

SUBCARRIERS

PAC-10/PAC-12 PROGRAM AUDIO CHANNELS & SC-1 SERVICE CHANNEL CONVERTER

MAIN FEATURES

PAC-10/PAC-12

- Outstanding headroom and very low harmonic distortion
- Four channels in a single rack unit
- Plug-in circuit card expansion
- Front panel accessible
- Optional 220 Vac or Vdc supplies
- Optional hot standby protection

SC-1

- Single sideband suppressed carrier
- Inputs/outputs for orderwire supervisory and control FDM multiplex
- Four SSB inputs and outputs for protected repeaters and drop/insert applications



Microwave Radio Communications offers a line of audio and auxiliary subcarrier equipment for use with its full range of video microwave radio systems. Both the PAC series and the SC-1 are compatible with most other microwave radio systems as well.

The PAC series is designed to carry program audio or wideband data transmission signals. The SC-1 unit allows the insertion of voice and data subcarriers above the video audio subcarriers, such as telephone channels, engineering orderwire, remote control, or alarm signals.

Many other subcarriers, such as composite stereo and T1, are available through MRC from third party vendors. As a specialist in microwave, MRC can help you select the right combination of subcarriers to fit your exact needs.

PAC-10/PAC-12 PROGRAM AUDIO CHANNELS

The PAC-10/PAC-12 system allows the insertion of audio subcarriers above the video channel in conventional microwave systems. In addition to transmitting and receiving program audio sources, it can be used to carry telephone channels, engineering orderwire, remote control, or alarm signals.

The full system consists of a PAC-10 Subcarrier Modulator and a PAC-12 Subcarrier Demodulator. Each one-rack chassis can accommodate up to four subcarriers.

The outstanding headroom of the system lets the user handle "hot" program sources, keeping harmonic distortion to a minimum. And it conforms to RS-250C differential phase and gain standards for individual left and right stereo transmission.

PAC-10/12 & SC-1 SUBCARRIERS

Carrier alarm detectors are equipped as standard, with four red LEDs on the front panel to indicate which module has failed. In addition, a summary alarm attaches to a rear-mounted 9-pin D-type connector. This alarm is configured for fail safe operation and provides a Form-C interface.

The PAC-10/PAC-12 operates on its own internal 115 Vac power supply. Optional power sources are 220 Vac or Vdc power supply. A barrier strip is provided in the DC format for easy connection.

PAC-10 MODULATOR

Audio input is 600-ohm balanced, and is attenuated by the deviation control. This control is accessible on the front edge of the printed circuit card, so that deviation can easily be reset in the field without expensive test equipment.

Audio input and output preamplifiers isolate the pre-emphasis. They also provide the necessary level to the varactor-controlled VCO for proper deviation.

The ECL voltage-controlled oscillator (VCO) derives its stability from a phase-locked loop frequency synthesizer. The reference oscillator is crystal controlled.

The tuned subcarrier amplifier filters the desired frequency. A subcarrier level adjust also is provided on the front edge of the printed circuit card. The output is high impedance for easy bridging on the video line.

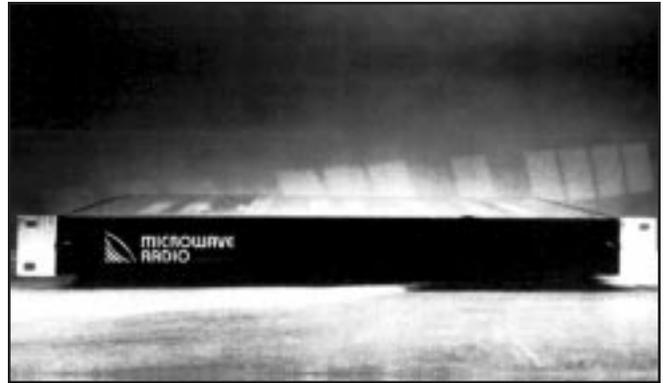
An alarm detector samples the output level and compares it to a preset threshold. When a fault occurs, a red LED on the front panel is lit. There also is a saturated collector and Form-C interface available on the rear panel for remote alarming.

PAC-12 DEMODULATOR

The demodulator input filter is fed composite baseband through a high impedance bridging bus on the back panel of the PAC-12 chassis. The bandpass filter is pretuned to the desired subcarrier frequency. A tuned buffer amplifier increases the desired level, and provides an additional pole to the overall bandpass characteristic.

