

Satellite Antennas



75cm Elliptical Antenna System

**Does not include LNBs, switch or cables*

Model 610029301

The Gain-Master features a newly designed feed bracket that supports three LNB's, providing DBS reception of 101°, 110°, and 119°.

- 65% More Gain than a standard Triple-Beam Satellite Antenna
- Attacks Rain Fade
- Ideal for MDU and Commercial Applications
- Perfect for High end Home Theater/HDTV
- Quick/Easy Installation

SPECIFICATIONS

Reflector Dimensions	35.3 x 26.2
Reflector Material	Fiberglass Reinforced Plastic
Antenna Mount Components Material	Galvanized Sheet Steel/Powder Coat Paint
Hardware Material	Steel w/Zinc + Clear Chromate + Clear Top Coat
Antenna Gain	35.7 dB, offset LNB's (typical)
Operating Temperature	-40°C to +50°C
Wind Loading	Operational: 50 mph Survival: 100 mph
Package Size (outside dimensions)	36.75" x 27" x 10.5"
Gross Weight	27 lbs.

18" DBS Antenna and Dual Output LNB

**Also available without LNB (Call CM for details)*

Model 6218

The system consists of the following components:

- 18" Steel Antenna
- Universal Mast/Base Assembly
- Bracket and Arm Assembly
- Assembly Hardware
- (1) Dual LNB
- Instruction Sheet



SPECIFICATIONS

Frequency Range	12.2 to 12.7 GHz
Polarization	RHCP/LHCP
Reflector F/D	0.6
Reflector Material	Galvanized Sheet Steel/Powder Coat Paint
Antenna Mount Components Material	Galvanized Sheet Steel/Powder Coat Paint
Hardware Material	Steel w/Zinc + Clear Chromate + Clear Top Coat
Antenna	Antenna Gain: 34 dB
LNB Noise Figure	1.1 Max.
Output Frequency	950 to 1450 MHz
LNB Conversion Gain Range	50 to 62 dB
Operating Temperature	-34 to +52°C (-29.2 to 125.6°F)
Wind Loading	Operational: 50 mph Survival: 100 mph
Package Size (outside dimensions)	20" x 21 1/8" x 5 3/4"
Gross Weight	10 lbs.

Satellite LNBF

LNBF

Part Number 2500-0208

Model CCS2500

- Integrated Dual Output Design
- Environmentally Sealed Aluminum Housing
- Electronic Circular Polarization Selection
- Unique High Cross-Polar Isolation Design
- DIRECTV PLUS and DIRECTV PARA TODOS Compatible



SPECIFICATIONS

Output Connectors	2X F-type female
Input Frequency Range	12.2 - 12.7 GHz
Output Frequency Range.	950 - 1450 MHz
Output VSWR	2.0:1 (at 75 ohm)
Conversion Gain	50 TO 62 dB
Gain Flatness a)	5 dB max over 500 MHz
Gain Flatness b)	1 dB max over 24 MHz
Noise Figure	1.1 dB max
Lo Frequency	11.25 GHz
Lo Stability	+/- 4 MHz max (over temp, aging)
Phase Noise	-50 dBc @ 1 KHz -75 dBc @ 10 KHz -95 dBc @ 100 KHz -115 dBc @ 1 MHz
Cross Polar Rejection	25 dB min
1dB Compression	0 dbm min (500 MHz)
Image Rejection	40 dB min
Supply Voltage	10.5 to 14.0 V (RHCP) 15.5 to 21.0 V (LHCP)
Supply Current	180 mA max

Channel Master now offers its customers a variety of Low Noise Block-Converters (LNBFs) that allow for the integration of antenna and electronics. This integration optimizes antenna system design and performance and eliminates the customer's need for procuring individual system components, assembly, and other logistical activities. The Channel Master Model CCS2500 LNBF is designed for digital Direct Broadcast Satellite installations. Its aluminum housing is completely environmentally sealed for long term outdoor use and incorporates a unique high performance cross polarization isolation technique.

DIRECTV PLUS and DIRECTV PARA TODOS are trademarks of DIRECTV, Inc., a unit of Hughes Electronics Corp., and are used with permission.

Non Penetrating Roof Mount

Model 611617401

- 36" x 36" base with 2 3/8" mast
- Pre-punched mounting holes to accommodate mounting of the universal mount foot when using for 18", 18" x 24", 18" x 20", and 50cm DBS antennas
- Can also be used with Channel Master 60cm, 75cm, 75e & 84e satellite antennas
- Can accommodate the 90cm & 1.0m when greater wind speeds are not expected
- Ideal for mounting a traditional terrestrial off air antenna
- Many other applications including mounting surveillance cameras or outdoor speakers.
- Designed for installations on a flat roof



Universal Mount-XL

Model 610027901

- Pre-galvanized steel with powder coat paint finish
- DBS gray color to match antenna system standard mast foot (Useful when performing an upgrade from a single feed to a dual feed system)
- 1.66 inch O.D mast diameter
- Compatible with Channel Master 46 cm (18"), 51cm (20") and multi-dish (18" X 24") antenna systems
- Used to replace or upgrade the current universal mount
- Designed for installations on a flat roof.



Additional 6 inches of mast to accommodate unique installations. The additional length places the antenna further away from the wall or allows for clearance when looking over the eave of a roofline.

Extended Universal Mount

The new Channel Master extended Universal Mount has been added to our extensive product line to offer greater flexibility when installing DBS satellite antenna systems. 6 additional inches have been added to the mast to allow for mounting the antenna system further away from the building to get additional turning radius when needed to achieve a look angle to the satellites. Another application would be when needing to get the antenna out away from the eave of the dwelling to look over the edge of the roof line when acquiring signal.

Satellite Signal Meters

Model 1009IFD

Digital Satellite Signal Meter

With the advent and spectacular growth of digital satellite TV and two-way satellite Internet services, there is a need for an aid to quick and accurate dish installation, ensuring maximum customer satisfaction and profit.

The Digital meter provides:

- Quick and accurate dish installation
- Picture quality measurement to maximize the accuracy of both cross-polarity and pointing accuracy
- Alignment to the correct satellite first time, every time
- Control of 22kHz and DiSEqC-type switches
- Four line display of the vital information
- Simple use with a three-button control panel
- Robust and lightweight
- Recharge in the field using car lighter adapter



RF Parameters

Input Signal Frequency	950MHz~2150MHz
Input Digital Signal Level	-65 dBm~25 dBm
LNB Service Voltage	13V/18V
LNB 22 KHz Switch	ON/OFF (0.6VDC at 50% Duty cycle)

Satellite Digital Receiver Parameter

Regional Settings	Up to 6 Languages (e.g. English, Spanish) or Geographical Areas (e.g. USA, South America, Canada)
Maximum Data Locations	120 per Regional Setting (i.e. 120 transponders from any satellite combination)
Satellite Identification	Only Chosen Satellite is found by Unique Identification Software
Reception Standard	DVB or DSS (selectable)
Modulation Standard	QPSK
Symbol Rate	3~40 MBIT/S
LNB Polarization Voltage Control	13V/18V (short-circuit self-protection)
LNB 22KHz Control	ON/OFF (0.6VDC at 50% duty cycle)

LCD Parameters

Screen Size	66.5mm x 25mm 2.6" x 1"
Number of Characters	64 (4 x 16)

Power Consumption

Whole Power Consumption	600mAh
Input Voltage	12V DC
Available Usage from Full Charge	3 Hours Continuous

Power Adapter Parameters

Power Service Voltage	AC 110V
Power Frequency	50-60 Hz
Output Voltage	12V DC
Output Current	400mAh
In-Car Charging	12V DC Cigarette Lighter Power Adapter
Charge Time	10 Hours to 90%

Operating Conditions

Operating Temperature	0C~80C
Relative Humidity	10%~90%
Atmosphere Pressure	86Kpa~106Kpa
Dimensions	208mm x 86mm x 56mm 8.2" x 3.4" x 2.2"
Weight	580 grams 1.3 lbs

Satellite Signal Meters

Model 1004IFD

Standard model

Model 1007IFD W/ 22KHz Tone Switching

Deluxe model with 13/18V battery pack and charger

Dual Satellite

Model 1008IFD W/ 22KHz Tone Switching

Deluxe model with 13/18V battery pack and charger



The 1004IFD, 1007IFD and 1008IFD are intended to aid in the alignment of a satellite dish. They include satellite IF (950-2150 MHz) amplification and a broadband detector. The detector drives a meter and a variable frequency audio tone. The dish is then aligned for maximum meter deflection or highest pitch tone. A gain control allows a wide range of input signal levels.

The units are connected to the LNB via a short coaxial cable. The 1004IFD output must be connected to the satellite receiver in order to supply power. The units operate from 11-24 VDC on the coaxial cable. Connection to the receiver is optional with the 1007IFD and 1008IFD but extends battery life between charges.

All models allow measurement of voltage on the coaxial cable. The 1007IFD and 1008IFD will also measure LNB current. The 1007IFD and 1008IFD includes an internal rechargeable nicad battery pack, carrying strap and a wall plug recharging unit.

The internal battery pack allows a dish to be aligned before it is connected to the satellite receiver. The battery pack is switchable between 13V and 18V output, allowing either polarization to be selected when used with a voltage switched LNB. In US DBS applications, LHCP is selected when the LNB voltage is nominally 17V. The 1007IFD and 1008IFD now includes a 22KHz tone switching signal to facilitate multi-satellite installation and alignment.

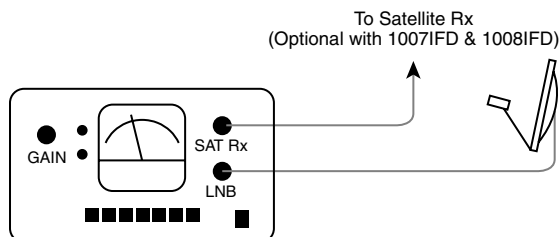
The 1008IFD includes two meters in one housing allowing easy alignment of dual satellite single dish installations. When peaking, the dish signal level can be viewed for both LNB's simultaneously, making alignment quick and easy. Carrying case included.

Certain commonly used spare parts are also available
Contact Channel Master Sales for details.

