VII. INTERNAL CHECKS AND ADJUSTMENTS

The tolerances mentioned in the following text apply to newly adjusted instruments only. The value may differ from those given in Chapter II Technical data.

Note: Always check the d.c. supply voltages before any adjustments are made.

1. Use figure X-2 to identify the location of trimmers and check points.

2. Test equipment

Check point	*Instrument*	*Required data*	*Recommended model*
3	Voltmeter	5—150 V d.c.	Philips PM 2412
4 6	Voltmeter	1 V d.c.	Philips PM 2412
5 8	Pulsegenerator	Frequency 10 kHz Amplitude 1 V Duty factor 0.5	Philips PM 5715 or PM 5705
5 8	Oscilloscope	Low frequency	Philips PM 3250
5 8	Probe	Passive 10 MΩ/11 pF	Philips PM 9336

3. D.C. voltages

3.1 Connect the voltmeter to jumper connector BU 104 and check the d.c. voltages according to table below.

Test point	*Measured voltage*
+120	115 . . . 130 V
+5.2	4.8 . . . 5.2 V
+12	11.5 . . . 13 V
—5.2	—5 . . . —5.4 V
—50	—50 . . . —60 V

4. D.C. balance channel A.

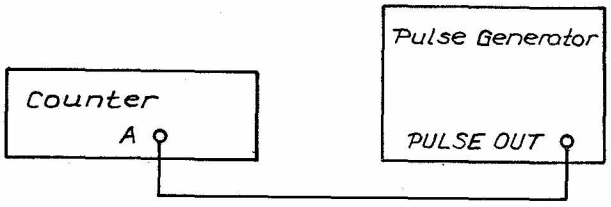
4.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg. level pot.	pulled

4.2 Connect the voltmeter to terminal 6 of IC 101 and adjust R 1104 until voltmeter shows 0 V.

5. Frequency compensation channel A

Test set up.



5.1 Set the controls of the counter:

Attenuator	200 mV position

5.2 Set the controls of the pulse generator:

Frequency	10 kHz
Amplitude	3 V_{p-p}
Duty factor	0.5

5.3 Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 6 of IC 101 and adjust C 102 to minimum distortion of the dispayed waveform.

6. D.C. balance channel B

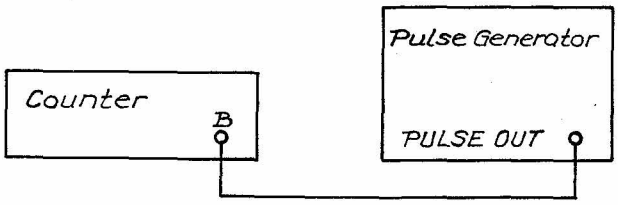
6.1 Disconnect all input signals, release all push-buttons and set the controls of the counter:

Start/Stop	upper position
Trigg.level pot.	pulled.

6.2 Connect the voltmeter to terminal 12 of IC 101 and adjust R 1044 until voltmeter shows zero.

7. Frequency compensation channel B

Test set up.



7.1 Set the controls of the counter:

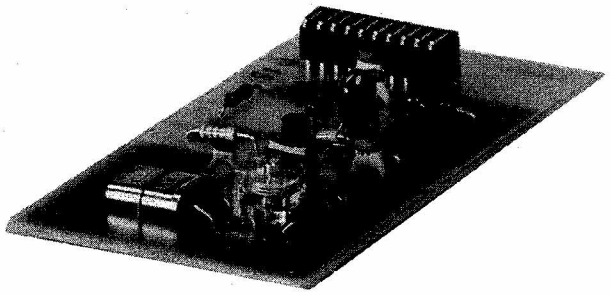
Attenuator	200 mV position

7.2 Set the controls of the pulse generator:

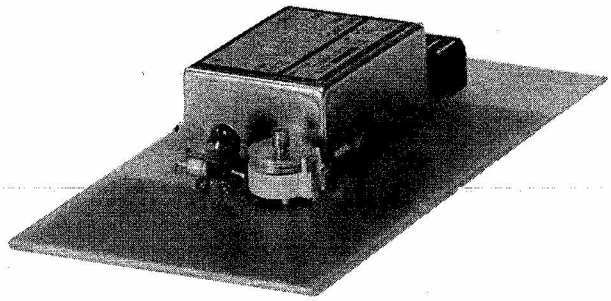
Frequency	10 kHz
Amplitude	3 V_{p-p}
Duty factor	0.5

7.3 Connect the oscilloscope via a well adjusted 10 MΩ/11 pF probe to terminal 12 of IC 101 and adjust C 112 to minimum distortion of the displayed wave form.

