

DATA SHEET

FI1216MF MK2

Desktop video tuner
multi system CCIR L/L' and B/G

Preliminary specification
File under BU Tuners, DC03

1996 Jul 09

Desktop video tuner multi system CCIR L/L' and B/G

FI1216MF MK2

FEATURES

- Systems CCIR L/L' and B/G
- True 5 V device (low power dissipation)
- Full frequency range from channel 2 (48.25 MHz) to channel 69 (855.25 MHz)
- PLL controlled tuning
- True-synchronous vision IF demodulator (PLL)
- Demodulated video output, AF sound output, second sound IF output
- I²C-bus control of tuning, address selection, AFC status information
- Complies with European regulations on radiation, signal handling and immunity ("CENELEC 55020, 55013")
- Small horizontally mounted metal housing.



The FI1216MF MK2 consists of a tuner section and an IF section, which are all designed on a single PCB. The front-end is assembled in a metal housing made of a rectangular tin plated steel frame with front and rear covers which have soldered contacts to the frame. A single phono or IEC aerial socket is mounted on one side of the frame. All other connections are made via pins at the bottom.

The tuner section is equipped with 3 tuned RF MOSFET input stages, with a 3-band mixer-oscillator IC, containing the oscillators, mixers and IF amplifier. Tuning and band switching in the tuner section are done with a digital programmable PLL tuning system. This enables tuning with step-size programmable between 31.25, 50.0 or 62.5 kHz. A DC-DC converter is built around the PLL synthesizer IC to provide the tuning voltage, thus making the FI1216MF MK2 front-end a true 5 V device.

The IF section uses a true-synchronous vision IF demodulator (PLL) with an intercarrier SAW filter in front of it. The analog AFC voltage is fed to the 5-level A/D converter in the PLL tuning IC, so that the AFC status can be read via the I²C-bus.

DESCRIPTION

The FI1200MK2 family of front ends are designed to meet a wide range of RF applications in the PC Multi-Media environment.

The FI1216MF MK2 type are available with a single 75 Ω input for TV reception. The input connector is available in either standard phono (female socket) or IEC (female socket).

The tuning and bandswitching are performed through the built-in digitally controlled I²C-bus. All front ends meet the input immunity and radiation requirements of CENELEC.

ORDERING INFORMATION

| TYPE | DESCRIPTION | CATALOGUE NUMBERS |
|---------------------|----------------|-------------------|
| FI1216MF MK2/HM/PH | standard phono | 3139 147 13571 |
| FI1216MF MK2/HM/IEC | IEC | 3139 147 13581 |

MARKING

The following items of information are printed on a sticker that is on the top cover of the tuner:

- Type number
- Code number
- Origin letter of factory
- Change code
- Year and week code.

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INTERMEDIATE FREQUENCIES

| SYSTEM | FREQUENCY ⁽¹⁾ (MHz) | | |
|-----------------|-----------------------------------|-------|---------|
| | L | L' | PAL B/G |
| Picture carrier | 38.90 | 33.95 | 38.90 |
| Colour | 34.47 | 38.38 | 34.47 |
| Sound 1 | 32.40 | 40.45 | 33.40 |
| Sound 2 | – | – | 33.16 |
| NICAM | 33.05 | 39.80 | 33.05 |

Note

1. The oscillator frequency is above the input signal frequency.

CHANNEL COVERAGE

| BAND | CHANNELS |
|-----------|----------------------|
| Low band | 48.25 to 170.00 MHz |
| Mid band | 170.00 to 450.00 MHz |
| High band | 450.00 to 855.25 MHz |

PINNING

| SYMBOL | PIN | DESCRIPTION |
|---------------------------------|-----------------------|--|
| V _T | 11 | tuning voltage (monitor) |
| V _S | 12 | supply voltage tuner section +5 V |
| SCL | 13 | I ² C-bus serial clock |
| SDA | 14 | I ² C-bus serial data |
| AS | 15 | I ² C-bus address select |
| n.c. | 21 | not connected |
| 2 nd IF sound output | 22 | second IF sound output |
| CVBS | 23 | Composite Video Baseband Signal output |
| V _{IF} | 24 | supply voltage IF section +5 V |
| AF sound output | 25 | AF sound output |
| – | TH1, TH2, TH3 and TH4 | mounting tags (ground) |