All Models

Frequency Range: 950-2150 MHz • Impedance: 75 ohm • Connectors: Type F female

		1004IFD	1007IFD	1008IFD
Audio Tone		Yes	Yes	Yes
LNB Voltage Measurement		Yes	Yes	Yes
LNB Current Measurement		No	Yes	Yes
22KHz Tone Switching		N/A	Yes	Yes
Insertion Loss (dB)		4.5	4.5	4.5
Input Level Range (dBm)	1 channel	-30 to +4	-30 to +4	-30 to +4
	8 channels	-39 to -5	-39 to -5	-39 to -5
	16 channels	-42 to -8	-42 to -8	-42 to -8
Dimensions (H x W x D)		3.6" x 5.8" x 2.8" (92 x 147 x 72mm)	3.5" x 6" x 4.5" (89 x 152 x 114mm)	4.9" x 7" x 3.8" (124 x 177 x 96mm)
Weight		17oz. (482g)	37oz. (1040g)	42oz. (1176g)
Wall Plug Charging Voltage (VDC)		N/A	24	24
Battery Capacity (mA hours)		N/A	600	24
Battery Life (hours between charges)		N/A	3.0	1.5



950-2150 MHz Power Dividers

2-Way

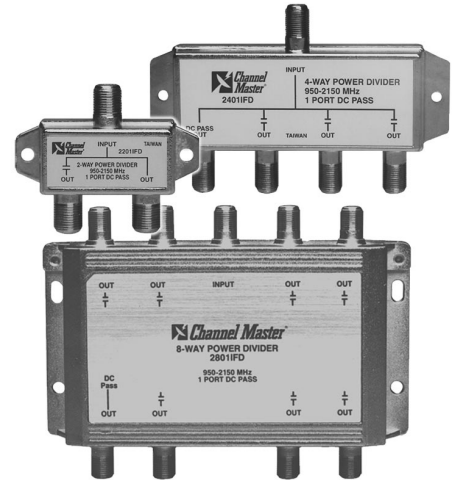
- Model 2201IFD** 1 port DC pass
Model 2202IFD 2 port DC pass
Model 2212IFD 2 port DC pass (diode steered)

4-Way

- Model 2401IFD** 1 port DC pass
Model 2404IFD 4 port DC pass
Model 2414IFD 4 port DC pass (diode steered)

8-Way

- Model 2801IFD** 1 port DC pass
Model 2818IFD 8 port DC pass (diode steered)



The above model numbers describe the Channel Master range of satellite IF (950-2150 MHz) power dividers. These low cost, yet high performance units have many applications in satellite IF distribution systems. Functional diagrams for these units are shown below.

The 2201IFD, 2401IFD and 2801IFD pass DC power from one output to the input (or in the opposite direction). Thus only one receiver supplies LNB power and controls any voltage switched polarization selection.

The 2202IFD and 2404IFD pass DC power from all outputs to the input (or in the opposite direction). Thus all receivers can supply LNB power. Care should be taken to ensure the input of a receiver will not be damaged by power from another receiver. Reverse powering protection is provided in many receivers and systems. These splitters are particularly useful where several

multiswitches are combined together as there is no 0.8V drop across the diodes as in 2212IFD, 2414IFD and 2818IFD. Channel Master satellite IF multiswitches include reverse powering protection.

The 2212IFD, 2414IFD and 2818IFD will pass DC power from any output to the input. There is a 0.8V drop across the diodes which are included to prevent one receiver from passing power back to another receiver. They are particularly useful in CATV headends as the multiple receiver LNB powering provides redundancy against losing LNB signals due to a receiver failure.

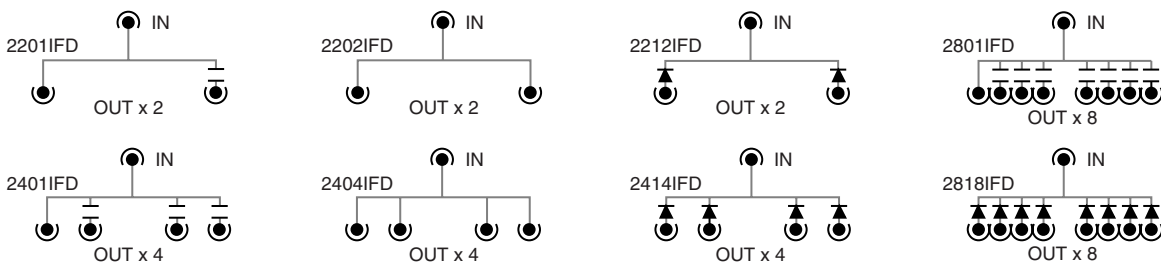
Unused outputs should be terminated to achieve optimum flatness, return loss and isolation. Channel Master terminators, Model 7184 (DC blocked) and Model 7190 (not DC blocked) are recommended.

All Models

Frequency Range: 950-2150 MHz • Impedance: 75 ohm • Connectors: Type F female

	2201IFD	2202IFD	2212IFD	2401IFD	2404IFD	2414IFD	2801IFD	2818IFD
Thru Loss (dB)	3.5	3.5	3.5	7.5	7.5	7.5	11.5	12.0
Return Loss (dB)	15	15	15	15	15	15	15	15
Isolation (dB)	20	20	20	20	20	20	20	20
DC Pass (ports)	1	2	2D	1	4	4D	1	8D
Thru Current (max, mA)	1000	1000	1000	1000	1000	1000	1000	1000
Dimensions (H x W x D)		2.0" x 2.2" x .8" (50 x 57 x 22mm)		2.9" x 4.6" x 7" (74 x 118 x 18mm)			4.3" x 5.9" x 1.1" (110 x 150 x 28mm)	

Isolation is between closest outputs • D indicates series diode • Dimensions are inclusive of connectors
 Thru loss figures are typical between 950 and 1450 MHz. At 2150 MHz, thru loss is approximately 0.5 dB higher



40-2150 MHz Directional Taps

1-Way

Model 1010IFD
10 dB tap

Model 1015IFD
15 dB tap

Model 1020IFD
20 dB tap

2-Way

Model 1220IFD
20 dB tap

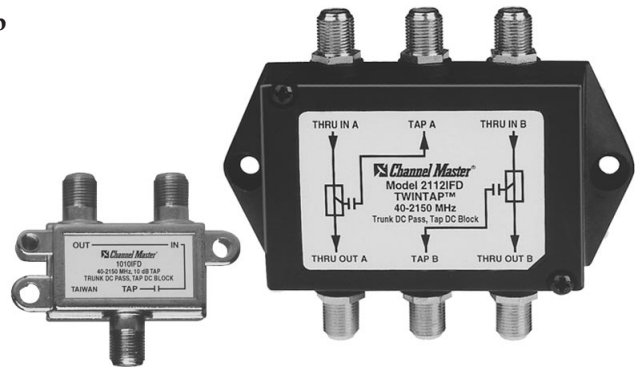
4-Way

Model 6418IFD
18 dB tap

Model 6424IFD
24 dB tap

1-Way, Dual Polarization

Model 2112IFD
12 dB tap



The above model numbers describe the Channel Master range of ultra wideband (40-2150 MHz) directional taps. In all cases, the trunk path will pass DC power and the tap is DC blocked. The functional diagram for each unit is shown in Figure 1. They are used mainly in medium to large distribution systems carrying satellite IF and/or VHF/UHF signals. These models have been re-engineered for enhanced performance above 2000 MHz for use with the latest “stacked” LNB systems.

Because the internal construction of the 2 and 4-way taps is a 1-way tap followed by a 2 or 4-way splitter, unused outputs should

be terminated to achieve optimum flatness, return loss, and isolation. Channel Master terminators, Model 7184 (DC blocked) and Model 7190 (not DC blocked), are recommended.

Model 2112IFD “Twintap™” contains two -12 dB taps in one housing. This is for use in dual polarization distribution networks. It features excellent return loss, thru loss and tap loss characteristics. It is the finest unit of its type and is the unit of choice in dual polarization distribution networks.

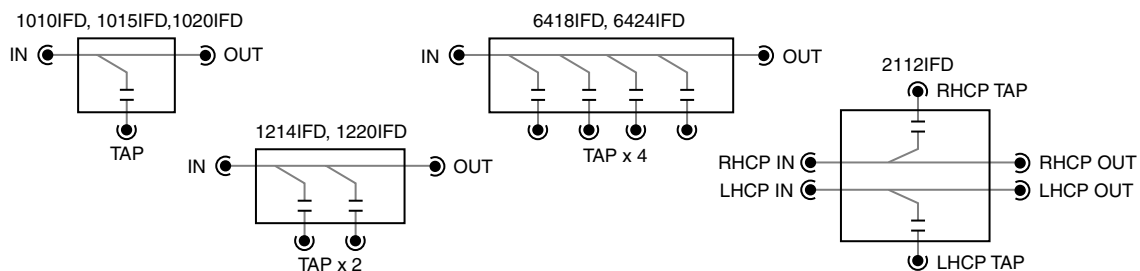
All Models

Frequency Range: 40-2150 MHz • Impedance: 75 ohm • Connectors: Type F female • DC Pass: Trunk DC pass, tap DC block

	1010IFD	1015IFD	1020IFD	1220IFD	6418IFD	6424IFD	2112IFD
Tap Outputs (dB)	1	1	1	2	4	4	1(dual pol)
Tap Loss (dB)	10	15	20	20	18	24	12
Thru Loss (dB)	1.8	1.8	1.8	1.8	2.0	2.0	1.5
Return Loss (dB)	13	13	13	13	13	13	17
Isolation-Tap to Out (dB)	25	25	25	25	25	25	25
Isolation-Tap to Tap (dB)	N/A	N/A	N/A	20	20	20	N/A
Isolation-Cross Pol (dB)	N/A	N/A	N/A	N/A	N/A	N/A	50
Thru Current (max, mA)	600	600	600	600	600	600	600
Dimensions (H x W x D)		2.0" x 2.2" x .8" (50 x 57 x 22mm)			3.1" x 3.9" x 1.1" (80 x 100 x 29mm)		3.1" x 3.9" x 1.1" (80 x 100 x 29mm)

Isolation is between closest outputs • Dimensions are inclusive of connectors

Thru loss figures are typical between 40 and 1450 MHz. At 2150 MHz, thru loss is approximately 0.5 dB higher



Satellite IF-VHF/UHF Diplexers

Separating Diplexers

Model 4001IFD

Standard performance

Combining Diplexers

Model 4002IFD

Single unit

Model 4022IFD

Dual unit

Model 4032IFD

As Model 4022IFD except VHF/UHF DC pass

Model 4014IFD

Quad unit



These diplexers are used for separating or combining satellite signals at 950-2150 MHz with VHF/UHF signals at 54-806 MHz. They include a high pass filter passing 950-2150 MHz and a low pass filter passing 54-806 MHz. In addition, a DC power pass is provided from the satellite port to the common in order to pass satellite receiver LNB voltage. The power pass feature passes DC through 22KHz for polarization and satellite selection commands using 13/18V, 22 KHz, Diseqc.

The 4001IFD is Channel Master's standard performance diplexer. This unit is for SEPARATING satellite signals from VHF/UHF off-air signals when they are received in the customer's living room on one cable. The satellite signals are then connected to the satellite receiver's 950-2150 MHz input and the VHF/UHF signals are normally connected to the satellite receiver's VHF/UHF input. The satellite receiver then provides

A/B switching as appropriate. Model 4001IFD is also available in several wall plate models (see 4004IFD).

The other models offers higher performance (much greater stopband rejection) than the 4001IFD. This is necessary when COMBINING satellite and VHF/UHF signals on to one cable because LNB noise extends down into the UHF spectrum and can degrade (add noise to) UHF TV reception if not adequately filtered out before connection to the distribution cable. Models 4022IFD and 4014IFD are dual and quad diplexers for two or four receivers.

Model 4032IFD also includes a DC pass from one output to the VHF/UHF port. It should only be used when it is desired to power a VHF/UHF preamplifier from a satellite receiver. VHF/UHF preamplifier, Model 0065DSB, is optimized for operation from the LNB power.

