5 X 20MM P/MTG.	02B	L2002		1	F2
FT500M11	FUSE 500 MILLIAMP ANTI-SURGE	03B	TDC11		1	F1
FT5A00123	FUSE 5 AMP ANTI-SURGE	03B	S504		1	F2
GR2491BLK	BLANKING PLUG (BLACK)	30H	2491+BLACK		1	
GR2497BLK	BLANKING PLUG (BLACK)	30H	2947+BLACK		1	
HC0220	CABLE ASSEMBLY PSG2400A	88M	4SC0220	B	1	
TK57F20	RECEPTACLE 24WAY	38D	57FE2024020N(D35)		1	
HR20418	SCREW LOK ED20418-2/TB8	84A	ED20418-2+SL8		2	SK9
MH18BLK	HEATSHRINK 1/8" DIA BLACK UL	27R	CFR-125+UL/CSA+VW1			
PM510K0KP	10K0 10% PRESET PMNT MTURN	02S	43P103T601		1	P3
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		2	R12 3
SA35093RD	SWITCH BUTTON RED	02L	035093-001		1	SW1
SA5000A	TRANSPARENT SWITCH COVER	45L	5000A		1	SW1
SB5020	MAINS SWITCH 6 WAY	45L	PBMS5020		1	SW1
SRHC4	RELAY HC4 12V DC	67P	HC4+12V		1	RL1
SRHC4B	RL BASE HC4 SS	67P	HC4-SS		1	RL1
TBA3904HS	4W HOUSING WITH STRAIGHT LOCK	07A	640250-4		1	S2
TBA3908HS	8W HOUSING WITH STRAIGHT LOCK	07A	640250-8		1	S1
TG3211	9WAY D CONNECTOR	45L	R3211-109-S0-000		1	SK9
TG6J4	MAINS INPUT FILTER	06T	VS-F6J4		1	S5
TK212	SOCKET DC 3 POLE	05D	RPC212RB3P		1	S6
ZR0322	TRANSFORMER PSG2400A REFZ1466	01B	2SR0322	B	1	TX1

47PSG2400FP FRONT PANEL PSG2400
5NPSGD DISPLAY PSG2400A

FRONT PANEL ASSEMBLY

Display Board Components

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
BC1375	FRONT PANEL PSG2400A	01K	1N7RBT13750	D	1	B
CEC470UEM4	470UF 16V 20%	06R	107-353		5	C1 3 5:24 5
CR44N70LM	4.7NF 20% 100V R050	159W	FKS2		1	C26
CR510N0LJ	10NF 5% 100V R050	159W	FKS2		18	C2 4 6-14:17-23
CR6470NKK	470NF 10% 63V R050	159W	MKS2		2	C15 6
DG4148	DIODE	23N	1N4148		8	D1-8
EC226	SHAFT ENCODER	23C	EC24B508000WB		1	P1
LD1301RED	LED HLMP-1301 RED	02H	HLMP-1301		27	LD5-31
LD2112J	LED HDSP2112J/I ONLY	02H	HDSP2112J/I+ONLY		5	U1-5
MB1218	TOP HAT BUSH 6BA	27K	A1218		1	U15 FIXING
MMT0220S	SIL-PAD INSULATOR TO220	14W	K228NA464		1	
RM11R00FF	1R00 1% 0W60 100PPM 250V	18P	MRS25		2	R4 5
RM3560RFF	560R 1% 0W60 50PPM 250V	18P	MRS25		1	R1
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		2	R2-3
RN41K009E	N/WORK 1K SIL 9E	05D	9E		4	N1-3 5
RN510K09E	N/WORK 10K 2% 9E	05D	9E		1	N4
RN6100KEQ8	N/WORK 100K SIL EQ8	05D	9E		1	N6
SRG2V5	G2E 5V ORM	05O	G2E-182P-M+5V+DC		1	RL1
TBA3902PR	2W PIN WAFER 90DEG WITH LOCK	07A	640389-2		1	S4
TBM2504PR	R/H PIN HEADER 4 WAY 2.54MM	23M	7478+22-05-3041		1	S3
TBM2516PT	R/H PIN HEADER 16 WAY 2.54MM	23M	4094+22-05-2161		1	S2
TIH2526NR1S	I.D.C. 26 WAY PIN HEADER	88M	ID101-H26-K-06-E1		1	S1
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		2	TP1 2
VA4941	VOLTS REG L4941BV	29S	L4941BV		1	U15
VD74HC08N	IC MM74HC08N STATIC	23N	MM74HC08N		1	U19
VD74HC107	74HC107	23N	MM74HC107		1	U17
VD74HC14N	IC 74HC14N STATIC	01T	74HC14N		1	U18
VD74HC154N	MM74HC154N 0.3" STATIC	23N	MM74HC154N		1	U6
VD74HC193	74HC193	23N	MM74HC193N		1	U16
VD74HC32	IC 74HC32 STATIC	23N	TC74HC32P		2	U9:20
VD74HC373	IC TC74HC373P STATIC	23N	74HC373P		1	U10
VD74HC374N	IC 74HC374N STATIC	01T	74HC374N		2	U7:11
VD74HC4078	IC M74HC4078 STATIC	29S	M74HC4078		1	U8
VD74HC574	74HC574 20PIN STATIC	23N	74HC574		4	U12-14:21

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		6	U8 9:17-20
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		1	U16
VS20L	IC SKT 20 WAY	28I	703-3320-01-04-10		7	U7:10-14:21
VS24LMIN	IC SKT 24W 0.3 PITCH	01T	24W+0.3"+PITCH		1	U6
VS28L	28W 703-1328-01-04-10	01H	D282801		5	U1-5
VTPMGP	ZTX551 BC488A TO92 (3SC0149)	03Z	ZTX551K(3SC0149)	A	1	Q1

Front Panel Assembly Components

7SF3280	BNC INSULATOR WASHER	00F	4SU003280	A	2	SK4
7SU4119	FALSE FRONT PANEL	00F	1SUCB4119	A	1	
HK0284	29mm KNOB BEIGE	01S	4SC0284	A	1	
HK0285	29mm KNOB CAP BEIGE	01S	4SC0285	A	1	
HW0193	FRONT PANEL PSG2400	47R	2SC0193	B	1	
HW1878	RFI SCREEN	18R	4SU001878	B	1	
TR1094	BNC SOCKET	10R	UG1094/B/U		2	SK2 3
TR10942	"N" BULKHEAD JACK	01G	N15H31J285X99		1	SK1
YX85	S/R COAX UT85 TINNED	37I	UT85			
ZC1U10	CHOKE 1UH SC10 ITT	103S	32794C		1	L2
ZC4U730	CHOKE SC30 4.7UH	103S	66247GM		1	L1

47PSG2400MF MAIN FRAME ASSEMBLY PSG2400A

4NPSGOB OUTPUT BOX PSG2400A
4NPSGRF RF OUTPUT PSG2400A
5NPSGAM AMPLITUDE MODULATOR PSG2400A

RF OUTPUT BOX ASSEMBLY

a)Amplitude Modulator Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU4155	CLAMP STRAP	00F	4SU004155	A	2	
7SU4159	AMP MOD	00F	3SU004159	A	1	
BC1469	AMPLITUDE MODULATOR	33C	137PKK14690	C	1	
CI11P00J	DISCOIDAL FEEDTHRU 1P0	44M	DF331-805SL010P50		3	C309:10:21
CI3100PJM	100PF 50V 20% F/THRU	44M	DF331-805-YN-101M		3	C316-18
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		5	C311-15
DG2826	DIODE	02H	5082-2826		1	D307
DG4148	DIODE	23N	1N4148		1	D305
DG6672006	SCHOTTKY DIODE	85A	DDL6672-006		1	D304
DZ15V10E	5.1V 5% 0W50	31I	ZPD5.1		2	Z301 2
HW5326	ATTENUATOR SCREEN PCB LAMINATE	01K	4SU005326	A	1	
HW5327	RELAY SCREEN PCB LAMINATE	01K	4SU005327	A	1	
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		2	R306:10
SR1725	RELAY 172-5	20T	172-5		1	RL301
VF10736	FET	28A	AFT10736		2	Q301 2
ZC0303	YE315S 2 TURNS	22K	3SR0303		3	L302 3 5
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC0U470	RF CHOKE 470NH SC30/0.470UH	103S	066241HM		2	L304 6
ZC4U730	CHOKE SC30 4.7UH	103S	66247GM		2	L301 7
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	D307

Amplitude Modulator (SMD Components)

CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		1	C303
DUG3810	HSMP3810	02H	HSMP3810		4	D301-3 6
RUM3100GA0	100R 2% 1206	18P	RC01-100R-2%		3	R308 9:13
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		1	C308
UCC3470JA0KC	470PF 5% 50V 1206 COG	08V	1206A471JXAT		6	C301 2 4-7
URM2470GA0	47R 2% 1206	18P	RC-01		1	R304
URM2750GA0	75R 2% 1206	18P	RC-01		1	R314
URM3150GA0	150R 2% 1206	18P	RC-01		2	R303 5
URM3220GA0	220R 2% 1206	18P	RC-01		1	R302
URM3470GA0	470R 2% 1206	18P	RC-01		2	R301:12
URM5100GA0	10KR 2% 1206	18P	RC-01		2	R307:11

5NPSGFD FREQUENCY DOUBLER PSG2400A

b)Frequency Doubler Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU4151	DIVISION'A'	00F	4SU004151	A	1	
7SU4152	DIVISION'B'	00F	4SU004152	A	1	
7SU4154	EARTH PLATE	00F	4SU004154	B	4	
7SU4158	FREQ DOUBLER	00F	3SU004158	A	1	
BC1468	FREQ DOUBLER PSG2400A	33C	127PKK14680	B	1	B
CEB10U0GT1	10UF 50% 25V AXIAL	18P	030-36109		2	C212 3
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		5	C207-11
DV183	VARACTOR DIODE	34N	1SV183		6	D201-6
DZ15V60E	5.6V 2% 0W50	31I	ZPD5.6		2	Z201 2
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		2	R204:16
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		2	R207:11
VF10736	FET	28A	AFT10736		2	Q201 2

Frequency Doubler Assembly (SMD Conponents)

CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		6	C201-6
DUG2828	HSMS2828	02H	HSMS2828		1	BR201
URM2100GA0	10R 2% 1206	18P	RC-01		2	R202:14
URM2560FC0	56R 1% MINI MELF	67P	ERO-10MKF56R0		2	R219:20
URM3470GA0	470R 2% 1206	18P	RC-01		4	R201 3:13-15
URM5100GA0	10KR 2% 1206	18P	RC-01		8	R205 6 8-10 2 7 8

5NPSGPA POWER AMPLIFIER PSG2400A

c) Power Amplifier Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU4153	BOTTOM FIXING	00F	4SU004153	A	1	
7SU4156	POWER AMP BOX	00F	4SU004156	A	1	
BC1474	POWER AMP	33C	137PKK14740	C	1	B
CEB10U0GT1	10UF 50% 25V AXIAL	18P	030-36109		1	C412
CI11P00J	DISCOIDAL FEEDTHRU 1P0	44M	DF331-805SL010P50		1	C411
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		7	C405-10 5
DG3081	DIODE	02H	5082-3081		1	D404
DG4148	DIODE	23N	1N4148		3	D401-3
DZ210V0H	10V 5% 1W30	02M	MZD10		1	Z401
RM3680RFF	680R 1% 0W60 50PPM 250V	18P	MRS25		1	R413
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		1	R404
SR1725	RELAY 172-5	20T	172-5		3	RL401-3
VA0306S	ATTENUATOR TS0306S	12E	TS0306S		1	U402
VA0312S	ATTENUATOR TS0312S	12E	TS0312S		1	U401
ZC0291	YE315S 1 TURN CHOKE	22K	3SR0291	C	1	L402
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC470U553	HIGH Q ENCAPSULATED CHK 470UF	28I	553+3635+33+02+00		1	L401

Power Amplifier Assembly (SMD Components)

CUC1100JA0KC	1PF +/-.25PF 50V 1206	08V	VJ1206A1R0CXA		3	C401:13 4
DUG679	BA679 UHF PIN DIODE	41S	BA679+MINI+MELF		1	D405
RUM3100GA0	100R 2% 1206	18P	RC01-100R-2%		1	R406
RUM3200FC0	200R 1% MINI-MELF 50PPM	70S	MS1+200R+1%		2	R410 1
UCC5220KA0KX	22NF 10% 50V 1206 X7R	08V	1206Y223KXAT		1	C403
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		2	C402 4
URM2100FC0	10R 1% MINI MELF	70S	MS1		1	R408
URM2330GA0	33R 2% 1206	18P	RC-01		1	R402
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		2	R409:12
URM3150GA0	150R 2% 1206	18P	RC-01		1	R405
URM3220GA0	220R 2% 1206	18P	RC-01		1	R401
URM4470GA0	4K7R 2% 1206	18P	RC-01		1	R407

