

Instruction Manual

Signal Conditioners M67-1F M67-4F



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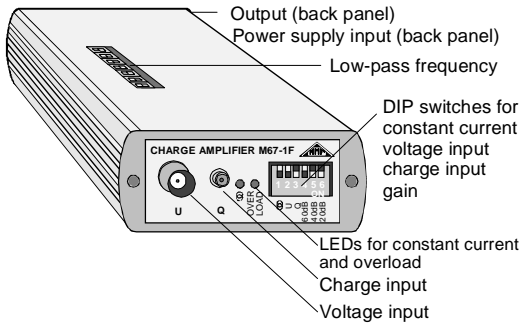
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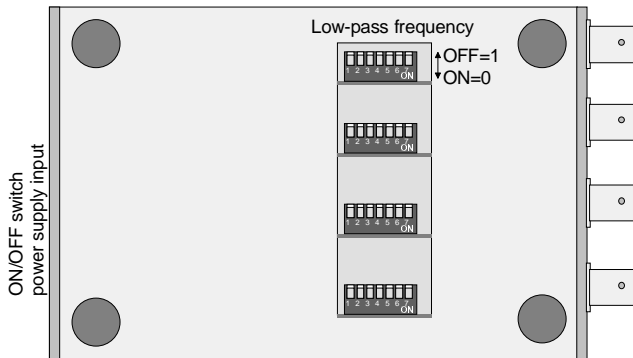
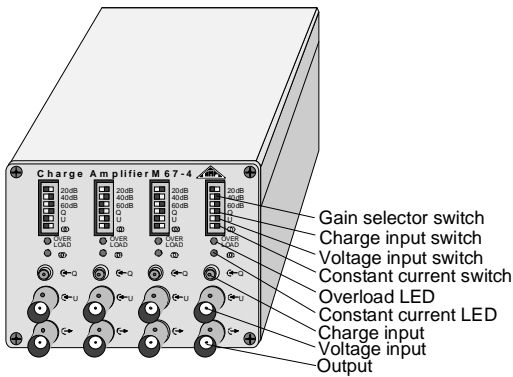
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Signal Conditioner M67-1F:



Notice: An optional wall mounting set is available for the M67-1F.

Quadruple Signal Conditioner M67-4F:



1. Purpose

The M67-1F and M67-4F are intended as signal conditioners for measurements with piezoelectric accelerometers, force and pressure transducers. The M67-4F contains four independent amplifier channels.

For example PC data acquisition systems, meters, recorders and analyzers can be connected to the output.

Applications are, for instance, vibration measurements in industry and laboratory, building measurements and seismology.

Both sensors with charge output and with integrated electronics can be used. Constant current supply for electronic accelerometers is included.

Additionally, the signal conditioners enable low-pass filtering. Cut-off frequencies are selectable by DIP-switches between 0.8 and 20 kHz in 128 steps. The 4-pole filter can be useful as antialiasing filter in data acquisition systems, for instance.

The M67-1F and M67-4F are powered by an external 9 .. 18 V DC source. This can be a data acquisition board, an AC/DC plug adapter, a car battery or other sources.

2. How it Functions

The signal conditioners have two different input stages:

The **charge input** is suitable for capacitive sources, particularly for sensors with charge output. The advantage of capacitive measurement is the extremely low influence of cable capacitance and insulation resistance.

On the other hand, the charge inputs should only be used with properly shielded low noise cables. Regular standard coaxial cables may cause considerable noise. When such cables are subjected to bending, compression or tension they generate charges due to the so called Triboelectric Effect.

The **voltage input** enables the connection of any voltage signal. It is suitable for piezoelectric transducers with integrated charge converters according to ICP[®] standard. These integrated charge converters transform the piezoelectric charge output into a low impedance voltage signal which is less susceptible to any kind of

interference. Therefore low cost standard coaxial cables can be used. ICP[®] standard defines that the integrated sensor electronics is supplied by constant current. The sensor signal and the constant current are transmitted via the same wire. For that purpose the voltage input features a constant current source. The amplifier section has four gain ranges within four decades. The amplifier stage is followed by a programmable low pass filter.

The M67-4F includes four independent amplifier channels.

3. Operation

3.1. Power Supply

The signal conditioners require an external DC supply voltage for operation. It can be supplied from mains plug adapters, car or other batteries or PC data acquisition boards. The allowed supply voltage range is 9 .. 18 V with a current consumption of less than 140 mA (M67-1F) and 300 mA (M67-4F). A DIN circular power connector is located at the back panel. Make sure that the positive terminal of the power supply is the inner contact of the power connector although the circuit is protected against false polarization.