The filtered signal is fed to a quadrature detector, which contains limiting, detection, signal level sensing and audio preamplification. The detected audio is fed through an emitter follower to the de-emphasis network. The "raw audio" is then filtered by an active low-pass filter before going to the audio output amplifier. The output amplifier is matched to provide a 600 ohm balanced output up to +18 dBm.

A DC signal proportional to the subcarrier level is supplied to an alarm comparator. This level is compared to a preset threshold, and when a fault occurs, a red LED on the front panel is lit. An alarm interface connector on the rear panel provides a saturated collector or Form-C contacts for remote alarming.



SC-1 SERVICE CHANNEL CONVERTER

The SC-1 allows the insertion of data subcarriers above the video and audio subcarriers on a microwave signal. It can send and receive engineering orderwire, remote control, and alarm signals, as well as 24 channels of frequency division multiplex (FDM).

The SC-1 Service Channel Converter is a complete single sideband modulator/demodulator in a unit that occupies one rackspace in a standard 19-inch EIA rack. Its single-sideband suppressed carrier permits parallel connection of multiple units in a multihop system.

A special feature of the SC-1 is its four independent inputs and outputs. This flexibility can be used for redundancy or drop-and-insert application.

SC-1 MODULATOR

The single sideband (suppressed carrier) modulator has 3 parallel input ports. Ports 1 and 2 have a bandwidth of 0.3 to 12 kHz and are generally called "orderwire input" and "alarm and control input." Port 3 has a bandwidth of 0.3 to 108 kHz and is called the "multiplex input."

The combined signals are buffered and fed to a phase shift SSB modulator, and upconverted to the desired subcarrier frequency. A temperature-controlled crystal oscillator (TCXO) is used for both the SC-1 up and down conversion process. The SC-1 features 4 isolated 75 ohm outputs. This flexibility can be used for redundancy or drop-and-insert applications.

SC-1 DEMODULATOR

The single sideband (suppressed carrier) demodulator can receive inputs from 4 discrete (microwave, fiber, coax) sources. All 4 inputs are isolated and provide port-to-port isolation in excess of 55 dB. These summed inputs are filtered and fed to a phase shift SSB demodulator. The outputs of the demodulator are low-pass filtered: the MUX at 108 kHz, orderwire and alarm/control at 12 kHz. All output levels can be adjusted for proper alignment.

PAC-10/12 SPECIFICATIONS

GENERAL

Subcarrier Frequencies

U.S.: 4.83, 5.2, 5.8, 6.2, 6.8, 7.5, and 8.3 MHz

CATV Special: 4.5 MHz (25 kHz deviation, modulator only available)

CCIR: 7.020, 7.5, 8.065, and 8.59 MHz

Alarms

Fault: Loss of subcarrier or prime power

Indication: Front panel LED 1-4

Output: Form-C contact; all connections available

ENVIRONMENTAL CONDITIONS

Ambient Temperature

Operating: - 5° to + 55°C

Meets All Specifications: +10° to + 40°C

Relative Humidity: 0 to 95% (+10° to + 40°C)

POWER REQUIREMENTS

AC

Voltage: 105 to 130 Vac or 210 to 260 Vac

Frequency: 47 to 63 Hz

Power: 10 watts

DC

Voltage: - 21 to - 32 Vdc or - 42 to - 56 Vdc

Power: 10 watts

PHYSICAL

Size: 1.75" h x 19" w x 7.5" d
(4.5 x 48.2 x 19.0 cm)

Weight: 7 lbs (3.2 kg)

SYSTEM PERFORMANCE

(Meets all RS-250C and CCIR standards)

Frequency Response (Ref 400 Hz @ 20 dB below TT)