5NPSGRA R.F ATTENUATOR PSG2400A

d) RF Attenuator Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
BC1385	RF ATTENUATOR PSG2400A	01K	37DKK13850	C	3	
BC1386	RF ATTENUATOR PSG2400A	01K	137DKK13860	C	1	5
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		12	C501-12
DG4148	DIODE	23N	1N4148		5	D502-6
DZ18V20E	8.2V 5% 0W50	31I	ZPD8.2		1	Z501
HW0202	ATTENUATOR ASMY	80P	4SC0202	A	1	
RM3470RDF	470R 1% 0W40 50PPM 200V	18P	MRS16T		1	R519
SR1725	RELAY 172-5	20T	172-5		5	RL501-5
TR1820	SMA RIGHT ANGLE PLUG	04Q	42-1820-061		1	S501
YX85	S/R COAX UT85 TINNED	37I	UT85			

RF Attenuator Assembly (SMD Components)

DUG62	BAT62 40V SOT 143	85S	BAT62		1	D501
RUM3180FC0	180R 2% MINI-MELF	70S	MS1+180R		4	R503 7:11 5
RUM3200FC0	200R 1% MINI-MELF 50PPM	70S	MS1+200R+1%		4	R502 6:10 4
UCC3470JA0KC	470PF 5% 50V 1206 COG	08V	1206A471JXAT		1	C514
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		1	C515
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		8	R501 4 5 8 9:12 3 6
URM5100GA0	10KR 2% 1206	18P	RC-01		1	R520

5NPSGRO R.F OUTPUT PSG2400A
5UPSGRO R.F OUTPUT PSG2400A

e) RF Output Board Assembly (SMD Components, Side 1)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC2270JA0KC	27PF 5% 50V 1206	08V	VJ1206A270JKA		3	C4-6
UBC1519	RF OUTPUT PSG2400A	01K	1N7RBT15190	E	1	SMD
UCC1560JA0KC	5P6 5% 50V 1206 COG	08V	1206A		1	C76
UCC2100JA0KC	10PF 5% 50V 1206 COG	08V	1206A100JXAT		1	C7
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		2	C2:75
UCC2820JA0KC	82PF 5% 50V 1206 COG	08V	1206A820JXAT		3	C3:12 7
UCC5100KA0KX	10NF 10% 50V 1206 X7R	08V	1206Y103KXAT		1	C1
UCC5220KA0KX	22NF 10% 50V 1206 X7R	08V	1206Y223KXAT		1	C13
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		10	C8 9:11:38 9:45:69:70-2
UDGC0LL4148	LL4148 MINI-MELF	41S	LL4148		3	D8:15 6
UIAP3LM741	LM741ID-LM741CM SO-8	01T	LM741CM		1	U6
UIAP3TL072	TL072CD SO-8	01T	TL072CD		1	U11
URM2100GA0	10R 2% 1206	18P	RC-01		1	R115
URM2330GA0	33R 2% 1206	18P	RC-01		3	R5:100 6
URM2470GA0	47R 2% 1206	18P	RC-01		1	R18
URM2750GA0	75R 2% 1206	18P	RC-01		1	R19
URM3100GA0	100R 2% 1206	18P	RC-01		2	R3:21
URM3150GA0	150R 2% 1206	18P	RC-01		2	R1:16
URM3180GA0	180R 2% 1206	18P	RC-01		1	R4
URM3330GA0	330R 2% 1206	18P	RC-01		1	R9
URM4220GA0	2K2R 2% 1206	18P	RC-01		1	R7
URM4330GA0	3K3 2% 1206	18P	RC-01		1	R104
URM4470GA0	4K7R 2% 1206	18P	RC-01		5	R101 2 7 8:112
URM4560GA0	5K6R 2% 1206	18P	RC-01		2	R2:105
URM5100GA0	10KR 2% 1206	18P	RC-01		1	R113
URM5150GA0	15KR 2% 1206	18P	RC-01		1	R60
URM5270GA0	27KR 2% 1206	18P	RC-01		2	R61 2
UTNP0LGP	SOT23#45V#A80#100G#180F(0143)	03Z	BCW66-G/H(3SC0143)	A	1	Q18

RF Output Board Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CC268P0LG	68PF 2% 100V N150 RP050				1	C79
CC3220PLG	220PF 2% 100V N750 RP050	18P	683+58221		1	C31
CEB10U0JM2	10UF 20% 50V FC +5MM	134N	KMVB		1	C34
CEB47U0DM	47UF 20% 10V FC +5MM	134N	KMVB		6	C21 8 9:44 7:58
CEB47U0EM	47UF 20% 16V FC +5MM	134N	KMVB		3	C25 6:3
CEC100UBM	100UF 20% 6.3V R050	05D	CEK1006.3		11	C18:41-43 48-52 54 5
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		19	C10 14-16 9:20 22-24 7:32 3 5:40 6:53 7:73 4
CR6220NKK	220NF 10% 63V R050	159W	MKS2		1	C80
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		1	C78
DG1001	DIODE SCHOTTKY	02H	HSCH1001/1N6263		4	D4 5 9:13
DG4148	DIODE	23N	1N4148		9	D1 2 6 7:10 2 9:20 1
DZ12V70E	2.7V 5% 0W50	31I	ZPD2.7		1	Z1
DZ14V70E	4.7V 5% 0W50	31I	ZPD4.7		1	Z3
DZ15V60E	5.6V 2% 0W50	31I	ZPD5.6		1	Z2
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		2	
MC2	CERAMIC BEAD LARGE	57M	IPB2		4	R57 X2/L
PM41K00MV	1K00 20% PRESET VERT STURN	02S	75H		1	P1
PM42K00KV3	2K0R 10% PRESET VERT MTURN	02S	64W		1	P2
PM550K0MV	50K0 20% PRESET VERT STURN	02S	75H		1	P3
RM210R0FF	10R0 1% 0W60 50PPM 250V	18P	MRS25		2	R99:114
RM218R0FF	18R0 1% 0W60 50PPM 250V	18P	MRS25		3	R10 1:23
RM233R0FF	33R0 1% 0W60 50PPM 250V	18P	MRS25		1	R29
RM256R0FF	56R0 1% 0W60 50PPM 250V	18P	MRS25		3	R17:87:93
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		1	R110
RM3120RFF	120R 1% 0W60 50PPM 250V	18P	MRS25		8	R65 7 9:71 3 5 7:95
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		1	R8
RM41K50FF	1K50 1% 0W60 50PPM 250V	18P	MRS25		3	R6:20:39
RM42K20FF	2K20 1% 0W60 50PPM 250V	18P	MRS25		5	R27:48 9:88:96
RM42K70FF	2K70 1% 0W60 50PPM 250V	18P	MRS25		2	R45 6
RM43K30FF	3K30 1% 0W60 50PPM 250V	18P	MRS25		1	R52
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		10	R13:66 8:70 2 4 6 8:86
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		8	R12:24 5:30 1:40:56:79
RM45K10FF	5K10 1% 0W60 50PPM 250V	18P	MRS25		2	R28:33
RM48K20FF	8K20 1% 0W60 50PPM 250V	18P	MRS25		2	R80 4
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		8	R35:42 3 7:55:81 5 9
RM512K0FF	12K0 1% 0W60 50PPM 250V	18P	MRS25		3	R14:50:83
RM515K0FF	15K0 1% 0W60 50PPM 250V	18P	MRS25		2	R41:53
RM522K0FF	22K0 1% 0W60 50PPM 250V	18P	MRS25		1	R90
RM533K0FF	33K0 1% 0W60 50PPM 250V	18P	MRS25		1	R54

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
RM547K0FF	47K0 1% 0W60 50PPM 250V	18P	MRS25		5	R34 6 7:91 2
RM568K0FF	68K0 1% 0W60 50PPM 250V	18P	MRS25		1	R51
RM6100KFF	100K 1% 0W60 50PPM 250V	18P	MRS25		1	R38
RM6150KFF	150K 1% 0W60 50PPM 250V	18P	MRS25		1	R117
RM6470KFF	470K 1% 0W60 50PPM 250V	18P	MRS25		1	R119
RW227R0JJ	27R0 5% 2W50	04E	74ER		1	R57 (MC2 X2/L/)
SR1725	RELAY 172-5	20T	172-5		3	RL1-3
TBM2502PS	STRAIGHT PIN HEADER 2 WAY 2.54	23M	6410+22-27-2021		1	S2
TBM2503PO	STRAIGHT PIN HEADER 3 WAY 2.54	23M	4030+22-03-2031		1	LK1
TBM2506PO	STRAIGHT PIN HEADER 6 WAY 2.54	23M	4030+22-03-2061		1	S3
TBM2510PBM	MOLEX CONNECTOR	23M	4455C-10BAA		1	S1
TL2W	JUMPER 2WAY	23M	7859-15-38-1024		4	S3A B C:LK1
TP15080	EYELETS C.B. PINS	89C	MR15080		5	
VA061	IC TL061CP STATIC	01T	TL061CP		1	U2
VA062	IC TL062CP STATIC	01T	TL062CP		3	U3 7:10
VA412CN	INT CCT LF412CN	23N	LF412CN		2	U4 5
VD4001BCN	IC CD4001BE STATIC	23N	CD4001BCN		1	U8
VD4051B	IC CD4051BCN STATIC	23N	CD4051BCN		1	U9
VD74HC4094	IC M74HC4094B1 STATIC	29S	M74HC4094B1		2	U12 3
VFN2110A	ZVN 2110A /100V/4R STATIC	03Z	ZVN2110A		2	Q19:20
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		1	U8
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		3	U9:12 3
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		6	U2-5 7:10
VT34T	BFQ34T SOT 37	06M	BFQ34T		1	Q2
VTNLGP	40V A6 W5 (3SC0146)	03Z	BC337PK35(3SC0146)	A	3	Q3 5 7
VTPLGP	40V A6 W5 (3SC0148)	03Z	BC327(3SC0148)	A	11	Q5-6 8-17
VTR90A	BFR90A/02 SOT37	01P	BFR90A/02		1	Q1
ZC0U470	RF CHOKE 470NH SC30/0.470UH	103S	066241HM		3	L2 3 8
ZC470U553	HIGH Q ENCAPSULATED CHK 470UF	28I	553+3635+33+02+00		1	L6
ZC4U7	CHOKE 47NH	28I	551-5172-05-02+00		4	L4 5:13 4
7SU4207	SCREEN PLATE	00F	4SU004207	A	1	
CC11P00LC	1.0PF .25PF 100V P100 RP050	18P	683+03108		1	C214
CEB22U0GT	22UF 50% 25V AXIAL	18P	030-36229		2	C319:20
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		3	C59:60 1
CV2210P808	V/CAP 2/10PF 80811109 K	18P	808-11109		1	C77
DG4148	DIODE	23N	1N4148		2	D11 2
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		2	
RM222R0FF	22R0 1% 0W60 50PPM 250V	18P	MRS25		1	R414
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		8	R26:32:63:82:103 9:11 8
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		1	R58
VAEMA1H	DOUBLE BALANCE MIXER	98C	EMA-1H		1	U1
VF45101	GAS FET	28A	VF45101		1	Q401

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			T201
YE0315SGRN	.315 BS4520/1 GRN GD2	05B	0.315MM+(GRN)			T201
YT22	T/C WIRE 22SWG	55M	22SWG			
YX9307	CONFORMABLE CABLE 9307	04Q	9037			
ZC0290	YE315S 4 TURNS CHOKE	22K	3SR0290	C	2	L1:15
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC0U470	RF CHOKE 470NH SC30/0.470UH	103S	066241HM		1	L308
ZF31	FERRITE TORROID	06N	28-002-31		1	T201
RF Output Board Assembly (SMD Components, Side 2)						
CUC1150JA0KC	1P5F +/-.25PF 50V 1206	08V	VJ1206A1R5CXA		1	C66
DUVBB515B	VARICAP BB515B UHF	85S	Q62702-B398		2	D17 8
UCC1560JA0KC	5P6 5% 50V 1206 COG	08V	1206A		2	C64 5
URM2220GA0	22R 2% 1206	18P	RC-01		1	R82
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		1	R116
URM4470GA0	4K7R 2% 1206	18P	RC-01		1	R97

