

HK-2M 2 METRE RECEIVER PROJECT

by Johannesburg Branch SARL

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This project was initiated by the Johannesburg branch of the SARL to fill a need for a high quality, low cost 2 metre receiver.

In recent months several amateur satellites have been launched with a view to increasing interest in schools. Short of laying out R1000 + on a commercially manufactured receiver, there is nothing in the market-place with the sensitivity, and immunity to interference, suitable for the reception of these new satellites.

The guidelines laid down for this receiver project were:

- Good sensitivity
- Immunity to strong commercial signals in the VHF band
- Good intermodulation performance
- Low cost
- Easy to construct and align
- Readily available components.

All the above objectives were met in this design. The receiver is constructed on a single sided PCB only 145 mm by 50 mm, using readily available commercial grade components. It has a sensitivity of better than 0.3 microvolts for 12dB signal to noise ratio with a spurious response rejection of 70dB and a 3rd order intermodulation rejection of 75dB. Adjacent channel selectivity is better than 70dB at 25kHz removed.

Once you have constructed the receiver you will want to align it for the best sensitivity. You will notice that the only adjustments are the six coils in the receiver front end and mixer, and local oscillator chain. The quadrature coil is pre-adjusted for resonance at 455kHz. Crystal frequencies are set using the trimmer capacitors.

Radiate a strong signal and adjust a crystal trimmer for minimum distortion. Using an off air signal adjust L11 and L12 (the local oscillator injection) for best quieting. Then adjust L1, L2, L4, and L5 for best quieting. You will need to progressively reduce the level of the input signal so as to accurately find the peak in the tuned circuits. Access to a good quality signal generator will make alignment a 5 minute task.

The quadrature coil L13 may be adjusted for maximum audio level and minimum distortion once everything else has been aligned. Crystal frequency may be set on each channel by

connecting a good quality frequency counter to the junction of C60 and L12 and setting each crystal trimmer so that the counter reads the channel frequency minus 10.7 MHz. (ie for 145.825 adjust for 135.125000).

We hope you have fun building and using this receiver. Complete kits will be available from Johannesburg Branch of the SARL. It is recommended that only those who have had some construction experience undertake this project.

HK-2M 2 METRE RECEIVER PARTS LIST

CAPACITORS

Qty	Value
1	0.33pF Ceramic disc NPO
3	0.47pF Ceramic disc NPO
1	8p2 Ceramic disc NPO
1	10pF Ceramic disc NPO
2	12pF Ceramic disc NPO
2	18pF Ceramic disc NPO
1	22pF Ceramic disc NPO
1	33pF Ceramic disc NPO
4	47pF Ceramic disc NPO
1	56pF Ceramic disc NPO
1	180pF Ceramic disc N750
7	1000pF Ceramic disc
5	0.01uF Ceramic disc
8	0.1uF Ceramic disc
1	0.047uF 50 Volt Polyester
1	0.47uF 50 Volt radial electrolytic
1	1uF 50 volt radial electrolytic
3	10uF 25 Volt radial electrolytic
2	47uF 16 Volt radial electrolytic
2	220uF 16 Volt radial electrolytic
1	470uF 16 Volt radial electrolytic
5	4-20pF Trimmer Philips P/N 2222 808 20209

FILTERS

1	10.7MHz 4 pole monolithic NDK 10F13BA (equiv to 40N01)
1	455kHz, 15kHz bandwidth Ceramic filter Murata CFU455D NTK LFB15

HARDWARE

1	HK-2M Blank PCB SARL JHB Branch
1	6 position 1 pole rotary switch 6mm shaft.

INDUCTORS

4	4.5turn 7mm space wound shielded coil yellow Coilcraft 150-04J08S Frontier 2436-04
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2	5.5turn 7mm space wound shielded coil green Coilcraft 150-04J08S Frontier 2436-05
1	455kHz Quadrature detector coil Toko 7MC-8128Z
1	1uH molded choke
2	10uH molded choke
2	100uH molded choke
1	470uH molded choke