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BLOCK DIAGRAM

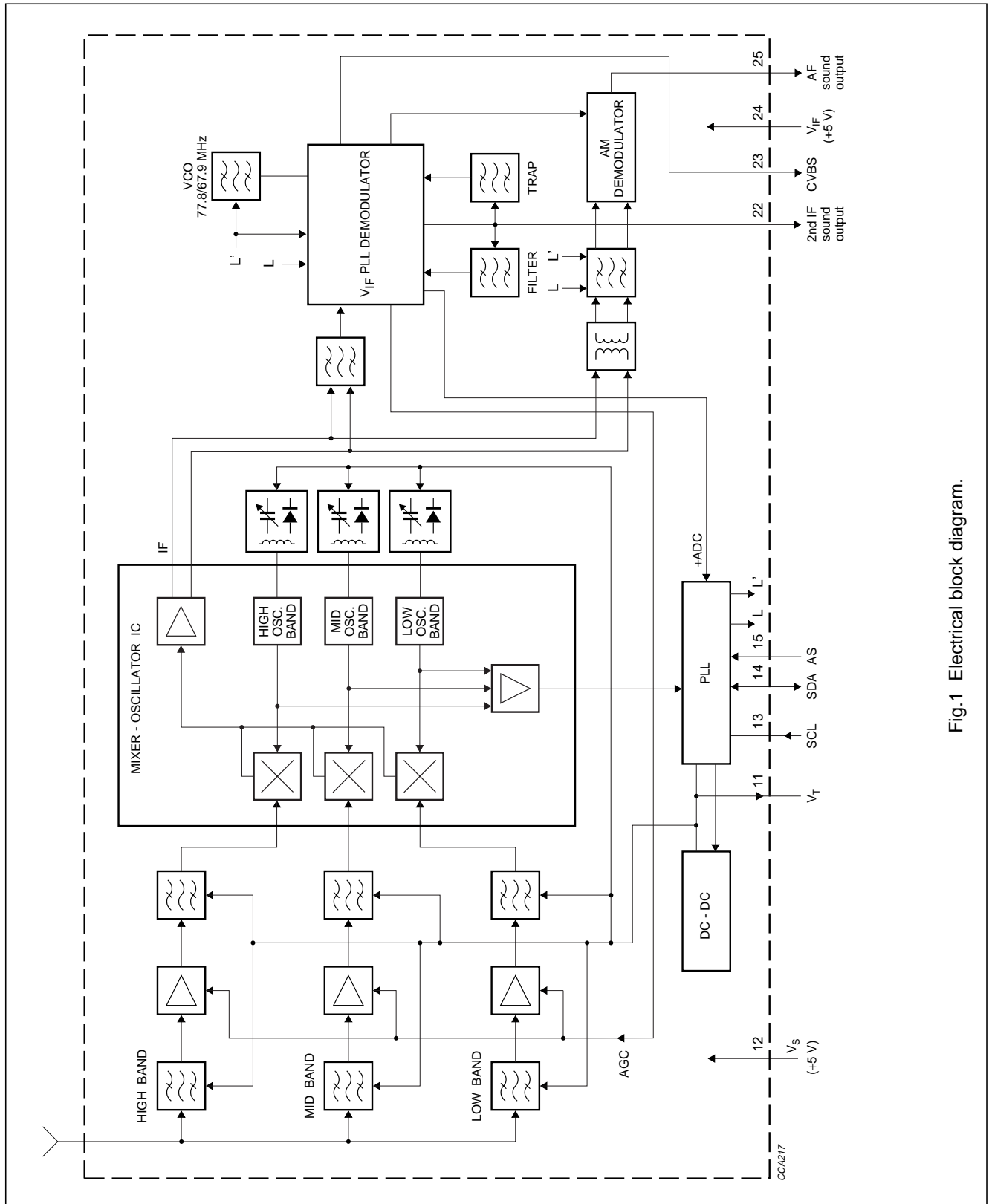


Fig.1 Electrical block diagram.

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LIMITING VALUES

Limiting values under operational conditions

The tuner can be guaranteed to function properly under the following conditions.

| SYMBOL | PARAMETER | PIN | MIN. | TYP. | MAX. | UNIT |
|-------------------------|--|-----|------------|----------|----------|--------------------------|
| V_S | supply voltage | 12 | 4.75 | 5.00 | 5.25 | V |
| $V_{S(\text{ripple})}$ | peak-to-peak ripple voltage susceptibility (at 5 V $\pm 5\%$); note 1 20 Hz to 100 kHz >100 kHz to 500 kHz | | – | – | 20 | mV |
| | | | – | – | 10 | mV |
| I_S | supply current | | – | – | 120 | mA |
| V_{SCL} | SCL bus input voltage | 13 | –0.3 | – | +5.25 | V |
| V_{SDA} | SDA bus input voltage | 14 | –0.3 | – | +5.25 | V |
| I_{SDA} | SDA bus current (open collector) | | –1 | – | +5 | mA |
| V_{AS} | address select voltage; note 2 | 15 | – | – | +5.25 | V |
| Z_{IF} | 2 nd IF sound output load impedance: DC AC | 22 | 0.5 0.5 | – – | – – | k Ω k Ω |
| Z_{CVBS} | Composite Video Baseband Signal load impedance: DC AC | 23 | – – | 75 75 | – – | Ω Ω |
| t_L | load time constant | | – | – | 100 | ns |
| V_{IF} | IF supply voltage | 24 | 4.75 | 5.0 | 5.25 | V |
| $V_{IF(\text{ripple})}$ | peak-to-peak ripple voltage susceptibility (at 5 V $\pm 5\%$); note 1 20 Hz to 100 kHz >100 kHz to 500 kHz | | – – | – – | 20 10 | mV mV |
| I_{IF} | IF supply current | | – | – | 100 | mA |
| Z_{AF} | AF sound output load impedance: DC AC | 25 | 1.0 0.6 | – – | – – | k Ω k Ω |

Notes

1. Sinusoidal ripple voltage superimposed on the 5 V supply voltage in the frequency range of 20 Hz to 500 kHz. Criteria for TV interference >57 dB.
2. For detailed information about the address decoding, refer to Chapter "Application information".

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Environmental conditions

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------------------------------|---------------------|-------------|------|------|------|------------------|
| Non-operational conditions | | | | | | |
| T _{amb} | ambient temperature | | -25 | - | +85 | °C |
| RH | relative humidity | | - | - | 100 | % |
| g _B | bump acceleration | 25 g | - | - | 245 | m/s ² |
| g _S | shock acceleration | 50 g | - | - | 490 | m/s ² |
| | vibration amplitude | 10 to 55 Hz | - | 0.35 | - | mm |
| Operational conditions | | | | | | |
| T _{amb} | ambient temperature | | -10 | - | +60 | °C |
| RH | relative humidity | | - | - | 95 | % |

OVERALL PERFORMANCE**Conditional data**

Unless otherwise specified, all electrical values for Chapter "Overall performance" apply at the following conditions.

| SYMBOL | PARAMETER | VALUE | UNIT |
|--------------------|---------------------------------------|----------|--------|
| T _{amb} | ambient temperature | 25 ±5 | °C |
| RH | relative humidity | 60 ±15 | % |
| V _S | supply voltage (tuner and IF section) | 5 ±0.125 | V |
| Z _{CVBS} | video output load impedance (DC) | >75 | Ω |
| Z _{IF} | IF sound output load impedance (DC) | >500 | Ω |
| t _{pr} | pre-heating time (+5 V at pin 24) | 10 | minute |
| Z _{S(AE)} | aerial source impedance (unbalanced) | 75 | Ω |

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TUNER SECTION**Tuner characteristics**

For detailed information about the PLL programming, refer to Chapter "Application information".

