5. Getting started

5.1. First time operation

The series 1109E peakmeter have been designed for built-in mounting in mixing consoles, control room panels etc. However, if stand-alone operation is required an optional case is available.

5.2. Connections

5.2.1. Connecting 1109E

A feature of the series 1109E peakmeter is the 32-pin connector according DIN standard 41612/C. Row A is wired as follows:

Pin:	Function:
1	Input left or upper display (+ or hot)
3	Input left or upper display (- or cold)
5	external function selection: integration time 10 msec or 1 msec
7	Input right or upper display (+ or hot)
9	Input right or upper display (- or cold)
13	external function selection: Gain +20 dB
15	external function selection: memory reset
17	external function selection: memory
19	common potential for external switches
21	external function selection: additional scale marks
22	frame
24	-15 V for symmetrical power supply
26	center (0 V)
28	+15 V for symmetrical power supply
30	0 V for single voltage supply
32	+24 V for single voltage supply

5.3. Safety symbols

The following symbols may be marked on the panels or covers of equipment or modules, and are used in this manual:



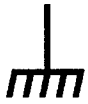
WARNING! - This symbols alerts you to a potentially hazardous condition, such as the presence of dangerous voltage that could pose a risk of electrical shock. Refer to the accompanying Warning Label or Tag, and exercise extreme caution.



ATTENTION! - This symbols allerts you to important operating considerations or a potential operating condition that could damage equipment. If you see this marked on equipment, consult the User´s manual or Operator manual for precautionary instructions.



FUNCTIONAL EARTH TERMINAL - This symbol marks a terminal that is electrically connected to a reference point and is intended to be earthed for any functional purpose other than safety.



PROTECTIVE EARTH TERMINAL - This symbol marks a terminal that is bonded to conductive parts of the instrument. Confirm that this terminal is connected to an external protective earthing system.

5.4. Safety information

Please read this safety information before using the instrument:

Do not service or repair this product unless properly qualified. Servicing should be peformed only by a qualified technician.



There are no user servicable parts inside the unit. Do not open the case while the unit is connected to power. High voltage exists inside the instrument.

The device has been designed for indoor use only.

Do not substitute parts or make any modifications without the written approval of RTW. Doing so may create safety and EMI hazards.

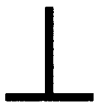
5.5. Connecting to a power supply



The peak meter can either be powered with a 24 V single voltage supply or a ±15 V symmetrical power supply. Please observe the wiring of the pins for the different modes of powering:

a) The conventional 24 V DC supply voltage is applied to pin 30 (negative) and pin 32 (positive).
b) Symmetrical DC supply is via pin 24 (-15 V), 26 (0 V) and pin 28 (-15 V). Maximum permissible voltage: ±18 V.

5.6. Audio input



The analog inputs are balanced and floating. Channel 1 is fed into pins 1 and 3, channel 2 into pins 7 and 9. We recommend that the screen of the AF line should only be connected at the source end. Pin 22 is connected to the casing and may be used for connection to the central mixer ground or the mixer cabinet.

5.7. External function control



External function control can be achieved by the use of pushbuttons or switches. Peakmeter of the series 1109E should use the switching potential (0 V) at pin 19a.

You can also connect the equivalent switching inputs of multiple RTW peakmeters of same kind to single lines so that only one switch per function is required for multichannel display.

5.8. Mode switches and LED functions

- GAIN KEY - The use of this pushbutton or its equivalent external function control boosts the input sensitivity by +20 dB The use of his function is stored as a flag in memory.
- GAIN LED - Indicates the use of the gain function. Recalling the memory this LED will also indicate a possible use of the gain function since the last memory reset.



- MEMO-KEY - The use of this pushbutton or its equivalent external function recalls the highest level value, the most negative correlation reading and a possible use of the gain mode since the last time a memory reset has been proceeded. Please keep attention to the fact that memory accuracy can be affected by interferenced signals (ESD- or Burst). This may cause misreadings from the memory or meter if you are using the instrument in an interferenced environment. A specific measurement of maximum level should be repeated if interference is suspected.



- RESET-KEY- The use of this pushbutton or its equivalent external function resets the memory.