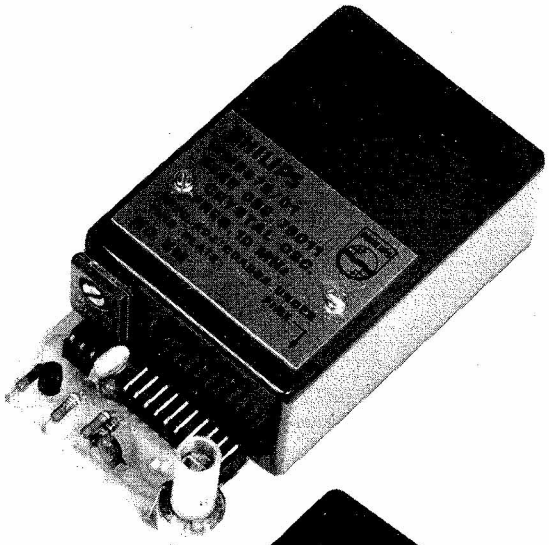
VIII. OSCILLATORS PM 9677, PM 9678, PM 9679 and PM 9690



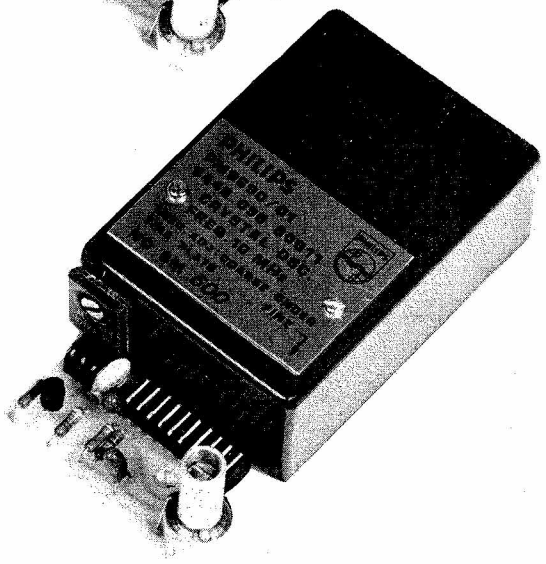
PM 9677
9446 096 770.1



PM 9678
9446 096 780.1



PM 9679
9446 096 790.1



PM 9690
9446 096 900.1

1. General

The oscillators are made as plug-in cards and have a nominal frequency of 10 MHz.

2. Technical data

2.1. Electrical	*PM 9677*	*PM 9678*	*PM 9679*	*PM 9690*
Nominal frequency, MHz	10.000 000	10.000 000	10.000 000	10.000 000
Trimming range, Hz	> ± 200	> ± 20	+20*) —30	+3*) —7
Output voltage, mV (into 1 kohm)	> 300	> 100	> 150	> 50
Supply voltage, V	+ 12	+ 12	+ 11.5 to 28 (from unregulated power supply)	+ 11.5 to 28 (from unregulated power supply)
Power consumption (+25°C)				
Continuous operation	< 100 mW	< 200 mW	< 100 mA	< 125 mA
Stand by	none	none	< 100 mA	< 125 mA
Warm up	none	none	< 400 mA	< 400 mA
Stability against:				
Ageing	$< 5\times10^{-7}$/month	$< 1\times10^{-7}$/month**)	$< 1\times10^{-7}$/month	$< 1.5\times10^{-9}$/24 h (after 72 hours of continuous operation)
Temperature 0...50°C (ref. to +25°C)	$< 1\times10^{-5}$	$< 1\times10^{-6}$	$< 1\times10^{-7}$	$< 3\times10^{-8}$
Line voltage ± 10 %	$< 1\times10^{-8}$	$< 1\times10^{-9}$	$< 1\times10^{-9}$	$< 5\times10^{-10}$
Change of measuring mode and change between line, ext. and int. battery	$< 3\times10^{-7}$	$< 5\times10^{-8}$	$< 1\times10^{-8}$	$<3\times10^{-9}$
Warm up time (to reach 1×10^{-7})			< 10 min	< 15 min

2.2. Environmental				
Temperature				
Storage, °C	—40 to +70	—40 to +70	—40 to +70	—40 to +70
Operating, °C	0 to +50	0 to +50	0 to +50	0 to +50
Altitude				
Storage, m	15000	15000	15000	15000
Operating, m	5000	5000	5000	5000
Humidity at 50°C	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % RH (26° dew point)	10—90 % (26° dew point)
Shock	Meets the requirement of the IEC Eb recommendations } all oscillators			
Vibration	Meets the requirement of the IEC 68F recommendations } all oscillators			

2.3. Mechanical				
Dimensions, mm	93×50×20	93×50×15	100×52×35	100×52×35
Weight, g	50	25	100	100

*) The indicated values regard only the fine trimming range. A coarse trimmer is available on the PM 9679 and PM 9690 to adjust for an ageing of more than 10 years.