5NPSGCR1 CRYSTAL REFERENCE PSG2400A

5UPSGCR1 CRYSTAL REFERENCE PSG2400A

e) Crystal Reference Board (SMD Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC1820JA0KC	8P2F 5% 50V 1206	08V	VJ1206A8R2CXA		2	C16 7
DUG682	BA682 DIODE(SMD)	41S	BA682		2	D1 2
DUVBB515B	VARICAP BB515B UHF	85S	Q62702-B398		1	D4
UBC1395	CRYSTAL REF PSG2400A	01K	1N7RBT13950	E	1	B
UCC1560JA0KC	5P6 5% 50V 1206 COG	08V	1206A		1	C25
UCC2180JA0KC	18PF 50V 5% 1206 COG	08V	VJ1206A180JXAT		2	C15 8
UCC2330JA0KC	33PF 5% 50V 1206 COG	08V	1206A330JXAT		2	C26 7
UCC3470JA0KC	470PF 5% 50V 1206 COG	08V	1206A471JXAT		9	C14 9-22 4:35 8 9
UCC4470KA0KX	4N7F 10% 50V 1206 X7R	08V	1206Y472KXAT		3	C31-33
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		16	C3-12:23 9:30 4 7:40
UDZ1820C0	ZMM8V2 5% MINI-MELF	31I	ZMM8V2		1	D3
URM2220GA0	22R 2% 1206	18P	RC-01		1	R2
URM2470GA0	47R 2% 1206	18P	RC-01		2	R13:45
URM2680GA0	68R 2% 1206	18P	RC-01		1	R26
URM3100GA0	100R 2% 1206	18P	RC-01		4	R5 6:28 9
URM3220GA0	220R 2% 1206	18P	RC-01		6	R9:24:32-35
URM3470GA0	470R 2% 1206	18P	RC-01		6	R10 4 5:30 1:44
URM3680GA0	680R 2% 1206	18P	RC-01		4	R37-40
URM3820GA0	820R 2% 1206	18P	RC-01		1	R36
URM4100GA0	1K0R 2% 1206	18P	RC-01		4	R3 7:16:23
URM4150GA0	1K5R 2% 1206	18P	RC-01		1	R22
URM4200GA0	2K0R 2% 1206	18P	RC-01		1	R43
URM4220GA0	2K2R 2% 1206	18P	RC-01		1	R42
URM4330GA0	3K3 2% 1206	18P	RC-01		1	R21
URM4470GA0	4K7R 2% 1206	18P	RC-01		1	R25
URM5100GA0	10KR 2% 1206	18P	RC-01		2	R1:20
URM6100GA0	100K 2% 1206	18P	RC-01		3	R8:11 2
UTNP0BCW72	BCW72/A10/150G 10UA K2	03Z	YCLBCW72TA		3	Q1 2 4
UTPP0BCW61D	BCW61D/32V/A20/380G BD	03Z	YLBCW61D		2	Q3 5
VUJNP0310	SST320 25V A024	41S	SST310		1	Q7

Crystal Reference Board (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CEB33U0EM1	33UF 20% 16V FC +5MM	134N	SMVB		1	C1
CEB47U0DM	47UF 20% 10V FC +5MM	134N	KMVB		1	C2
CEB47U0EM	47UF 20% 16V FC +5MM	134N	KMVB		2	C13:28
CEC100UBM	100UF 20% 6.3V R050	05D	CEK1006.3		1	C36
PM510K0KV2	10K0 10% PRESET VERT MTURN	02S	64W		1	P1
RM12R20FF	2R20 1% 0W60 100PPM 250V	18P	MRS25		1	R41
TBM2502PS	STRAIGHT PIN HEADER 2 WAY 2.54	23M	6410+22-27-2021		1	S2
TBM2504PS	STRAIGHT PIN HEADER 4 WAY 2.54	23M	6410+22-27-2041		1	S1
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		2	X1 2
VA0685	INT CCT MSA0685	28A	MSA0685		1	Q8
VA12040P	INT CCT MC12040P/L	02M	MC12040P		1	U6
VA1677C	RF AMPLIFIER	34N	UPC1677C		1	U4
VA503	IC MB503	05F	MB503		1	U7
VA5534AN	INT CCT NE5534AN	01P	NE5534AN		1	U5
VD74HC132	IC M74HC132 STATIC	29S	M74HC132		2	U1 2
VD74HC390N	IC 74HC390N STATIC	01T	74HC390N		1	U3
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		2	U1 2
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		1	U3
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		1	U5
VTPHGP	50V 2A 1W (3SC0151)	03Z	FXT751(3SC0151)	A	1	Q6
VX0386	TCX04-B0386. DO NOT WASH.	44S	TCX04-B0386		1	XTL1
YX188	COAX PTFE RG188A-U	30S	075950X+/+075951R		0	
ZC0290	YE315S 4 TURNS CHOKE	22K	3SR0290	C	3	L4 8 9
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)		0	
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC04J12	CHOKE 144-04J12	32C	144-04J12		1	L2
ZC10U00	RF CHOKE 10UH SC30/10UH	103S	043693RM		2	L3 7
ZC1M10	CHOKE 1000UH	85S	B78108-S1105-J		1	L1
ZC4U7	CHOKE 47NH	28I	551-5172-05-02+00		2	L5 6

5NPSGOD OUTPUT DISTRIBUTION PSG2400A

g) Output Distribution Board.

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
BC1532	OUTPUT DISTRIBUTION PSG2400A	01K	1N7PAT15320	B	1	B
TBM2510PT	R/H PIN HEADER 10 WAY 2.54MM	23M	4094+22-05-2101		2	S1 2
TP15080	EYELETS C.B. PINS	89C	MR15080		9	X1-9
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		6	C1-6
ZC0292	YE315S 6 TURNS CHOKE	18J	3SR0292	A	3	L1-3
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	

5NPSGR RANGE DIVIDER PSG2400A
5UPSGR RANGE DIVIDER PSG2400A

h) Range Divider Assembly

Range Divider Board (SMD Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		1	C19
DUG682	BA682 DIODE(SMD)	41S	BA682		8	D6 7:11 2 6 7:23 4
UBC1522	RANGE DIVIDER PSG2400A	01K	UBC15220	C	1	SMD
UCC2100JA0KC	10PF 5% 50V 1206 COG	08V	1206A100JXAT		4	C15-18
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		1	C68
UCC3470JA0KC	470PF 5% 50V 1206 COG	08V	1206A471JXAT		4	C23 4:40 1
URM2470GA0	47R 2% 1206	18P	RC-01		6	R10 2 9:20:41:60
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		2	R11:45
URM2680GA0	68R 2% 1206	18P	RC-01		1	R18
URM3100GA0	100R 2% 1206	18P	RC-01		2	R42:61
URM3150GA0	150R 2% 1206	18P	RC-01		2	R16 7
URM3220GA0	220R 2% 1206	18P	RC-01		1	R6
URM4100GA0	1K0R 2% 1206	18P	RC-01		4	R1-3 5
URM4270GA0	2K7R 2% 1206	18P	RC-01		1	R4
URM4330GA0	3K3 2% 1206	18P	RC-01		1	R80
URM4470GA0	4K7R 2% 1206	18P	RC-01		3	R7-9
URM5100GA0	10KR 2% 1206	18P	RC-01		1	R81
UTNP0BCW72	BCW72/A10/150G 10UA K2	03Z	YCLBCW72TA		1	Q5
UTPP0LGP	SOT23#45V#A80#100G#180F(0144)	01P	BC807-25/40(3SC0144)	A	4	Q1-4

5UPSGUO UHF OSCILLATOR PSG2400A

Range Divider Assembly (UHF Oscillator Section)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU4160	OSC SCREEN	00F	3SU004160	A	1	
CI3100PJM	100PF 50V 20% F/THRU	44M	DF331-805-YN-101M		1	C28
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		5	C23-27
CUC1100CA7JC	1PF .25PF 50V 0606	65T	500CHA1R00CTL		1	C18
CUC1160CA7JC	1P6F .25PF 50V 0606	65T	500CH1R6CTL		2	C11:21
CUC1220CA7JC	2P2F .25PF 50V 0606	65T	500CHA2R2CTL		1	C14
CUC1270CA7JC	2P7F .25PF 50V 0606	65T	500CHA2R7CTL		1	C4
CUC1470CA7JC	4P7F .25PF 50V 0606	65T	500CHA4R7CTL		1	C7
CUC3100JA7JC	100PF 5% 50V 0606	65T	500CHA101JTL		6	C5 6:12 3 9:20
DUG679	BA679 UHF PIN DIODE	41S	BA679+MINI+MELF		3	D1 4 7
DV673010	VARACTOR DIODE	85A	DVH6730-10		1	D9
DV673013	VARACTOR DIODE	85A	DVH6730-13		1	D6
DV673016	VARACTOR DIODE	85A	DVH6730-16		1	D3
UBC1467	UHF OSCILLATOR PSG2400A	33C	927PLK14670	B	1	SMD
UCC3100JA0KC	100PF 5% 50V 1206 COG	08V	1206A101JXAT		10	C1 2 3 8 9:10 5 6 7:22
UDZ1470C0	ZMM4.7 4V7 MINI MELF	31I	ZMM4-7		3	D2 5 8
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		3	R1 3 5
URM3470GA0	470R 2% 1206	18P	RC-01		1	R7
URM4100GA0	1K0R 2% 1206	18P	RC-01		3	R2 4 6
VT41435	R.F TRANSISTOR	02H	AT41435		3	Q1-3
YX9307	CONFORMABLE CABLE 9307	04Q	9037			
ZC0U100	RF CHOKE 100NH SC30/0.1UH	103S	022921RM		8	L5-12
ZC0U220	RF CHOKE 220NH SC30/0.22UH	103S	066239GM		4	L1-4

Range Divider Board (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CC13P30LC	3.3PF .25PF 100V NPO RP050	18P	683+09338		1	C31
CC15P60LC	5.6PF .25PF 100V NPO RP050	18P	683+09568		2	C32:47
CC247P0LG	47PF 2% 100V N150 RP050	18P	683+34479		1	C74
CC3470PLK1	470PF 10% 100V RP025	18P	630+18471		29	C13 4:25-30 34-39:42-46:50-55:62-64 7
CC44N70LK	4.7NF 10% 100V RP050	18P	630+19472		2	C33:48
CEB10U0JM2	10UF 20% 50V FC +5MM	134N	KMVB		3	C8-10
CEB47U0EM	47UF 20% 16V FC +5MM	134N	KMVB		9	C1 2 6 7:56-8:60 5
CEC100UBM	100UF 20% 6.3V RO50	05D	CEK1006.3		1	C59
CR6100NKM	100NF 20% 63V RO50	159W	MKS2MIN		10	C11 2:20-22:49:61 2 6:73
CRA1U00KM1	1.0UF 20% 63V RO50	159W	MKS2		3	C3-5
DG221	DIODE VARACTOR	85S	BB505B		2	D3 4
DG284	DIODE	85S	BA284		1	D22
DG329	TUNING DIODE	85S	BB609A		7	D8 9:13 4 8 9:20
DG4148	DIODE	23N	1N4148		2	D21 5
DV183	VARACTOR DIODE	34N	1SV183		2	D1 2
DZ14V70E	4.7V 5% 0W50	31I	ZPD4.7		1	Z1
GT23	CTY001/NT20 75C UL	28P	PLT1M-M		2	
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		1	
PM45K00MV	5K00 20% PRESET VERT STURN	02S	75H		1	P2
PM520K0MV	20K0 20% PRESET VERT STURN	02S	75H		2	P3 4
PM6100KMV	100K 20% PRESET VERT STURN	02S	75H		1	P1
RM233R0FF	33R0 1% 0W60 50PPM 250V	18P	MRS25		3	R56:72:82
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		2	R52:68
RM256R0FF	56R0 1% 0W60 50PPM 250V	18P	MRS25		1	R84
RM268R0FF	68R0 1% 0W60 50PPM 250V	18P	MRS25		2	R15:21
RM3120RFF	120R 1% 0W60 50PPM 250V	18P	MRS25		1	R77
RM3470RFF	470R 1% 0W60 50PPM 250V	18P	MRS25		7	R39:40 9:57:65:73 6
RM3820RFF	820R 1% 0W60 50PPM 250V	18P	MRS25		1	R83
RM42K70FF	2K70 1% 0W60 50PPM 250V	18P	MRS25		4	R43:53:62 9
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		1	R78
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		1	R24
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		13	R47 8:50 4 5 8:63 4 6:70
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		4	R27-30
RM515K0FF	15K0 1% 0W60 50PPM 250V	18P	MRS25		4	R31 2 5 6

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
RM518K0FF	18K0 1% 0W60 50PPM 250V	18P	MRS25		1	R26
RM530K0FF	30K0 1% 0W60 50PPM 250V	18P	MRS25		1	R25
RM533K0FF	33K0 1% 0W60 50PPM 250V	18P	MRS25		4	R33 4 7 8
RM539K0FF	39K0 1% 0W60 50PPM 250V	18P	MRS25		1	R22
RM547K0FF	47K0 1% 0W60 50PPM 250V	18P	MRS25		5	R23:51 9:67:75
SR161A	REED RELAY 161A-1	52A	161A-1		1	RL2
SR1725	RELAY 172-5	20T	172-5		1	RL1
TBM2502PS	STRAIGHT PIN HEADER 2 WAY 2.54	23M	6410+22-27-2021		1	S3
TBM2503P0	STRAIGHT PIN HEADER 3 WAY 2.54	23M	4030+22-03-2031		1	S2
TBM2510PBM	MOLEX CONNECTOR	23M	4455C-10BAA		1	S1
TL2W	JUMPER 2WAY	23M	7859-15-38-1024		1	S2A
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		6	
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		1	R44
VA061	IC TL061CP STATIC	01T	TL061CP		1	U3
VA064CN	IC TL064CN STATIC	01T	TL064CN		1	U4
VA0685	INT CCT MSA0685	28A	MSA0685		2	U1 2
VA1677C	RF AMPLIFIER	34N	UPC1677C		1	U12
VD211CJ	IC DG211CJ STATIC	41S	DG211CJ		1	U11
VD212CJ	IC DG212CJ STATIC	41S	DG212CJ		1	U10
VD4070	IC CD4070BE STATIC	70H	CD4070BE		1	U9
VD4902	PRE SCALER SP4902	43G	SP4902DP		1	U5
VD4904	PRE SCALER SP4904	43G	SP4904DP		3	U6-8
VD74HC4094	IC M74HC4094B1 STATIC	29S	M74HC4094B1		1	U13
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		2	U4 9
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		3	U10 1 3
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		1	U3
VTPLGP	40V A6 W5 (3SC0148)	03Z	BC327(3SC0148)	A	5	Q6-10
YX9307	CONFORMABLE CABLE 9307	04Q	9037			
ZC0290	YE315S 4 TURNS CHOKE	22K	3SR0290	C	1	L13
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC0303	YE315S 2 TURNS	22K	3SR0303		2	L1 2
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
ZC0U100	RF CHOKE 100NH SC30/0.1UH	103S	022921RM		2	L9:10
ZC0U330	330NH SC30 CHOKE	103S	SC30		2	L7 8
ZC1U00	RF CHOKE 1UH SC30/1UH	103S	066243DM		2	L11 2
ZC4U7	CHOKE 47NH	28I	551-5172-05-02+00		2	L5 6

RF Output Box Assembly Components.

