

ACTIVE COMBINER

CW -4076

USER'S GUIDE

Dear User!

Thank you for your trust in our company, expressed by buying our product. We believe your new equipment will come up to your expectations and through faultless operation it will justify your decision.

We would like to support you in your work by summarizing here all the instructions related to the installation and use of the unit.

MECHANICAL CONSTRUCTION

The ACTIVE COMBINER is accommodated in a standard 4 unit high 19" rack frame. The unit is delivered along with the following accessories:

1. Power cord 1 ea.
2. Mains fuse T 0.4 A (slow) 1 ea.
2. 75 Ω F-type termination 2 ea.

For easy cabling, it is practical to mount the ACTIVE COMBINER in the mid of the rack. The channel processing units are to be separated from each other by using a vented cover plate (CW-4004) between them.

ELECTRICAL CONSTRUCTION

The CW-4076 ACTIVE COMBINER has been designed for combining analogue TV signals, digital TV signals and FM radio signals, as well as for amplifying and distributing the signals in the reverse path.

The input and output connectors are arranged in the unit's rear panel:

10 ea. Analogue TV input	F socket
10 ea. Digital TV input	F socket
6 ea. FM radio input	F socket
1 ea. High level output	F socket
1 ea. Control output	F socket
5+1 ea. Low level output	F socket
3+1 ea. Reverse output	F socket

The inputs and outputs are capacitively separated.

The main subunits of the CW-4076 ACTIVE COMBINER are built in module form and are interchangeable. The main modules are followings:

○ **Output module**, built of two high drive excitation GaAs hybrids. One of them drives the conventional two-way analogue output, the other drives the optical lines through five attenuated outputs (OUT1... OUT5) and a high level output (OUT). From this latter high level output (OUT), further optical line driver outputs can be established by connecting an external directional coupler. The output has to be terminated with 75 Ω .

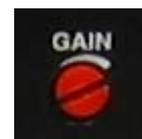
The signals coming from the direction of the distribution network are separated from the conventional output by a crossover filter, and led to the reverse path module.

The output signal levels of the low and high level amplifiers can be adjusted with the OUTPUT LEVEL



attenuators on the rear panel.

○ **Analogue TV signal combiner module**, equipped with 10 wide-band inputs for 47-860 MHz, thus, using external eight-input SELECTIVE COMBINER-8 units as pre-combiners, the module can receive the signals of $10 \times 8 = 80$ analogue TV channels. The module comprises a hybrid as preamplifier, and its gain can be adjusted with the module's GAIN potentiometer on the rear panel.



○ **Digital signal combiner module**, with the same construction as the analogue TV signal combining module, thus with a capability of combining the signals of $10 \times 8 = 80$ digital TV channels. The gain of the module can be adjusted with the module's GAIN potentiometer on the rear panel.

o **FM radio channel combiner module**, equipped with 6 inputs, thus, using external eight-input COMBINER-8 units as pre-combiners, the number of radio inputs can be extended up to $6 \times 8 = 48$. The level of the FM packet can be adjusted with the module's GAIN potentiometer on the rear panel. The output of the module is equipped with an 87.5-108 MHz bandpass filter.

o **Reverse path module**, which follows the 65/85 MHz-crossover filter and amplifies the input signals using a low frequency hybrid, then drives through directional couplers 3 attenuated outputs (OUT1 ... OUT3) and a high level output (OUT). The signal of the high level output (OUT) can further be distributed using an external directional coupler. The output has to be terminated with 75 Ω. The gain can be adjusted with the module's GAIN potentiometer.

The modules and the further circuitries are supplied by a switching mode power supply. For reserve purposes, the instrument frame is equipped with two independent power supplies, which can be switched on and off separately with the POWER SUPPLY 1 and POWER SUPPLY 2 toggle switches on the rear panel. The reserve power supply is the one marked as POWER SUPPLY 2. Switch-over of the internal +24 V and +5V supply voltages is automatic thus, either active redundancy or working reserve mode can be selected.



The ACTIVE COMBINER is built with the most advanced GaAs hybrids which are cooled with an internal high lifetime blower. The values of the internal supply voltages (+24V, +5V) and the temperatures of the 6 hybrids are measured by microcontroller, which can be contacted via the CW-Bus of the CW-4000 system. In headends not equipped with this bus, the same function is available from the serial port of the PC, by using a CW-4059 DEMO CABLE and the SW-4076 software.

Remark: If any of the temperature sensors measures a temperature above 80 °C, warning is given out by blinking all LEDs on the front panel (+24 V, +5 V, MAINS 1, MAINS 2) at the same time.

The reason for such overheating can be the defect of the internal blower or the increase of the external ambient temperature. In this latter case assure proper ventilation or operate air condition equipment.