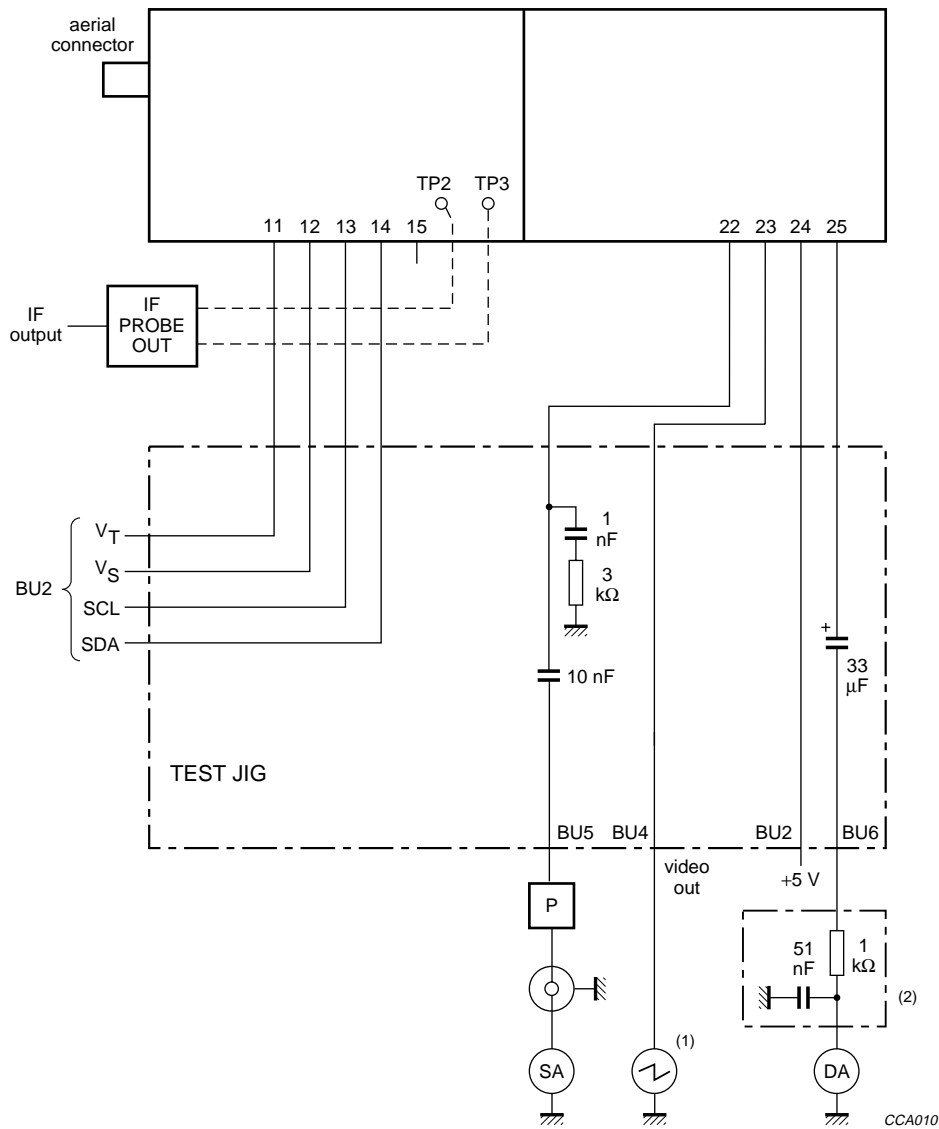
The desktop video tuner is guaranteed to function properly within the specified operational conditions, but a certain deterioration of performance parameters may occur at the limits of the operational conditions.

Test equipment

| EQUIPMENT | PARAMETER | VALUE | UNIT |
|-------------------|---|--------------|-------------|
| DC voltmeter | input impedance | >1 | MΩ |
| Oscilloscope | input impedance: resistance capacitance | >1 <15 | MΩ pF |
| Spectrum analyzer | input impedance | 50 | Ω |
| FET probe | input impedance: resistance capacitance | 1 3.5 | MΩ pF |
| | output impedance | 50 | Ω |
| | voltage gain | 0 | dB |

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- (1) BU4 loaded with 75 Ω.
- (2) 50 μs de-emphasis.
- SA = spectrum analyzer.
- P = FET probe.
- DA = distortion analyzer.

Fig.2 Typical test set-up.

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Definitions of test signals (see Fig.2)

| TEST SIGNAL | FREQ. (MHz) | AMPLITUDE | MODULATION | |
|---|----------------|-------------------------------|--|---|
| | | | VIDEO | AUDIO |
| A0: unmodulated vision carrier | 480.25 | 60 dB μ V | | |
| A1: L system signal with video modulation; see note 1 | 480.25 | 60 dB μ V (peak white) | 100% (sync. level at 0%) 2T pulse and bar | |
| A2: B/G system signal with video modulation | 480.25 | 60 dB μ V (top sync) | 100% (rest carrier 10%) 2T pulse and bar | |
| A3: B/G system signal with video modulation | 480.25 | 60 dB μ V | 100% (rest carrier 10%) 15625 kHz horizontal frequency square wave | |
| B1: unmodulated main sound carrier B/G system | 485.75 | -13 dB w.r.t. A2 | | |
| B2: AM modulated sound carrier L system | 486.75 | -10 dB w.r.t. A0 to A1 | | m = 0.54; modulation frequency 1 kHz |
| B3 FM modulated main sound carrier B/G system | 485.75 | -13 dB w.r.t. A2 | | 1 kHz; modulation frequency deviation \pm 27 kHz; 50 μ s pre-emphasis |
| B4: unmodulated second sound carrier B/G system | 486.10 | -20 dB w.r.t. A0 to A1 | | |

Note

- Line 17 and 330 shall always contain a composite video signal (ITS lines).

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Aerial input characteristics

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|------------------|---|---|------|------|------|
| V _{SWR} | reflection coefficient | referred to 75 Ω impedance (worst case on or between picture and sound carrier at maximum gain) | – | 5 | |
| V _{PSM} | surge protection voltage | | 5 | – | kV |
| V _{ant} | antenna connection disturbance voltage | <1.75 GHz | – | 46 | dBμV |

General characteristics

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-----------------|---|---|---------------------------|-------------------------|----------------------------|--------------------------------------|
| f _b | frequency range: low band mid band high band | | 48.25 175.25 455.25 | – – – | 168.25 447.25 855.25 | MHz MHz MHz |
| Δf _b | margin: for low band for mid/high band | | 1.5 3 | – – | – – | MHz MHz |
| α _i | image rejection (nominal gain to 10 dB gain reduction): low band mid band mid band high band | <300 MHz >300 MHz | 70 66 60 50 | – – – – | – – – – | dB dB dB dB |
| α _{IF} | IF rejection (picture) | | 60 | – | – | dB |
| Z _{IF} | 1/2 IF susceptibility: E2 to E12 E21 to E69 | | 75 60 | – – | – – | dBμV dBμV |
| α _S | sound-chrominance moiré rejection: off-air UHF | up to 40 dB gain control up to 30 dB minimum gain control | 56 56 | – – | – – | dB dB |
| m _x | cross modulation: in-channel in-band low band (n ±2) mid band (n ±3) high band (n ±5) out of band | | 70 78 78 84 – | – – – – 100 | – – – – – | dBμV dBμV dBμV dBμV dBμV |
| | breakthrough susceptibility: E2 to E12; E21 to E69 | | 60 | – | – | dBμV |