Measurement ground and power supply ground are insulated.

The M67-4F has a power switch which is located at the back panel.

3.2. Inputs

All adjustments are done by DIP-switches. Use a pen or screw driver to change the position of the white switch levers.

To select the desired input, push either the "Q" switch for charge input or the "U" switch for voltage input towards the "On" position. Both inputs must not be used simultaneously. Both inputs are protected against overload.

In combination with the voltage input a constant current source can be activated by the DIP switch with current source symbol (two circles). Provided a sensor with integrated charge converter is connected to the voltage input and the current source is on, proper function of sensor supply is indicated by a yellow LED with current source symbol. If the LED remains dark this can be caused by cable break or defective sensors.

In case of output overload the red LED will flash up. The overload indicator responds when the output voltage exceeds $\hat{u}_{out} > 6$

V. The output signal will be clipped above $\hat{u}_{out} > 7 \text{ V}$ resulting in increased distortion.

Notice: Due to the lower frequency limit of 0.3 Hz the circuitry of the amplifier comprises long time constants. In case of heavy overload the output will need some seconds to recover, consequently. This may also occur after a transducer was connected to the input or when the power was just switched on.

3.3. Gain

Three DIP switches (20 / 40 / 60 dB) at the front panel select the gain of the corresponding channel. The required range is obtained by pushing one of gain switches towards the "On" position. Only one of the three switches must be set to "On". Other combinations result in invalid parameters.

If all gain switches are in the left position ("Off") the amplifier works with unity gain or 0 decibel.

The following table compares the ranges for charge and voltage signals:

| Voltage amplifier | | Charge Amplifier |
|-------------------|--------|------------------|
| Decibel | Factor | |
| 0 dB | 1 | 1 mV/pC |
| 20 dB | 10 | 10 mV/pC |
| 40 dB | 100 | 100 mV/pC |
| 60 dB | 1000 | 1000 mV/pC |

3.4. Filter

The M67-1F and M67-4F feature low pass filters for each channel. Selectable are cut-off frequencies between 0.8 and 20 kHz in 128 steps. Programming is carried out by 7 DIP switches which are accessible through an opening at the side (M67-1F) or after removing the bottom cover (M67-4F), respectively.

At low frequencies the density of possible values is higher than at the upper end. The table below shows the binary codes with corresponding -3 dB cut-off frequencies. A complete listing of all possible codes is not useful because of the filter tolerances. If more accuracy is required intermediate frequencies should be determined individually.

| Position of DIP Switches 1-7 | | | | | | | Binary (OFF=1) | f _{-3dB} |
|------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|-------------------|-------------------|
| 7 (2 ⁶) | 6 (2 ⁵) | 5 (2 ⁴) | 4 (2 ³) | 3 (2 ²) | 2 (2 ¹) | 1 (2 ⁰) | | kHz (-3 dB) |
| ON | ON | ON | ON | ON | ON | ON | 0 | 0.8 |
| ON | ON | ON | OFF | ON | OFF | ON | 10 | 0.9 |
| ON | ON | OFF | ON | ON | OFF | ON | 18 | 1.0 |
| ON | ON | OFF | OFF | ON | ON | ON | 24 | 1.1 |
| ON | ON | OFF | OFF | OFF | ON | OFF | 29 | 1.2 |
| ON | OFF | ON | ON | ON | OFF | ON | 34 | 1.3 |
| ON | OFF | ON | ON | OFF | ON | OFF | 37 | 1.4 |
| ON | OFF | ON | OFF | ON | ON | OFF | 41 | 1.5 |
| ON | OFF | ON | OFF | OFF | ON | ON | 44 | 1.6 |
| ON | OFF | ON | OFF | OFF | OFF | ON | 46 | 1.7 |
| ON | OFF | OFF | ON | ON | ON | OFF | 49 | 1.8 |
| ON | OFF | OFF | ON | ON | OFF | OFF | 51 | 1.9 |
| ON | OFF | OFF | ON | OFF | ON | OFF | 53 | 2.0 |
| ON | OFF | OFF | OFF | OFF | ON | ON | 60 | 2.5 |
| OFF | ON | ON | ON | ON | OFF | OFF | 67 | 3 |
| OFF | ON | OFF | ON | OFF | ON | OFF | 85 | 4 |
| OFF | ON | OFF | OFF | OFF | OFF | OFF | 95 | 5 |
| OFF | OFF | ON | ON | OFF | OFF | ON | 102 | 6 |
| OFF | OFF | ON | OFF | OFF | ON | ON | 108 | 7 |
| OFF | OFF | OFF | ON | ON | ON | ON | 112 | 8 |
| OFF | OFF | OFF | ON | ON | OFF | ON | 114 | 9 |
| OFF | OFF | OFF | ON | OFF | ON | ON | 116 | 10 |
| OFF | OFF | OFF | OFF | ON | ON | ON | 120 | 12 |
| OFF | OFF | OFF | OFF | ON | OFF | OFF | 123 | 14 |
| OFF | OFF | OFF | OFF | OFF | ON | ON | 124 | 16 |
| OFF | OFF | OFF | OFF | OFF | OFF | ON | 126 | 18 |
| OFF | OFF | OFF | OFF | OFF | OFF | OFF | 127 | 20 |