Front panel displays

- OPERATION ERROR red LED
Lights, if an operational error occurred on the CW-Bus.
- CONTROL DATA RECEIVED yellow LED
Lights, if the PC addressed the unit via the CW-Bus.
- +24 V green LED
Lights, if the +24 V supply voltage exists.
- +5 V green LED
Lights, if the +5 V supply voltage exists.
- MAINS 1 green LED
Lights, if POWER SUPPLY 1 is switched on.
- MAINS 2 green LED
Lights, if POWER SUPPLY 2 is switched on.



In order to achieve excellent carrier-to-noise ratio, the output signals of the analogue and digital TV modulators are to be connected to the ACTIVE COMBINER through CW-307X SELECTIVE COMBINER-8 units.

At combining FM radio signals, there is no need for filtering by channel, thus the CW-307R FM COMBINER-8 can be used. In the ACTIVE COMBINER, the output amplifier of the FM radio channel combiner module is followed by a 87.8-108 MHz bandpass filter.

For mounting the eight-input combiners in the instrument rack cabinet, CW-3007 COMBINER ADAPTER mounting frames are available.

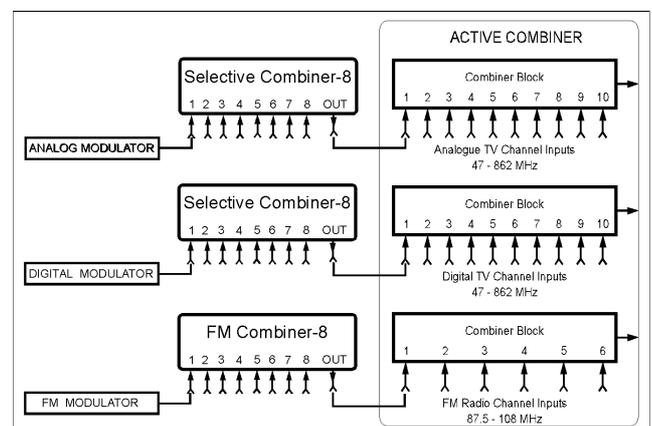


Fig. 1. Selective combining of the headend's output signals

CABLING

The interconnections between the units have to be made with high quality, low attenuation cables. Such cables (CW-3931 ... 34) and cable sets are included in our company's product range, too.

Connecting cables made by the system installer can also be used, however they must be made of high quality cable. For making special cables, we offer cables and connectors in a large choice.

At cabling always use the shortest possible cables. Especially the cables connecting the converter and modulator outputs to the inputs of the passive combiners must be very short. For connecting the outputs of the passive combiners with the inputs of the ACTIVE COMBINER longer cables are permitted to be used.

After the cabling has been finalized, it is advisable to mark all cables at both ends. This can easily be accomplished using the CW-1940 CABLE LABEL SET. Here, the identification mark will be written on the mat white side, then the self-adhesive label will be stuck on the cable.

LEVEL ADJUSTMENT

After having installed and cabled the system, switch on all units and perform the adjustment of the levels of the system.

The output level is to be set according to the number of the TV channels. Transmitting 80 TV channels and 48 radio channels, the nominal level of the high level output can be 112 dBµV. Adjust the level of the digital channels with 64 QAM by 10-15 dB, and the nominal output level of the radio channels by 10 dB below the level of the analogue TV channels.

Measuring the nominal level of the digital channels with spectrum analyzer:

The actual level of the QAM signal is established by adding a correction value to the spectrum analyzer reading. For a digital signal of 8 MHz channel bandwidth, at 100 kHz spectrum analyzer resolution bandwidth (RB), the correction value is 21 dB, thus the actual level of the signal is:

$$U_{QAM} [dB] = \text{Spectrum analyzer reading} [dB] + 21 \text{ dB}$$

For the example of Fig. 2:

$$U_{QAM} = 99.78 + 21 = 120.78 \text{ dB}\mu\text{V}$$

Correction values for the most frequent cases:

RB	Correction value
30 kHz	26 dB
100 kHz	21 dB
300 kHz	16 dB
1 MHz	11 dB
3 MHz	6 dB

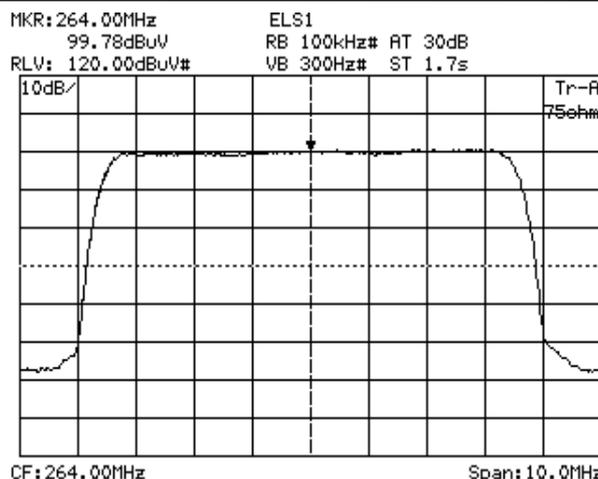


Fig. 2. Measuring the signal level of the digital channel with spectrum analyzer

The output levels can be adjusted with screwdriver attenuators on the rear panel.