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| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------|---|----------------------------|------|------|------|------------|
| V_{osc} | oscillator voltage at all pins | | – | – | 70 | dB μ V |
| t_{li} | oscillators lock-in time | charge pump set logic HIGH | – | – | 150 | ms |
| α_{vs} | the video signal-to-sound interference ratio with the tuner exposed to sound signals in the audio frequency range 100 Hz to 10 kHz and sound pressure levels up to 105 dB (20 μ Pa) | | 40 | – | – | dB |
| V_{ESD} | electrostatic discharge (ESD) on all pins | note 1 | 2 | – | – | kV |

Note

1. All the pins of the desktop video tuner are protected against electrostatic discharge (ESD) up to 2 kV. The product is classified in category B ("MIL-STD-883C").

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Video and audio characteristics (see Fig.2)

| PARAMETER | TEST SIGNAL | TEST POINT | MIN. | TYP. | MAX. | UNIT |
|---|--|------------|------|------|------|------------|
| CVBS characteristics: | | | | | | |
| video amplitude signal at pin 23 | A1 (peak-to-peak value) | BU4 | 0.7 | 0.9 | 1.1 | V |
| DC level sync pulse at pin 23 | A1 | BU4 | – | 0.35 | – | V |
| Video amplitude drop with respect to modulation 0.1 MHz at $T_{amb} = 45\text{ }^{\circ}\text{C}$: | | | | | | |
| at 2 MHz | A1 | BU4 | –1.5 | – | +1.5 | dB |
| at 3 MHz | A1 | BU4 | –2.5 | – | +1.5 | dB |
| at 4 MHz | A1 | BU4 | –4.0 | – | +2.0 | dB |
| at 4.43 MHz | A1 | BU4 | –6.0 | – | +2.0 | dB |
| Sound carrier rejection | A1 + B3 | BU4 | 40 | – | – | dB |
| Residual 40.4 MHz signal in video channel: level of 1.5 MHz | A1 + B3 | BU4 | – | – | 68 | dB μ V |
| Residual 77.8 MHz signal in video channel | A2 | BU4 | – | – | 80 | dB μ V |
| Second IF sound output level at level of 5.5 MHz | A2 + B1 | BU5 | 84 | – | – | dB μ V |
| Test on 2T pulse at $T_{amb} = 45\text{ }^{\circ}\text{C}$: | | | | | | |
| 2T pulse/bar response for L mode | A1 | BU4 | –3.0 | – | +3.0 | % |
| 2T pulse response for L mode | A1 | BU4 | – | – | +3.0 | % |
| 2T pulse/bar response for B/G mode | A1 | BU4 | –4.5 | – | +3.0 | % |
| 2T pulse response for B/G mode | A1 | BU4 | – | – | +5.0 | % |
| CVBS S/N (unweighted) | A1 + B1 | BU4 | 40 | – | – | dB |
| Gain limited sensitivity at 1 dB reduction of video output | A3 | BU4 | – | – | 30 | dB μ V |
| B/G audio characteristics: | | | | | | |
| AF output level measured via LP 20 kHz filter, RMS detector, 50 μ s de-emphasis | A2 + B3 | BU6 | 0.25 | 0.35 | 0.50 | V |
| THD (Total Harmonic Distortion) measured via LP 20 kHz filter, RMS detector, 50 μ s de-emphasis | A2 + B3 | BU6 | – | 0.15 | 0.5 | % |
| S/N measured via CCIR filter, peak CCIR detector, 50 μ s de-emphasis | A2 (6 kHz sine wave, black-to-white) + B3 | BU6 | 40 | 47 | – | dB |
| L/L' audio characteristics: | | | | | | |
| AF output level measured via LP 20 kHz filter, RMS detector | A1 + B2 | BU6 | 0.40 | 0.50 | 0.60 | V |
| THD (Total Harmonic Distortion) measured via LP 20 kHz filter, RMS detector | A1 + B2 | BU6 | – | 0.7 | 1.5 | % |
| S/N measured via CCIR filter, peak CCIR detector | A1 (black) + B2 | BU6 | 41 | 46 | – | dB |
| AM suppression ratio | A1 + B2 | BU6 | 40 | – | – | dB |
| Aerial input level for S/N = 45 dB: | | | | | | |
| system B/G | A2 (black) + B3 | BU4 | – | 35 | 40 | dB μ V |
| system L | A1 (black) + B2 | BU4 | – | 40 | 45 | dB μ V |

**Desktop video tuner
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F11216MF MK2**Digital AFC status**

| PARAMETER | CONDITIONS | FREQUENCY (kHz) | DIGITAL READ-OUT |
|--|---|----------------------------|-----------------------------|
| ADC word at I ² C-bus during read operation | input voltage at pin 10: 0.0 to 0.15V _S | -125 | 00 |
| | input voltage at pin 10: 0.15 to 0.30V _S | -62.5 | 01 |
| | input voltage at pin 10: 0.30 to 0.45V _S | 0 | 02 |
| | input voltage at pin 10: 0.45 to 0.60V _S | +62.5 | 03 |
| | input voltage at pin 10: 0.60 to 1.00V _S | +125 | 04 |

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APPLICATION INFORMATION

A detailed description of the I²C-bus specification, with applications, is given in brochure "The I²C-bus and how to use it". This brochure may be ordered using the code number 9398 393 40011.