40 Hz to 100 Hz: + 0.5 dB, - 1.0 dB

100 Hz to 7.5 kHz: + 0.5 dB, - 0.5 dB

7.5 kHz to 15 kHz: + 0.5 dB, - 1.5 dB

Distortion (THD) @ 75 kHz Peak Deviation: 1%

Signal-to-Noise Ratio: 70 dB

PAC-10

Audio, Input Level: + 8 dBm

Adjustable: 0 to +18 dBm

Impedance: 600 Ω balanced

Return Loss: 26 dB

Pre-emphasis (can be strapped flat), Standard: 75 μs

Optional: 50 μs

RF Subcarrier Output, Modulation: FM

Level (p-p): 100 mV nominal

Adjustable (p-p): 50 to 150 mV

Impedance: High-Z bridging

Deviation (1 kHz TT): 75 kHz

PAC-12

Audio, Output Level: + 8 dBm

Adjustable: 0 to +18 dBm

Impedance: 600 Ω balanced or

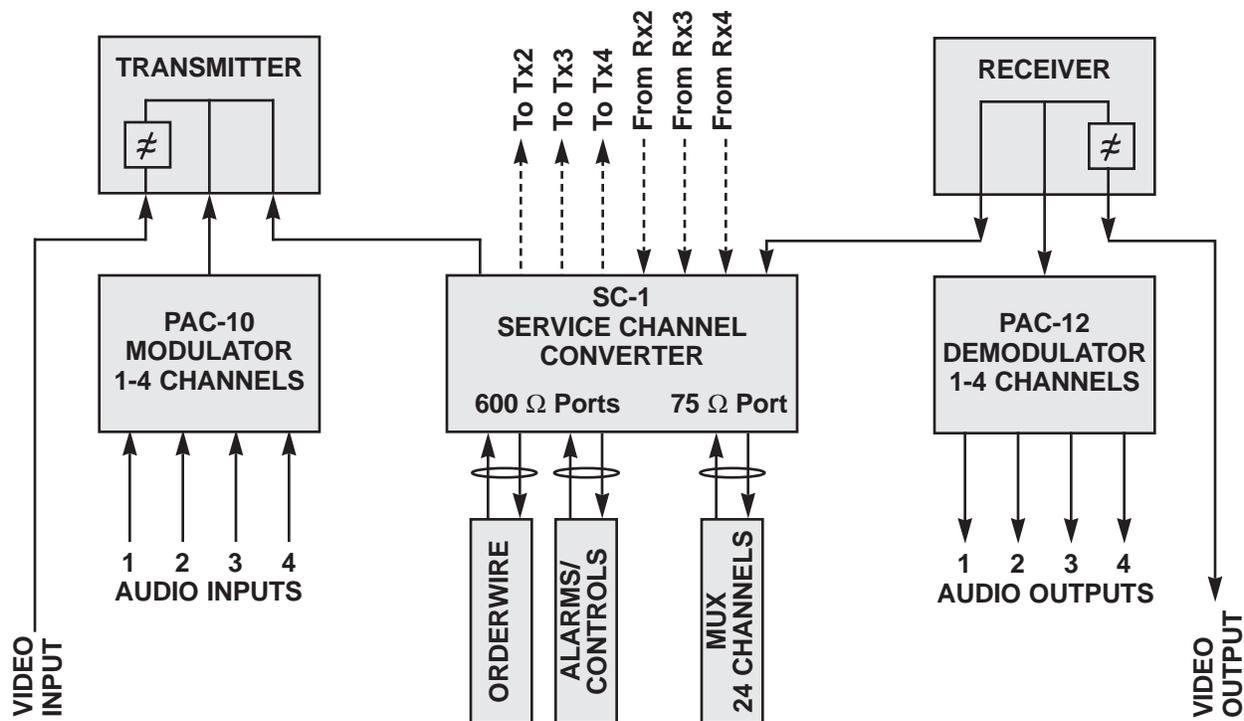
strappable to less than 50 Ω

Return Loss: 26 dB

RF Subcarrier Input, Level (p-p): 50 to 150 mV

Impedance: High-Z bridging

Typical Subcarrier Applications



SC-1 SPECIFICATIONS

TRANSMIT END-INPUT

| | |
|---------------------------------|------------------------|
| Baseband Allocation, Orderwire: | 0.3 to 4 kHz |
| Alarm/Control: | 4 to 12 kHz |
| Multiplex: | 12 to 108 kHz |
| Impedance, Orderwire: | 600 Ω balanced |
| Alarm/Control: | 600 Ω balanced |
| Multiplex: | 75 Ω unbalanced |
| Levels, Orderwire: | - 20 dBm |
| Alarm/Control: | - 20 dBm |
| Multiplex: | - 20 dBm max. |
| Connectors, Orderwire: | Plug-in terminal block |
| Alarm/Control: | Plug-in terminal block |
| Multiplex: | BNC female |