SEMICONDUCTORS

1	BZX557v5 7.5 Volt 500mW zener diode
1	J310 J-FET
1	MC3361 FM IF integrated circuit
3	MPS918 NPN small signal RF transistor
1	TBA820M 8 pin 1.5Watt audio amplifier
1	1N4002 1 Amp silicon diode
9	1N4148 Silicon signal diode
1	3N202 Dual gate MOS-FET mixer
1	78L05 TO92 voltage regulator

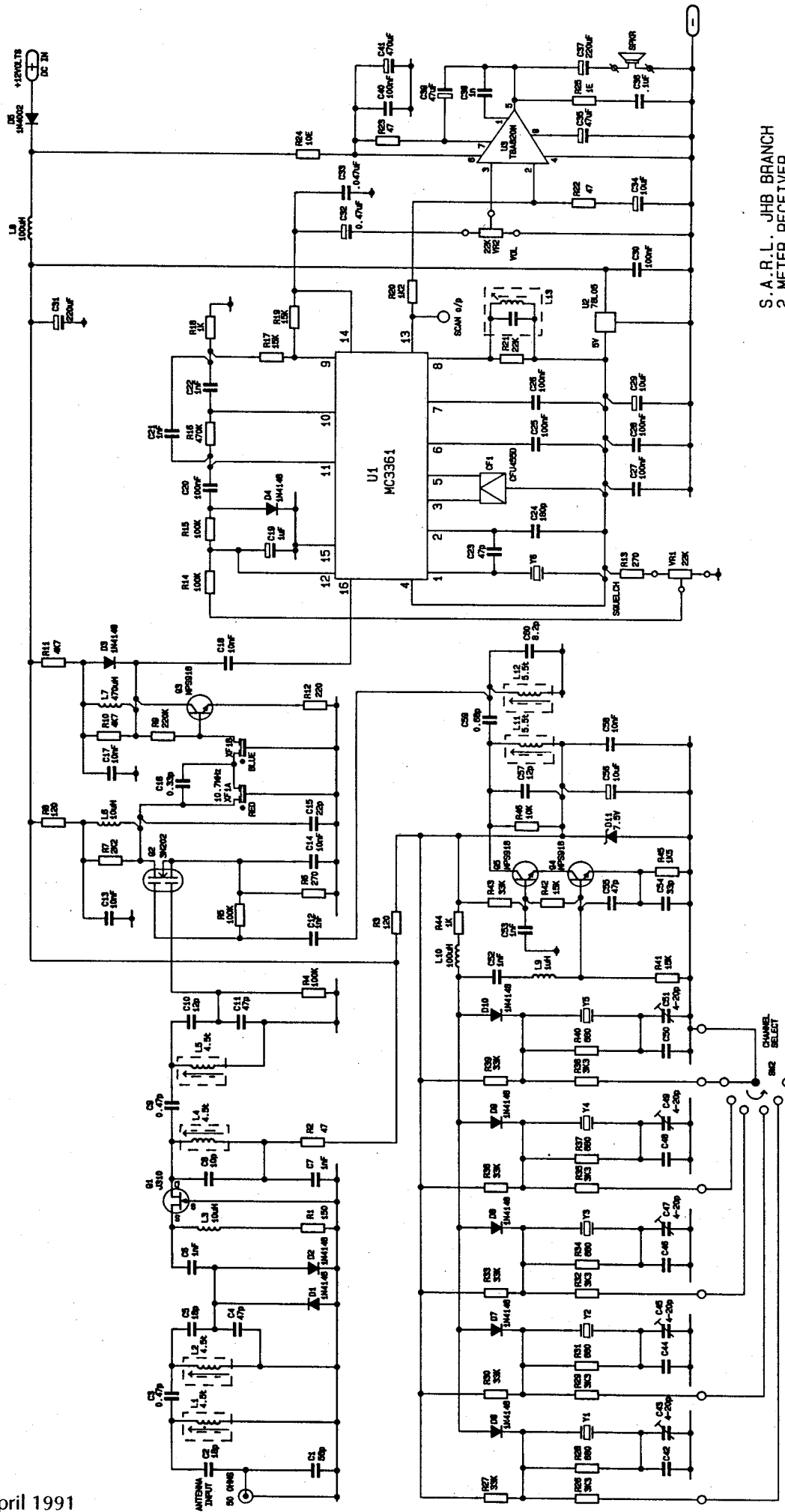
RESISTORS

All resistors 0.25 Watt 5% unless otherwise stated

1	1 ohm
1	10 ohm 0.5 Watt
3	47 ohm
2	120 ohm
1	150 ohm
1	220 ohm
2	270 ohm
5	680 ohm
2	1k
1	1k2
1	1k5
1	2k2
5	3k3
2	4k7
1	10k
4	15k
1	22k
6	33k
4	100k
1	220k
1	470k
2	22k log Potentiometers 6mm shaft

CRYSTALS

2nd Local Oscillator crystal Y6	
1	10.245MHz
Specification:	Fundamental 30pF parallel 10ppm at 25 °C 10ppm -10 to 60 °C HC49/u



S.A.R.L. JHB BRANCH
 2 METER RECEIVER