WRITE mode

| BYTE | BITS | | | | | | | | |
|----------------------------|-------|-----|-----|-----|-----|-----|-----|-------|------------------|
| | 7 MSB | 6 | 5 | 4 | 3 | 2 | 1 | 0 LSB | A ⁽¹⁾ |
| Address byte | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | 0 | A |
| Program divider byte 1 | 0 | n14 | n13 | n12 | n11 | n10 | n9 | n8 | A |
| Program divider byte 2 | n7 | n6 | n5 | n4 | n3 | n2 | n1 | n0 | A |
| Control information byte 1 | 1 | CP | T2 | T1 | T0 | RSA | RSB | OS | A |
| Control information byte 2 | P7 | P6 | P5 | P4 | P3 | P2 | P1 | P0 | A |

Note

1. A = Acknowledge.

ADDRESS SELECTION

V_S = +5 V (PLL supply voltage)

| MA1 | MA0 | ADDRESS | VOLTAGE AT PIN 15 (see note 1) |
|-----|-----|---------|-------------------------------------|
| 0 | 0 | C0 | 0 to 0.1V _S |
| 0 | 1 | C2 | 0.2 to 0.3V _S |
| 1 | 0 | C4 | 0.4 to 0.6V _S |
| 1 | 1 | C6 | 0.9V _S to V _S |

Note

1. If the AS pin is left floating, the internal bias will automatically set the address to C2.

PROGRAMMABLE DIVIDER SETTINGS (BYTES 1 AND 2)

Divider ratio:

$N = 16 \times \{f_{RF(pc)} + f_{IF(pc)}\}$, where (pc) is picture carrier and f_{RF} and f_{IF} are expressed in MHz

$f_{osc} = N/16$ (MHz).

$N = (8192 \times n13) + (4096 \times n12) + (2048 \times n11) + (1024 \times n10) + (512 \times n9) + (256 \times n8) + (128 \times n7) + (64 \times n6) + (32 \times n5) + (16 \times n4) + (8 \times n3) + (4 \times n2) + (2 \times n1) + n0$

CONTROL BYTE

Charge pump settings:

CP = 1, for fast tuning

CP = 0, for moderate speed tuning with slightly better residual oscillator FM.

Test mode settings:

T2 = T1 = 0; T0 = 1, for normal operation.

PLL disabling:

OS = 0, for normal operation

OS = 1, for switching the charge pump to the high impedance state.

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Ratio select bits

| RSA | RSB | STEP SIZE |
|-----|-----|--------------------------------------|
| X | 0 | 50 kHz |
| 0 | 1 | 31.25 kHz (for slow picture search) |
| 1 | 1 | 62.5 kHz (for normal picture search) |

PORTS BYTE

| BAND/ SYSTEM | BIT (see note 1) | | | | | | | |
|-------------------------|------------------|----|----|------------|----|----|----|----|
| | P0 | P1 | P2 | P3 | P4 | P5 | P6 | P7 |
| Band switching | | | | | | | | |
| Low band | | | 0 | see note 2 | 0 | 1 | 0 | 1 |
| Mid band | | | 0 | | 1 | 0 | 1 | |
| High band | | | 0 | | 1 | 1 | 0 | 0 |
| System switching | | | | | | | | |
| L | 1 | 1 | | see note 2 | | | | |
| L' | 0 | 1 | | | | | | |
| B/G | 1 | 0 | | | | | | |

Notes

1. X = don't care; P0 to P7 are output ports on the PLL device.
2. P3 is a system switch output for customer applications.

TELEGRAM EXAMPLES (WRITE MODE)

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Cb - Ack - Pb - Ack - Stop.

Start - Adb - Ack - Cb - Ack - Pb - Ack - Db1 - Ack - Db2 - Ack - Stop.

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Cb - Ack - Stop.

Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Stop.

Where:

- Start = start condition
- Adb = address byte
- Ack = acknowledge
- Db1 = divider byte 1
- Db2 = divider byte 2
- Cb = control byte
- Pb = ports byte
- Stop = stop condition.

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Remark: for channel selection involving band switching, and to ensure smooth tuning to the desired channel without causing unnecessary charge pump action, it is recommended to consider the difference between wanted channel frequency (f_w) and the current channel frequency (f_c):

- If $f_w > f_c$, use telegram as:
Start - Adb - Ack - Db1 - Ack - Db2 - Ack - Cb - Ack - Pb - Ack - Stop.
- If $f_w < f_c$, use telegram as:
Start - Adb - Ack - Cb - Ack - Pb - Ack - Db1 - Ack - Db2 - Ack - Stop.

Unnecessary charge pump action will result in very low tuning voltage ($V_T \approx 0$ V) which may drive the oscillator to extreme conditions.

READ mode

The in-lock can be read by setting the R/W bit to 1.

| BYTE | BITS | | | | | | | | |
|--------------|--------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|
| | 7 MSB | 6 | 5 | 4 | 3 | 2 | 1 | 0 LSB | A ⁽⁵⁾ |
| Address byte | 1 | 1 | 0 | 0 | 0 | MA1 | MA0 | 1 | A |
| Status byte | POR ⁽¹⁾ | FL ⁽²⁾ | I2 ⁽³⁾ | I1 ⁽³⁾ | I0 ⁽³⁾ | A2 ⁽⁴⁾ | A1 ⁽⁴⁾ | A0 ⁽⁴⁾ | A |

Notes

1. POR = Power On Reset. POR is internally set to 1 in case V_S drops below 3 V. The POR bit is reset when an end of data is detected by the PLL IC.
2. FL = In-lock flag; FL = 1: loop is phase-locked. The loop must be phase-locked during at least 8 periods of the internal 7.8125 kHz reference frequency before the FL flag is internally set to 1.
3. I2, I1 and I0 = digital information for I/O ports P2, P1 and P0 respectively.
4. A2, A1 and A0 = built-in 5-level A/D converter on I/O port P6. AFC information to the controller of the IF section is available on pin 10 (see Table "Digital AFC status").
5. A = Acknowledge.

TELEGRAM EXAMPLES (READ MODE)

Start - Adb - Ack - STB - Ack - STB - - Stop (no Ack from processor = End-of-data).