6. Construction and description of operation

6.1. General

The RTW peak meter 1109E uses a gas plasma bar graph display. The entire electronics including the display is housed in a metal casing measuring 190 x 40 x 107 mm. The display unit with its front frame, scale and keyboard is a plug-in module. It follows a description of the different electrical function groups.

6.1.1. Power Supply

The unit may be powered by supply voltages between 21 V and 36 V DC. The voltage is fed through a decoupling diode to a regulator IC315. Input voltages higher than 26 volt are fixed to a value of about 24 volts. An active filter circuit stops interference pulses generated inside the unit from entering the power supply circuitry.

The regulator IC316 delivers the positive supply voltage to the analog ICs. IC317 generates the internal ground. The difference voltage between this potential and the negative input voltage pol is the negative op amp supply voltage. A 5 volt fix regulator, IC318, finaly stabilizes the supply voltage for the HCMOS logic ICs.

6.1.2. Input amplifiers, Filters, Full-Wave Rectifier

The audio signals enter the operating amplifiers IC101 (IC201) via the input transformers. Potentiometer P3 and P4 control the input sensitivity (level control). On pushing the „+20 dB" button the gain increased by exactly 20 dB. Signals down to -70 dB can then be measured. In the subsequent low-pass filter consisting of an active part IC102 (IC202) as well as passive R-C circuit the frequency response is restricted according to IRT recommendation 3/6 (roll-off above 20 kHz: 12 dB/octave). The signals then enter the full-wave rectifier stages IC103 (IC203) with subsequent first integrating stages. These consist of C113 (C213) together with a switching stage T102 (T202). In PCM mode the fast input pulses are stored in C113 (C213).

A buffer stage IC104 (IC204) decouples the signal voltage from the first integration stage and feeds it to the second integration stage. The capacitor C114 (C214) is then charged via the resistor R119 (R219). A second switching stage changes the time constant by reducing the loading resistance in the PCM mode. The charge on the capacitor C114 (C214) depends on the level of the rectified audio signal and the selected integration time. In normal operating the integration time is 10 msec., in PCM mode 1 msec. An LED indicator on the display panel shows when the meter is in the PCM mode. The fall back time of the luminous bar is determined by the discharge time ofthe capacitor C114 C214). The potentiometer P5 (P6) is used to ad-

just this discharge time and hence fall back time down as far as the -20 dB mark on the scale. Governing the fall back time from -20 dB to -40 dB is a constant current circuit adjusted by the potentiometer P7 (P9). If these potentiometers are set correctly, the fall back characteristics comply with the values given in standards (DIN 45406/IEC publication 268-10/IRT specification 3/6).

6.1.3. Saw Tooth and Pulse Duration Modulation

For driving the display a sequence of 300 single pulses, a reset pulse and a square wave the width of which is modulated by the audio signal is required. The master clock generator IC301 generates pulses 16 µsec wide which drive a 12-bit binary counter. Its output address two CMOS-EPROMs (1C303, IC304). The data stored here is used for generating „RAMP"-data and control pulses. The data for the generation of „RAMP"-signals is available in 12-bit format. The composition of the data is such that the „RAMP"-pulses from the D/A converter correspond to the scale graduation. This „RAMP"-voltage is compared with the rectified audio signals in subsequent comparators. At the comparator outputs appear square wave pulses with pulse width dependent on the audio input voltage and the instantaneous „RAMP"-voltage. The shape of the „RAMP"- voltage therefore determines the scale graduation of the meter. The amplitude of the „RAMP"-voltage is 2.5 Vpp. Offset errors of the rectifiers, „RAMP"- generator and comparators are compensated by feeding a DC voltage of opposing polarity, proportional to the errors, into the inverting comparator inputs.

This offset compensation is adjusted by means of potentiometers P1 and P2. Further data from the EPROMs is used to increase the pulse width to 100 µs for displaying the brighter scale marks and highlighting the overload range. Greater pulse width means longer „ON"-time and brighter segments. Via an external switching contact the scale graduation can be altered for measuring purposes by changing the EPROM addresses. This new scale graduation has brighter segments from -10 dB to the end of the overload range in 1 dB intervals.

The reset pulse resets the display as well as the counter 1C. The frequency of the display cycle (time from first clock pulse to end of reset pulse) is 70 Hz; measuring scale graduation, 95 Hz.