All Models

Impedance: 75 ohm • Connectors: Type F female

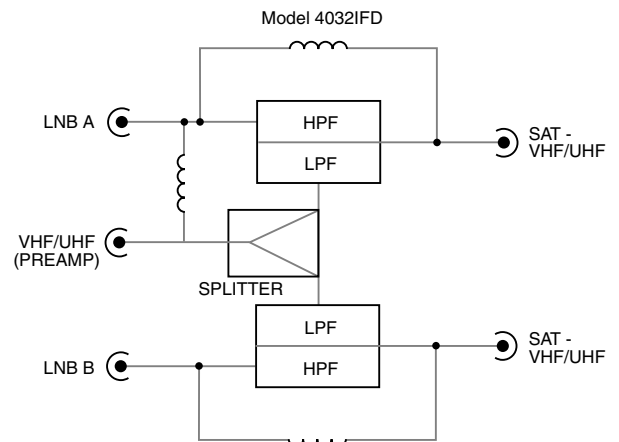
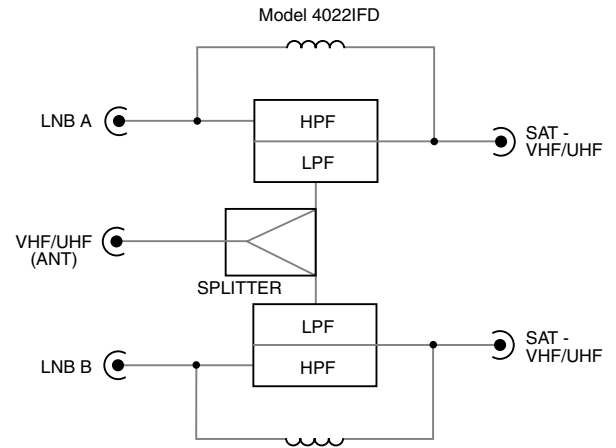
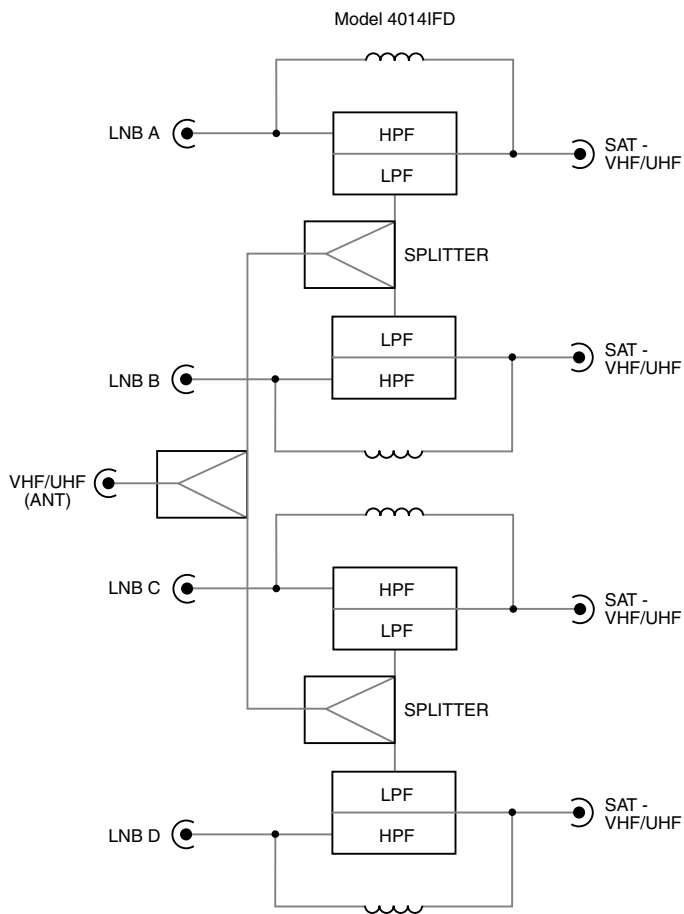
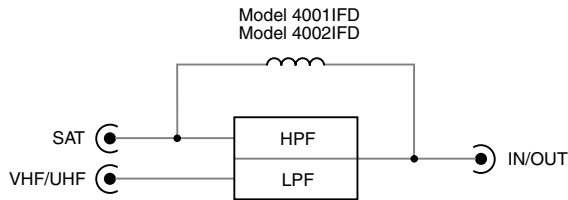
	4001IFD	4002IFD	4022IFD	4032IFD	4014IFD
Satellite Port					
Passband (MHz)	950-2150	950-2150	950-2150	950-2150	950-2150
Thru Loss (dB)	0.8	1.5	1.5	1.5	1.5
Return Loss (dB)	10	13	13	13	13
Stop Attenuation 806 MHz	30	50	50	50	50
DC Pass to In/Out	Yes	Yes	Yes	Yes	Yes
Number of Ports	1	1	2	2	4
VHF/UHF Port					
Passband (MHz)	40-806	40-806	40-806	40-806	40-806
Thru Loss (dB)	0.5	0.8	4.5	4.5	8.0
Return Loss (dB)	10	12	12	12	12
Stop Attenuation 950 MHz	10	40	50	50	50
1000 MHz	10	40	50	50	50
1100 MHz	10	40	50	50	50
DC Pass to In/Out	No	No	No	Yes	No
Number of Ports	1	1	1	1	1
General					
Number Inputs	1	2	3	3	5
Number Outputs	2	1	2	2	4
Dimensions (H x W x D)					
	1.9" x 2.5" x .8" (47 x 64 x 21mm)	3.1" x 3.9" x 1.1" (80 x 100 x 29mm)		3.1" x 3.9" x 1.1" (80 x 100 x 29mm)	

Isolation is between closest outputs • Dimensions are inclusive of connectors

Thru loss figures are typical between 40 and 1450 MHz. At 2150 MHz, thru loss is approximately 0.5 dB higher

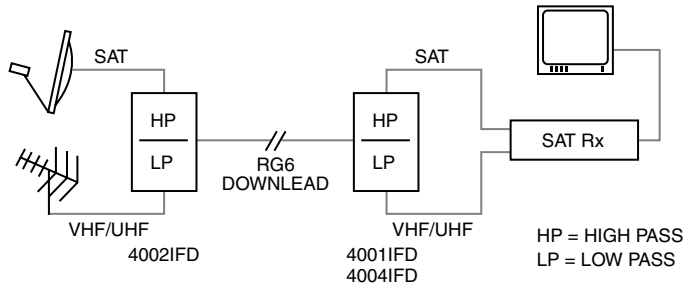
Satellite IF-VHF/UHF Diplexers

HPF = High Pass Filter
LPF = Low Pass Filter

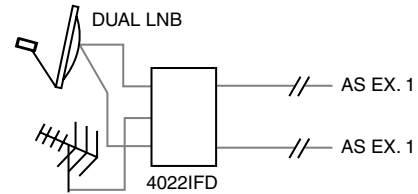


Satellite IF-VHF/UHF Diplexers

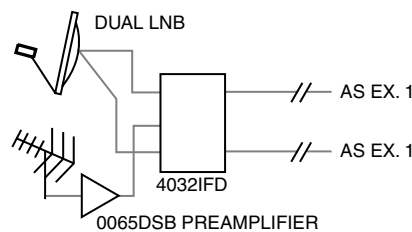
1. One TV, passive VHF/UHF



2. Two TVs, passive VHF/UHF

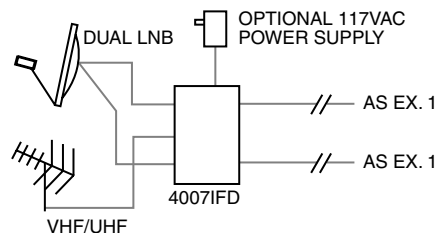


3. Two TVs, amplified VHF/UHF



- Diplexer Model 4032IFD passes LNB DC power to the VHF/UHF input.
- Preamplifier Model 0065DSB (and 0265DSB) are designed for operation from the satellite receiver LNB voltage. Current draw is 100mA. Ensure this will not overload the satellite receiver.
- If using a preamplifier with separate 117VAC power supply, use combining diplexer Model 4002IFD which does not pass power to the VHF/UHF input.

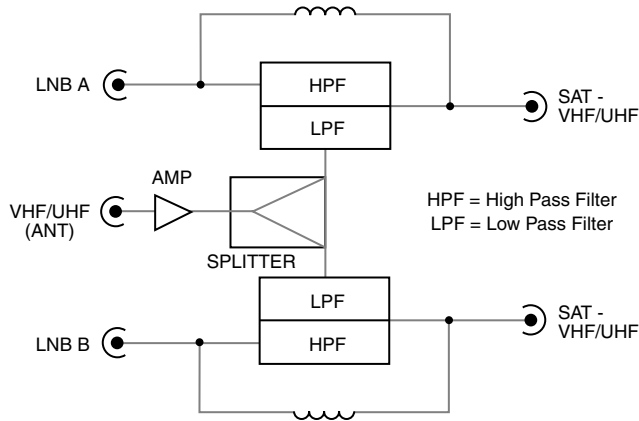
4. One TV, amplified VHF/UHF – The “One Box Solution”



- Model 4007IFD power is from the wall plug supply (if used); or either satellite receiver LNB voltage (with no power supply).
- Do not use with “active/amplified” antennas. Model 4007IFD has sufficient gain.
- For best off-air noise figure, keep coax length from antenna to Model 4007IFD short and use RG6 cable.

Amplified Satellite Diplexers & Wall Plates

Model 4007IFD Dual satellite diplexer Amplified VHF/UHF



Model 4007IFD is the complete one box solution to provide satellite and amplified VHF/UHF signals to two locations in a building from a twin LNB and off-air antenna.

The two high performance diplexers eliminate UHF LNB noise and any off-air pickup at satellite frequencies. The VHF/UHF preamplifier is a split-band type and includes FM trapping. It is based on Channel Master's industry standard preamplifier Model 0064DSB. Preamplifier power is from either the included wall plug power unit or from the LNB voltage on either output.

Impedance: 75 ohm • Connectors: Type F female

	4007IFD
DC Pass	SAT A - VHF/UHF to LNB A (max 500mA) SAT B - VHF/UHF to LNB B (max 500mA)
Passband	SAT 950-2150 MHz VHF/UHF 54-88, 174-216, 470-806 MHz (95-108 MHz trapped)
Thru Gain	SAT - 1 dB (passive), VHF +10 dB, UHF +16 dB
Noise Figure	VHF 3.5 dB, UHF 2.5 dB
Max Input	VHF 4 ch at 35 dBmV, UHF 8 ch at 20 dBmV (-46 dB x-mod)
Isolation	SAT input -50 dB at <806 MHz VHF/UHF input -30 dB at <950 MHz SAT x-pol -50 dB, VHF/UHF outputs -25 dB
Power	105 mA DC from highest voltage of Power Unit, Rx A or Rx B (max 26V)
Number Inputs	3 (LNB A, LNB B, VHF/UHF)
Number Outputs	2 (SAT A - VHF/UHF, SAT B - VHF/UHF)
Dimensions (H x W x D)	1.9" x 2.5" x .8" (48 x 64 x 20mm)

Model 4004IFD Telephone jack Diplexer

Model 4005IFD Telephone jack Two F barrels

Model 4006IFD Telephone jack Three F barrels



Model 4004IFD

For a professional satellite and off-air installation, Channel Master wall plates finish the job properly. No more unsightly loose cables, hanging diplexers and telephone adaptors. These wall plates fit a standard electrical box. A label sheet allows various markings on Models 4004IFD, 4005IFD and 4006IFD.