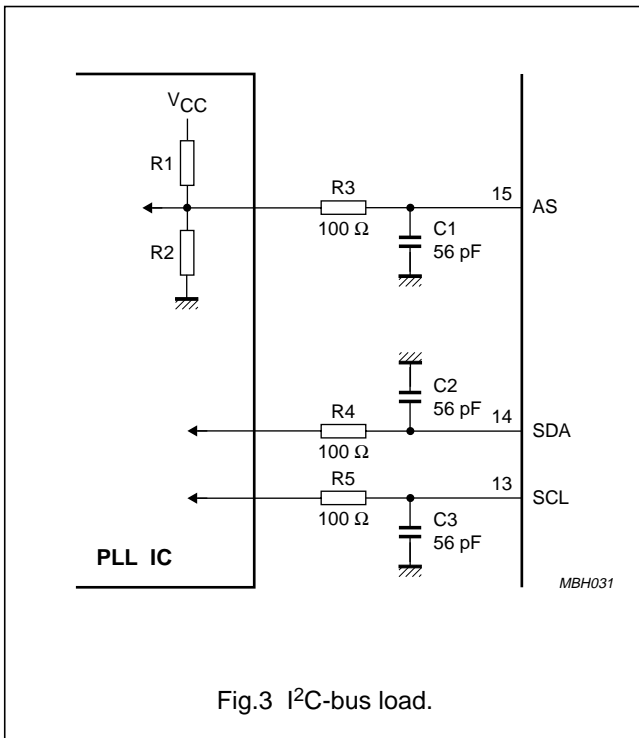
Start - Adb - Ack - STB - - Stop (no Ack from processor = End-of-data).

Where:

STB = Status byte.

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Video buffer

A video buffer is built into the video module to enable the unit to drive a 75 Ω load directly. In case it is required to use the F11216MF MK2 as a replacement for the F11216 in the same videocard, it is necessary to replace the 75 Ω series resistor in the video card by a 0 Ω series resistor. At the same time the 22 kΩ series resistor in the tuning supply must be removed.

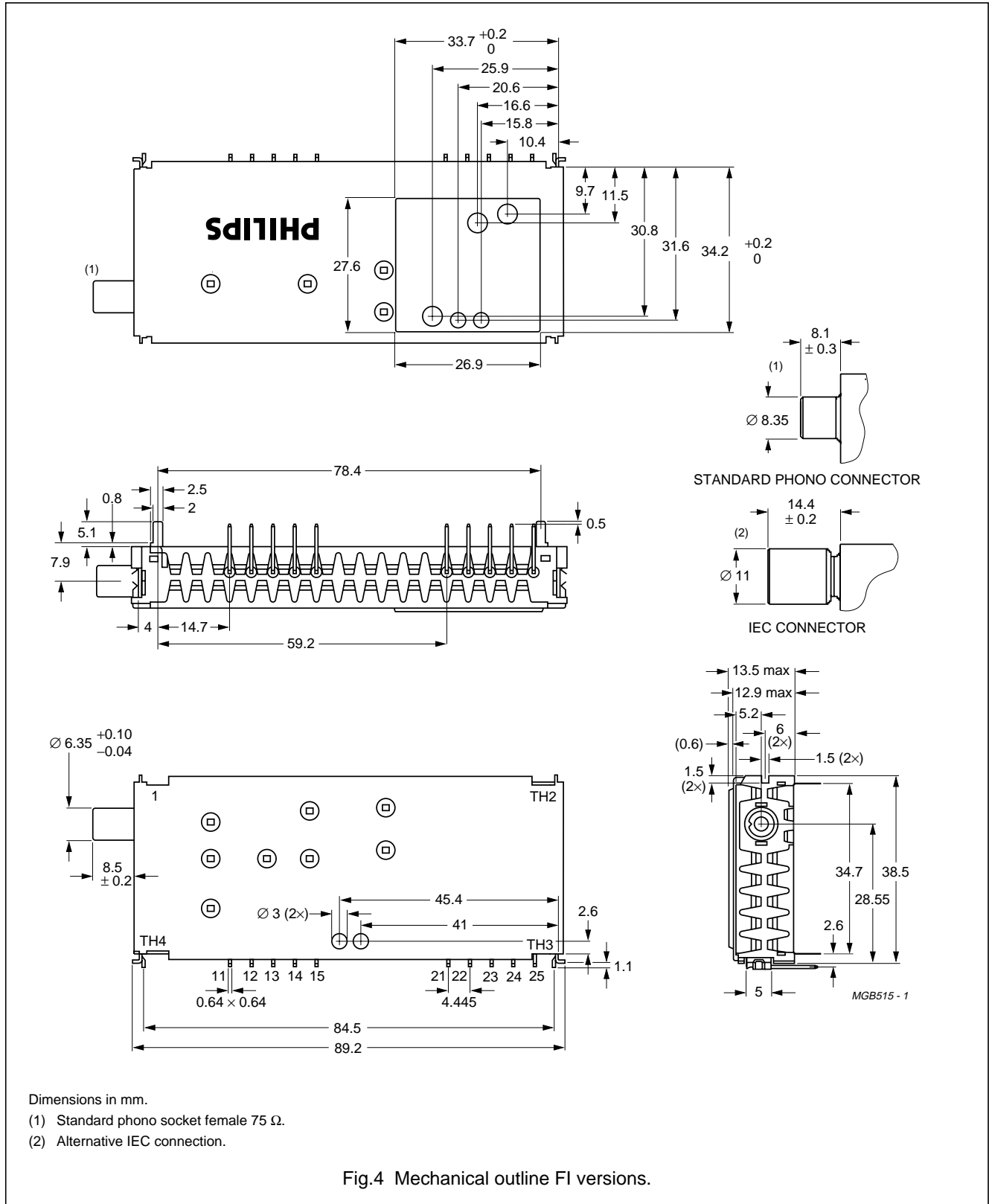
I²C-bus load

The F11216MF MK2 contains a series resistor (R = 100 Ω) in the SCL and SDA lines. Both lines also have a capacitive load of typical 56 pF (see Fig.3).

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MECHANICAL DATA



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Aerial connections

Standard-phono socket female 75 Ω or IEC (female).

Solderability

The solderability of pins and mounting tags when tested initially and after 16 hours steam ageing in accordance with "IEC 68-2-20", test Ta, method 1 (solder bath 235 °C for 2 s), results in a wetted area of 95%. No de-wetting will occur when soldered at 260 °C for 5 s.

Resistance to soldering heat

The product will not be damaged when tested in accordance with "IEC 68-2-20", test Tb, method 1A (solder bath 260 °C for 10 ± 1 s).

Mass

Approximately 50 g.

Robustness of pins

The pins will not be damaged when tested in accordance with "IEC 68-2-21":

- Test Ua1, tensile of 10 N in axial direction
- Test Ua2, thrust of 4 N in axial direction.