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
7SU3310	SCREEN 1	00F	3SU003310	A	1	
7SU3311	SCREEN 2	00F	3SU003311	A	1	
7SU4117	COVER SIDE	00F	3SU004117	A	2	
7SU4123	RF O/P BOX	00F	1SU004123	C	1	
7SU4125	RF O/P BOX COVER	00F	1SU004125	A	1	
7SU4128	SIDE FLANGE 'A'	00F	3SU004128	A	1	
7SU4129	SIDE FLANGE 'C'	00F	3SU004129	A	2	
7SU4130	SIDE FLANGE 'B'	00F	3SU004130	A	2	
7SU4138	SIDE FLANGE 'D'	00F	3SU004138	A	1	
CI3100PJM	100PF 50V 20% F/THRU	44M	DF331-805-YN-101M		4	C1-4
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		24	C5-28
HR28S14	STUD 28S1/4 CAM	18C	28S1-4		6	
HR31212	RECEPT 312/12 CAM	18C	312-12		6	
MR25BLK	RUB SLV BLK C20X20 OSX	40S	C20X20+OSX+BLK		1	
TBM2502HP	CRIMP HOUSING 2 WAY 2.54MM	23M	6471+22-01-2025		3	S2 CR:S2 RO:S3 R
TBM2504HP	CRIMP HOUSING 4 WAY 2.54MM	23M	6471+22-01-2045		1	S1 CR
TR50675	FEED THROUGH	22S	50/675/0000/31		1	SK5
TS307	STRIP WIRE TAG	89C	T307		20	
TS68383	SOLDER TAG 6BA STC402297RM	05R	RC383/6BA		3	
YMMNS513	RF GASKET 0090-0030 3	24K	FSP282-0032-0095		3	
ZC0291	YE315S 1 TURN CHOKE	22K	3SR0291	C	11	L3-13
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	

4NPSGSB SYNTHESIZER BOX PSG2400A
5NPSGCS COARSE STEP LOOP PSG2400A
5UPSGCS COARSE STEP LOOP PSG2400A

SYNTHESIZER BOX ASSEMBLY

a) Coarse Step Loop Assembly (SMD Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		2	C106:10
CUC1390JA0KC	3P9 5% 50V 1206 COG	62S	1206J0503P8CC		2	C107:11
CUC2120JA7JC	12PF 5% 50V 0606 COG	65T	500CHA120JTL		1	C109
DUVBB515B	VARICAP BB515B UHF	85S	Q62702-B398		8	D101-8
UBC1524	COARSE STEP PSG2400A	01K	UBC15240	A	1	SMD
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		2	C108:12
UCC3100JA0KC	100PF 5% 50V 1206 COG	08V	1206A101JXAT		5	C101 5:14 5 6
UCC5100JA1KC	10NF 5% 50V 1812 COG	08V	VJ1812A103JFAT		3	C102 4:13
UCC7100KA2KX	1UF 10% 50V 2220 X7R SP	08V	2220Y105KFAT		1	C117
UDZ2100C0	ZMM10 10V MINI MELF	31I	ZMM10		1	Z101
URM3100GA0	100R 2% 1206	18P	RC-01		4	R106-9
URM3470GA0	470R 2% 1206	18P	RC-01		1	R102
URM4220GA0	2K2R 2% 1206	18P	RC-01		2	R103 4
URM4470GA0	4K7R 2% 1206	18P	RC-01		2	R101 5
UTNP0BCW72	BCW72/A10/150G 10UA K2	03Z	YCLBCW72TA		1	Q101
UTPP0BCW61D	BCW61D/32V/A20/380G BD	03Z	YLBCW61D		1	Q104
VUJNP0310	SST320 25V A024	41S	SST310		2	Q102 3

Coarse Step Loop Assembly (Conventional Components)

7SU4149	TOP BOX				00F	4SU004149	A	1
7SU4150	BOTTOM BOX				00F	4SU004150	A	1
CC215P0LG	15PF	2%	100V NP0	RP050	18P	683+10159		5 C39:57-60
CC227P0LG	27PF	2%	100V N150	RP050	18P	683+34279		1 C3
CC3120PLG	120PF	2%	100V N150	RP050	18P	683+34121		1 C36
CC3270PLG	270PF	2%	100V N750	RP050	18P	683+58271		1 C63
CC3470PLG	470PF	2%	100V N1500	RP025	18P	682+70471		1 C35
CC41N00LK	1.0NF	10%	100V	RP050	18P	630+19102		4 C1 2 5 6
CCA2U20JK	2.2UF	10%	50V X7R	RM100	44M	RPE117X7R225K50		2 C16 9
CEB33U0EM	33UF	20%	16V	R020	134N	SMVB		2 C48:52
CEC100UGM	100UF		25V	R035	134N	KMVB		2 C45 9
CEC220UEM	220UF	20%	16V	R050	18P	035-55221		4 C8:40:103:18
CR510N0LJ	10NF	5%	100V	R050	159W	FKS2		2 C14 5
CR547N0KM	47NF	20%	63V	R050	159W	MKS2		2 C64 5
CR6100NKJ	100NF	5%	63V	R050	159W	MKS2		1 C32

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		30	C4 7 9-13 17 8:20-28:33 4 7 8:43 4 6:50 53-56
CR6220NKK	220NF 10% 63V R050	159W	MKS2		2	C61 2
CR6220NLJ1	220N 5% 100V	159W	MKS4		1	C31
CRA1U00KJ	1U00 5% 63V 10PCM	159W	MKS4		2	C29:30
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		4	C41 2 7:51
DG4148	DIODE	23N	1N4148		4	D1-4
DZ15V10E	5.1V 5% 0W50	31I	ZPD5.1		1	Z1
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		2	
PM3100RMV1	100R 20% PRESET VERT STURN	02S	75H		1	P2
PM45K00MV	5K00 20% PRESET VERT STURN	02S	75H		2	P1 3
RM11R00FF	1R00 1% 0W60 100PPM 250V	18P	MRS25		1	FIT IN L3
RM12R20FF	2R20 1% 0W60 100PPM 250V	18P	MRS25		1	R38
RM3180RFF	180R 1% 0W60 50PPM 250V	18P	MRS25		1	R20
RM3470RFF	470R 1% 0W60 50PPM 250V	18P	MRS25		3	R30 2:41
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		3	R9:17:36
RM41K80FF	1K80 1% 0W60 50PPM 250V	18P	MRS25		1	R29
RM42K20FF	2K20 1% 0W60 50PPM 250V	18P	MRS25		2	R6:19
RM42K55FF	2K55 1% 0W60 50PPM 250V	18P	MRS25		2	R27 8
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		2	R16:31
RM44K42FF	4K42 1% 0W60 50PPM 250V	18P	MRS25		4	R21 2 5 6
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		7	R2 3 7:10:33 4 5
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		1	R15
RM46K80FF	6K80 1% 0W60 50PPM 250V	18P	MRS25		2	R8:11
RM48K20FF	8K20 1% 0W60 50PPM 250V	18P	MRS25		1	R39
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		3	R4:14 8
RM513K0FF	13K0 1% 0W60 50PPM 250V	18P	MRS25		1	R13
RM518K0FF	18K0 1% 0W60 50PPM 250V	18P	MRS25		1	R37
RM6100KFF	100K 1% 0W60 50PPM 250V	18P	MRS25		2	R5:40
RM6150KFF	150K 1% 0W60 50PPM 250V	18P	MRS25		1	R1
RM6220KFF	220K 1% 0W60 50PPM 250V	18P	MRS25		1	R12
SR161A	REED RELAY 161A-1	52A	161A-1		5	RL1-5
TBM2502PS	STRAIGHT PIN HEADER 2 WAY 2.54	23M	6410+22-27-2021		1	S2
TBM2508PS	STRAIGHT PIN HEADER 8 WAY 2.54	23M	6410+22-27-2081		1	S1
TP15080	EYELETS C.B. PINS	89C	MR15080		3	X1 3 5
VA177FP	OP AMP	103P	OP-177-FP		1	U14
VA356TC	IC UAF356TC/LF356N	23N	LF356N		1	U13
VA5204N	NE5204N WIDE BAND HF AMP	01P	NE5204N		1	U1
VA5534AN	INT CCT NE5534AN	01P	NE5534AN		6	U10 2 15-18
VAOM350	HYBRID AMP OM350	01P	OM350		1	U2
VD4044P	INT CCT MC4044P				1	U9
VD54JP	16BIT D/A CONVERTER	84B	PCM54JP		1	U22

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
VD74HC40103	74HC40103	01P	PC74HC40103P		2	U6 7
VD74HC4094	IC M74HC4094B1 STATIC	29S	M74HC4094B1		4	U5 8:20 1
VD74HC4518	IC 74HC518 STATIC	01P	74HC4518		1	U23
VD74HC74N	IC 74HC74N STATIC	01T	74HC74N		1	U24
VD74HCT00	IC 74HCT00 STATIC	23N	MM74HCT00N		1	U4
VD7543JN	MP7543JN DIGITAL-ANALOGUE	10M	MP7543JN		1	U19
VD8793	PRE SCALER SP8793	43G	SP8793DP		1	U3
VFN2110A	ZVN 2110A /100V/4R STATIC	03Z	ZVN2110A		1	Q5
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		3	U4 9:24
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		8	U5-8:19-21 3
VS28	28W IS501-28	27F	IS501-28		1	U22
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		8	U10 12-18
VT64	MPSA 64 30V DARL TO92 P	02M	MPSA64		1	Q2
VTA13	MPS/A/13 30V DARL N	02M	MPSA13		1	Q1
VTNMGP	ZTX451 BC487A TO92(3SC0147)N	03Z	ZTX451-K(3SC0147)	A	1	Q3
ZC04J12	CHOKE 144-04J12	32C	144-04J12		1	L102
ZC0U100	RF CHOKE 100NH SC30/0.1UH	103S	022921RM		1	L2
ZC10U00	RF CHOKE 10UH SC30/10UH	103S	043693RM		6	L101 3-7
ZC15U10	CHOKE 15UH SC10 ITT	103S	32801D		1	L4
ZC1M10	CHOKE 1000UH	85S	B78108-S1105-J		2	L1 6
ZC220U10	CHOKE 220UH 10% 0.2WATT SC10	103S	32808AM		1	L5

5NPSGFS FINE STEP LOOP PSG2400A

5UPSGFS FINE STEP LOOP PSG2400A

b) Fine Step Loop Assembly (SMD Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		2	C26:31
CUC1390JA0KC	3P9 5% 50V 1206 COG	62S	1206J0503P8CC		2	C27:32
DUVBB515B	VARICAP BB515B UHF	85S	Q62702-B398		6	D1-6
UBC1521	FINE STEP PSG2400A	01K	1N7RBT15210	C	1	SMD
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		2	C28:41
UCC3100JA0KC	100PF 5% 50V 1206 COG	08V	1206A101JXAT		3	C30 4 9
UCC5100JA1KC	10NF 5% 50V 1812 COG	08V	VJ1812A103JFAT		5	C29:33 6 8:40
URM3470GA0	470R 2% 1206	18P	RC-01		1	R25
URM4220GA0	2K2R 2% 1206	18P	RC-01		2	R23 4
URM4470GA0	4K7R 2% 1206	18P	RC-01		2	R26 7
UTNP0BCW72	BCW72/A10/150G 10UA K2	03Z	YCLBCW72TA		1	Q5
UTPP0BCW61D	BCW61D/32V/A20/380G BD	03Z	YLBCW61D		1	Q6
VUJNP0310	SST320 25V A024	41S	SST310		2	Q3 4

Fine Step Loop Assembly (Conventional Components)