**) Trimming range will cover at least 10 years of operation since the ageing will decrease substantially after the first 6 months.

3. Frequency adjustment PM 9677

3.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-6}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25°C.
3.2. Remove the bottom cover of the counter.
3.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
3.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL A: pulled
3.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 10 Hz.

4. Frequency adjustment PM 9678

4.1. This adjustment requires a reference oscillator having an accuracy of $\leq 1 \times 10^{-7}$.
The oven enclosed PHILIPS oscillator PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of +25°C.
4.2. Remove the bottom cover of the counter.
4.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to INPUT A of the counter to be adjusted.
4.4. Set the controls of the counter to be adjusted:
FUNCTION SELECTOR: FREQUENCY A 1 Hz
TRIGGER LEVEL: pulled
4.5. Adjust trimming capacitor C 1 to 10000.000 kHz plus or minus 1 Hz.
4.6. Set FUNCTION SELECTOR to position 0.1 Hz and check that display read out is the same as before. If not, adjust C1 slightly to correct frequency.

5. Frequency adjustment PM 9679

5.1. This adjustment requires a reference oscillator having an accuracy of $\leq 3 \times 10^{-8}$.
The oven enclosed PHILIPS oscillators PM 9680*, PM 9681* and PM 9690* meet this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
5.2. Remove the bottom cover of the counter.
5.3. Connect the reference signal available at socket 10 MHz OUT of the external counter to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
5.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
5.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div./3 s (0.3 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 5.6 to 5.12.
5.6. Set trimming potentiometer R 208 to fully clockwise position.
5.7. Remove the two screws fixing the oscillator's text plate to the box.
5.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
5.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
5.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000020 Hz.
5.11. Refit the plastic cylinder and the text plate.
5.12. Perform steps 5.3 to 5.5.

6. Frequency adjustment PM 9690

6.1. This adjustment requires a reference frequency having an accuracy of $\leq 1 \times 10^{-9}$.
Hewlett-Packard quartz frequency standard HP 105* meets this requirement.
The adjustment should preferably be made at an ambient temperature of 25°C and the oscillator must have been operating continuously 72 h before any adjustment is made.
6.2. Remove the bottom cover of the counter.
6.3. Connect any of the three reference signals available at sockets 5 MHz, 1 MHz and 100 kHz of the HP 105 to socket EXT. TRIGG of oscilloscope PHILIPS PM 3250 or PM 3400.
6.4. Connect the oscillator signal available at socket 10 MHz OUT of the counter to be adjusted to INPUT A of the oscilloscope.
6.5. Set oscilloscope to 100 ns/div and adjust trimming potentiometer R 208 until waveform moves with a velocity of maximum 1 div/10 s (0.1 Hz).
If the adjustment range of R 208 is too narrow perform the following steps 6.6 to 6.12.
6.6. Set trimming potentiometer R 208 to fully clockwise position.
6.7. Remove the two screws fixing the oscillator's text plate to the box.
6.8. Remove the small plastic cylinder beneath the text plate using a pair of tweezers.
6.9. Connect an external counter to socket 10 MHz OUT at the rear panel of the counter to be adjusted.
6.10. Adjust trimming capacitor C 108 until the display read out of the external counter is 10000003 Hz.
6.11. Refit the plastic cylinder and the text plate.
6.12. Perform steps 6.3 to 6.5.

7. Repair of oscillator PM 9679 and PM 9690

7.1. Repair of these oscillators may not be carried out by the local service organisations. In case of breakdown the complete sealed osclllator box has to be sent to the factory for repair.

Factory address:

PHILIPS ELEKTRONIKINDUSTRIER AB
INDUSTRIAL OPERATIONS
FACK
S-175 20 JÄRFÄLLA
SWEDEN

8. Pin configuration

Pin	*PM 9677*	*PM 9678*	*PM 9679*	*PM 9690*
1	⊥	⊥	⊥	⊥
2	⊥	⊥	⊥	⊥
3	⊥	⊥	⊥	⊥
4			+ 11.5 to 28 V	+11.5 to 28V
5	10 MHz out	10 MHz out	10 MHz out	10 MHz out
7	+ 12 V	+ 12 V		

*To be checked against a frequency standard such as Droitwich or HBG.