Punching pattern of chassis PCB

Field rejects are often related to broken tag joints. Therefore, the following punching pattern is recommended (see Fig.5).

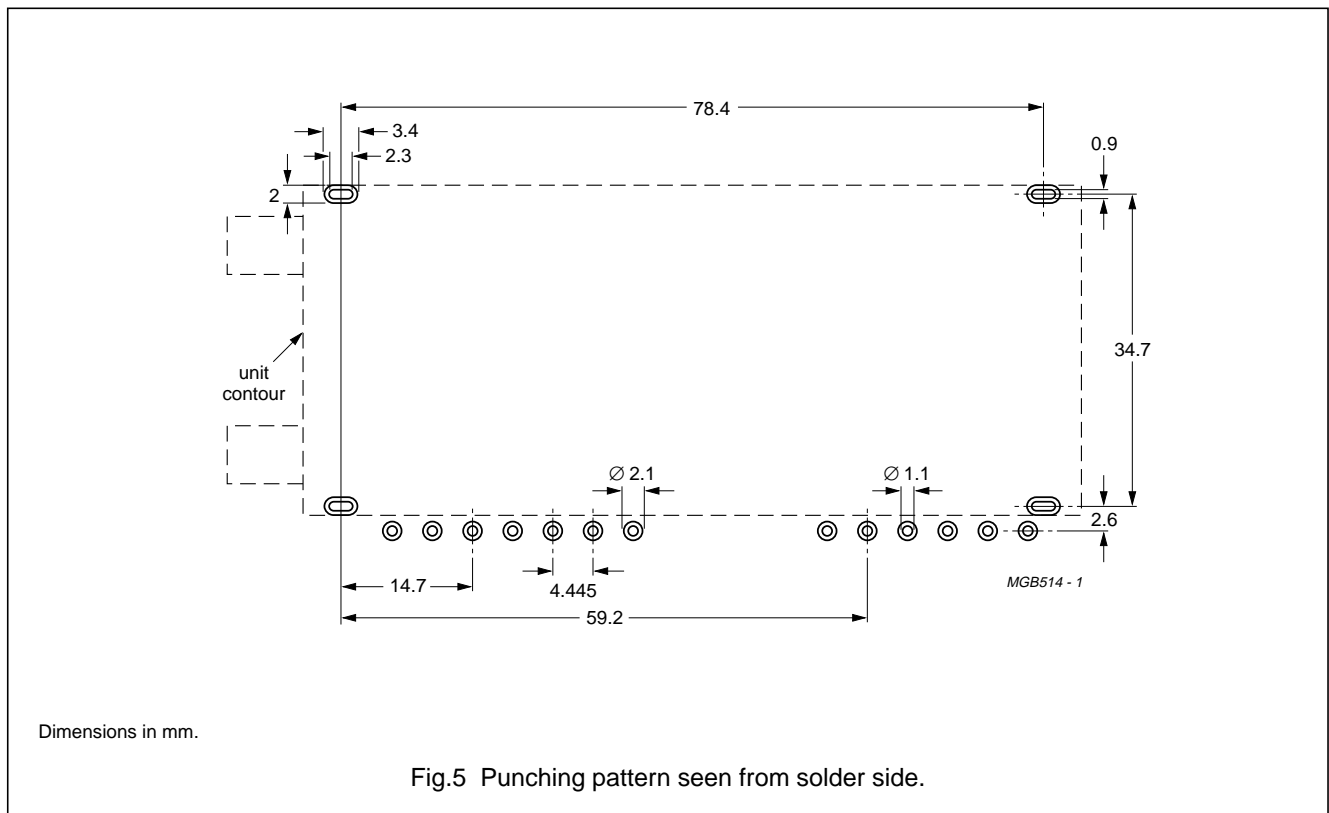


Fig.5 Punching pattern seen from solder side.

**Desktop video tuner
multi system CCIR L/L' and B/G**

FI1216MF MK2

TV CHANNEL FREQUENCIES (MHz)

CCIR cable

Vision IF = 38.90 MHz; sound IF = 33.40 MHz.

| CHANNEL | FREQ. RANGE | PICTURE CARRIER FREQUENCY | SOUND CARRIER FREQUENCY |
|---------|-------------|---------------------------|-------------------------|
| E2 | 47-54 | 48.25 | 53.75 |
| E3 | 54-61 | 55.25 | 60.75 |
| E4 | 61-68 | 62.25 | 67.75 |
| S01 | 68-75 | 69.25 | 74.75 |
| S02 | 75-82 | 76.25 | 81.75 |
| S03 | 82-89 | 83.25 | 88.75 |
| S1 | 104-111 | 105.25 | 110.75 |
| S2 | 111-118 | 112.25 | 117.75 |
| S3 | 118-125 | 119.25 | 124.75 |
| S4 | 125-132 | 126.25 | 131.75 |
| S5 | 132-139 | 133.25 | 138.75 |
| S6 | 139-146 | 140.25 | 145.75 |
| S7 | 146-153 | 147.25 | 152.75 |
| S8 | 153-160 | 154.25 | 159.75 |
| S9 | 160-167 | 161.25 | 166.75 |
| S10 | 167-174 | 168.25 | 173.75 |
| E5 | 174-181 | 175.25 | 180.75 |
| E6 | 181-188 | 182.25 | 187.75 |
| E7 | 188-195 | 189.25 | 194.75 |
| E8 | 195-202 | 196.25 | 201.75 |
| E9 | 202-209 | 203.25 | 208.75 |
| E10 | 209-216 | 210.25 | 215.75 |
| E11 | 216-223 | 217.25 | 222.75 |
| E12 | 223-230 | 224.25 | 229.75 |
| S11 | 230-237 | 231.25 | 236.75 |
| S12 | 237-244 | 238.25 | 243.75 |
| S13 | 244-251 | 245.25 | 250.75 |
| S14 | 251-258 | 252.25 | 257.75 |