Channel Master wall plates are available in all the variations you need with options for:

- Satellite/Off-Air Diplexer (4001IFD performance)
- Telephone Jack (required in most installations)
- High Return Loss Type-F Barrels (15 dB at 2150 MHz)

Satellite Line Amplifiers

Model 5113IFD

Satellite IF, 13dB

Model 5213IFD

Dual satellite IF, 13dB



The 5113IFD is a general purpose, low cost satellite IF (950-2150 MHz) line amplifier with 14 dB gain at 1450 MHz and appropriate gain between 950 and 2150 MHz to give cable slope compensation. Typical applications include:

- i. With long (greater than 100 feet) runs of coaxial cable from satellite receiver to LNB.
- ii. In a satellite IF distribution system where signal levels may have become marginal towards the end of the system.
- iii. Prior to splitting a signal many ways which might cause excessive splitting loss.

Notes:

- i. Most satellite receivers are designed to operate with input signal levels between -60 and -30 dBm per channel. It is recommended that IF distribution systems be designed to give no less than -50 dBm per channel at the customer outlet.

ii. Care should be taken not to overload the amplifier (see specifications). Depending upon LNB gain, this will usually involve leaving a minimum distance of 100 feet of RG6U between the LNB and the line amplifier.

- iii. If two amplifiers must be cascaded, there should be approximately 14 dB of cable loss at 1450 MHz between the two amplifiers. Then for the same distortion at the output of the second amp, the input level to each amplifier must be 3 dB lower than for one amplifier.

Model 5213IFD is similar, but includes two amplifiers in one housing. This is for dual cable, dual polarization systems. Note the diagram in Figure 2. Each amplifier is DC passive but both amplifiers are powered from the same side. This technique provides higher output capability.

All Models

Frequency Range: 950-2150 MHz • Impedance: 75 ohm • Connectors: Type F female • DC Power Pass: Both directions

		5113IFD	5213IFD
Gain (dB)	950 MHz	11.5	11.5
	1200 MHz	13	13
	1450 MHz	14	14
	1750 MHz	15	15
	2150 MHz	16	16
Input Return Loss (dB)		6	13
Output Return Loss (dB)		6	13
Noise Figure (dB)		5	5
Output Capability (dBm, per channel)			
13V operation	16 channels, -40 dBc IMD	-25	-25
17V operation	16 channels, -40 dBc IMD	-20	-18
Input Capability			
Isolation—Amp A to Amp B (dB)		N/A	50
Voltage Requirements (VDC)		11-20	11-21
Current Requirements (mA)		20 (13V), 30 (17V)	65 (17V)
Dimensions (H x W x D)		.8" x 2.8" x .6" (22 x 71 x 15mm)	3.1" x 3.9" x 1.1" (80 x 100 x 29mm)

Figure 1

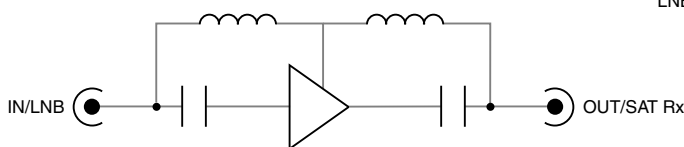
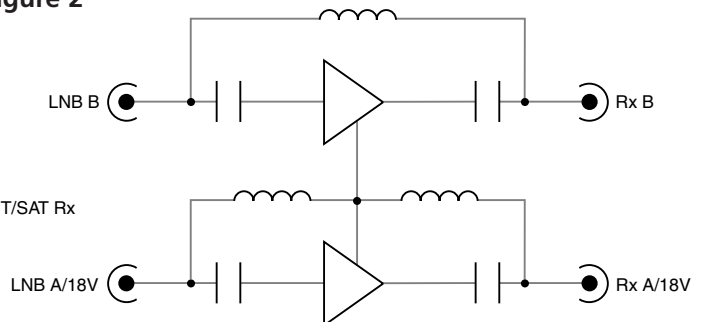


Figure 2



Headend Amplifier with LNB Power Supply

Model 5224IFD

Dual satellite

Model 8014IFD

LNB powering power supply

24V at 600 mA

Included with 5224IFD



Model 5224IFD is a dual polarization headend LNB amplifier with an LNB powering 117 VAC power supply. This unit is designed to drive dual polarization IF distribution networks. It may also be used as dual high level line extender in cases where 117 VAC power is available. Applications include multiple dwelling units, TV showrooms, and offices.

This model offers cable slope compensation and provides very high output capability. A block diagram of the unit is shown below.

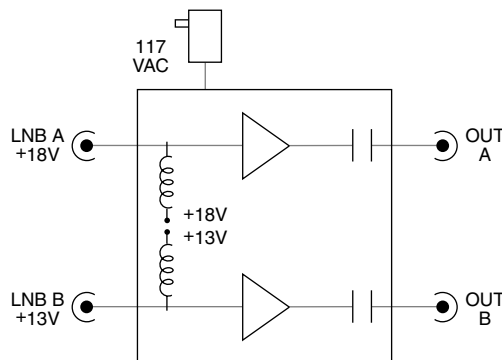
Most distribution networks will be of either the home-run type involving a network of splitters at the headend; or the tapped-trunk type which use taps placed along the two trunk

cables. Some systems will use a combination of these two distribution network types. Channel Master carries a wide range of satellite IF 2, 4 and 8-way splitters and taps. Channel Master also carries a range of multiswitch taps. When used as a line extender with careful system design, it may be cascaded for use with very long cable runs such as in a shopping mall.

DC power is provided at the input connections to the unit; +18V at input A (LHCP) and +13V at input B (RHCP). This voltage is ideal for powering voltage switched LNBs. When DC power is not required at the input, Model 7264 DC block should be added. The outputs are DC blocked.

Frequency Range: 950-1750 MHz • Impedance: 75 ohm • Connectors: Type F female

	5224IFD
Gain (dB)	
950 MHz	20
1200 MHz	22
1450 MHz	24
1750 MHz	24
Return Loss-Input and Output (dB)	13
Isolation-Amp A to Amp B (dB)	55
Noise Figure (dB)	6
Output Capability (dBm, per transponder)	
-40 dBc third order products	
2 transponders	+5
8 transponders	-4
16 transponders	-7
LNB A Voltage (VDC, diode steered)	+18
LNB B Voltage (VDC, diode steered)	+13
LNB Current-Maximum, A+B (mA)	240
Voltage Requirements (VAC)	117
Dimensions (H x W x D)	7.9" x 5.4" x 1.4" (210 x 137 x 36mm)



Satellite IF Multiswitches

4 Output

Model 6214IFD
Passive VHF/UHF

Model 6314IFD
Active VHF/UHF

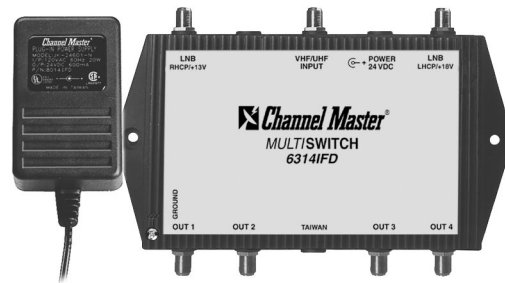
8 Output

Model 6228IFD
Passive VHF/UHF

Model 6328IFD
Active VHF/UHF

Model 8014IFD

LNB powering power supply, 24V at 600 mA
Included with each model



These multiswitches are used to provide satellite signals of either RHCP or LHCP polarization from one dish at four or eight locations. In addition, when required, they provide terrestrial VHF/UHF signals diplexed on the same coaxial cable. At the customer outlet, the satellite signals are separated from the VHF/UHF signals with a diplexer such as Channel Master Model 4001IFD.

When VHF/UHF channels are not required, models 6214IFD and 6228IFD are recommended. The VHF/UHF input is left unconnected.

Model 6214IFD and Model 6228IFD combine VHF/UHF (54-806 MHz) signals with satellite IF signals on one cable to provide up to eight independently switchable wideband outputs. They should be used with a masthead preamplifier or MATV amplifier when all desired VHF/UHF TV signals can be received at comparable levels from a stationary antenna or antenna system, or with a channelized MATV system when this is not the case. Passive VHF/UHF processing allows complete flexibility for VHF/UHF amplification.

Recommended VHF/UHF amplifiers are:

For 6214IFD – Spartan 3™, 7778, 7723, 7721

For 6228IFD – 7777, 7722

Models 6314IFD and 6328IFD amplify VHF/UHF (54-806 MHz) signals and combine them with satellite IF signals on one cable to provide up to eight independently switchable wideband outputs. They should be used when all desired VHF/UHF terrestrial TV signals can be received at comparable levels from a stationary antenna or antenna system. Other VHF/UHF amplifiers are not normally required or desired.

Each model requires the Channel Master 8014IFD 24VDC wall plug power supply (included.) This power supply will power the multiswitch and provide +13V at the RHCP input and +18V at the LHCP input for the LNB. The current available is sufficient to power the multiswitch and the LNB plus, where needed, one 5213IFD or two 5113IFD line amplifiers.

The polarization selection control at each output is by receiver LNB voltage; a nominal +13V will select RHCP (or vertical polarization) signals whereas a nominal +18V will select LHCP (or horizontal polarization) signals. These units may be used with either a dual-fixed output LNB, twin-switched output LNB or from two LNBs connected to an orthomode transducer (OMT).

All Models

Impedance: 75 ohm • Connectors: Type F female

	6214IFD	6314IFD	6228IFD	6328IFD
Satellite Input				
Frequency Range (MHz)	950-2150	950-2150	950-2050	950-2050
Insertion Loss (dB)	5	5	3	3
Noise Figure (dB)	7	7	7	7
Isolation-Cross Polarization	32	32	35	35
Maximum Input (dBm, per transponder)				
16 transponders, -35 dBc IMD	-20	-20	-25	-25
VHF/UHF Port				
Frequency Range (MHz)	54-806	54-806	54-8060	54-806
Gain (dB)	N/A	1	N/A	1
Insertion Loss (dB)	8	N/A	23	N/A
Noise Figure (dB)	N/A	4.5	N/A	5.0
Maximum Input (dBmV, per channel)				
8 channels, -46 dB x mod	N/A	35	N/A	17
Power				
Wall Plug Power Supply Input (VAC, 60 Hz)	117	117	117	117
Wall Plug Power Supply Output (VDC center positive)	24	24	24	24
Multiswitch RHCP LNB Voltage (V diode steered)	12	12	13	13
Multiswitch LHCP LNB Voltage (V diode steered)	18	18	18	18
Maximum LNB Current (mA RHCP + LHCP)	450	400	325	275
Maximum Current Drawn From IRD (mA)	14	14	30	30
General				
Multiswitch Dimensions (H x W x D) (incl. connectors)	6.5" x 4.2" x 1.2"		9.9" x 5.4" x 1.4"	
Power Supply Dimensions (H x W x D)	2.3" x 3.2" x 1.9"		2.3" x 3.2" x 1.9"	
Operating Temperature -20 to +50°C	-20 to +50°C			

Installation Guidelines

Ensure that all cable installation is complete before switching on the power supply associated with the unit. Typical losses for various TV and satellite cables are shown here:

Cable Type	Loss in dB per 100 feet Length						
	100MHz	200MHz	500MHz	900MHz	1450MHz	1750MHz	2050MHz
RG59U	2.6 dB	4.0 dB	6.5 dB	9.0 dB	11.9 dB	13.6 dB	15.3 dB
RG6U	2.1 dB	3.1 dB	5.0 dB	6.9 dB	9.1 dB	10.4 dB	11.7 dB
RG11U	1.5 dB	2.2 dB	3.7 dB	5.2 dB	6.9 dB	7.9 dB	8.9 dB

For new installations, it is recommended that as a minimum RG6U, which has been sweep tested to the maximum frequency in use, be used for the download cable with longer cable runs using RG11U or its equivalent. To minimize voltage drop, only coaxial cable which has a solid, copper-center conductor should be used.