7SU4149	TOP BOX	00F	4SU004149	A	1	
7SU4150	BOTTOM BOX	00F	4SU004150	A	1	
CC41N00LK	1.0NF 10% 100V RP050	18P	630+19102		8	C1 2 4-8:10
CEB33U0EM1	33UF 20% 16V FC +5MM	134N	SMVB		2	C17;23
CEB33U0IT	33UF 50% 40V AXIAL	18P	030-37339		2	C35 7
CEC100UGT	100UF 50% 25V AXIAL	18P	030-36101		2	C19:20
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		5	C9:12 3 8:21
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		9	C3:11 14-16:22 4 5:42
DZ12V70E	2.7V 5% 0W50	31I	ZPD2.7		1	Z1
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		2	
RM210R0FF	10R0 1% 0W60 50PPM 250V	18P	MRS25		2	R20 1
RM239R0FF	39R0 1% 0W60 50PPM 250V	18P	MRS25		2	R3 8
RM3110RFF	110R 1% 0W60 50PPM 250V	18P	MRS25		3	R1 2 4
RM3150RFF	150R 1% 0W60 50PPM 250V	18P	MRS25		4	R5-7 9
RM42K20FF	2K20 1% 0W60 50PPM 250V	18P	MRS25		2	R10:22
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		2	R16 7
RM47K50FF	7K50 1% 0W60 50PPM 250V	18P	MRS25		1	R18
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		2	R14 5
RM533K0FF	33K0 1% 0W60 50PPM 250V	18P	MRS25		1	R28
RM539K0FF	39K0 1% 0W60 50PPM 250V	18P	MRS25		1	R11
RM556K0FF	56K0 1% 0W60 50PPM 250V	18P	MRS25		1	R19
RM6150KFF	150K 1% 0W60 50PPM 250V	18P	MRS25		1	R13
TBM2506PS	STRAIGHT PIN HEADER 6 WAY 2.54	23M	6410+22-27-2061		1	SK1
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		2	X2-3

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
VA356TC	IC UAF356TC/LF356N	23N	LF356N		1	U7
VA5204N	NE5204N WIDE BAND HF AMP	01P	NE5204N		2	U5 6
VA8660DP	IC SP8660DP	43G	SP8660DP		1	U4
VD201870	2018-70	01X	XC2018-70PC68C		1	U2
VD27C256	IC MMC27C256Q25 STATIC	01T	TM527C25625JL		1	U1
VD74HC390N	IC 74HC390N STATIC	01T	74HC390N		1	U8
VD8792	PRE SCALER SP8792	43G	SP8792DP		1	U3
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		1	U8
VS28L	28W 703-1328-01-04-10	01H	D282801		1	U1
VS68	68W PIN PLCC SKT	61T	TZT+PLCC68T		1	U2
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		1	U7
VTNMGP	ZTX451 BC487A TO92(3SC0147)N	03Z	ZTX451-K(3SC0147)	A	1	Q1
VTPMGP	ZTX551 BC488A TO92 (3SC0149)	03Z	ZTX551K(3SC0149)	A	1	Q2
ZC05J12	RF CHOKE 144-05J12	32C	144-05J12		1	L3
ZC0U510	CHOKE 0U47 SC10	103S	32792G		2	L1 2
ZC10U00	RF CHOKE 10UH SC30/10UH	103S	043693RM		6	L4-9

5NPSGHL HETERODYNE LOOP PSG2400A
5UPSGHL HETERODYNE LOOP PSG2400A

c) Heterodyne Loop Assembly (SMD Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		2	C106:10
CUC1390JA0KC	3P9 5% 50V 1206 COG	62S	1206J0503P8CC		2	C107:11
CUC2120JA7JC	12PF 5% 50V 0606 COG	65T	500CHA120JTL		1	C109
DUVBB515B	VARICAP BB515B UHF	85S	Q62702-B398		8	D101-8
UBC1471	HET LOOP PSG2400A	01K	UBC14710	E	1	SMD
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		2	C108:12
UCC3100JA0KC	100PF 5% 50V 1206 COG	08V	1206A101JXAT		5	C101 5:14 5 6
UCC5100JA1KC	10NF 5% 50V 1812 COG	08V	VJ1812A103JFAT		3	C102 4:13
UCC7100KA2KX	1UF 10% 50V 2220 X7R SP	08V	2220Y105KFAT		1	C117
URM3470GA0	470R 2% 1206	18P	RC-01		1	R102
URM4220GA0	2K2R 2% 1206	18P	RC-01		2	R103 4
URM4470GA0	4K7R 2% 1206	18P	RC-01		2	R101 5
UTNP0BCW72	BCW72/A10/150G 10UA K2	03Z	YCLBCW72TA		1	Q101
UTPP0BCW61D	BCW61D/32V/A20/380G BD	03Z	YLBCW61D		1	Q104
VUJNP0310	SST320 25V A024	41S	SST310		2	Q102 3

Heterodyne Loop Assembly (Conventional Components)

7SU4149	TOP BOX	00F	4SU004149	A	1	
7SU4150	BOTTOM BOX	00F	4SU004150	A	1	
CC218P0LG	18PF 2% 100V NP0 RP050	18P	683+10189		1	C40
CC247P0LG	47PF 2% 100V N150 RP050	18P	683+34479		1	C41
CC256P0LG	56PF 2% 100V N150 RP050	18P	683+34569		4	C28 9:43 4
CC3100PLG	100PF 2% 100V N150 RP050	18P	683+34101		4	C16:21 5:36
CC3120PLG	120PF 2% 100V N150 RP050	18P	683+34121		1	C42
CC3220PLG	220PF 2% 100V N750 RP050	18P	683+58221		4	C3 6 7:10
CC3270PLG	270PF 2% 100V N750 RP050	18P	683+58271		1	C27
CC3330PLG	330PF 2% 100V N750 RP050	18P	683+58331		2	C13:32
CC42N20LK	2.2NF 10% 100V RP050	18P	630+19222		1	C11
CEC100UGM	100UF 25V R035	134N	KMVB		2	C1 2
CEC220UEM	220UF 20% 16V R050	18P	035-55221		6	C18:23:35 9:103:18
CR42N20LJ	2.2NF 5% 100V R050	159W	FKS2MIN		2	C26:37
CR510N0LJ	10NF 5% 100V R050	159W	FKS2		2	C4:17
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		9	C5 8 9:14 9:20 2 4:34
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		6	C12 5:30 1 3 8
DG4148	DIODE	23N	1N4148		1	D1
HW3122	BOX/CVR 3122 231 20261	20P	3122-23-20261		2	
PM525K0MV	DO NOT USE SEE PM520K0MV	02S	75H		1	P1

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
RM227R0FF	27R0 1% 0W60 50PPM 250V	18P	MRS25		1	R7
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		1	R10
RM268R0FF	68R0 1% 0W60 50PPM 250V	18P	MRS25		4	R17:23 4:31
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		8	R4 5 6:11 6;28 9:30
RM3470RFF	470R 1% 0W60 50PPM 250V	18P	MRS25		1	R1
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		1	R20
RM43K30FF	3K30 1% 0W60 50PPM 250V	18P	MRS25		3	R3:14:25
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		4	R8 9:21 2
RM46K80FF	6K80 1% 0W60 50PPM 250V	18P	MRS25		1	R2
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		6	R12 3 5 8:26 7
RM71M00FF	1M00 1% 0W60 50PPM 250V	18P	MRS25		1	R19
TBM2503PS	STRAIGHT PIN HEADER 3 WAY 2.54	23M	6410+22-27-2031		1	S1
TP15080	EYELETS C.B. PINS	89C	MR15080		3	X3 4 5
VA1677C	RF AMPLIFIER	34N	UPC1677C		1	U1
VA353N	IC LF353N STATIC	23N	LF353N		1	U6
VA5204N	NE5204N WIDE BAND HF AMP	01P	NE5204N		3	U2 3 5
VA5534AN	INT CCT NE5534AN	01P	NE5534AN		1	U8
VASBL1	MIXER SBL-1 DALE	08D	SBL-1		1	U4
VD4044P	INT CCT MC4044P				1	U7
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		2	U6 8
VTX313KCR	ZTX313 15V A5 500M N	03Z	ZTX313K35		1	Q1
VTX451K	ZTX451 60V 1A TO92 N	03Z	ZTX451K+(4SC0174)		1	Q2
VTX551K	ZTX551 60V 1A P	03Z	ZTX551K+(4SC0174)		1	Q3
ZC04J12	CHOKE 144-04J12	32C	144-04J12		1	L102
ZC0U510	CHOKE 0U47 SC10	103S	32792G		5	L1-3 7 8
ZC10U00	RF CHOKE 10UH SC30/10UH	103S	043693RM		8	L9:10:101 3-7
ZC33U10	CHOKE 33UH 10% 0.2WATT SC10	103S	32803XM		1	L6
ZC4U7	CHOKE 47NH	28I	551-5172-05-02+00		3	L4 5:11

5NPSGUS UHF STEP PSG2400A

d) UHF Step Loop Assembly (Conventional Components)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
BC1472	UHF STEP PSG2400A	01K	1N7RBT14720	C	1	B
CC215P0LG	15PF 2% 100V NP0 RP050	18P	683+10159		1	C27
CC256P0LG	56PF 2% 100V N150 RP050	18P	683+34569		2	C52 3
CC3150PLG	150PF 2% 100V N150 RP050	18P	683-34151		1	C55
CC3220PLG	220PF 2% 100V N750 RP050	18P	683+58221		9	C2 7 9:19:20 5 6 8 9
CC3390PLG1	390PF 2% 100V N750 RP025	18P	630-18391		1	C12
CC3470PLG	470PF 2% 100V N1500 RP025	18P	682+70471		1	C43
CEC220UEM	220UF 20% 16V RO50	18P	035-55221		7	C3 5:23 4:47 8:54
CR41N00LJ	1.0NF 5% 100V RO50	159W	FKS2		2	C41 2
CR42N20LM	2.2NF 20% 100V RO50	159W	FKS2MIN		2	C13 4
CR510N0LJ	10NF 5% 100V RO50	159W	FKS2		3	C1 4 6
CR547N0KM	47NF 20% 63V RO50	159W	MKS2		2	C11 6
CR6100NKM	100NF 20% 63V RO50	159W	MKS2MIN		16	C17:30-40 5 6:50 1
CR6470NKK	470NF 10% 63V RO50	159W	MKS2		2	C10 5
CRA1U00KM1	1.0UF 20% 63V RO50	159W	MKS2		4	C8:18:44 9
DG1001	DIODE SCHOTTKY	02H	HSCH1001/1N6263		1	D2
DG4148	DIODE	23N	1N4148		1	D1
HSIC16P	H/SINK 16PIN ICK16H	11D	ICK16H		1	U2
PM3200RMV	200R 20% PRESET VERT STURN	02S	75H		1	P3
PM45K00MV	5K00 20% PRESET VERT STURN	02S	75H		1	P2
PM510K0MV	10K0 20% PRESET VERT STURN	02S	75H		1	P1
RM12R20FF	2R20 1% 0W60 100PPM 250V	18P	MRS25		1	R53 4 7
RM239R0FF	39R0 1% 0W60 50PPM 250V	18P	MRS25		1	R21
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		2	R14 8
RM256R0FF	56R0 1% 0W60 50PPM 250V	18P	MRS25		2	R48:52
RM268R0FF	68R0 1% 0W60 50PPM 250V	18P	MRS25		3	R36:55 6
RM282R0FF	82R0 1% 0W60 50PPM 250V	18P	MRS25		1	R34
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		5	R12 3 5:35 7
RM3150RFF	150R 1% 0W60 50PPM 250V	18P	MRS25		2	R22 3
RM3220RFF	220R 1% 0W60 50PPM 250V	18P	MRS25		7	R1 2:10 1 6 7:38
RM3390RFF	390R 1% 0W60 50PPM 250V	18P	MRS25		9	R29:30-33:42 5 9:50
RM3470RFF	470R 1% 0W60 50PPM 250V	18P	MRS25		1	R39
RM3820RFF	820R 1% 0W60 50PPM 250V	18P	MRS25		1	R41
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		4	R44 6 7:51
RM41K80FF	1K80 1% 0W60 50PPM 250V	18P	MRS25		1	R40
RM42K20FF	2K20 1% 0W60 50PPM 250V	18P	MRS25		2	R3 4
RM42K70FF	2K70 1% 0W60 50PPM 250V	18P	MRS25		1	R25
RM43K30FF	3K30 1% 0W60 50PPM 250V	18P	MRS25		1	R19
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		5	R5 6 8 9:43
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		2	R20:60
RM568K0FF	68K0 1% 0W60 50PPM 250V	18P	MRS25		1	R61