6.1.4. Display Driver and High Voltage Supply



The display driver board contains the display driver stages and the high voltage power supply. In IC403 the clock pulses are turned into a 6-stroke signal. This signal drives the cathodes of the display via a driver IC404.

In order that an individual display segment can strike and light up, voltage must be applied to the anode and the appropriate cathode (cathodes 1 , 2, 3, 4, 5 or 6). Also, the individual segments only strike when they have been pre-ionized by the precceeding segment. The luminous band is built up by the six-phase driving of the cathodes as long as the anodes remain switched on.

In order that the luminous band can give a reading on the scale, the anode and thus the luminous band must be switched off the duration of the pulse, a width-modulated square wave. The width of this pulse is proportional to the audio input voltage. The anoder driver transistors T412/T413 are switched by this square wave.

A high voltage is necessary for striking the luminous segments - approx. 250 V. A multivibrator (T401 - T406) generates a quare wave with a frequency of approximately 10 kHz the voltage of which is multiplied to approximately 210 V (open circuit) or 220 V (full load). The subsequent stage stabilizes this down to the operating voltage of the display.

CAUTION

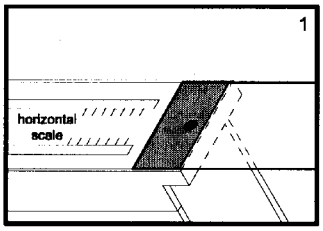
While servicing please note that some components carry high voltages. Wrong connections may lead to the immediate destruction of the voltage sensitive CMOS components.

6.1.5. Memory

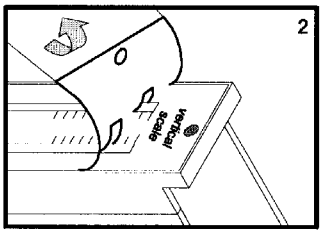
Maximum levels are stored in the memory section. A master counter (IC307) delivers clock pulses to one slave counter per channel (IC308, IC309). The slave counter only registers when the number of illuminated segments exceeds that of a previous cycle. The slave count consequently corresponds to the maximum level. IC314 converts the counts into a pulse with a width that is proportional to the number of counted clock pulses. The stored maximum value represented by this pulse can be displayed, as already explained above. The slave counter can be reset using either the built-in reset button or an external switching contact. On releasing the reset button storage is resumed.

6.2. Sandwichscale and scale change

The unit is delivered with a visible horizontal scale and a vertical scale which is mounted underneath. For vertical mounting direction remove the upper horizontal scale by using the added 'liftoff strip'.
You can also use a normal selfadhesive tape:



Press the selfadhesive tape onto the right end (correlator side) of the horizontal scale (fig 1).



Pull back the tape in direction of the arrow (fig 2). The vertical scale can be seen now; the unit is ready to be installed.

Do not pull upwards ! Do not use force !

6.3. Calibration



Important: This description is not intended to be used as a service manual. These are guidelines for an expierenced service engineer to proceed a basic calibration of our meter. However, we strongly recommend repair of faulty meters in our factory.

Please refer to the safety instruction before continuing.

The peak meter 1109E maintains a constant accuracy. The zero setting, integration time and fall back characteristics will remain the same for years. If a readjustment is necessary, the following procedures have to be carried out.

1. Open the upper meter cover. Store screws and metal plate.
2. Supply power and signal to the unit.
3. 0 dB adjustment:
   Apply a 1 kHz sine wave at the desired reference level (usually 1.55 V/ +6 dBu) and adjust the potentiometers P3 and P4 so that both display columns show 0 dB.
4. Zero setting:
   With no signal applied and the input terminated adjust potentiometers PI and P2 so that the first three segments light up. Major adjustments in the zero setting may mean that the 0 dB adjustment will have to be repeated (repeat „3").
5. Checking scale graduation:
   For checking scale calibration apply the reference level to the input via an attenuator working in 10 dB steps. Scale calibration in the entire measuring range is determined by the data contained in the EPROMS. Readjust mentor correction of this calibration is not foreseen. Adjustment between -40 dB and -50 dB can be made by changing the zero setting (P1, P2). Step „3" should be repeated. To check the „RAMP"-voltage apply an oscilloscope to pin 1 of IC305. The displayed voltage should amount to 2.5 Vpp.
6. Fall back adjustment:
   After removing a level of 1 kHz/0 dB the display reading should drop to -20 dB within 1.5 seconds. Adjust potentiometer P5 and P6 if necessary. Reading should drop from 0 dB to -40 dB within 2.5 seconds. Use potentiometers P7 and P8. These adjustments should be carried out alternately until the above times have been met exactly. Repeat 0 dB calibration as described in „3".
7. Response time:
   Checking of the response time will only be necessary if components have been replaced which determine time constants. This only applies to the IC 103 (IC 203) / IC 104 (IC 204) and the R-C circuits C 113, R 119 / R 121 / C 114 or C 219, R 219 / R 221 / C 214. For checking or matching these R-C circuits an appropriate pulse generator is required.