The recommended levels at the outlet plate for satellite signals are: -55 dBm minimum and -35 dBm maximum.

The recommended minimum level for VHF/UHF signals is 25 dBmV at the input connector of the 6214IFD or 6228IFD.

The recommended minimum level for VHF/UHF signals is 5 dBmV at the input connector of the 6314IFD or 6328IFD.

Installers of these units are advised that the cases should be connected to an electrical ground via the ground bonding terminal provided and that all input and output signal cables are ground bonded externally to the unit.

Typical Installation Diagrams

The following diagrams show some possible installations. Many other possibilities exist. Please contact our Technical Service Department, which will assist with any specific applications not covered here.

Figure 1 describes an application where satellite IF signals and VHF/UHF TV signals are diplexed onto one cable and distributed to four outlet points using 6214IFD units. Model 6228IFD may be used with the same input connections to provide eight outlet points

Figure 2 describes an application having sixteen outputs showing how 6228IFD units can be arranged to provide additional outlets. Two 6214IFD units may be used with the same input connections to provide eight outputs.

Figure 3 describes an application where satellite IF signals and VHF/UHF TV signals are diplexed onto one cable and distributed to eight outlet points using 6328IFD units. Model 6314IFD may be used with the same input connections to provide four outlet points.

Figure 4 describes an application having eight outputs showing how 6314IFD units can be arranged to provide additional outlets. Two 6328IFD units may be used with the same input connections to provide sixteen outlet points.

Installation Guidelines

Figure 1
Satellite IF and VHF/UHF TV
Distributed to Four Outlets on
One Cable per Outlet

Use Model 6228IFD
 for Eight Outlets

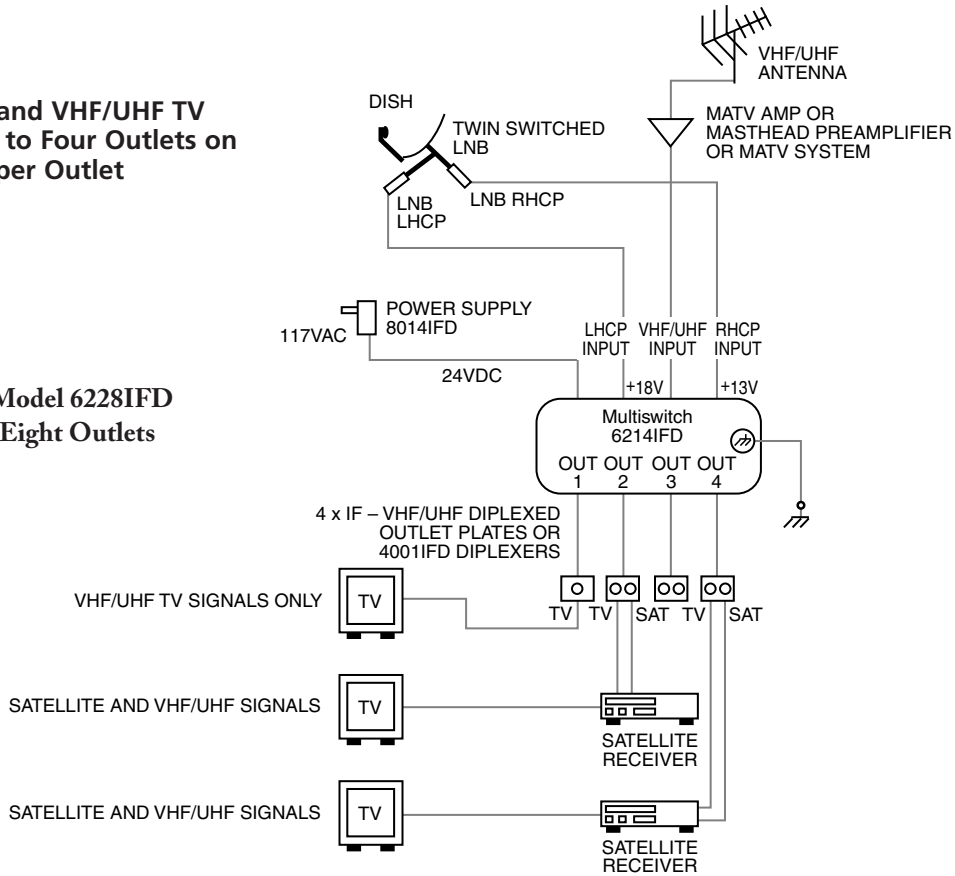
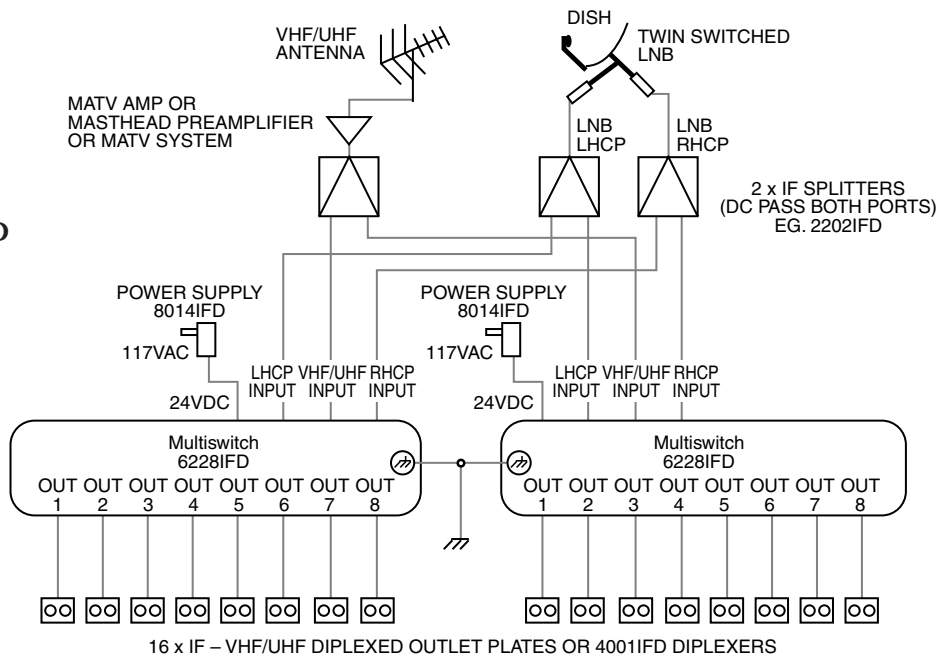


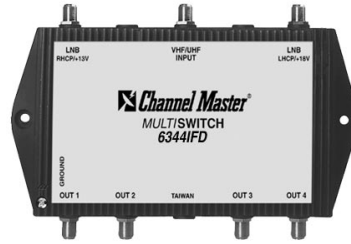
Figure 2
Satellite IF and VHF/UHF TV
Distributed to Sixteen Outlets

Use 2 x Model 6214IFD
 for Eight Outlets



Satellite IF Multiswitch

4 Output Model 6344IFD Active VHF/UHF



This model represents Channel Master's lowest cost multiswitch. It supplies LNB power from the satellite receiver and does NOT require an 8014IFD power supply. It is intended for use in systems when 117VAC is not available at the distribution point where it is desired to locate a multiswitch, making these units ideal.

Model 6344IFD includes a VHF/UHF amplifier. As such, at least one satellite receiver must be connected to Model 6344IFD to pass VHF/UHF signals.

Caution 1: Ensure that the maximum current, in addition to LNB current, plus any line amplifiers, will not overload the satellite receiver.

Caution 2: Solid copper center conductor RG6U coaxial cable must be used. It has a loop resistance of 1.0 ohms per 100 feet.

At 300mA, this implies a voltage drop of 0.3V per 100 feet. (Never use copper clad steel center conductor cable which has a much higher loop resistance.) As a result, to minimize voltage drops: (a) keep downloads from the multiswitch to the satellite receiver shorter than 75'. This will ensure proper switching action, and (b) keep cable lengths from the LNB to the multiswitch less than 75'. This will ensure adequate voltage to the LNB.

Caution 3: Note that the LNB voltages from the multiswitch are determined as follows:

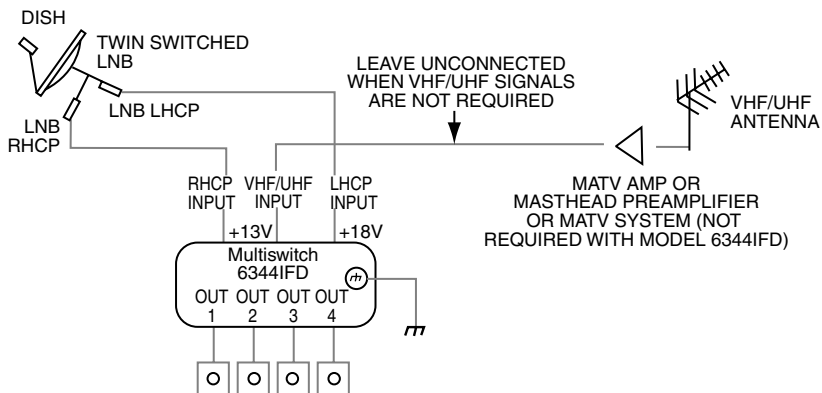
Nominal 17V = Highest satellite receiver voltage minus 0.3V.

Nominal 13V = 11.2V (with greater than 12.0V into any output).

Check that these voltages are compatible with the LNB in use.

The diagram below shows a four output system using this unit.