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
TBM2510PS	STRAIGHT PIN HEADER 10 WAY	23M	6410+22-27-2101		1	S1
TP1510	BRASS TUBE EYELET	26P	B1.5X0.25X10MS		3	X1 2 3
VA0685	INT CCT MSA0685	28A	MSA0685		1	Q8
VA12040P	INT CCT MC12040P/L	02M	MC12040P		1	U5
VA5534AN	INT CCT NE5534AN	01P	NE5534AN		5	U8:10 3 5 6
VD08CP	DAC08CP DIGITAL-ANALOGUE	04P	DAC08CP		1	U7
VD10H016L	INT CCT MC10H016L	02M	MC10H016L		1	U4
VD10H141P	MC10H141P 4BIT UNIV SHIFT	02M	MC10H141P		1	U3
VD11C91DC	INT CCT FAIRCHILD	23N	11C91DC		1	U2
VD12013P	INT CCT MC12013P MOT	02M	MC12013P		1	U17
VD412DJ	IC DG412DJ SIL	41S	DG412DJ		1	U11
VD4902	PRE SCALER SP4902	43G	SP4902DP		1	U12
VD74HC04	IC M74HC04 STATIC	23N	M74HC04		1	U14
VD74HC4094	IC M74HC4094B1 STATIC	29S	M74HC4094B1		2	U1 6
VD7543JN	MP7543JN DIGITAL-ANALOGUE	10M	MP7543JN		1	U9
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		1	U14
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		5	U1 6 7 9:11
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		5	U8:10 3 5 6
VT51	BFQ51 MUL ONLY SOT-37	01P	BFQ51		4	Q1 2 5 6
VTNHGP	50V 2A 1W (3SC0150)	03Z	FXT651(3SC0150)	A	1	Q3
VTPHGP	50V 2A 1W (3SC0151)	03Z	FXT751(3SC0151)	A	1	Q4
VTX551K	ZTX551 60V 1A P	03Z	ZTX551K+(4SC0174)		1	Q7
ZC0U220	RF CHOKE 220NH SC30/0.22UH	103S	066239GM		1	L3
ZC2U200	RF CHOKE 2.2UH SC30/2.2UH	103S	066245XM		1	L1
ZC4U7	CHOKE 47NH	28I	551-5172-05-02+00		1	L4
ZC4U730	CHOKE SC30 4.7UH	103S	66247GM		1	L2

e) Synthesizer Box Assembly Components

7SU4112	HET DIVIDER	00F	3SU004112	A	1	
7SU4113	COARSE DIVIDER	00F	3SU004113	A	1	
7SU4114	UHF DIVIDER	00F	3SU004114	A	1	
7SU4116	SYNTH BOX COVER	00F	1SU004116	A	1	
7SU4117	COVER SIDE	00F	3SU004117	A	2	
7SU4127	SYNTH BOX	00F	1SU004127	A	1	
7SU4129	SIDE FLANGE 'C'	00F	3SU004129	A	2	
7SU4130	SIDE FLANGE 'B'	00F	3SU004130	A	2	
7SU4139	SIDE FLANGE 'E'	00F	3SU004139	A	1	
7SU4140	SIDE FLANGE 'F'	00F	3SU004140	A	1	
CI3100PJM	100PF 50V 20% F/THRU	44M	DF331-805-YN-101M		9	C31-39
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		33	C40-72
HR28S14	STUD 28S1/4 CAM	18C	28S1-4		6	
HR31212	RECEPT 312/12 CAM	18C	312-12		6	

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
TBM2502HP	CRIMP HOUSING 2 WAY 2.54MM	23M	6471+22-01-2025		1	S2 CS
TBM2503HP	CRIMP HOUSING 3 WAY 2.54MM	23M	6471+22-01-2035		1	S1 HL
TBM2506HP	CRIMP HOUSING 6 WAY 2.54MM	23M	6471+22-01-2065		1	S1 FS
TBM2508HP	CRIMP HOUSING 8 WAY 2.54MM	23M	6471+22-01-2085		1	S1 CS
TBM2510HP	CRIMP HOUSING 10 WAY 2.54MM	23M	6471+22-01-2105		1	S1 UHF
TS307	STRIP WIRE TAG	89C	T307		20	
TS6B383	SOLDER TAG 6BA STC402297RM	05R	RC383/6BA		1	
YMMNS513	RF GASKET 0090-0030 3	24K	FSP282-0032-0095		4	
ZC0291	YE315S 1 TURN CHOKE	22K	3SR0291	C	16	L14-29
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)			
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
7NU0974573	DC FILTER BOX	00F	4000974573	C	1	
7SU3211	CENTRE PIECE #	00F	4SU003211	B	1	
7SU4141	BOX BRACKET'A'	00F	3SUCB4141	A	4	
CI3100PJM	100PF 50V 20% F/THRU	44M	DF331-805-YN-101M		1	C1
GCNX0	CABLE CLIP 3.4MM I/D	04H	NX0		3	
GT23	CTY001/NT20 75C UL	28P	PLT1M-M		1	
HA0135	3U HANDLE DARK ADMIRALTY GREY	14K	1SV000135	A	4	
HA0136	3U HANDLE INSERT DK AD'LTY GRY	14K	2SV000136	A	4	
HC0219	CABLE ASSEMBLY PSG2400A	88M	4SC0219	B	1	
RM11R00FF	1R00 1% 0W60 100PPM 250V	18P	MRS25		16	R1-16
RM222R0FF	22R0 1% 0W60 50PPM 250V	18P	MRS25		1	R18
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		1	R17
TBA3902HS	2W HOUSING WITH STRAIGHT LOCK	07A	640250-2		2	S4(FP)-S102
TBA3906HS	6W HOUSING WITH STRAIGHT LOCK	07A	640250-6		1	S4
TBM2504HP	CRIMP HOUSING 4 WAY 2.54MM	23M	6471+22-01-2045		1	S101
TBM2508HP	CRIMP HOUSING 8 WAY 2.54MM	23M	6471+22-01-2085		1	S4
TBM2510HP	CRIMP HOUSING 10 WAY 2.54MM	23M	6471+22-01-2105		1	S103
TBM2512HP	CRIMP HOUSING 12 WAY 2.54MM	23M	6471+22-01-2125		1	S301
TR1820	SMA RIGHT ANGLE PLUG	04Q	42-1820-061		1	SK4
TR24BNC13C	BNC PANEL JACK 50 OHM	76S	50-2-13C/133		1	SK7
TR24SMB13C	SMB BULKHEAD JACK 50 OHM	76S	50-2-13C/111		1	SK6
YX188	COAX PTFE RG188A-U	30S	075950X+/+075951R			
YX85	S/R COAX UT85 TINNED	37I	UT85			
YX9307	CONFORMABLE CABLE 9307	04Q	9037		1	
ZC0U470	RF CHOKE 470NH SC30/0.470UH	103S	066241HM		1	L1

5NPSGC	CONTROL	PSG2400A
5NPSGC1	CONTROL "1"	PSG2400A
5NPCM80	PCM80 ASSY	
5UPCM80	PCM80 ASSY	

CONTROL BOARD ASSEMBLY

a) Control Section (CT1)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
UBC1195	PCM80 CIRCUIT BOARD	01K	S7NCT11950	B	1	
UCC5220KA0KX	22NF 10% 50V 1206 X7R	08V	1206Y223KXAT		4	C1-4
UIDP474HC139	IC 74HC139 SO-14#STATIC#	01P	CD74HC139M		1	U5
UIDP474HC154	74HC154 SO-24 #STATIC#K	23N	MM74HC154WM		1	U4
VD4464	IC UPD4464 G15L STATIC	51T	TC5564AFL15		1	U3
VD84C0006	IC Z84C0006VEC STATIC	59H	Z84C0006VEC		1	U1
HE3000	LEAD FRAME BA3000/040	21B	BA3000/040		64	
VS28C	28W CARRIER 612-92-628	27F	612-92-628		1	
CC3120PLG	120PF 2% 100V N150 RP050	18P	683+34121		1	C101
CEB47U0EM	47UF 20% 16V FC +5MM	134N	KMVB		2	C160 1
CEC220UET	220UF 50% 16V AXIAL	18P	031-35221		1	C114
CR41N00LJ	1.0NF 5% 100V R050	159W	FKS2		4	C102 4:63 4
CR44N70LM	4.7NF 20% 100V R050	159W	FKS2		1	C108
CR522N0KM	22NF 20% 63V R050	159W	MKS2MIN		1	C109
CR533N0KM	33NF 20% 63V R050	159W	MKS2		2	C110:62
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		50	C106 7:13 15-59:65 8
CR6220NKK	220NF 10% 63V R050	159W	MKS2		1	C167
CR6220NLM	220NF 20% 100V R100	159W	MKS4		1	C103
CR6470NKK	470NF 10% 63V R050	159W	MKS2		1	C112
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		3	C105:11:66
DG1001	DIODE SCHOTTKY	02H	HSCH1001/1N6263		1	D104
DG4148	DIODE	23N	1N4148		2	D101 3
DZ12V45C	2.45 0W30	43G	ZN404		1	FIT IN D102
EA889	BUZZER (STK NO. 09984H)	30S	889-1521A		1	SP101
EB6117	LITHIUM BATTERY	06V	6117501501		1	BT101
RM210R0FF	10R0 1% 0W60 50PPM 250V	18P	MRS25		1	R110
RM227R0FF	27R0 1% 0W60 50PPM 250V	18P	MRS25		8	R111-18
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		1	R138
RM3390RFF	390R 1% 0W60 50PPM 250V	18P	MRS25		1	R133
RM3820RFF	820R 1% 0W60 50PPM 250V	18P	MRS25		1	R120
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		3	R102 4 7
RM43K30FF	3K30 1% 0W60 50PPM 250V	18P	MRS25		1	R101
RM43K90FF	3K90 1% 0W60 50PPM 250V	18P	MRS25		1	R130
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		10	R119:21-29
RM512K0FF	12K0 1% 0W60 50PPM 250V	18P	MRS25		1	R134

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
RM515K0FF	15K0 1% 0W60 50PPM 250V	18P	MRS25		1	R105
RM522K0FF	22K0 1% 0W60 50PPM 250V	18P	MRS25		1	R103
RM539K0FF	39K0 1% 0W60 50PPM 250V	18P	MRS25		1	R135
RM556K0FF	56K0 1% 0W60 50PPM 250V	18P	MRS25		1	R132
RM6150KFF	150K 1% 0W60 50PPM 250V	18P	MRS25		1	R109
RM6220KFF	220K 1% 0W60 50PPM 250V	18P	MRS25		1	R106
RM6330KFF	330K 1% 0W60 50PPM 250V	18P	MRS25		1	R108
RM71M00FF	1M00 1% 0W60 50PPM 250V	18P	MRS25		2	R136 7
SAOMIT	SWITCHES/RELAY OMITTED				1	S105
TBA3902PR	2W PIN WAFER 90DEG WITH LOCK	07A	640389-2		1	S102
TBM2502PT	R/H PIN HEADER 2 WAY 2.54MM	23M	4094+22-05-2021		1	S101
TBM2508PT	R/H PIN HEADER 8 WAY 2.54MM	23M	4094+22-05-2081		1	S107
TBM2510PT	R/H PIN HEADER 10 WAY 2.54MM	23M	4094+22-05-2101		1	S103
TIH2526NR1S	I.D.C. 26 WAY PIN HEADER	88M	ID101-H26-K-06-E1		2	S104 6
VA062	IC TL062CP STATIC	01T	TL062CP		1	U152
VA4941	VOLTS REG L4941BV	29S	L4941BV		1	U147
VAOMIT	TRANSISTORS/ICS OMITTED	00F	IN+HOUSE+REFERENCE		1	U149
VD233	IC MAX233CPP STATIC	96M	MAX233CPP		1	U131
VD27C256	IC MMC27C256Q25 STATIC	01T	TM527C25625JL		3	U1:102:43
VD428E8	IC ZN428E-8 STATIC	43G	ZN428E-8		1	U151
VD691	IC MAX691CPE STATIC	96M	MAX691CPE		1	U104
VD7002C	IC UPD7002C	35N	UPD7002C		1	U139
VD7210C	IC UPD7210C IEEE	35N	UPD7210C		1	U122
VD74HC00N	IC 74HC00N STATIC	01T	74HC00N		1	U118
VD74HC02	IC 74HC02 STATIC	23N	74HC02		2	U115:29
VD74HC04	IC M74HC04 STATIC	23N	M74HC04		3	U106:36:50
VD74HC08N	IC MM74HC08N STATIC	23N	MM74HC08N		2	U120 1
VD74HC11	INT CCT 74HC11 STATIC	23N	74HC11		1	U103
VD74HC138N	IC 74HC138N STATIC	23N	74HC138N		1	U113
VD74HC221	INT CCT 74HC221 STATIC	23N	MM74HC221AN		1	U119
VD74HC245	IC TC74HC245P STATIC	23N	TC74HC245P		2	U112:35
VD74HC251	IC MM74HC251 STATIC	23N	MM74HC251		1	U116
VD74HC279	IC TC74HC279P STATIC	51T	TC74HC279P		1	U128
VD74HC32	IC 74HC32 STATIC	23N	TC74HC32P		3	U114:30:40
VD74HC390N	IC 74HC390N STATIC	01T	74HC390N		1	U146
VD74HC4020N	IC 74HC4020N STATIC	01T	74HC4020N		1	U127
VD74HC4040	IC MM74HC4040N STATIC	23N	MM74HC4040N		1	U117
VD74HC4046P	IC 74HC4046 STATIC	23N	74HC4046		1	U105
VD74HC4078	IC M74HC4078 STATIC	29S	M74HC4078		2	U133:48
VD74HC573	74HC573 20PIN STATIC	23N	74HC573		3	U134 7 8
VD74HC574	74HC574 20PIN STATIC	23N	74HC574		10	U107-11:32:41 2 4 5
VD75160AN	INT CCT SN75160AN -BN	01T	SN75160AN-BN		1	U123
VD75161AN	INT CCT SN75161BN	01T	SN75161BN		1	U124
VD82C51AT	IC MSM82C51AT STATIC	97M	MSM82C51AT		1	U126

