File No	RDPS-POTS328	
Revision	R2	
System Application	Asymmetric Digital Subscriber Line	
Product Type	POTS Splitter	
Product Name	CPF105C	
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1. Introduction:

The CPF105C is a splitter module 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 CPF105C integrate low pass filter that block the high frequency energy from reaching the POTS device and provide isolation from impedance effects of the POTS device on ADSL. In addition , these 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 splitter 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 splitter to protect against line overstress which could damage the splitter itself.

2. Reference:

Ref. 1 : ETS 300 001 Attachment to Public Switched Telephone Network
Ref. 2 : ANSI T1.413 Network and Customer Installation Interface
Ref. 3 : ETSI TR 101 728 V1.2.1(2002-05)
Ref. 4 : ETSI TS 101 952-1-1 V1.1.1

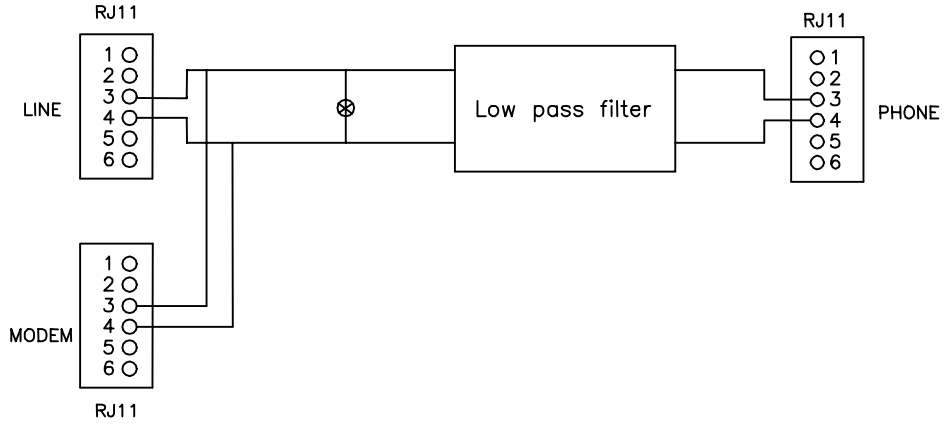
3. Abbreviations:

ADSL	Asymmetric Digital Subscriber Line
CO	Central Office
CPE	Customer Premise Equipment.
POTS	Plain Old Telephone Service
RT	Remote Terminal

4. Technical requirements:

4.1. Schematic:

The following drawing illustrate the block diagram of this product.



4.2. Electrical Specification :

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 .The following requirement is specified for a single splitter.

Splitter parameter	Electrical requirements	
	Range	values
Frequency range		
Splitter bandwidth		DC to 16KHz
Nominal voice band		0.3KHz to 3.4KHz
Billing tone		12KHz±80Hz
Ringing frequency		15.3Hz to 68Hz
ADSL band		30KHz to 1104KHz
Line Impedance ZL		600ohm
CO impedance ZTc		600ohm
RT impedance ZTr		600ohm
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 150Vrms(113Vpp to 424 Vpp)
DC voltage		0V to 105V
Max. AC voltage		150Vrms with -105VDC offset
Max. differential		320V
Current voice band		
Loop current		<100mA
Transient current(on/off hook)	400msec	<150mA
DC Resistance		
DC Resistance		<=25 ohm
Isolation resistance tip/ring		>5 Mohm
Voice –band characteristic		
Insertion loss	1004Hz	<0.3dB
Attenuation distortion	200Hz<f<3.4KHz	<±0.6 dB
	3.4Hz<f<4KHz	<1.0 dB
Delay distortion	200Hz<f<4KHz	<100 usec
Return loss	200Hz< f< 500Hz	>=14 dB
	500Hz< f< 2KHz	>=18 dB
	2KHz< f< 3.4KHz	>=14 dB
Longitudinal conversion loss LCL	200Hz to 3KHz	>53 dB
ADSL modem interface		
Isolation voltage		>2000Vrms for 1 minute
ADSL band characteristic		
Stop band attenuation	30KHz<f<1104KHz	>65 dB

4.3. DC characteristic :

All requirement of this specification can be met in the presence of all POTS loop currents from 0mA to 100mA. This in line filter can pass POTS tip-to-ring dc voltages of 0V to 105V and ringing signals of 40V to 150Vrms at any frequency from15.3Hz to 68Hz with a dc component in the range from 0V to 105V.

The DC resistance from tip-to-ring at the line port interface with the phone interface shorted, shall be less than or equal to 25 ohms . 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 to5 Megohms . The ground point shall be local building or green wire ground. As an objective , the dc resistance should exceed 10MΩ.