| CHANNEL | FREQ. RANGE | PICTURE CARRIER FREQUENCY | SOUND CARRIER FREQUENCY |
|---------|-------------|---------------------------|-------------------------|
| S15 | 258-265 | 259.25 | 264.75 |
| S16 | 265-272 | 266.25 | 271.75 |
| S17 | 272-279 | 273.25 | 278.75 |
| S18 | 279-286 | 280.25 | 285.75 |
| S19 | 286-293 | 287.25 | 292.75 |
| S20 | 293-300 | 294.25 | 299.75 |
| S21 | 302-310 | 303.25 | 308.75 |
| S22 | 310-318 | 311.25 | 316.75 |
| S23 | 318-326 | 319.25 | 324.75 |
| S24 | 326-334 | 327.25 | 332.75 |
| S25 | 334-342 | 335.25 | 340.75 |
| S26 | 342-350 | 343.25 | 348.75 |
| S27 | 350-358 | 351.25 | 356.75 |
| S28 | 358-366 | 359.25 | 364.75 |
| S29 | 366-374 | 367.25 | 372.75 |
| S30 | 374-382 | 375.25 | 380.75 |
| S31 | 382-390 | 383.25 | 388.75 |
| S32 | 390-398 | 391.25 | 396.75 |
| S33 | 398-406 | 399.25 | 404.75 |
| S34 | 406-414 | 407.25 | 412.75 |
| S35 | 414-422 | 415.25 | 420.75 |
| S36 | 422-430 | 423.25 | 428.75 |
| S37 | 430-438 | 431.25 | 436.75 |
| S38 | 438-446 | 439.25 | 444.75 |
| S39 | 446-454 | 447.25 | 452.75 |
| S40 | 454-462 | 455.25 | 460.75 |
| S41 | 462-470 | 463.25 | 468.75 |

Desktop video tuner
multi system CCIR L/L' and B/G

F11216MF MK2

CCIR B/G

Vision IF = 38.90 MHz; sound IF = 33.40 MHz.

| CHANNEL | FREQ. RANGE | PICTURE CARRIER FREQUENCY | SOUND CARRIER FREQUENCY |
|---------|-------------|---------------------------|-------------------------|
| 2 | 47-54 | 48.25 | 53.75 |
| 3 | 54-61 | 55.25 | 60.75 |
| 4 | 61-68 | 62.25 | 67.75 |
| 5 | 174-181 | 175.25 | 180.75 |
| 6 | 181-188 | 182.25 | 187.75 |
| 7 | 188-195 | 189.25 | 194.75 |
| 8 | 195-202 | 196.25 | 201.75 |
| 9 | 202-209 | 203.25 | 208.75 |
| 10 | 209-216 | 210.25 | 215.75 |
| 11 | 216-223 | 217.25 | 222.75 |
| 12 | 223-230 | 224.25 | 229.75 |
| 21 | 470-478 | 471.25 | 476.75 |
| 22 | 478-486 | 479.25 | 484.75 |
| 23 | 486-494 | 487.25 | 492.75 |
| 24 | 494-502 | 495.25 | 500.75 |
| 25 | 502-510 | 503.25 | 508.75 |
| 26 | 510-518 | 511.25 | 516.75 |
| 27 | 518-526 | 519.25 | 524.75 |
| 28 | 526-534 | 527.25 | 532.75 |
| 29 | 534-542 | 535.25 | 540.75 |
| 30 | 542-550 | 543.25 | 548.75 |
| 31 | 550-558 | 551.25 | 556.75 |
| 32 | 558-566 | 559.25 | 564.75 |
| 33 | 566-574 | 567.25 | 572.75 |
| 34 | 574-582 | 575.25 | 580.75 |
| 35 | 582-590 | 583.25 | 588.75 |
| 36 | 590-598 | 591.25 | 596.75 |
| 37 | 598-606 | 599.25 | 604.75 |
| 38 | 606-614 | 607.25 | 612.75 |
| 39 | 614-622 | 615.25 | 620.75 |

| CHANNEL | FREQ. RANGE | PICTURE CARRIER FREQUENCY | SOUND CARRIER FREQUENCY |
|---------|-------------|---------------------------|-------------------------|
| 40 | 622-630 | 623.25 | 628.75 |
| 41 | 630-638 | 631.25 | 636.75 |
| 42 | 638-646 | 639.25 | 644.75 |
| 43 | 646-654 | 647.25 | 652.75 |
| 44 | 654-662 | 655.25 | 660.75 |
| 45 | 662-670 | 663.25 | 668.75 |
| 46 | 670-678 | 671.25 | 676.75 |
| 47 | 678-686 | 679.25 | 684.75 |
| 48 | 686-694 | 687.25 | 692.75 |
| 49 | 694-702 | 695.25 | 700.75 |
| 50 | 702-710 | 703.25 | 708.75 |
| 51 | 710-718 | 711.25 | 716.75 |
| 52 | 718-726 | 719.25 | 724.75 |
| 53 | 726-734 | 727.25 | 732.75 |
| 54 | 734-742 | 735.25 | 740.75 |
| 55 | 742-750 | 743.25 | 748.75 |
| 56 | 750-758 | 751.25 | 756.75 |
| 57 | 758-766 | 759.25 | 764.75 |
| 58 | 766-774 | 767.25 | 772.75 |
| 59 | 774-782 | 775.25 | 780.75 |
| 60 | 782-790 | 783.25 | 788.75 |
| 61 | 790-798 | 791.25 | 796.75 |
| 62 | 798-806 | 799.25 | 804.75 |
| 63 | 806-814 | 807.25 | 812.75 |
| 64 | 814-822 | 815.25 | 820.75 |
| 65 | 822-830 | 823.25 | 828.75 |
| 66 | 830-838 | 831.25 | 836.75 |
| 67 | 838-846 | 839.25 | 844.75 |
| 68 | 846-854 | 847.25 | 852.75 |
| 69 | 854-862 | 855.25 | 860.75 |

**Desktop video tuner
multi system CCIR L/L' and B/G**

FI1216MF MK2**France**

Vision IF = 38.90 MHz; sound IF = 32.40 MHz.

| CHANNEL | PICTURE CARRIER FREQUENCY | SOUND CARRIER FREQUENCY |
|----------------|--|--|
| FA | 47.75 | 41.25 |
| FB | 55.75 | 49.25 |
| FC1 | 60.50 | 54.00 |
| FC | 63.75 | 57.25 |
| F1 | 176.00 | 182.50 |
| F2 | 184.00 | 190.50 |
| F3 | 192.00 | 198.50 |
| F4 | 200.00 | 206.50 |
| F5 | 208.00 | 214.50 |
| F6 | 216.00 | 222.50 |

Desktop video tuner
multi system CCIR L/L' and B/G

FI1216MF MK2

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| Data sheet status | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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