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		14	U103 6:14 5 8:20 1 9:30 3
		08R	ICO-143-S8A-T			6:40 8:50
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		9	U104 7:13 6 7 9:27 8:40
VS20L	IC SKT 20 WAY	28I	703-3320-01-04-10		18	U107-12:23 4:31 2 4 5 7 8
		08R	ICO-203-S8A-T			:41 2 4 5
VS28L	28W 703-1328-01-04-10	01H	D282801		4	U102:26:39:43
VS40L	IC SKT 40 WAY	28I	703-3340-03-04-10		1	U122
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		1	U152

5NPSGC2 CONTROL "2" PSG2400A

b) Modulation Source 1 and 2 Section. (CT2A,B)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CAOMIT	CAPACITORS OMITTED				9	C70 3 6 9:82 8:91 4 7
CASOT	CAP SELECT ON TEST				13	C10 6 9:22 5 8:31 4:40 3 6:61 4
CC210P0LG	10PF 2% 100V NPO	RP050	18P	683+10109	2	C12:66
CC222P0LG	22PF 2% 100V N150	RP050	18P	683+34229	2	C7:58
CC239P0LG	39PF 2% 100V N150	RP050	18P	683+34399	2	C13:67
CC247P0LG	47PF 2% 100V N150	RP050	18P	683+34479	2	C9:60
CC3100PLG	100PF 2% 100V N150	RP050	18P	683+34101	4	C18:30:72:81
CC3150PLG	150PF 2% 100V N150	RP050	18P	683-34151	2	C17:71
CC3330PLG	330PF 2% 100V N750	RP050	18P	683+58331	6	C11 5:33:63 5:87
CR41N00LJ	1.0NF 5% 100V	R050	159W	FKS2	6	C8:14:21:59:62 9
CR41N50LJ	1.5NF 5% 100V	R050	159W	FKS5	2	C20:68
CR42N20LJ	2.2NF 5% 100V	R050	159W	FKS2MIN	6	C32 7:45:85 6:96
CR43N30LJ	3.3NF 5% 100V	R050	159W	FKS2MIN	6	C27 9:39:78:80:90
CR44N70LJ	4.7NF 5% 100V	R050	159W	FKS2MIN	6	C23 4:52:74 5:503
CR510N0LJ	10NF 5% 100V	R050	159W	FKS2	8	C26:36:50 1:77:84:501 2
CR515N0KK	15NF 10% 63V	R050	159W	MKS2	2	C35:83
CR533N0PJ	33NF 5% 250V	R075	85S	MKT-B32560-D3333J	6	C42 4 8:93 5 9
CR547N0KM	47NF 20% 63V	R050	159W	MKS2	2	C49:100
CR6100NKJ	100NF 5% 63V	R050	159W	MKS2	4	C38:41:89:92
CR6220NLJ	220NF 5% 100V	R075	85S	MKT-32560-D1224J	2	C47:98
CRA1U00KM1	1.0UF 20% 63V	R050	159W	MKS2	15	C1-6:53-57:504-506
PM3200RMV	200R 20% PRESET VERT STURN		02S	75H	2	P1 2
RASOT	#### SELECT ON TEST ####		00F	RASOT	4	CAP C94 6 7:500
RM3100RFF	100R 1% 0W60 50PPM	250V	18P	MRS25	8	R2 3:23 4:43-46
RM3510RFF	510R 1% 0W60 50PPM	250V	18P	MRS25	2	R6:26
RM41K00FF	1K00 1% 0W60 50PPM	250V	18P	MRS25	34	R4 5 7-21 5 27-42
RM510K0FF	10K0 1% 0W60 50PPM	250V	18P	MRS25	2	R1:22
VA353N	IC LF353N	STATIC	23N	LF353N	6	U6-8:15-17
VA356TC	IC UAF356TC/LF356N		23N	LF356N	2	U5:14
VA767KN	IC AD767KN/JN		55A	AD767KN	2	U4:13
VD201870	2018-70		01X	XC2018-70PC68C	2	U1:10
VD27C512	27C512		11T	D27C512120V10	4	U2 3:11 2
VD4052B	IC CD4052B	STATIC	23N	CD4052B	2	U9:18
VS16L	IC SKT 16WAY		28I	703-3316-01-04-10	2	U9:18
VS24LMIN	IC SKT 24W 0.3 PITCH		01T	24W+0.3"+PITCH	2	U4:13
VS28L	28W 703-1328-01-04-10		01H	D282801	4	U2 3:11 2
VS68	68W PIN PLCC SKT		61T	TZT+PLCC68T	2	U1:10
VS8P	IC SKT 8WAY		28I	703-3308-01-04-10	8	U5-8:14-17

5NPSGC3 CONTROL "3" PSG2400A

c) Modulation Control Section (CT3)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CC12P70LC	2.7PF .25PF 100V NPO RP050	18P	683+09278		2	C321:33
CC215P0LG	15PF 2% 100V NPO RP050	18P	683+10159		2	C314 5
CC247P0LG	47PF 2% 100V N150 RP050	18P	683+34479		3	C331 2 4
CC3180PLG	180PF 2% 100V N750 RP050	18P	683+58181		1	C335
CEB33U0EM1	33UF 20% 16V FC +5MM	134N	SMVB		9	C304 5:10 1 9:20 2 9:30
CEB47U0DM	47UF 20% 10V FC +5MM	134N	KMVB		3	C303 9:28
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		13	C302 6 7 8:12 3 7 8:23-27
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		2	C300 1
CS516N2KF	16.2N 1% 63V R050	13R	PFE225		1	C316
DG4148	DIODE	23N	1N4148		1	D301
DZ16V20D1	6.2V 0W40	28C	1N823		1	Z301
PM3500RMV	500R 20% PRESET VERT STURN	02S	75H		1	P303
PM42K00MV	2K00 20% PRESET VERT STURN	02S	75H		1	P304
PM510K0MV	10K0 20% PRESET VERT STURN	02S	75H		1	P305
RM227R0FF	27R0 1% 0W60 50PPM 250V	18P	MRS25		1	R310
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		1	R323
RM3100RFF	100R 1% 0W60 50PPM 250V	18P	MRS25		1	R331
RM3470RFF	470R 1% 0W60 50PPM 250V	18P	MRS25		1	R320
RM3820RFF	820R 1% 0W60 50PPM 250V	18P	MRS25		1	R304
RM42K00FF	2K00 1% 0W60 50PPM 250V	18P	MRS25		1	R332
RM42K20FF	2K20 1% 0W60 50PPM 250V	18P	MRS25		1	R326
RM46K20FF	6K20 1% 0W60 50PPM 250V	18P	MRS25		1	R333
RM49K10FF	9K10 1% 0W60 50PPM 250V	18P	MRS25		1	R325
RM510K0BB	10K0 1% 0W25 50PPM 250V	94M	H8		12	R301-3 5:12-19
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		4	R321 4 8 9
RM520K0FF	20K0 1% 0W60 50PPM 250V	18P	MRS25		2	R311:22
RM522K0FF	22K0 1% 0W60 50PPM 250V	18P	MRS25		1	R327
RM533K0FF	33K0 1% 0W60 50PPM 250V	18P	MRS25		1	R330
SR161A	REED RELAY 161A-1	52A	161A-1		1	RL301
TBM2512PT	R/H PIN HEADER 12 WAY 2.54MM	23M	4094+22-05-2121		1	S301
VA412CN	INT CCT LF412CN	23N	LF412CN		6	U302 6:13 4 7:20
VA413	DG413DJ ANALOGUE GATE	41S	DG413DJ		5	U301:10 1 5:22
VA6321N	LM6321N OP AMP	23N	LM6321N		1	U316
VD4001BCN	IC CD4001BE STATIC	23N	CD4001BCN		1	U312
VD4094BCN	IC CD4094BCN STATIC	23N	CD4094BCN		4	U304 5 8 :19
VD74HC4094	IC M74HC4094B1 STATIC	29S	M74HC4094B1		1	U309
VD7533JN	AD/MP7533JN STATIC	55A	AD/MP7533JN		3	U303 7:18
VD7543JN	MP7543JN DIGITAL-ANALOGUE	10M	MP7543JN		1	U321
VS14L	IC SKT 14WAY	28I	703-3314-01-04-10		1	U312
VS16L	IC SKT 16WAY	28I	703-3316-01-04-10		14	U301 3-5 7-11 5 8 9:21 2
VS8P	IC SKT 8WAY	28I	703-3308-01-04-10		7	U302 6:13 4 6 7:20

5NPSGC4 CONTROL "4" PSG2400A

d) SINAD Section (CT4)

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
CAOMIT	CAPACITORS OMITTED				1	R423
CEB10U0JM2	10UF 20% 50V FC +5MM	134N	KMVB		3	C403-5
CEB33U0EM1	33UF 20% 16V FC +5MM	134N	SMVB		1	C421
CEB47U0DM	47UF 20% 10V FC +5MM	134N	KMVB		4	C406-8:20
CEC100UBM	100UF 20% 6.3V R050	05D	CEK1006.3		1	C402
CL3470PLJ	470PF 5% 100V R050	159W	FKP2		1	C418
CR41N00LJ	1.0NF 5% 100V R050	159W	FKS2		2	C409:26
CR41N50LJ	1.5NF 5% 100V R050	159W	FKS5		1	C425
CR42N20LJ	2.2NF 5% 100V R050	159W	FKS2MIN		1	C416
CR510N0LJ	10NF 5% 100V R050	159W	FKS2		2	C410 1
CR522N0KM	22NF 20% 63V R050	159W	MKS2MIN		1	C414
CR533N0KM	33NF 20% 63V R050	159W	MKS2		4	C412 3 5 7
CR6100NKM	100NF 20% 63V R050	159W	MKS2MIN		2	C419:24
CRA1U00KM1	1.0UF 20% 63V R050	159W	MKS2		3	C401:22 7
PM45K00MV	5K00 20% PRESET VERT STURN	02S	75H		2	P401 4
PM510K0MV	10K0 20% PRESET VERT STURN	02S	75H		2	P402 3
RM247R0FF	47R0 1% 0W60 50PPM 250V	18P	MRS25		1	R403
RM41K00FF	1K00 1% 0W60 50PPM 250V	18P	MRS25		1	R411
RM42K55FF	2K55 1% 0W60 50PPM 250V	18P	MRS25		1	R430
RM42K70FF	2K70 1% 0W60 50PPM 250V	18P	MRS25		1	R405
RM44K30FF	4K30 1% 0W60 50PPM 250V	18P	MRS25		1	R413
RM44K70FF	4K70 1% 0W60 50PPM 250V	18P	MRS25		1	R426
RM45K60FF	5K60 1% 0W60 50PPM 250V	18P	MRS25		1	R407
RM46K80FF	6K80 1% 0W60 50PPM 250V	18P	MRS25		1	R420
RM47K50FF	7K50 1% 0W60 50PPM 250V	18P	MRS25		1	R424
RM49K10FF	9K10 1% 0W60 50PPM 250V	18P	MRS25		2	R421 2
RM510K0FF	10K0 1% 0W60 50PPM 250V	18P	MRS25		5	R401 6:10:27 8
RM512K0FF	12K0 1% 0W60 50PPM 250V	18P	MRS25		1	R416
RM513K0FF	13K0 1% 0W60 50PPM 250V	18P	MRS25		1	R429
RM515K0FF	15K0 1% 0W60 50PPM 250V	18P	MRS25		1	R415
RM518K0FF	18K0 1% 0W60 50PPM 250V	18P	MRS25		2	R418:23
RM522K0FF	22K0 1% 0W60 50PPM 250V	18P	MRS25		1	R402
RM539K0FF	39K0 1% 0W60 50PPM 250V	18P	MRS25		1	R419
RM543K0FF	43K0 1% 0W60 50PPM 250V	18P	MRS25		1	R417
RM547K0FF	47K0 1% 0W60 50PPM 250V	18P	MRS25		1	R425
RM6200KFF	200K 1% 0W60 50PPM 250V	18P	MRS25		2	R408 9
RM71M00FF	1M00 1% 0W60 50PPM 250V	18P	MRS25		1	R404

COMPONENT	DESCRIPTION		MAN.	MAN. PART NUMBER	ISS	QTY	CIRCUIT REFERENCE
VA061	IC TL061CP	STATIC	01T	TL061CP		1	U403
VA064CN	IC TL064CN	STATIC	01T	TL064CN		1	U404
VA10CN	IC MF10CN	STATIC	23N	MF10CCN		1	U402
VA412CN	INT CCT LF412CN		23N	LF412CN		1	U406
VA6270CDP	IC 8DIL SL6270CDP		43G	SL6270CDP		1	U401
VA636JD	IC AD636JD		55A	AD636JD		1	U407
VD4051B	IC CD4051BCN	STATIC	23N	CD4051BCN		1	U405
VS14L	IC SKT 14WAY		28I	703-3314-14-01-04-10		2	U404 7
VS20L	IC SKT 20 WAY		28I	703-3320-01-04-10		1	U402
VS8P	IC SKT 8WAY		28I	703-3308-01-04-10		3	U401 3 6
7SU4982	BOARD HEATSINK		00F	4SUBA4982	A	1	
BC1470	CONTROL BOARD PSG2400A		01K	1N7RBT14700	D	1	
7SU4120	RH SIDE PA PANEL		00F	1SUCB4120	A	1	
7SU4121	LH SIDE PANEL		00F	1SUCB4121	A	1	
7SU4122	CONTROL TRAY		00F	1SUBA4122	A	1	
7SU4996	CONTROL TRAY HINGE		00F	2SUDA4996	A	1	
7SX4608	TOP BOTTOM TRIM		00F	2SUDF4608	A	4	