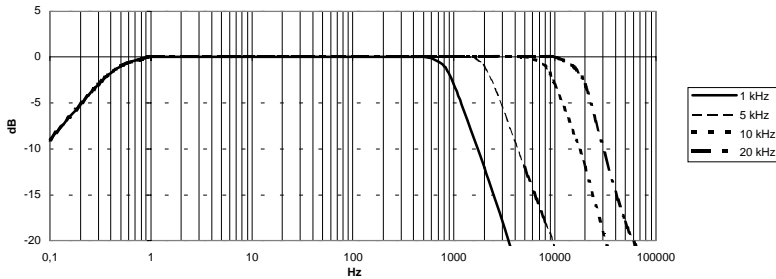


Figure 1: Amplitude response with different low-pass frequencies

4. Technical Data

| | |
|----------------------------------|--|
| Charge input | source capacitance 1nF, UNF 10-32 socket |
| Voltage input | $R_i > 10 \text{ M}\Omega$ with constant current supply, BNC socket |
| Input overload protection | >500V, Voltage input with activated current source cuts off above 22 V |
| Charge gain ranges | 1 / 10 / 100 / 1000 mV/pC $\pm 2\%$ selectable with DIP switches |
| Voltage gain ranges | 0 / 20 / 40 / 60 dB $\pm 2\%$ selectable with DIP switches |
| Frequency range | 0.3 .. 20 000 Hz (-3dB) |

| | |
|--|---|
| Low-pass | 0.8 .. 20 kHz, -40 dB / Decade, selectable with DIP switches in 128 steps |
| Low-pass frequency tolerance of nominal value | < 15 % |
| Intrinsic noise | |
| charge mode | $<10^{-2}$ pC with 1 nF at input, 1000 mV/pC and L.P. 10kHz |
| voltage mode | <8 μ V at 60 dB and low-pass 10 kHz |
| Constant current supply | 3.8 .. 5.6 mA / > 18 V, with LED indicator |
| Output | ± 7 V via 560 Ω / 10 μ F, BNC socket |
| Overload indicator | LED, at 80 % of full-scale output |
| Power supply | external DC source 9 .. 18V, <140 mA (M67-1F) / <300 mA (M67-4F), DIN circular power connector (5.5 / 2.1 mm), positive terminal at inner contact |
| Operating temperature range | -10 .. 55 $^{\circ}$ C |
| Dimensions | 160 x 85 x 35 mm ³ (M67-1F) 105 x 85 x 140 mm ³ (M67-4F) |
| Accessories | mains plug adapter 230 V / 0.5 A, wall mounting set for M67-1F(optional) |

Limited Warranty

Metra warrants during a period of
12 months
that its products will be free from defects in material or
workmanship and shall conform to the specifications
current at the time of shipment.

The warranty period starts with the date of purchase.
Customer has to provide the dated bill of sale as evidence.

The warranty period ends after 12 months.

Repairs do not extend the warranty period.

This limited warranty covers only defects which arise as a result
from normal use according to the instruction manual.

Metra's responsibility under this warranty does not apply to any
improper or inadequate maintenance or modification and
operation outside the product's specifications.

Shipment to Metra has to be paid by the customer.
The repaired or replaced product will be sent back
at Metra's expense.



Declaration of Conformity

Products: Signal Conditioners
Models: M67-1F
M67-4F

The products mentioned above relate
with the following standards:

- EN 50081
- EN 50082

Responsible for the manufacturer

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Meissner Str. 58
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Manfred Weber
Radebeul, September 3, 1997