8. Rules for measuring the response characteristic given in IRT specification 3/6 dated 1.77.

1.1. Full-wave level	3.5 dB above reference level of peak meter
1.2. Frequency	5 kHz
1.3. Pulse duration	3 ms
1.4. Pulse spacing	2 s
1.5. Pattern	pos. or neg. half-waves (half-wave rejection min. 50:1)
1.6 Meter reading	-3.0 dB (mean value from readings taken for both polarities as per 1.7.)
1.7. Polarity error	smaller 0.6 dB (according 1.6. readings for both polarities should be between -2.7 dB and -3.3 dB)

Several pulses of positive and negative half-waves must be applied to obtain accurate measurements.

2. Pulses for measuring response characteristic as per DIN 45406 and IEC 268-10

2.1. Full-wave level	0 dB	
2.2. Frequency	5 kHz	
2.3. Pulse duration	10 ms, 5 ms, 3 ms, 0.4 ms	
3.4. Pulse spacing	2.5 s	
2.5. Pulse duration	Rated value	Tolerance
10 ms	- 1 dB	± 0.5 dB
5 ms	-2 dB	± 1 dB
3 ms	-4 dB	± 1 dB
0.4 ms	-15 dB	±4 dB



If readings higher than those permitted by the tolerance range are displayed then the charging resistor determining the time constant of the R-C circuit has to be increased (e.g. to 30 Ω). If the readings obtained are less than those permitted, then the resistance should be reduced (e.g. down to 24 Ω). Use only metal film resistors.

3. Pulses for measuring the response characteristic PCM-mode 1 ms
Switch peak meter to PCM-mode by ext. button.

3.1. Full-wave level	0 dB
3.2. Frequency	5 kHz
3.3. Pulse duration	1 ms
3.4. Pulse spacing	2.5 s
3.5. Meter reading	-1.0 dB
3.6. Polarity error	±0.5 dB

If readings higher than those permitted by the tolerance range are displayed then the charging resistor determining the time constant of the R-C circuit has to be increased (e.g. to 33 Ω). If the readings obtained are less than those permitted, then the resistance should be reduced (e.g. down to 24 Ω). Use only metal film resistors.

4. Pulses for the response characteristic PCM-mode 0.1 ms.
Switch peak meter to PCM-mode by ext. button.

4.1. Full-wave level	0 dB
4.2. Frequency	5 kHz
4.3. Pulse duration	0.1 ms
4.4. Pulse spacing	2.5 s
4.5. Meter reading	-1.0 dB
4.6. Polarity error	±0.5 dB

If readings higher than those permitted by the tolerance range are displayed then the charging resistor determining the time constant of the R-C circuit has to be increased (e.g. to 2.4 Ω). If the readings obtained are less than those permitted, then the resistance should be reduced (e.g. down to 2.0 Ω). Use only metal film resistors.

9. References other than 1.55 V:
If the meter is to be used in installations with reference levels other than that set in the factory, then the following modifications are recommended:

9.1. For level ranges from +2 dBu to +10 dBu:
Adjust potentiometers P3 and P4.

9.2. For level ranges from +10 dBu to +18 dBu:
The attenuation must be increased so as not to impair the overload capacity of the meter. This can be done by inserting resistors R103 and R203, 2,2 K each as voltage dividers. For fine adjustment use potentiometers P3 and P4. The maximum input level is then raised to +30 dBu.