1ERPSG2400AA PSU 23 - 30V DC INPUT OPTION

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
RM41K50FF	1K50 1% 0W60 50PPM 250V	18P	MRS25		1	R3
SRHC424	RELAY HC4 24V DC	67P	HC4+24V		1	RL1
VF530	IRF530 220N STATIC	10I	IRF530		2	Q3 4

1ERPSG2400AM PULSE MODULATION OPTION

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
4NPSGPM	PULSE MOD ASSEMBLY			A	1	
5UPSG2400M	PULSE MODULATION SMD CB ASM.			B	1	
CUC1220JA0KC	2P2F +/-.25PF 50V 1206	08V	VJ1206A2R2CXA		9	C2-5:10-4
UBC1518	PULSE MODULATION CB PSG2400A	33C	137PKK15180	C	1	B
UCC2470JA0KC	47PF 5% 50V 1206 COG	08V	1206A470JXAT		2	C6 7
UCC6100KA0KX	0U1F 10% 50V 1206 X7R	08V	1206Y104KXAT		2	C1 15
UDGC0LL4148	LL4148 MINI-MELF	41S	LL4148		1	D1
UFNN239	SW239 GAS FET	129M	SW239		3	U1-3
URM2560FC0	56R 1% MINI MELF	67P	ER0-10MKF56R0		1	R9
URM3220GA0	220R 2% 1206	18P	RC-01		2	R2 5
URM3330GA0	330R 2% 1206	18P	RC-01		2	R3 6
URM3470GA0	470R 2% 1206	18P	RC-01		2	R1 4
URM4100GA0	1K0R 2% 1206	18P	RC-01		1	R7
UTPP0HF	15V 5000F SOT-23	01P	BFT92		2	Q1 2
7SU4157	PULSE MODULATION BOX PSG2400A	00F	3SU004157	A	1	
CEB10U0GT1	10UF 50% 25V AXIAL	18P	030-36109		1	C15
CI41N00VZ	1.0NF 600V -20+80%	95B	TPS014B		2	C8 9
DZ16V80E	6.8V 5% 0W50	31I	ZPD6.8		1	Z1
RM3120RFF	120R 1% 0W60 50PPM 250V	18P	MRS25		1	R8
TR16SMB10C	SMB ELBOW FEMALE PLUG	76S	50-2-10C/111		1	
VD75ALS191	SN75ALS191 8-PIN DIL I.C.	01T	SN75ALS191		1	U4
ZC0290	YE315S 4 TURNS CHOKE	22K	3SR0290	C	2	L1 2
YE0315S	.315 BS4520/1 RED GD2	05B	0.315MM+(RED)		0	
ZF1115	FERRITE BEAD L=5.6MM OD=4.15	15P	FX1115		1	
TR16SMB10C	SMB ELBOW FEMALE PLUG	76S	50-2-10C/111		1	
TR24BNC13C	BNC PANEL JACK 50 OHM	76S	50-2-13C/133		1	B/PANEL
TR34SMB02	SMB CONNECTOR	76S	34SMB50-0-2/111		1	O/P RF BOX
YX188	COAX PTFE RG188A-U	30S	075950X+/+075951R		0	B/PANEL

1ERPSG2400AO HI-STAB FREQUENCY REF OPTION

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
VX10MK1270	10MHZ L1270. DO NOT WASH.	44S	L1270		1	XTL1 (CRYSTAL REF CB.)

1EXA10120 BATTERY PACK OPT.

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
7SM5587	3U HANDLE BRACKET	00F	2SUDG5587	A	2	
HB2529	HANDLE BRACKET	32R	2SUDC2529	A		1
FT160M123	FUSE 160 MILLIAMP ANTI-SURGE	03B	S504		1	F1 KIT DIRECT-RF TEST
FT4A00S503	FUSE 4 AMP ANTI-SURGE	03B	S503		1	F2 KIT DIRECT-RF TEST
FT500M123	FUSE 500 MILLIAMP ANTI-SURGE	03B	S504		1	110V ONLY KIT TO RF TEST
HC22V2	PLUG & LEAD 22/V/2	50C	22-V-2		1	
7SU2862	BATTERY BRACKET	00F	3SUBA2862	B	1	
DBC606	BRIDGE RECTIFIER	11G	GBPC606		1	BR1
EB0127	BATTERY PACK 12V	84S	3SC000127	D	1	B1 KIT DIRECT TO RF TEST
FH2002	FUSE HOLDER 5 X 20MM P/MTG.	02B	L2002		2	F1 2
GR1012	GROMMEX PS1012 HEL	45H	PS1012		0	
GR2326	GROMMET HV2326	53M	HV2326		1	
MR100BLK	RUB SLV BLK 100X50 OSX	40S	C100X50MM+BLK+X20MM		1	
MT38150	FOAMPAD 38X150 7814780	49B	38+X+150++7814780		4	
RW233R0NJ	33R0 5% 10W0	02W	WH5		1	R1
SS2225B	SLIDE SW T2225B MARKED	12A	T2225B		1	SW1
TG212	MINIATURE PLUG 3 POLE 5AMP	05D	RPC212P3S		1	PL1
TK212	SOCKET DC 3 POLE	05D	RPC212RB3P		1	SK2
TKCM3	IEC MAINS SOCKET 6AMP	50C	CL1920/MS-1S		1	SK1
TS6B383	SOLDER TAG 6BA STC402297RM	05R	RC383/6BA		1	
TS6B388	SOLDER TAG 6BA	05R	RC388/6BA		1	
TV1867	SHROUD	28B	L1867		1	
ZR207374	TRANSFORMER	06R	207-374		1	TX1

15A20100 RACK MOUNTING KIT 3U,3/4R

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
7SM5587	3U HANDLE BRACKET	00F	2SUDG5587	A	1	
HB2529	HANDLE BRACKET	32R	2SUDC2529	A	1	
7SM5589	3U 3/4 W OFFSET HANDLE BKT	00F	2SUDG5589	A	1	
HB2530	HANDLE BRACKET EXTENSION	32R	2SUOO2530	B	1	

1EXA20180 PROTECTIVE CARRYING CASE OPTION

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
JP0208	PADDED CARRY CASE 4U 3/4 R	40T	1SC0208	B	1	
JP0263	PACKING PIECE -3U 3/4 R	40T	3SC0263	A	1	

1ERA30320 REMOTE FOOTSWITCH OPTION

COMPONENT	DESCRIPTION	MAN.	MAN. PART NUMBER	ISS	QU	CIRCUIT REFERENCE
SF6289CC	MOMENTARY SPDT FOOT SWITCH		6289CC		1	
TKD9W	9 WAY D-SOCKET	45L	R3213-109		1	
TV9W	D-SHELL & CAPTIVE LNG JACK SRW	01F	150-773		1	

15.4 SUPPLIER CODES.

00F	FARNELL INSTRUMENTS LTD
01B	BBH COIL & TRANSFORMER CO LTD
01F	FARNELL ELECTRONIC COMP PLC
01G	M/A-C0M GREENPAR LTD.
01H	HARWIN ENGINEERING LTD
01K	KELAN CIRCUITS LTD
01P	PHILIPS SEMICONDUCTORS
01S	SIFAM LTD
01T	TEXAS INSTRUMENTS LTD
01X	XILINX
02B	BELLING & LEE LTD
02H	HEWLETT-PACKARD LTD
02L	LUCAS NSF
02M	MOTOROLA LTD
02S	SPECTROL-RELIANCE LTD
02W	WELWYN ELECTRIC LTD
03B	BESWICK COOPER UK LTD
03Z	ZETEX PLC
04E	ERG INDUSTRIAL CO LTD
04H	HELLERMAN INSULOID LTD
04P	PRECISION MONOLITHICS INC
04Q	QUADRANT METER CO LTD
05B	BICC CONNOLLYS LTD
05D	DUBILIER COMPONENTS
05F	FUJITSU MICROELECTRONICS LTD
05Q	QUILLER COMPONENTS LTD
05R	ROSS COURTNEY & CO LTD
06M	MACRO-MARKETING LTD
06N	NEOSID LTD
06R	R S COMPONENTS LTD
06T	TEKDATA TRADING LTD
06V	VARTA (GB) LTD
07A	AMP OF GREAT BRITAIN LTD
08D	DALE ELECTRONICS
08R	ROBINSON NUGENT LTD
08V	VITRAMON LABORATORIES LTD
103P	PRECISION MONOLITHICS INC
103S	SIGMA PRODUCTS(NORTHAMPTON)LTD
10I	INTERNATIONAL RECTIFIIFIIFIER CO LTD
10M	M.P.S.
10R	RADIALL MICROWAVE COMP LTD

Supplier Codes Continued

11C	COMPRESSION TERMINALS & TOOL
11D	DAU COMPONENTS LTD
11G	GENERAL INSTRUMENTS (UK) LTD
11T	ERNEST TAYLOR
129M	M/A COM (UK)
12A	ARCOLECTRIC SWITCHES PLC
12E	EMC TECHNOLOGY INC
134N	EUROPE CHEMICON (DEUTSCHLAND)
13R	RIFA EVOX UK LTD
14K	KAVIA MOULDED PRODUCTS LD
14W	WARTH INTERNATIONAL LTD
159W	WILHELM WESTERMAN
15P	PHILIPS COMPONENTS MAGNETICS
18C	CAMLOC UK LTD
18J	MRS.S.D.JONES
18P	PHILIPS COMPONENTS LTD
18R	RFI SHIELDING LTD
20P	PHILIPS LTD
20T	TELEDYNE RELAYS LTD
21B	BATTEN &N & ALLEN LTD
22K	P J KAISER
22S	SYSTEMATION EURO LTD
23C	CIRKIT DISTRIBUTION LTD
23M	MOLEX ELECTRONICS LTD
23N	NATIONAL SEMICONDUCTORS
24K	KEMTRON INTERNATIONAL LTD
26P	PRESTINCERT FASTENERS
27F	FELCO ELECTRONICS LTD
27K	KARELIA LTD
27R	REMTEK INTERNATIONAL INC
28A	AVANTEK LTD
28B	A F BULGIN & CO LTD
28C	COMPENSATED DEVICES INC
28I	INTERCONNECTION PRODUCTS LTD
28P	PANDUIT LTD
29S	SGS THOMSON MICROELECT LTD
30H	HEYCO LIMITED
30S	ESD
31I	ITT SEMICONDUCTORS LTD
32C	COILCRAFT UK
32R	ROMANS ENGINEERING
33C	CARLTON COMELIM CIRCUITS
34N	NEC GMBH
35N	NEC ELECTRONIC LTD

Supplier Codes Continued

37I	ITT CANNON UK
38D	DISTRIBUTED TECHNOLOGY
40S	SIEGRIST-OREL LTD
40T	TOPPER CASES LTD
41S	SILICONIX LTD
43G	G E C PLESSEY SEMICONDUCTORS
44M	MURATA ELECTRONICS
44S	STC COMPONENTS
45H	HELLERMAN ELECTRIC
45L	LORLIN ELECTRONICS LTD
47R	ROWLAND AUTOMATION LTD
49B	BEIERSDORF UK (TESA DIV)
50C	CLIFF ELECTRONIC COMP LTD
51A	ALSAMEX PRODUCTS LTD
51T	TOSHIBA UK LTD (SEMICON DIV)
52A	ASTRALUX (AX DISTRIBUTION)
53D	VISHAY COMPONENTS U.K LTD
53M	MOSS PLASTICS PARTS LTD
53S	SOURIAU UK LTD
55A	ANALOG DEVICES LTD
55M	MSS LTD
57M	METWAY ELECT INDUSTRIES
59H	HI-TEK ELECTRONICS
61T	TOBY ELECTRONICS LTD
62S	SYFER TECHNOLOGY LTD
65T	TEKELEC COMPONENTS LTD
67P	PANASONIC INDUSTRIAL UK
70H	HARRIS SEMICONDUCTORS LTD
70S	STEATITE INSULATIONS
76S	SUHNER ELECTRONICS LTD
80P	PHOTO PLANAR LTD
84A	ACTIVTIVE ELECTRONICS LTD
84B	BURR-BROWN INTERNATIONAL
84S	SAFT (UK) LTD
85A	ALPHA INDUSTRIES LTD
85S	SIEMENS PLC.
88M	MCMURDO INSTRUMENTS LTD
89C	CLIFFORD WHATMOUGH LTD
92B	B H COMPONENTS (WEYMOUTH)
94M	MEGGITT ELECT COMPONENTS LTD
95B	BECK ELECTRONICS LTD
96M	MAXIM INTEGRATED PRODUCTS (UK)
97M	MITSUBISHI ELECTRIC (UK) LTD
98C	COSSMIC TECHNICTRON
99F	FARNELL INSTRUMENTS LTD

16. AMENDMENTS

There are no amendments or addenda.