"TCF" SIDEBAND/CW TRANSCEIVER FOR 40 M

Here are details of a 40 m version of the TCF transceiver. Transmitter and receiver sections have individual circuit boards, so these may be built as separate items (with small adaptions), or in stages, as desired. The prototype has the following measured characteristics:

Receiver

Frequency Range:	Nominally 7.0 to 7.250 MHz.
Sensitivity:	0.5 uV for 10 dB S+N:N.
Reception Modes:	SSB, CW, DSB and AM (as SSB).
Image Rejection:	70 dB.
IF (4 MHz) Rejection:	60 dB.
Incremental Tune (RIT):	Nominally +/-3 kHz.
Frequency Stability:	Less than 100 Hz in any hour after warm-up.
Spurious Signals:	One sub-microvolt spur at 6.998 MHz.

Transmitter

Frequency Range:	Same as receiver.
Power Output:	At least 2 W, typically 3 W into 50 ohms.
Modes:	SSB (LSB) and CW.
Carrier Suppression:	35 dB.
USB Suppression:	35 dB.
Harmonics and Spurs:-	At least -55 dB at full output.
Frequency Stability:	Same as receiver.
Load Tolerance:	Withstands any load SWR without damage.
Power Supply:	+12 to +13.8 Vdc at up to 1 A.

Circuit

The receiver section is in the lower half of the schematic. VFO and crystal oscillator, which are common to both the receiver and transmitter, and are shown in the centre. Transmitter is in the top portion.

An IF of 4 MHz was found by experiment to produce the cleanest transmit signal, and most spur-free reception using cheap computer crystals. Complexity is greatly reduced by having identical Twin Crystal Filters (TCF), one each for transmit and receive functions.

Receiving: Signals in the 7.0 to 7.25 MHz range are admitted via the top-coupled band pass filter, and applied to one of the NE602 inputs of the receive mixer. The VFO is adjustable from 11.0 to about 11.25MHz, and is injected into the oscillator port at pin 6. The wanted product; IF at 4 MHz must negotiate the 4-crystal ladder filter, whose bandwidth is determined by the value of the five coupling capacitors- 33pF yields a BW of about 1.8 kHz. The filtered 4 MHz signal is again presented to an NE602 as product detector. Crystal derived oscillator (BFO) signal at about 3.9995 MHz is applied to the osc. port at pin 6. The 4.0 MHz oscillator crystal is pulled about 500 Hz low with a 10 uH coil to place it on the lower edge of the crystal filter bandpass, thus providing reception of LSB signals on SSB (the polarity of the sideband is reversed by the VFO mixing process), and single-signal reception of CW signals. The low level audio product is applied to a conventional '741/'386 audio amplifier to power speaker or 'phones.

The NE602 was designed originally by Signetics for mobile radio applications, and has a 500 MHz input bandwidth. To keep unwanted VHF signals out of the set, the receive signal is routed via the transmitter's low-pass filter.

For CW operation, and to allow for small netting errors on SSB, incremental tuning is provided on receive with a diode and capacitor at the source tap of the VFO tank coil. The effective value of capacitance is altered by varying the forward current through the diode. A 470 ohm resistor sources the diode on transmit from the regulated +6 V which powers the bal. mod., and thereby biases the diode to the same nominal current level as at the mid point of the 1 kohm offset pot, which is sourced on receive from a

"TCF" SIDEBAND/CW TRANSCEIVER FOR 40 M

Here are details of a 40 m version of the TCF transceiver. Transmitter and receiver sections have individual circuit boards, so these may be built as separate items (with small adaptions), or in stages, as desired. The prototype has the following measured characteristics:

Receiver

Frequency Range:	Nominally 7.0 to 7.250 MHz.
Sensitivity:	0.5 uV for 10 dB S+N:N.
Reception Modes:	SSB, CW, DSB and AM (as SSB).
Image Rejection:	70 dB.
IF (4 MHz) Rejection:	60 dB.
Incremental Tune (RIT):	Nominally +/-3 kHz.
Frequency Stability:	Less than 100 Hz in any hour after warm-up.
Spurious Signals:	One sub-microvolt spur at 6.998 MHz.

Transmitter

Frequency Range:	Same as receiver.
Power Output:	At least 2 W, typically 3 W into 50 ohms.
Modes:	SSB (LSB) and CW.
Carrier Suppression:	35 dB.
USB Suppression:	35 dB.
Harmonics and Spurs:-	At least -55 dB at full output.
Frequency Stability:	Same as receiver.
Load Tolerance:	Withstands any load SWR without damage.
Power Supply:	+12 to +13.8 Vdc at up to 1 A.

Circuit

The receiver section is in the lower half of the schematic. VFO and crystal oscillator, which are common to both the receiver and transmitter, and are shown in the centre. Transmitter is in the top portion.

An IF of 4 MHz was found by experiment to produce the cleanest transmit signal, and most spur-free reception using cheap computer crystals. Complexity is greatly reduced by having identical Twin Crystal Filters (TCF), one each for transmit and receive functions.

Receiving: Signals in the 7.0 to 7.25 MHz range are admitted via the top-coupled band pass filter, and applied to one of the NE602 inputs of the receive mixer. The VFO is adjustable from 11.0 to about 11.25MHz, and is injected into the oscillator port at pin 6. The wanted product; IF at 4 MHz must negotiate the 4-crystal ladder filter, whose bandwidth is determined by the value of the five coupling capacitors- 33pF yields a BW of about 1.8 kHz. The filtered 4 MHz signal is again presented to an NE602 as product detector. Crystal derived oscillator (BFO) signal at about 3.9995 MHz is applied to the osc. port at pin 6. The 4.0 MHz oscillator crystal is pulled about 500 Hz low with a 10 uH coil to place it on the lower edge of the crystal filter bandpass, thus providing reception of LSB signals on SSB (the polarity of the sideband is reversed by the VFO mixing process), and single-signal reception of CW signals. The low level audio product is applied to a conventional '741/'386 audio amplifier to power speaker or 'phones.

The NE602 was designed originally by Signetics for mobile radio applications, and has a 500 MHz input bandwidth. To keep unwanted VHF signals out of the set, the receive signal is routed via the transmitter's low-pass filter.

For CW operation, and to allow for small netting errors on SSB, incremental tuning is provided on receive with a diode and capacitor at the source tap of the VFO tank coil. The effective value of capacitance is altered by varying the forward current through the diode. A 470 ohm resistor sources the diode on transmit from the regulated +6 V which powers the bal. mod., and thereby biases the diode to the same nominal current level as at the mid point of the 1 kohm offset pot, which is sourced on receive from a