TRANSMIT END-OUTPUT

| | |
|---------------------------|--|
| Type: | Single-sideband, suppressed carrier |
| Frequency: | 5.65 and 8.85 MHz standard 4.5 MHz standard for 10 MHz RF channel spacing Other frequencies available upon request |
| Bandwidth: | 110 kHz nom. |
| Level: | - 20 dBm max. Total of all inputs not to exceed -14 dBm |
| Lower Sideband Rejection: | 33 dB min. |
| Carrier Level: | - 70 dBm max. |
| Number of Outputs: | 4 |
| Impedance: | 75 Ω unbalanced |
| Connector: | BNC female |

TRANSMIT/RECEIVE LOOP

| | |
|--|---|
| Frequency Response, Orderwire: | ± 2 dB |
| Alarm/Control: | ± 2 dB |
| Multiplex: | ± 2 dB ± 0.5 dB/4 kHz |
| Signal-to-Noise (<i>Ref. -20 dBm</i>), Orderwire: | 65 dB |
| Alarm/Control: | 65 dB |
| Multiplex: | 60 dB |
| Harmonic Distortion, Orderwire and Alarm/Control Inputs: | 1% |
| Frequency Stability Temperature ($+10^\circ$ to $+50^\circ\text{C}$): | $\pm 1 \times 10^{-7}$ |
| Aging Rate (<i>1st year</i>): | 1×10^{-6} /year; 5×10^{-9} /day, average |
| Short-Term Stability, Constant Temperature: | 1×10^{-9} /second |
| Frequency Adjustment Stability: | 1×10^{-7} |

RECEIVE END-INPUT

| | |
|---------------------------|--|
| Type: | Single-sideband suppressed carrier |
| Frequency: | 5.65 and 8.85 MHz standard 4.5 MHz standard for 10 MHz RF channel spacing Other frequencies available on request |
| Bandwidth: | 110 kHz nom. |
| Number of Inputs: | 4 |
| Impedance: | 75 Ω unbalanced |
| Connector: | BNC female |
| Level: | - 20 dBm max. Total of all inputs not to exceed -10 dBm |
| Lower Sideband Rejection: | 33 dB min. |
| Port-to-Port Isolation: | 55 dB min. |

RECEIVE END-OUTPUT

| | |
|---------------------------------|------------------------|
| Baseband Allocation, Orderwire: | 0.3 to 4 kHz |
| Alarm/Control: | 4 to 12 kHz |
| Multiplex: | 12 to 108 kHz |
| Impedance, Orderwire: | 600 Ω balanced |
| Alarm/Control: | 600 Ω balanced |
| Multiplex: | 75 Ω unbalanced |
| Levels, Orderwire: | -20 dBm |
| Alarm/Control: | -20 dBm |
| Multiplex: | -20 dBm max. |
| Connectors, Orderwire: | Plug-in terminal block |
| Alarm/Control: | Plug-in terminal block |
| Multiplex: | BNC female |

ENVIRONMENTAL CONDITIONS

| | |
|-----------------------------------|--|
| Ambient Temperature, Operational: | - 5 $^\circ$ to + 55 $^\circ\text{C}$ |
| Meets All Specifications: | + 10 $^\circ$ to + 40 $^\circ\text{C}$ |
| Relative Humidity: | 0 to 95% (+ 10 $^\circ$ to + 40 $^\circ\text{C}$) |

POWER REQUIREMENTS

| | |
|--------------|--------------------------------------|
| AC, Voltage: | 105 to 130 Vac or 210 to 260 Vac |
| Frequency: | 47 to 63 Hz |
| Power: | 24 watts |
| DC, Voltage: | - 21 to - 32 Vdc or - 42 to - 56 Vdc |
| Power: | 24 watts |

PHYSICAL

| | |
|---------|---|
| Size: | 1.75" h x 19" w x 7.25" d (4.5 x 48.3 x 18.5 cm) |
| Weight: | 5 lbs (2.2 kg) |



**MICROWAVE
RADIO
COMMUNICATIONS**



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