4.4. ZHP-r Definition :

ZHP-r is defined to be the impedance presented to the POTS connection by an ATU-R .The equivalent circuit of ZHP-r is showing Figure.1. The ZH is valid only for voice band frequencies. The combination of capacitors in the ZH-r is only representative .

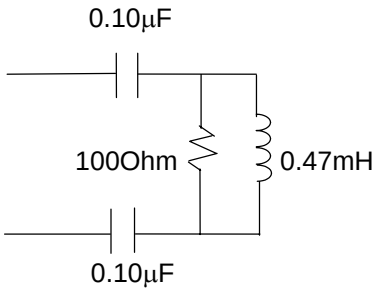
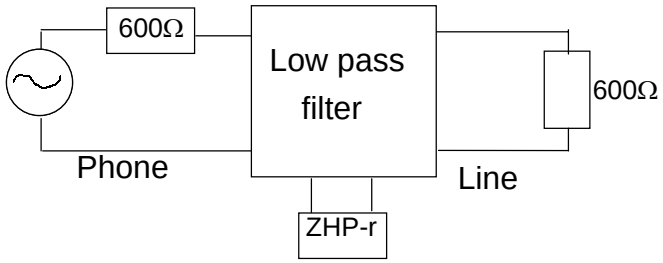


Figure 1.

4.5 . Test method :

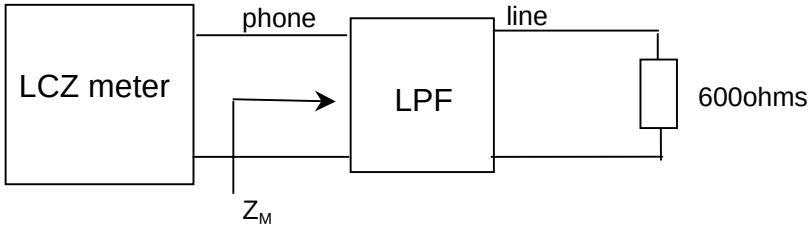
4.5.1. Insertion loss :

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 $|V1 / V2|$ 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 measure the amount of energy that is lost 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 are a function of the impedance of the circuit involved and are therefore frequency dependent.
These impedance must be closely maintained in order to reduce the possibility of undesirable reflection and echoes which in long distance circuit the telephone user or 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 as below: Return loss = 20 log $|Z_L + Z_M / Z_L - Z_M|$ dB
Where Z_L = the reference impedance Z_M = the measured impedance
The test setup is shown in drawing below:



5. Environmental condition:

5.1. EMC , surge and power- contact:

The splitter has to comply with EMC Requirements as per ITU K21, so the following requirements must be taken into consideration: Uko and POTS(a/b)(indoor lines, twisted pair , unshielded , L>10m)

No	Test	Test specification	Number of tests
1	Lightning surge simulation	1500V , 10/700μs , 200ms	10
2	Power induction	600V , 1s	5
3	Power contact	230V , 15 minute	1

5.2. Climatic condition:

5.2.1. Operating temperature:

Application	indoor
Low ambient temperature	-5^0C
High ambient temperature	$+45^0$C

(according to ETS 300 019, class 3.2)

5.2.2. Storage and transport:

Low ambient temperature	-40^0C
High ambient temperature	$+85^0$C

(according to ETS 300 019, transport: class 2.3, storage: class 1.2)

6. Reliability condition:

6.1. Operation:

Test	Test specification
Vibration sinusoidal	IEC 68 Part 2-6 10 to 58Hz 0,075mm 58 to 500Hz 10m/S^2 , 1octaver/minute 3 axis; every 10 cycles
Shock(half sine)	IEC 68 Part 2-27 ≤100kg 100m/ S^2 11ms 6 directions; every 3 shocks

6.2. Handling:

Test	Test specification
Freefall	IEC 68 Part 2-32 Stand alone:<10kg 75mm Built in:2x ground area

6.3. Storage and transport:

Test	Test specification
Vibration(random)	IEC 68 Part 2-64
Bump	IEC 68 Part 2-29
Freefall	IEC 68 Part 2-32 <10kg 800mm Twice at any possible Transport position on concrete floor

6.4.Product safety :

Test	Test specification
Electrical hazard	EN 60950 (A4), (≡VDE 0805)
Mechanical hazard	EN 60950 (A4), (≡VDE 0805)
Fire hazard	EN 60950 (A4), (≡VDE 0805)

7. Mechanical condition: