

TUNER 4707PH5

3X 7612

TARGET - SPECIFICATION ELECTRICAL DATA (PRELIMINARY)

1. Description

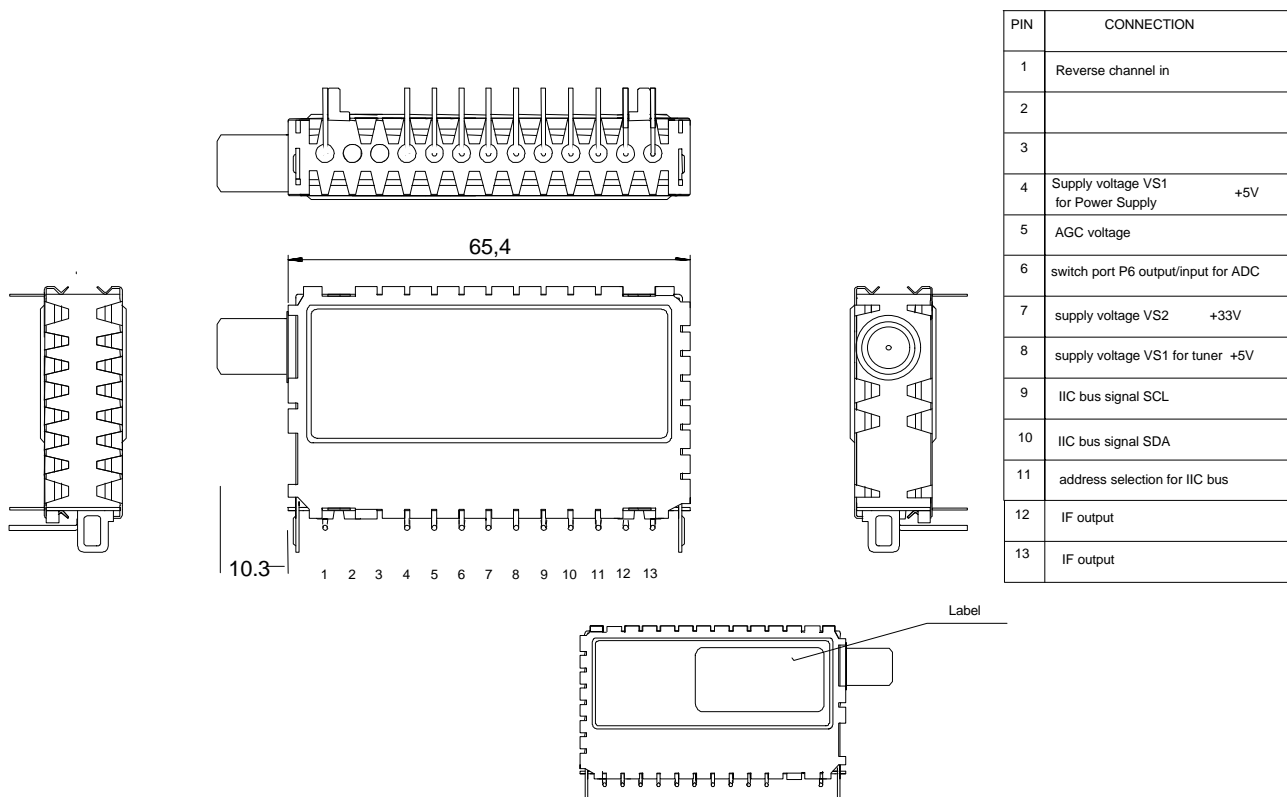
The tuner 4707 PH5 is specially designed for subscriber side cable modem applications. It covers a frequency range from 50 to 860 MHz with a channel bandwidth of 8 MHz for the downstream signals, and a frequency range of 5 to 42 MHz for the upstream signals. The receiver uses a single conversion approach with the reception frequency range divided into VHF low, VHF high and UHF. Band selection and tuning is done via I²C-bus.

A balanced IF output is available with a center frequency of 36.125 MHz. The IF outputs are designed to interface directly with a standard SAW filter.

An AGC control input allows for external control of the output signal amplitude.

The common antenna input/output is realized by an Phono-Connector.

A digital AFC-function can also be realized, because the AFC-voltage generated by the IF-Demodulator is fed to a built in analogue/digital converter, available via pin 6 and readable via I²C-bus.



2. Mechanical Characteristics

2.1. Dimensions: connector	according drawing 3X 7054 with Phono-
2.2. Weight:	appr. 41 g
2.3. Plug holding strength:	(Plug according IEC 169-2)
2.4. Tuner connection:	The tuner provides four pins at bottom cover for horizontal mounting and grounding.

3. Functional Characteristics

3. 1. Frequency Range

VHF low	50 MHz ...	148 MHz
VHF high	140 MHz ...	471 MHz
UHF	463 MHz ...	860 MHz

Referred to center frequency of 8 MHz bandwidth:

VHF low	54 MHz ...	144 MHz
VHF high	144 MHz ...	467 MHz
UHF	467 MHz ...	856 MHz

3. 2. Tuning Resolution

The standard tuning increment is 62.5 kHz (see table 7.3).

3. 3. Recommended take over frequencies

VHF low / VHF high	141 MHz
UHF	464 MHz

3.4. IF

Center frequency: 36.125 MHz

Oscillator operates above received frequency.

3.5. Input impedance

VHF/UHF common 50 Ω, unbalanced

3.6. AGC

AGC-Voltage for maximum gain : $U_{AGC} = + 4 V \pm 0.1 V$
 AGC-Current: max. 12 μA
 Limiting voltage : $U_{AGC} = + 6 V$

3.7. Supply voltage

Supply voltage V_{S1} : 5 V \pm 5%, typ. 160 mA, max. 200 mA
 Permissible ripple voltage: max. 20 mVpp, 20 Hz - 100 kHz
 Limiting voltage : $V_{S1} = + 6 V$

Supply voltage V_{S2} : 33V \pm 5%, max. 2 mA
 Permissible ripple voltage: max. 10 mVpp, 20 Hz - 100 kHz
 Limiting voltage : $V_{S2} = + 35 V$

3.8. Temperature

Operating temperature: -10 ... +60 °C
 Storage temperature: -25 ... +60 °C

4. Test conditions

If not otherwise noticed all data are hold under following conditions:

Measurement tolerance: 10 % or 1 dB
 Ambient temperature: + 25 °C \pm 3°
 Supply voltages: + 5 V \pm 2%
 AGC-Voltage: + 4 V \pm 2%

5. Tuner Data

5.1. Voltage Gain

Voltage gain is measured between antenna input and IF1 and IF2.
 For this measurement the input is loaded with 50 Ω , the IF output is loaded with a test circuit according test circuit pages 5, 6.

	min.	typ.	max.	unit
50 MHz to 860 MHz	40			dB

	min.	typ.	max.	unit
5.2. Noise Figure				
VHF low		8.5	10	dB
VHF high		8.5	10	dB
UHF		8.5	10	dB

5.3. VSWR

50 MHz ... 860 MHz			3	
--------------------	--	--	---	--

5.4. AGC-Range

By varying of AGC-voltage from + 4 V to + 0.5 V following gain reduction must be possible:

VHF low	45		dB
VHF high	40		dB
UHF	35		dB

5.4.1. Influence of AGC

By varying voltage gain between nominal gain and 20 dB gain reduction.

50 MHz ... 860 MHz tilt may increase by 1dB

5.5. IF-Rejection

Measured from channel center frequency to 36.125 MHz.

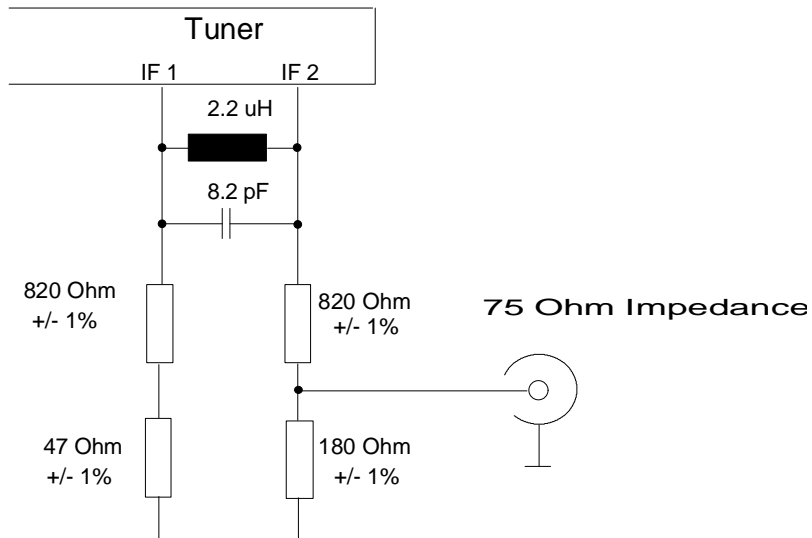
VHF low	50	70	dB
VHF high	60	80	dB
UHF	60	75	dB

5.6. Image-Rejection

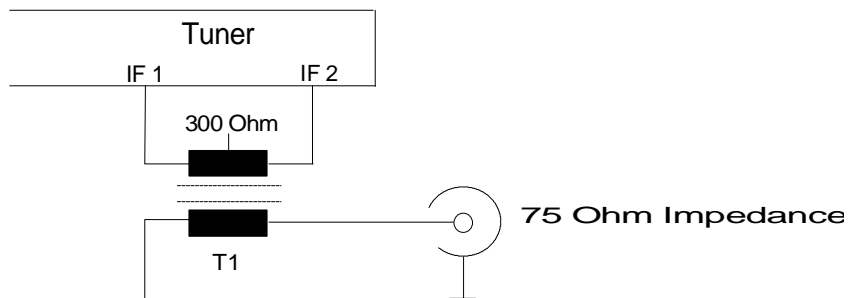
VHF low	60	70	dB
VHF high	55	65	dB
UHF	53	60	dB

5.7. RF Tilt

Over a 8 MHz bandwidth around center frequency		2	3	dB
--	--	---	---	----

Measuring Method
5.8. Test circuit for voltage gain


test circuit attenuation: 30.3 dB

5.9. Test circuit for noise figure


T1 = RF - Transformer

W- Ratio = 1:4

Type: MCL T4-1 or equivalent

Supplier: Industrial Electronics GmbH

Hauptstr. 71-79

65760 Eschborn

Tel.: 06196-48689

	min.	typ.	max.	unit
5.10. Signal level for 1 dB gain compression				
AGC deactivated with AGC = 4 V for max. gain:	70			dB μ V
with AGC = 2 V:	100			dB μ V

5.11. Phase noise

measured at 1 kHz distance from carrier	VHF low	- 71	-55	dBc/Hz
	VHF high	- 60	-55	dBc/Hz
	UHF	- 58	-55	dBc/Hz
measured at 10 kHz distance from carrier	VHF low	- 95	-80	dBc/Hz
	VHF high	- 85	-80	dBc/Hz
	UHF	- 85	-80	dBc/Hz
measured at 20 kHz distance from carrier	VHF low	- 102	-90	dBc/Hz
	VHF high	- 92	-85	dBc/Hz
	UHF	- 90	-85	dBc/Hz
measured at 100 kHz distance from carrier	VHF low	- 109	-100	dBc/Hz
	VHF high	- 106	-100	dBc/Hz
	UHF	- 103	-100	dBc/Hz

5.12. Oscillator voltage at aerial terminal and RF output

< 88 MHz	no oscillator signal
< 860 MHz	5 dB μ V
< 1740 MHz	40 dB μ V

5.13. Intermodulation

With a fully loaded multi-tone signal generator, with carrier levels at + 15 dBmV, and with AGC set for a 15 dB reduction in gain, distortion levels shall not exceed the following limits.

Composite triple beat	50	dB
Composite second order beat	50	dB

	min.	typ.	max.	unit
--	------	------	------	------

5.14. Group delay

Over any 8 MHz bandwidth centered about the tuned frequency the group delay variation as measured between the antenna terminal and the IF output terminal shall not exceed the following limits.

VHF low	70	100	ns	p-p
VHF high	40	100	ns	p-p
UHF	30	100	ns	p-p

5.15. PLL Settling Time:

		100		ms
--	--	-----	--	----

6. Reverse Channel Input (Pin 1)

6.1. Insertion loss from Pin 1 to Antenna Terminal input (antenna input terminated with 50 Ω)

Frequency range : 5 MHz 42 MHz		1	2.5	dB
Frequency range : 50 MHz< 54 MHz	25			dB
Frequency range : 54 MHz 864 MHz	30			dB

6.2. Antenna input to tuner part input (antenna input terminated with 50 Ω)

Frequency range : 50 MHz< 54 MHz	25			dB
Frequency range : 121 MHz 864 MHz	30			dB

6.3 Diplexer channel input VSWR (Pin 1)

Frequency range : 5 MHz ... 42 MHz		1.5	2	
------------------------------------	--	-----	---	--

6.4 Diplexer Group Delay Variation

In any 2 MHz bandwidth within the frequency range of 5 MHz to 42 MHz the group delay variation shall not exceed 60 nsec.

7. I²C bus

7.1. Write data format

	MSB							LSB	
Address byte	1	1	0	0	0	MA1	MA0	R/W	A
Divider byte 1	0	n14	n13	n12	n11	n10	n9	n8	A
Divider byte 2	n7	n6	n5	n4	n3	n2	n1	n0	A
Control byte 1	1	CP	T2	T1	T0	RSA	RSB	OS	A
Control byte 2	P7	P6	P5	P4	P3	P2	P1	P0	A

A = Acknowledge

R/W = 0 : write mode

CP = 1 : charge pump current high

7.2. Address selection

MA1	MA0	Address	Voltage at Pin 11
0	0	C0	(0 to 0.1) V _{S1}
0	1	C2	always valid
1	0	C4	(0.4 to 0.6) V _{S1}
1	1	C6	(0.9 to 1) V _{S1}