All Models	Impedance: 75 ohm • Connectors: Type F female	6344IFD
Satellite Input		
Frequency Range (MHz)		950-2150
Insertion Loss (dB)		5
Noise Figure (dB)		7
Isolation-Cross Polarization (output to opposite polarity input)		32
Maximum Input (dBm, per transponder)		-23
16 transponders, -40 dBc IMD		
Number of Outputs		4
VHF/UHF Input		
Frequency Range (MHz)		54-806
Gain (dB)		1
Insertion Loss (dB)		N/A
Noise Figure (dB)		4.5
Maximum Input (dBmV, per channel)		35
8 channels, -46 dB x mod		
General		
LNB Voltage (Nominal 13V, >12.0V into any output)		11.2
LNB Voltage (Nominal 17V)		(Highest Rx) - 0.3
Maximum Current Drawn From IRD (mA plus LNB and line amps)		110
Multiswitch Dimensions (H x W x D) (incl. connectors)		6.4" x 4.2" x 1.2"
Operating Temperature -20 to +50°C		



Cascade Multiswitch Taps

2 Output Model 6222IFD

Cascade tap 15 dB

Model 6232IFD

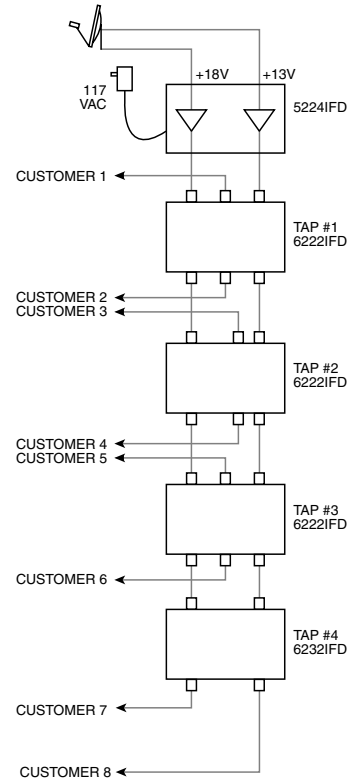
Terminating tap 11 dB



These units are multiswitch taps designed for cascade use in dual polarization, tapped trunk distribution systems. Each of the tap outputs can select either thru trunk signal depending upon voltage present on the customer cable. 0 to +14V selects one trunk, whereas +16 to +21V selects the other. A typical application would be to serve apartments on each floor of a high-rise multiple dwelling unit with the trunk cables passing down a service shaft.

They are passive and wideband, allowing VHF/UHF as well as satellite IF signals to pass. An input directional coupler on model 6222IFD gives very low thru loss and allows DC to pass along the trunk. It should be used in conjunction with a satellite IF headend distribution amplifier such as the Channel Master Model 5224IFD. The units are cascaded along the two trunk cables as far as system losses allow. The terminating models should be used as the final device in a cascade.

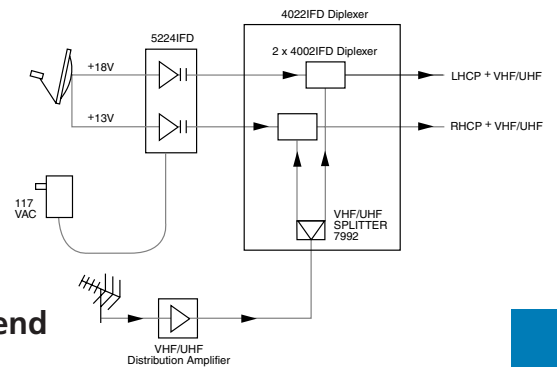
When signal attenuation by the cable and thru losses makes signal levels too low to be useful, it is possible to extend the two trunk lines by inserting a line extender. The line extender should be powered by an 8002IFD power supply. When amplification is required along the trunk line, it is not generally possible to pass VHF/UHF signals on the same cables.



All Models

Frequency Range: 54-2150 MHz • Impedance: 75 ohm • Connectors: Type F female

	6222IFD	6232IFD
Trunk DC Pass (mA)	500	N/A
Thru Loss (dB)	2	N/A
Tap Loss (dB)	15	11
Input Return Loss (dB)	13	13
Tap Return Loss (dB)	10	13
Isolation	50	50
Trunk, Cross Pol (dB)	30	N/A
Tap Directivity (dB)	20	20
Out 1 to Out 2, Same Pol (dB)	20	20
Out 1 to Out 2, Opp Pol (dB)	40	40
Switching Voltage (V)	15	15



Satellite IF and VHF/UHF High Level Distribution Headend

Use in dual polarization networks and with multiswitch taps.

Loss calculation for system shown previous diagram.

Normally, the lowest tap output level will be from the tap just prior to the final, terminating tap. Calculations are based on the output of that tap at the highest frequency (usually 1450 MHz in the US, 1750 MHz in Latin America).

LNB output level = -35 dBm per transponder (typical)
 Minimum customer level = -55 dBm per transponder
 Therefore, maximum distribution loss = 20 dB

Considering Customer #6

Cable loss between dish and Tap #3 = a dB
 Cable loss from Tap #3 to customer = b dB
 Thru loss, Taps 1 and 2 = c dB
 Tap loss, Tap 3 = d dB
 Headend amplifier gain = e dB

When satellite IF and VHF/UHF signals are distributed on the same cable, they must be separated at the customer's location using a 4001IFD diplexer. The diplexer's satellite output is then connected to the IRD satellite IF input, and the diplexer's VHF/UHF output is connected to the satellite receiver's VHF/UHF input.
 A 4022IFD dual diplexer is equivalent to 2 x 4002IFD + Model 7992 splitter.

Then a+b+c+d-e must be less than 20 dB. In this example, c=4, d=15, e=24.

22KHz Multiswitch

Model 6904IFD-01

- 4 Input
- 4 Output
- LNB powering



Channel Master multiswitch model 6904IFD is designed to distribute 2 polarizations (usually RHCP and LHCP) from 2 satellites to up to 4 IRDs. Polarization selection is by 13V/18V LNB voltage switching. Satellite selection is by a 22KHz tone on the LNB voltage which is present when the second satellite is required.

No power supply is required with model 6904IFD as the IRD's voltage is passed to the desired LNB. As only the desired LNB is powered (switched by 0 KHz or 22 KHz), the IRD's power supply is not overloaded. Model 6904IFD is supplied with many 2 satellite systems.

An upward gain slope compensates for coaxial cable losses and slope.

Application of Model 6904IFD multiswitch:

The accompanying figures show several applications in different 2 satellite distribution systems. Many other configurations are possible. Channel Master Technical Service will assist in system design.

It is recommended that IRD powering of the LNBs is only used in small systems, eg 4 or 8 outputs AND where coaxial cable runs are short, say less than 100 feet. This is due to voltage drops in the cable which can cause polarization confusion and also because of signal losses in cable and splitters.

The internal topology of these switches consists of a directional tap, followed by a PIN diode switch, followed by a MMIC amplifier. This configuration has an inherently high noise figure of around 19dB. As such, signal levels should not be allowed to fall below -50dBm at the multiswitch input. This is typically about 15dB below the typical LNB output level of -35dBm. Otherwise, the thermal noise floor will start to degrade the QPSK signals. The maximum input level of -25dBm per transponder must also be observed. Such a high level is only usually possible in an amplified system.

The applications shown include:

- 4 and 8 output, non-powered home run systems
- Larger, amplified home run systems with 117VAC power
- A cascaded system
- A 4 output system with VHF/UHF signals diplexed at the output

The application notes show separate satellite dishes for clarity, though in most cases, a single dish with 2 LNBs will be used.

Freq. Range: 950-2150 MHz • Impedance: 75 ohm • Connectors: Type F female

Number of Inputs, Sat A LHCP,RHCP Sat B LHCP,RHCP	4
Return Loss, In and Out (dB)	8
Gain and Slope (dB at 950,1450,2025 MHz)	-2, +2, +4
Noise Figure (dB)	19
Isolation, Cross Pol and Cross Sat (dB)	40
Maximum Input, 16 channels (dBm per channel)	-25
Minimum Input (dBm per channel)	-50
Current From IRD, at 18V (mA)	60
Satellite Section, Sat A (KHz)	0
Satellite Section, Sat B (KHz)	22
Tone Blocking, IRD to LNB	Yes
Polarization Selection (mA to selected LNB only, diode steered)	13/18
Thru Voltage Drop (V)	0.6

Figure 1
A 4 Output Home Run System – Non Powered

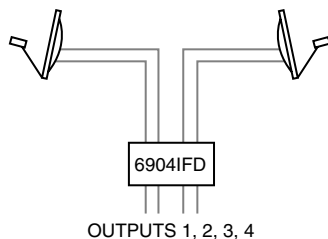
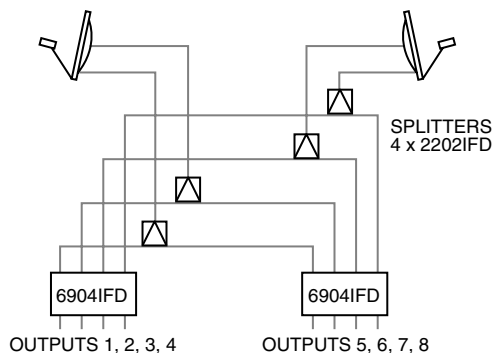


Figure 2
An 8 Output Home Run System – Non Powered



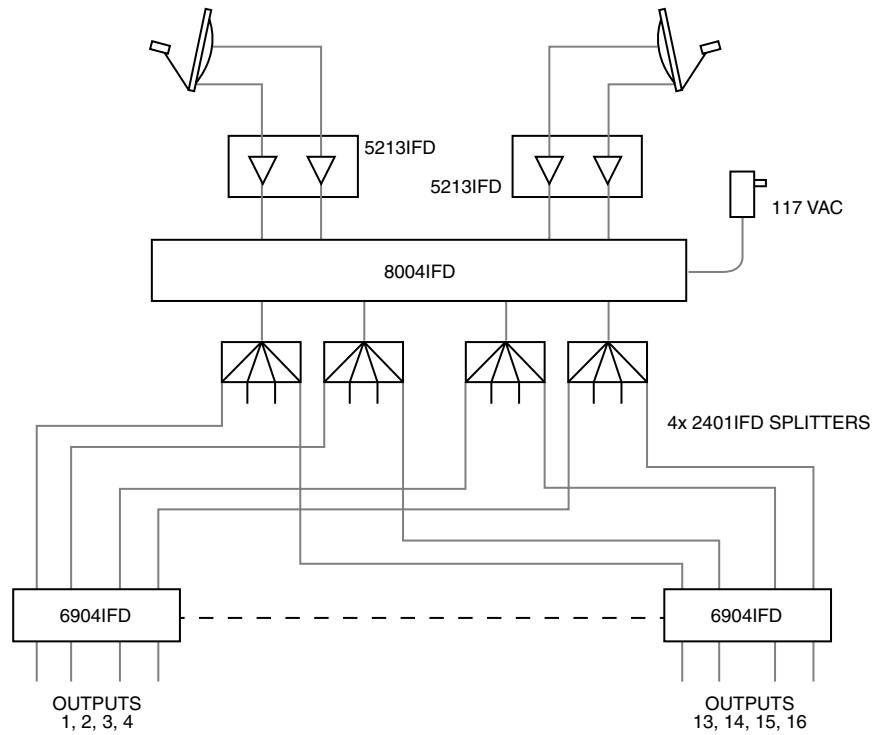
The maximum length of RG-6 coaxial cable in Figures 1 and 2 is 100 feet. Exceeding this length may cause polarization selection problems due to voltage drops in the cable.

The splitters of Figure 2 are DC pass, all ports.