Recommended sequence of adjusting the output levels:

1. Analogue channels.
2. Digital channels.
3. FM radio channels.
4. Adjusting the level of the signal combined of the above channels, using the OUTPUT LEVEL attenuator.

ADDITIONAL INFORMATION

1. The main output (OUT) of the 'REVERSE PATH OUTPUTS 5-65 MHz' module has to be terminated with a 75 Ω F-type termination plug.
2. The main output (OUT) of the 'LOW LEVEL OUTPUTS 47-862 MHz' module has to be terminated with a 75 Ω F-type termination plug.
3. The main output of the 'HIGH LEVEL OUTPUTS 85-862 MHz' module has to be terminated with a 75 Ω F-type termination plug, when measuring signal level at the CONTROL OUTPUT.
4. The unused inputs of the ACTIVE COMBINER should be terminated with 75 Ω F-type termination plugs, for having an amplitude response less by several dBs.

GENERAL INFORMATION

The type number and serial number of the unit is marked in a label on the unit's side cover.

The ACTIVE COMBINER needs no adjustment, it is sufficient to check up the adjustments once in a year.

Dear Customer!

We hope, this guide will effectively support you in your job. Should you have any question when using the unit, our experts are at your disposal at any time.

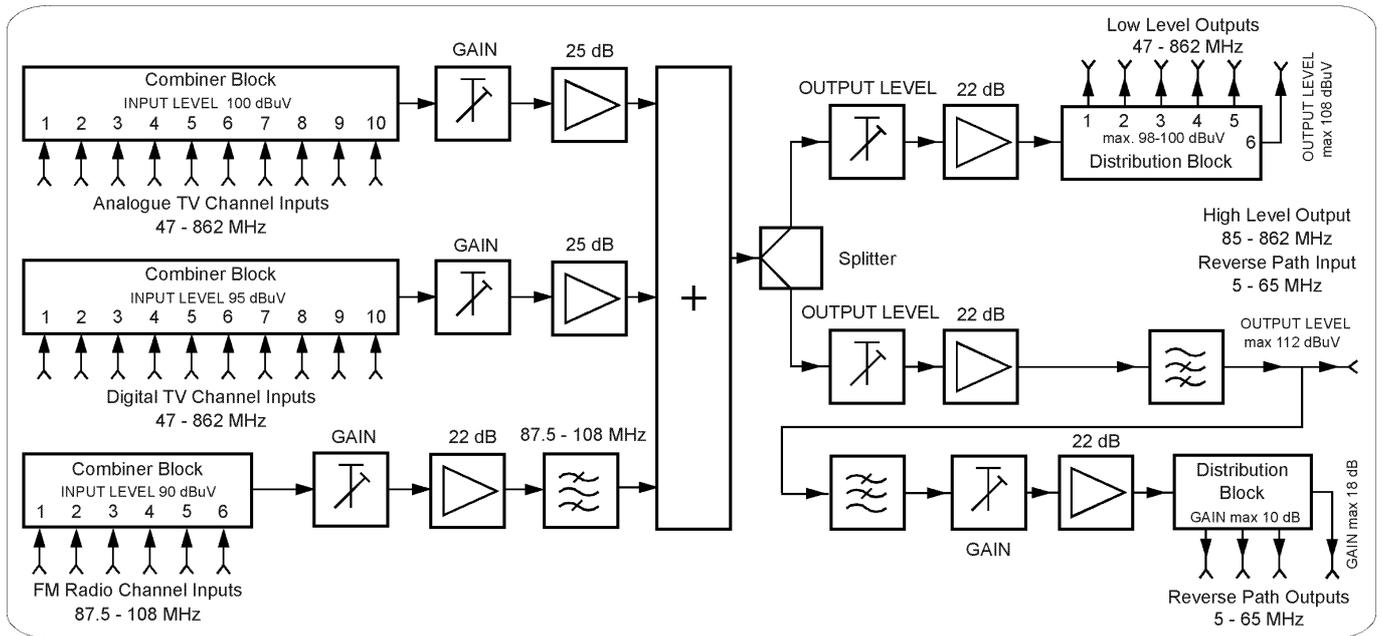


Fig. 3. Block diagram of the CW-4076 ACTIVE COMBINER

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