 MODEL: HK-2M
 VERSION 1.1

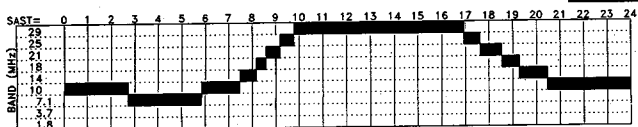
CSIR FREQUENCY SELECTION CHARTS

NEAREST BAND TO MEDIAN-MUF

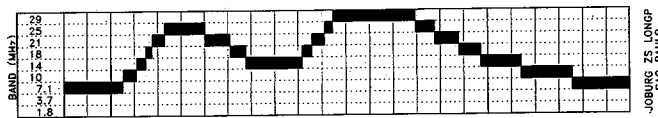
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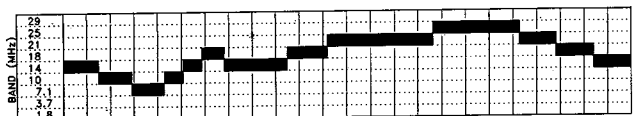
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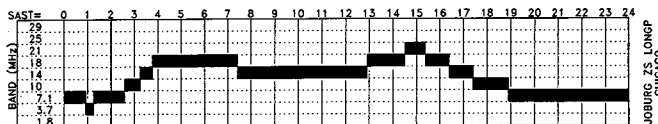
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SAO PAULO



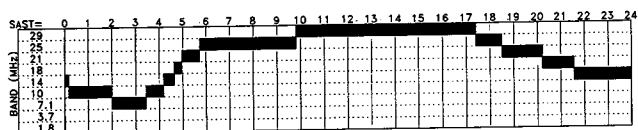
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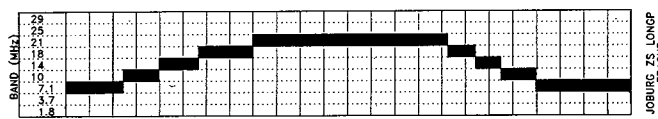
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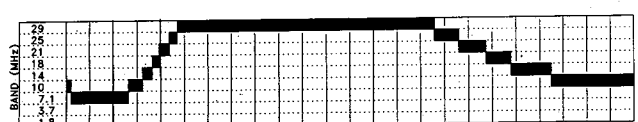
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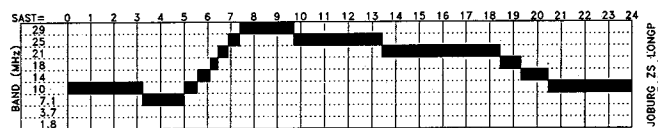
JOBURG ZS N
PRAGUE