Application of Model 6904IFD Multiswitch

Figure 3

A 16 Output Home Run System – 117VAC Powered

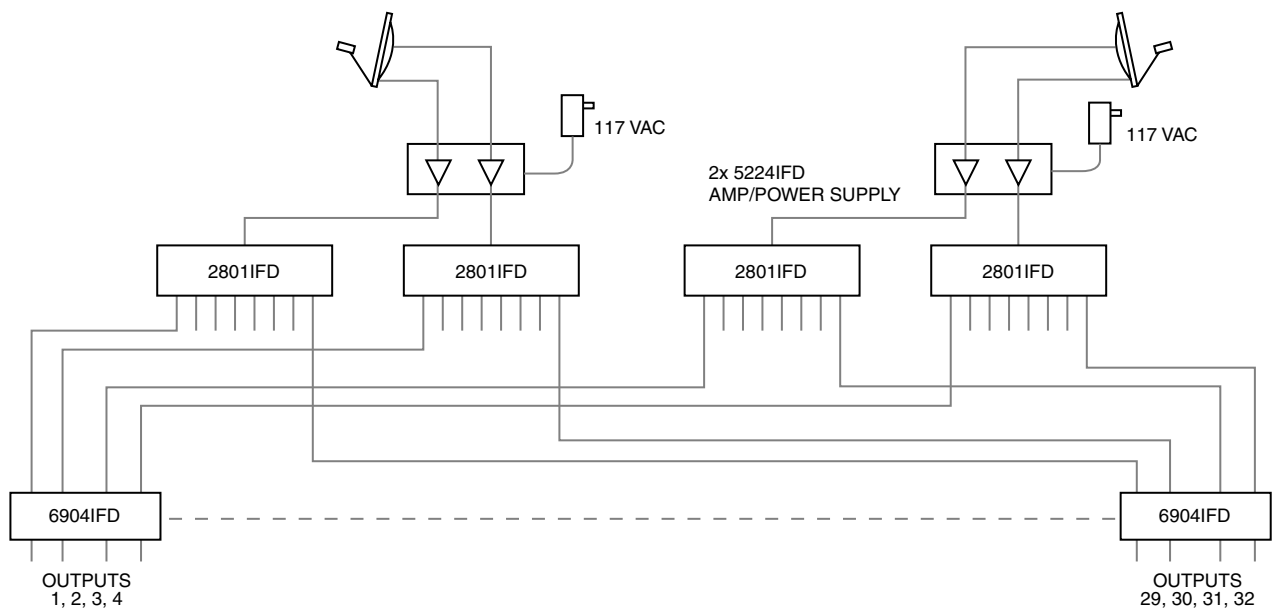


Ensure model 5213IFD amplifiers will not be overdriven. This is only likely in rare instances such as where large dishes are in use.

Ensure model 5213IFD amplifiers are powered by +18VDC (not +13VDC) from the 8004IFD quad power supply/injector.

Figure 4

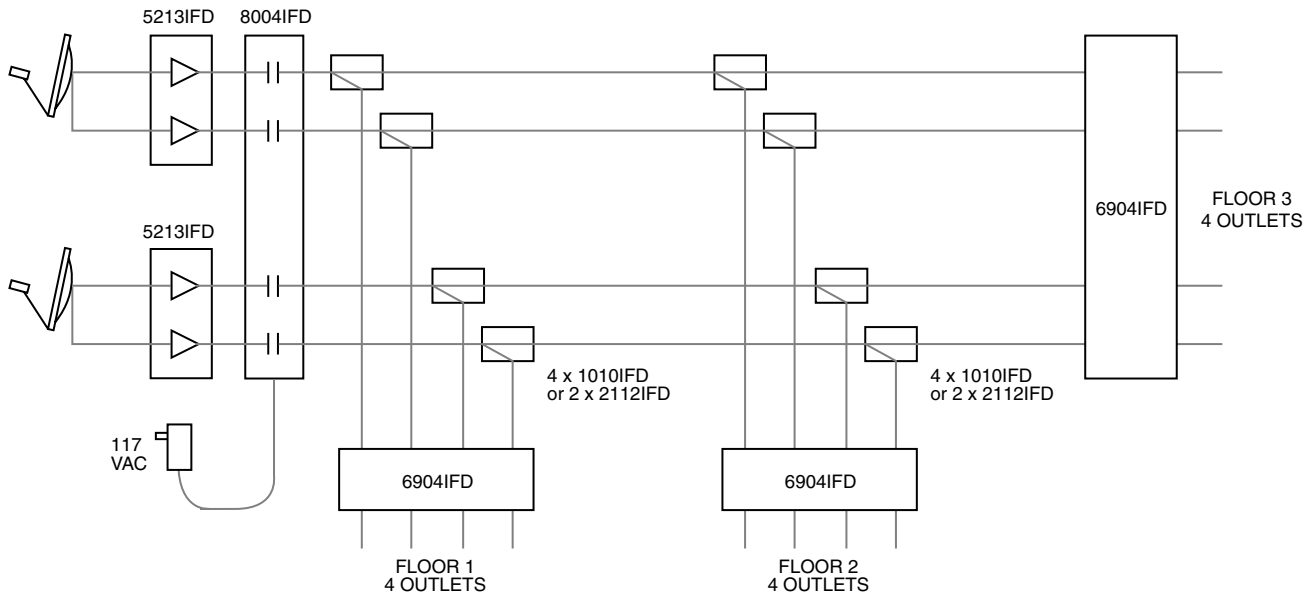
A 32 Output Home Run System – 117VAC Powered



Application of Model 6904IFD Multiswitch

Figure 5

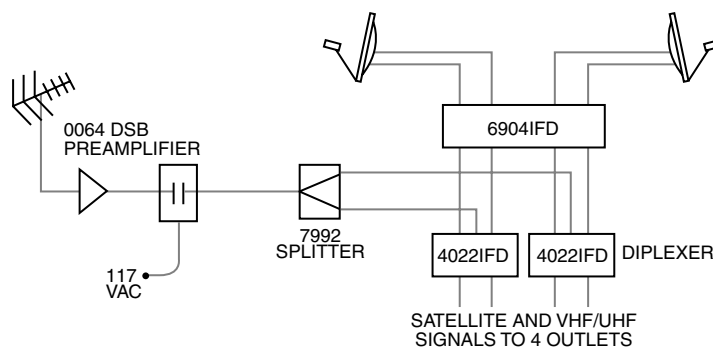
A 3 Floor, 12 Output, Cascaded System



Switch 6904IFD always provides a high input return loss regardless of output connections. As such, it may be used as a terminating tap as shown on Floor 3.

Figure 6

A 4 Output Home Run System – Non Powered with Diplexed VHF/UHF Signals



The VHF/UHF signals are diplexed at the outputs of the multiswitch. The preamplifier is usually needed to overcome the approx 8dB of VHF/UHF splitting loss. Many similar configurations are possible.

Dual & Quad LNB Power Supply/Injectors

Dual Supply Model 8002IFD

13 and 18V with Model 8014IFD power supply

Quad Supply Model 8004IFD

13 and 18V with Model 8014IFD power supply



These units are designed for external powering of twin switched LNBs. Model 8002IFD will power one twin LNB, Model 8004IFD will power two twin LNBs. Each LNB is supplied with +13V and +18V regulated. The power source is a standard wall plug supply which has an unregulated output of approximately +24VDC. The output lines are all DC blocked.

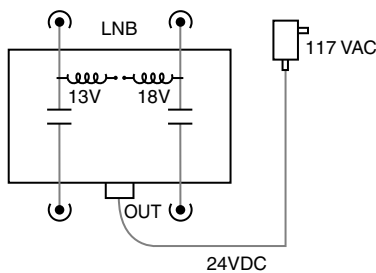
For both models, the total LNB current should not exceed 600 mA. The main application for these units is in SMATV systems where it is not desirable to power the LNB from the satellite receivers. Model 8004IFD is used mainly in two satellite installations. Many other applications are possible such as powering line amplifiers, eg. Model 5213IFD, 5113IFD.

All Models

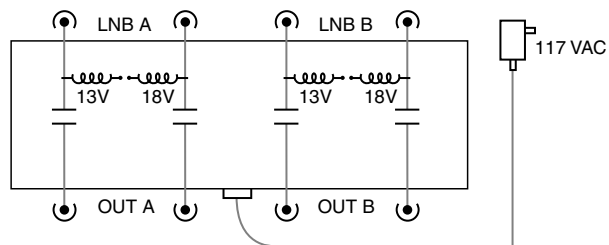
Frequency Range: 50-2150 MHz • Impedance: 75 ohm • Connectors: Type F female

	8002IFD	8004IFD
Insertion Loss (dB)	.6	.7
Return Loss (dB)	17	17
Cross-Pol Isolation (dB)	50	45
Cross-Satellite Isolation (dB)	N/A	45
LNB A Voltage (V)	13 and 18	13 and 18
LNB B Voltage (V)	N/A	13 and 18
Maximum Total Current (mA)	600	600
Dimensions Injector (H x W x D)	3.3" x 4.1" x 1.0" (84 x 104 x 25mm)	4.2" x 4.5" x 1.2" (107 x 114 x 30mm)
8014IFD Wall Plug Input	117 VAC, 60 Hz	
8014IFD Wall Plug Output	24VDC unregulated at 600 mA max	
8014IFD Dimensions Wall Plug (H x W x D)	3.3" x 2.2" x 1.9" (84 x 56 x 49mm)	

Model 8002IFD



Model 8004IFD



Wall Plug Power Supply Model 8014IFD

24 VDC, 600 mA

Model 8014IFD is used in many Channel Master products such as multiswitches, headend amplifiers and LNB power supplies. It is available on its own for replacement purposes. Refer to Model 8002IFD chart (above) for specifications.

Model 8014IFD is available with a 230 VAC/50 Hz input and Euro style plug. Contact Channel Master Sales for details.



Listed Power Supply

Dual & Quad LNB Power
Supply/Injectors

Model 2717IFD

40-1750 MHz

Model 2721IFD

40-2150 MHz

Channel Master models 2717IFD and 2721IFD are cable slope equalizers designed to provide an upward sloping frequency response which will correct an excessive downward slope caused by long cable runs and high end fall off in distribution components.

Model 2717IFD should be used for systems with a top frequency of 1450 or 1750 MHz (mainly US and South American systems). Model 2721IFD should be used for systems with a top frequency of 2025 or 2150 MHz (mainly US "stacked" and European systems).



Attenuation vs frequency is shown in the chart below. They are DC passive and can pass up to 1A DC. They also feature excellent return loss and as such two units may be cascaded for even greater slope correction, however, it is normally preferable to spread units through the system to maintain a more "flat" response throughout the distribution system.

