File No	RDPS-MF063	
Revision	R1	
System Application	Asymmetric Digital Subscriber Line	
Product Type	Micro filter	
Product Name	MF606G	
Date	Jan . 15rd, 2003	
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1. Introduction:

The MF606G is a "in – line" (on distributed) filter that has been specifically designed to implement the functionality of low pass filter in POTS over ADSL application.

Asymmetric Digital Subscriber Line (ADSL) technology is dedicated , point to point , public network access technology that allow multiple forms of data , voice , and video to be carried over twisted-pair copper wire on the local loop between a network service provider' s (NSP' S) central office and the customer site or on local loops created either intra-building or intra-campus. Best of all , ADSL delivers this high speed performance over existing copper telephone line all while allowing traditional voice service to coexist without interruption through POTS low pass filters. The POTS-filter on the customer premises side consists of a lowpass section(installed in a separated plastic box.

The MF606G integrates low pass filter that blocks the high frequency energy from reaching the POTS device and provides isolation from impedance effects of the POTS device on ADSL. In addition , this filter will also attenuate any wideband impulse noise generated by the POTS device due to the interruption of loop current(e.g. pulse dialing or on hook / off hook transfer). Because the POTS filter connects directly to the subscriber loop media , it must also provide some protection for externally induced line hits or faults which could damage any attached equipment or endanger humans interacting with the installed equipment. The circuit protection will be provided mostly by standard central office line protection means and additional protection measures built into POTS filter to protect against line overstress which could damage the filter itself.

2. Reference:

Ref. 1 :	ETS 300 001	Attachment to Public Switched Telephone Network
Ref. 2 :	AS/ACIF S002 : 2001	Analogue interworking and non-interference requirements for Customer Equipment for connection to the Public switched Telephone Network
Ref. 3 :	ITU-T K21	Resistibility of subscribers terminal to overvoltage and overcurrents

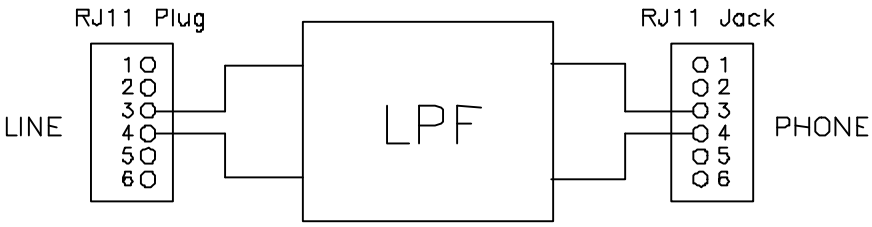
3. Abbreviations:

ADSL	Asymmetric Digital Subscriber Line
CO	Central Office
CPE	Customer Premise Equipment
POTS	Plain Old Telephone Service
RT	Remote Terminal
ADSL-NT	Network termination of ADSL

4. Technical requirements:

4.1. Schematic:

The following drawing illustrates the block diagram of this product.



4.2. Electrical specification: ⚠1

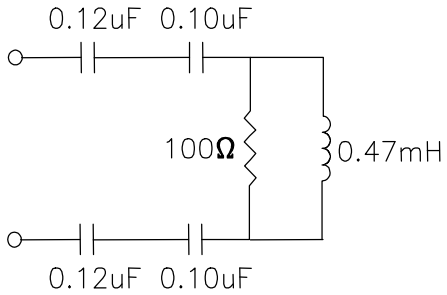
The low pass filter shall satisfy the following parametric limits with a complex impedance ZL shown in this table across the Line side of this device .

Splitter parameters	Electrical requirements	
	Range	Values
Frequency range		
Nominal voice band		0.3KHz to 3.4KHz
Ringing frequency		22Hz ±28Hz
ADSL band		30KHz to 1104KHz
Line Impedance ZL		220ohm + (820ohm ‖ 115nF)
CO impedance ZTc		220ohm + (820ohm ‖ 115nF)
RT impedance ZTr		220ohm + (820ohm ‖ 115nF)
Modem impedance	30KHz< f< 1104KHz	100 ohm
Operation voltage voice band		
Nominal signal		21mVpp to 5.4 Vpp
Billing tone		10Vpp to 30.2Vpp
Ringing signal		40Vrms to 80Vrms(113Vpp to 227 Vpp)
DC voltage		0V to -72V
Max. AC voltage		70Vrms with -72VDC offset
Max. differential		190V
Current voice band		
Loop current		<120mA
Transient current(on/off hook)		<400mA

Splitter parameters	Electrical requirements	
	Range	Values
DC Resistance		
DC Resistance		<100 ohm
Isolation resistance tip/ring		>5 Mohm
Voice –band characteristic		
Insertion loss for single splitter	1KHz	<1.5 dB
	200Hz<f<3.4KHz	<3.5dB
Insertion loss for with two added Parallel filters	1KHz	<1.5dB
	200Hz<f<3.4KHz	<3.5dB
Delay distortion	200Hz<f<4KHz	<150u sec
Return loss for single splitter	300Hz< f< 2000Hz	>=15 dB
	200Hz< f< 3.4KHz	>=12 dB
Return loss for with two added Parallel filters	300Hz< f< 2000Hz	>=15 dB
	200Hz< f< 3.4KHz	>=12 dB
Longitudinal conversion loss LCL	600Hz to 3.4KHz	>=45 dB
ADSL modem interface		
Isolation voltage		>2000Vrms for 1 minute
ADSL band characteristic		
Stop band attenuation (with ZHP-r)	30KHz	>18 dB
	100KHz<f<300KHz	>30 dB
	300KHz<f<1104KHz	>40 dB
Stop band attenuation (without ZHP-r)	30KHz	>18 dB
	100KHz<f<300KHz	>30 dB
	300KHz<f<1104KHz	>40 dB
Loading or ADSL signal path	30KHz<f<1104KHz	<0.25dB

4.3. ZHP-r Definition:

To facilitate the test of the splitter , the high pass data have to be taken into consideration. ZHP-r shown below is defined to allow proper termination of the ADSL port during voice band testing, and ZHP-r is valid only for voice band frequency. ZHP-r is almost the same as 27nF + 470µ H // 100Ω defined inAS/ACIF.



4.4. DC characteristic:

All requirement of this specification can be met in the presence of all POTS loop currents from 0mA to 120mA. This in line filter can pass POTS tip-to-ring dc voltages of 0V to 72V and ringing signals of 40V to 80Vrms at any frequency from15.3Hz to 68Hz with a dc component in the range from 0V to 72V. The dc resistance from tip-to-ring at the line port interface with the phone interface shorted, shall be less than or equal to 100 ohms for one filter. The DC resistance from tip-to-ground and from ring-to-ground at the POTS interface with the U-R interface open shall be greater than or equal to 5 Megohms. The ground point shall be local building or green wire ground. As an objective , the dc resistance should exceed 10MΩ.

4.5. Test method:

4.5.1. Insertion loss:

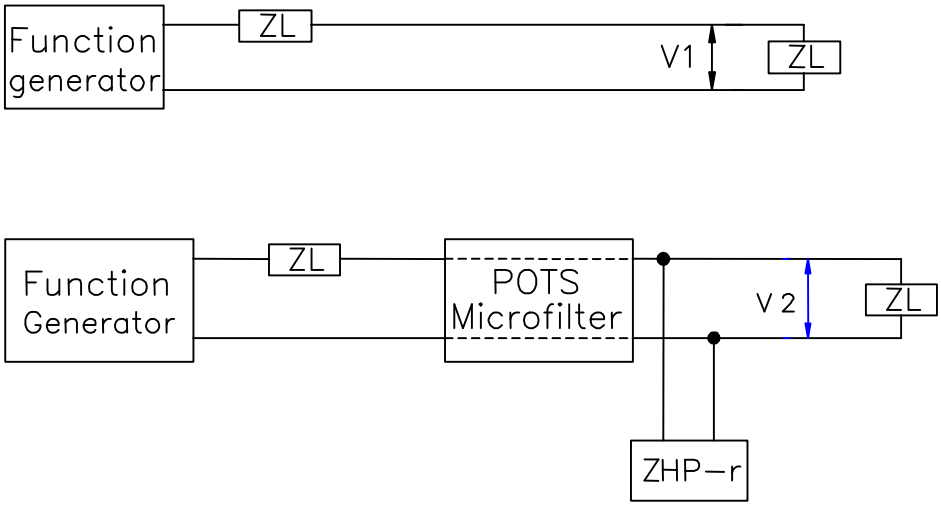
The insertion loss of a device connected into a given transmission system is defined as the ratio, expressed in dB, of the load power available(before and after insertion) delivered to the output network beyond the point of insertion at a given frequency. In general , the insertion loss of a device inserted in a given transmission system mainly caused by internal component resistive loss while all of the impedance between source , load and device interface having been matched. To perform the insertion loss measurement ,thru calibration must be done prior the testing . General Insertion loss equation can be expressed as following

Insertion loss = 20 log $|V2 / V1|$ dB where

V1 = the measured voltage value of load without LPF in circuit.

V2 = the measured voltage value of load with LPF in circuit.

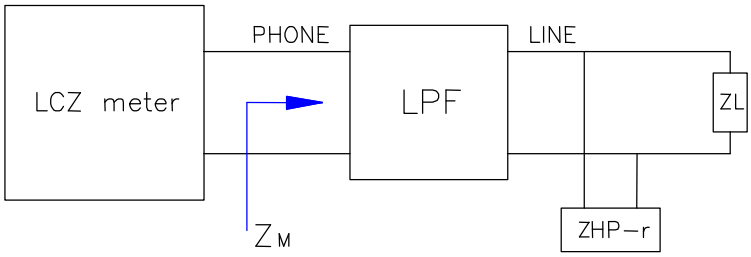
The test setup is shown in drawing below :



4.5.2. Return loss:

Return loss measures the amount of lost energy due to reflection which resulted from impedance mismatching at the interface. Return loss is essentially defined as the ratio of the power incident upon a given transmission system to the power reflected caused by impedance mismatch with respect to reference impedance at the interface between source and device. Return loss figure is a function of the impedance of the circuit involved and is therefore frequency dependent.These impedance must be closely maintained in order to reduce the possibility of undesirable reflection and echoes which occur in long distance circuit for the telephone user and destroy the data being sent. To perform the return loss test ,open ,short, load calibration must be done prior measurement while the LCZ impedance analyzer being selected in impedance mode. Return loss is general expressed in decibels. General return loss equation is shown:

Return loss = 20 log $|Z_L + Z_M / Z_L - Z_M|$ dB Where Z_L = the reference impedance Z_M = the measured impedance



5. Environmental condition :

5.1. Resistibility to overvoltages and overcurrents :

The splitter has to comply with requirements as per ITU-T K.21.

5.2. Climatic conditions :

5.2.1. Operating temperature :

Application indoor

Long time operation guarantee temperature (5 to 40 ^{0}C)

Short time operation guarantee temperature (0 to 50 ^{0}C)

(According to ETS 300 019, class 3.2)

5.2.2. Storage and transport :

Low ambient temperature - 20 ^{0}C

High ambient temperature +85 ^{0}C

(According to MIL-STD-202 method 107)

5.2.3. Operation humidity :

Long time operation guarantee humidity (5 to 85 %)

Short time operation guarantee humidity (5 to 90 %)

Short time : within 72 continuous hours and 15 days in a year

6. Reliability conditions :

6.1. Thermal shock :

Temperature from -20 °C to +85 °C for 5 cycles

(According to MIL-STD-202 , method 107)

6.2. Temperature humidity exposure :

+50 °C /95RH , 96hrs

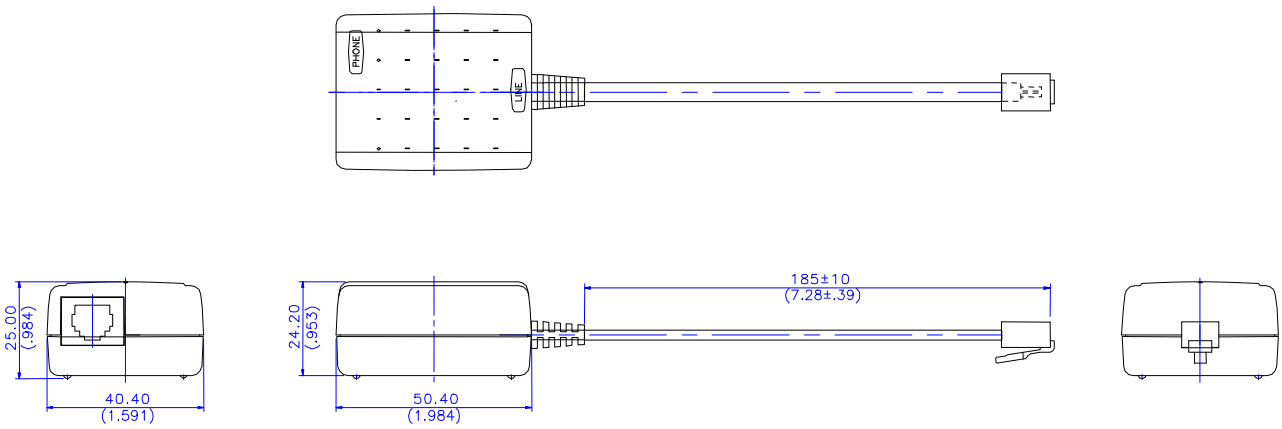
(According to MIL-STD-202 , method 103)

6.3. Vibration test :

Random vibration , frequency 5-500Hz , sweep time : 1 hr / axis /

Force : 2.4grams (According to MIL-STD-202 , method 204)

7. Mechanical condition:



TOLERANCES	
.	±0.5
.X	±0.2
.XX	±0.10

Note :

1: Connect the line side of the microfilter to the wall jack and the phone side of the microfilter to the phone.

2: The in-line microfilter does not provide protection against transient noise for multi-line phone.

3: Unless otherwise specified ,all tolerances are mm(inch)±0.25(0.010)