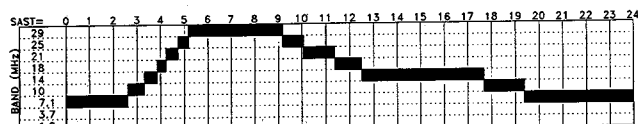
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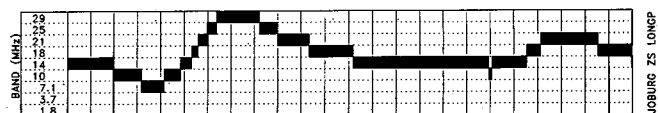
JOBURG ZS NE
TOKYO



JOBURG ZS LONGO
TOKYO



JOBURG ZS E
ADELAIDE



JOBURG ZS LONGO
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Charts for other HF bands and propagation paths, as well as a large variety of propagation consulting services as HF, VHF, UHF and SF, can be obtained from:

Propagation Prediction Services Section
Programme for Radion Communication Systems
MIKOMTEK, CSIR, P.O. Box 395, PRETORIA 0001
Tel: (012) 841-4912 Fax: (012) 841-4720

Al die inligting in hierdie dokument behoort aan die WNNR en kopiereg word ten sterkste voorbehou. Eenige ongemagtigde kopiëring of verspreiding is 'n oortreding van die Wet op Outeursreg en die oordreder stel homself bloot aan kriminele sowel as siviele vervolging.

Kaarte vir ander HF-bande en voortplantingspaaie, sowel as 'n wye verskeidenheid voortplantings-konsultasiedienste by HF, BHF, UHF en SHF kan verkry word aan:

Afdeling Voortplantingsvoorspellingdienste
Program vir Radiokommunikasiesistelsels
MIKOMTEK, WNNR, Posbus 395, PRETORIA 0001
Tel: (012) 841-4912 Faks: (012) 841-4720

Channel crystals

Formula:

$$\text{crystal freq} = \frac{(\text{chan freq} - 10.7)}{3}$$

Specification: 3rd Overtone
Series resonant
10ppm at 25 °C
10ppm -10 to 60 °C
HC49/u

The PC board and a set of filters and coils are available from the Johannesburg Branch, SARL PO Box 13754 Northmead 1511.

Channel crystals are available from DKW crystals under P/N HK-2M. Please specify channel frequency when ordering. Their address is found elsewhere in their advertisement in this magazine.



PRESS RELEASE

Communicomp in Pretoria is the latest firm to enter the amateur radio field with the opening of its Communications Division in the Fountain Square Shopping Centre, Monument Park Extension 2, Pretoria.

They stock a broad range of general amateur radio products and also cater to amateur operators with more focused interests such as HF and VHF DXing and contesting, digital modes and satellites.

The shop is managed by Roy Alexander, ZS6MI, well-known in the Pretoria area and very active in the digital modes. Business hours are 08H30 to 17H00 Monday through Friday and if you have difficulty seeing us during the week, we will open on Saturday by appointment.

Factory warranty and full backup service is provided on everything sold and repair service is available for equipment purchased elsewhere. Other services provided including assisting in planning your station and helping you dispose of amateur equipment surplus to your needs.

Conveniently located just off the Pretoria-Kempton Park Highway near the Waterkloof Air Base outside Pretoria, the shop can be reached from downtown Johannesburg in about forty minutes.

For more information call Roy, ZS6MI or Hal, ZS6WB during office hours at (012) 45-1133.

THE COMMUNICOMP COMMUNICATIONS DIVISION WILL BE OPEN DURING THE BIG PRETORIA HAM-FEST AND GIANT FLEA MARKET ON APRIL 20.