7.3. Oscillator frequency and divider byte calculation

RSA	RSB	Reference divider	Min. tuning step [kHz]	f _{ref} [kHz]
1	1	512	62.5	7.8125
X	0	640	50.0	6.25
0	1	1024	31.25	3.90625

$$f_{osc} = f_{ref} * 8 * SF$$

f_{osc} : Local oscillator frequency

f_{ref} : Crystal reference frequency / 512 = 4 MHz / 512 = 7.8125 kHz

SF : Programmable scaling factor

Scaling factor

$$SF = 16348 * n_{14} + 8192 * n_{13} + 4096 * n_{12} + 2048 * n_{11} + 1024 * n_{10} + 512 * n_9 + 256 * n_8 + 128 * n_7 + 64 * n_6 + 32 * n_5 + 16 * n_4 + 8 * n_3 + 4 * n_2 + 2 * n_1 + n_0$$

7.4. Control bytes

7.4.1. Control byte 1 settings (default)

	MSB							LSB	
Control byte 1	1	1	0	0	1	1	1	0	A

CP = Charge pump current, 1 = fastest tuning, 0 = better phase noise for distance < 10 kHz to the carrier

T0, T1, T2 = Test mode bit

RSA, RSB = Reference divider see 8.2.2

OS = Tuning voltage, 0 = ON

7.4.2. Control byte 2 (Bandselection):

Band	Active port	P7	P6	P5	P4	P3	P2	P1	P0
UHF	P0	X	0	X	X	0	0	0	1
VHF high	P2	X	0	X	X	0	1	0	0
VHF low	P1	X	0	X	X	0	0	1	0

X = not used

7.5. Read data format

	MSB							LSB	
Address byte	1	1	0	0	0	MA1	MA0	R/W	A
Status byte	POR	FL	I2	I1	I0	A2	A1	A0	A

R/W : 1 = Read mode

POR : Power on reset flag (POR =1 at power on)

FL : In lock flag (FL= 1 when PLL is locked)

I2, I1, I0: Digital levels for I/O ports P7, P5 and P4

A2, A1, A0: Digital output of 5-level ADC for AFC function.
Value for correct tuning: A2 = 0, A1= 1, A0 = 0

MSB is transmitted first.

7.6. A/D converter levels

Voltage applied on port P6	A2	A1	A0
0.6 VS1 to VS1	1	0	0
0.45 VS1 to 0.6 VS1	0	1	1
0.3 VS1 to 0.45 VS1	0	1	0
0.15 VS1 to 0.3 VS1	0	0	1
0 to 0.15 VS1	0	0	0

8. Safety and Reliability

8.1. ESD protection



The tuner contains components that can be damaged by static discharge.

Observe these precautions:

Ground yourself before handling the tuner.

Do not touch the tuner connector pins without ESD protection.

8.2. High Voltage:

The Tuner meets specifications IEC 801.2 level 2

8.3. Humidity:

Local oscillator drift

Test conditions:

VHF Low	± 15 kHz
VHF High	± 45 kHz
UHF	± 75 kHz

1. 60h @ 55°C and 20% RH
2. 1h @ 23°C and 50% RH
3. 1st measurement
4. 65h @ 40°C and 95% RH
5. 2nd measurement

8.4. Vibration Test

After applying vibration of 1.5 mm amplitude, frequency of 10 - 55 - 10 Hz (1 min.) each X, Y, Z direction for 2 hrs (total 6 hrs), tuner shall not have any rattling or loosening and shall comply with the followings to its initial value.

Gain variation	< ± 3 dB
Wave variation	< ± 30 %

8.5. Microphony

Test is made with a TV-set.

Resolution: optimal

With max. AF-output of the TV-set the tuner is free of microphony effects, provided the unit is installed in a professional manner.

8.6. Loose Contact

Test is made with a TV-set.
 Test pattern: Color bar
 Resolution: optimal
 By knocking the TV-set there must be no visible effects,
 provided the unit is installed in a professional manner.

8.7. Loose Contact Test of Tuner alone

Test pattern: Color bar
 Resolution: 3 MHz

Test: Knocking the edge of the tuner, fastened with ground contact, there
 must be no interruption effects.

8.8. National Reglementations

The tuner meets the requirements of VDE 9872/7.72 and Amtsblatt DBP 069/1981 (FTZ), EN 55013,
 EN 55020 (if properly mounted into TV-Set, VCR or Converter).

We reserve the right to make changes to improve technical design without further notice.

TEMIC TELEFUNKEN Hochfrequenztechnik GmbH, Kriegsstr. 1, D - 85098 Großmehring GERMANY

Phone: +49 (0)8407 9270 - 20

Fax: +49 (0)8407 9270 - 24

REV.:	01				
FÄM.- NO.	73 / 99				
DATE	4.8.99				
NAME	Reiß				
SIGNATURE					