All Models

Impedance: 75 ohm • Connectors: Type F female • DC Power Pass: Both directions, 1000mA

	2717IFD	2721IFD
Passband (MHz)	40-1750	40-2150
Gain (dB)		
54 MHz	9.8	9.8
470 MHz	9.1	9.4
806 MHz	7.7	8.5
950 MHz	6.5	7.5
1450 MHz	2.8	4.5
1750 MHz	1.6	2.7
2025 MHz	N/A	1.4
2150 MHz	N/A	1.4
Return Loss (dB)	15	15
Noise Figure (dB)	5	5
Dimensions, incl. connectors (H x W x D)	.8" x 2.8" x .6" (22 x 71 x 15mm)	.8" x 2.8" x .6" (22 x 71 x 15mm)

40-2150 MHz Attenuators

Model 2803IFD

3 dB, AC/DC passive

Model 2806IFD

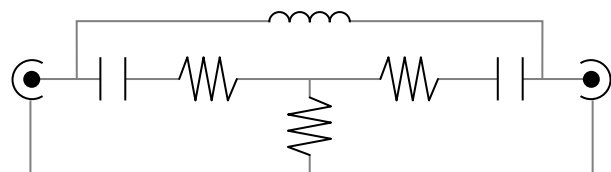
6 dB, AC/DC passive

Model 2810IFD

10 dB, AC/DC passive



The above models are general purpose, ultra wideband in-line antennas. For ease of installation, one end is type F male and the other end type F female. Their primary application is to prevent excess signal overloading of an amplifier or receiver. As these units are power passive, it is still possible to pass DC line power.



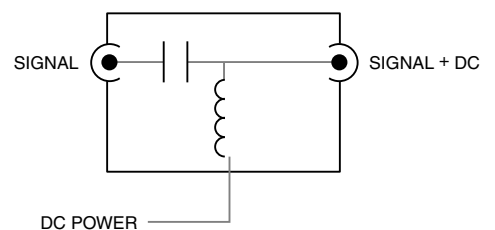
General Purpose Line Power Adder/DC Block

Model 8001IFD

Serves a variety of purposes such as powering LNBS, line amplifiers, etc.

Frequency Range: 40-2150 MHz • Impedance: 75 ohm
Connectors: Type F female

Insertion Loss (dB)	.5
Return Loss (dB)	17
Connector Power	6 foot cord
Maximum Voltage (V)	60
Maximum Current (A)	1.5
Dimensions, incl. connectors (H x W x D)	2.0" x 1.9" x .7" (51 x 47 x 19mm)



Cable Slope Equalizers, Power Passing Attenuators/Line Power Adder

1. Levels

As a starting point, assume a level of -35 dBm per transponder out of the LNB. This will of course vary with satellite footprint EIRP, antenna size and LNB gain.

A simplified calculation to determine LNB output level is shown below.

In clear sky conditions:

LNB output (dBm) = Footprint EIRP (dBW) + 30 - Path Loss (dB) + Antenna gain (dB) + LNB gain (dB).

Assume path loss = 206 dB (at 12.45 GHz); antenna gain = 34.0, 36.5 or 40.7dB for antenna size of 0.46, 0.60 or 1.0m (at 12.45 GHz); typical footprint = 51 dBW; typical LNB gain = 56 dB.

Example: LNB output level = 51 + 30 - 206 + 34 + 56 = -35 dBm

Design for a level at secondary distribution points in the range -45 dBm to -30 dBm per transponder. This will typically be in the range of -10 dB to +5 dB relative to LNB level.

Home run systems are those where each outlet has its own coaxial cable from the outlet back to the secondary distribution point. In a home run system, the secondary distribution points will typically be located at a point convenient to feed a particular group of outlets, this may be at the headend.

Systems serving several floors are often more conveniently designed with a cascade, tapped-trunk architecture. Here the secondary distribution points will typically be located at a central point on each floor.

Some systems will be most conveniently designed as a combination of home run and cascade networks, forming a “tree and branch” structure.

Design for a level at the customer outlet of -55 dBm to -35 dBm per transponder.

Perform calculations of signal level at the highest frequency in use. In the United States this is generally 1450 MHz. In South America, it is generally 1750 MHz.

It is worthwhile repeating the calculations at 950 MHz to ensure that the signal slope from 950 to 1450 MHz is acceptable. Maintain less than 7 dB slope.

2. Measurement of Signal Level

An installer of medium and large satellite IF distribution systems requires a spectrum analyzer. The spectrum analyzer will allow him to measure the signal level of each transponder. Without a spectrum analyzer, a system may be constructed, and if it does not immediately function correctly without adjustment, the installer is “in the dark” as to why it doesn’t work properly. He will then probably resort to changing parts in a random manner; wasting both time and money. The following are just a few of the problems that can be instantly recognized with a spectrum analyzer:

- a. Signal levels within the desired range.
- b. Acceptable flatness across the spectrum ie. the difference in level between lowest (950 MHz) and highest transponder (1450 MHz).
- c. No unusual notches or “suck-outs”. This effect is usually called by poor coaxial cable or type F connectors.
- d. No ingress or other interfering signal which may cause certain transponders to be degraded.

The following are guidelines to the use of a spectrum analyzer with digital QPSK signals as found in DBS TV applications:

The total occupied bandwidth of a digital DBS signal is 24 MHz with the power distributed fairly evenly across the 3 dB power bandwidth of approximately 20 MHz. As a result, the appearance on a spectrum analyzer when viewing the 16 transponders at 950-1450 MHz IF is similar to viewing a square wave on an oscilloscope.

The occupied bandwidth is much wider than the resolution bandwidth (IF filter) of most spectrum analyzers which are typically 1 MHz or 3 MHz in their widest setting. As a result, the displayed signal level is much lower than the actual level.

The correction in dB to be applied depends on the ratio of the analyzer’s resolution bandwidth to 20 MHz from the following formula:

$$\text{dB correction} = 10 \log (20/\text{RB})$$

RB is the resolution bandwidth in MHz

This figure calculates to 13 dB for an analyzer with a 1 MHz resolution bandwidth or 8 dB for an analyzer with 3 MHz resolution bandwidth.

Some analyzers have been specifically designed for this application and use IF filters wide enough to pass the digital DBS signal without truncation. In this case, no correction need be applied.

The following procedure may be found useful for measuring satellite signal levels at IF with a spectrum analyzer:

1. Start by taking care not to apply DC to the analyzer unless designed to handle it.
2. Set the frequency span from approximately 900 to 1500 MHz. This will allow any slope in the system to be identified.
3. Set the input attenuator to an appropriate level. Expect approximately -35 dBm per transponder out of the LNB.
4. Set the analyzer to the widest resolution bandwidth.
5. Maximum video filtering is useful in achieving a reduced noise display.
6. Read the level at the top of the “square wave”.
7. Add the correction described above to this level.

3. System Size Limitations

The same factors that limit the reach of a CATV system apply to satellite IF distribution systems. Specifically:

- a. Intermodulation Distortion (IMD products). These are mixing products created by amplifier non-linearities. We recommend that the final component in a cascade have no worse than -40 dBc IMD products at its output. See the section on line extender amplifiers (page 9) for guidelines on input levels to limit production of IMD products.
- b. Noise. As signal levels are kept down to keep IMD products in check, noise can start to degrade the signal. This problem is less severe than in CATV due to the high LNB gain and relatively low C/N signals.
- c. Slope build up. It is difficult to maintain a flat response with many units in cascade.

In summary to limit the effects of the above, we recommend that distribution systems be designed for no more than four active units in any one cascade line from the headend to the customer outlet. Active units include headend amplifiers, line extender amplifiers and active multiswitches (not passive multiswitch models 6222IFD and 6232IFD); eg. one headend amplifier, two line extender amplifiers and one active multiswitch in any one line from headend to customer outlet is the maximum cascade we suggest.

4. Home Run Distribution Systems

Home run systems are those where each outlet has its own coaxial cable from the outlet back to the secondary distribution point. Refer to the example in Figure 1. The secondary distribution points will typically be located at a point convenient to feed a particular group of outlets. In small systems, this may be at the headend itself.

In a voltage switched system, multiswitches or a single output switch are connected to each pair of cables at the secondary distribution points.

The signal level at the secondary distribution points may be calculated relative to the LNB level for the system in Figure 1 as follows:

At the highest frequency in use (1450 MHz in US):

Total loss between LNB and secondary distribution points = 2801IFD loss + 2201IFD loss + Cable loss = L dB

5224IFD gain at 1450 MHz = 24dB, therefore,

Level at secondary distribution point = LNB level + 24 - L dBm.

Figure 2 shows a voltage-switched, home-run system with 64 outlets. Each multiswitch could be located in a convenient position to feed a group of four outlets. The multiswitch input signals could be taken from the headend in Figure 1.

Home run systems are the easiest to set up and give fewest problems, particularly in the deployment phase of the project. This is unlike cascade systems where a problem in one component is likely to hurt all outlets “down the line”.

Figure 1

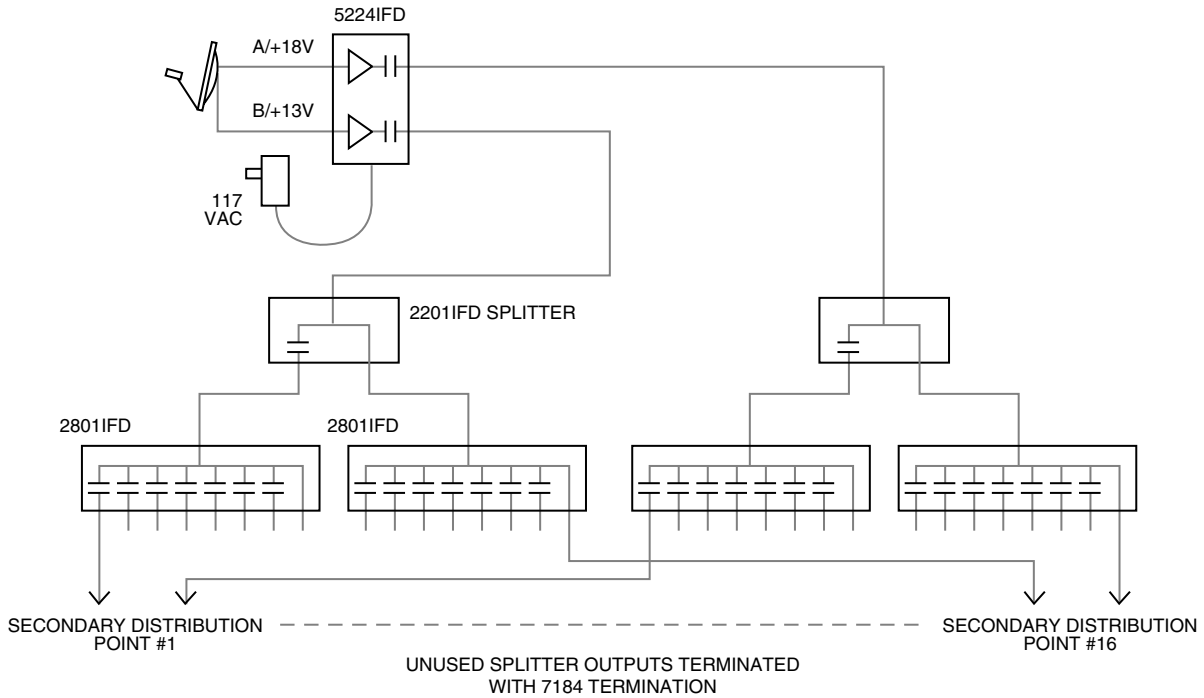
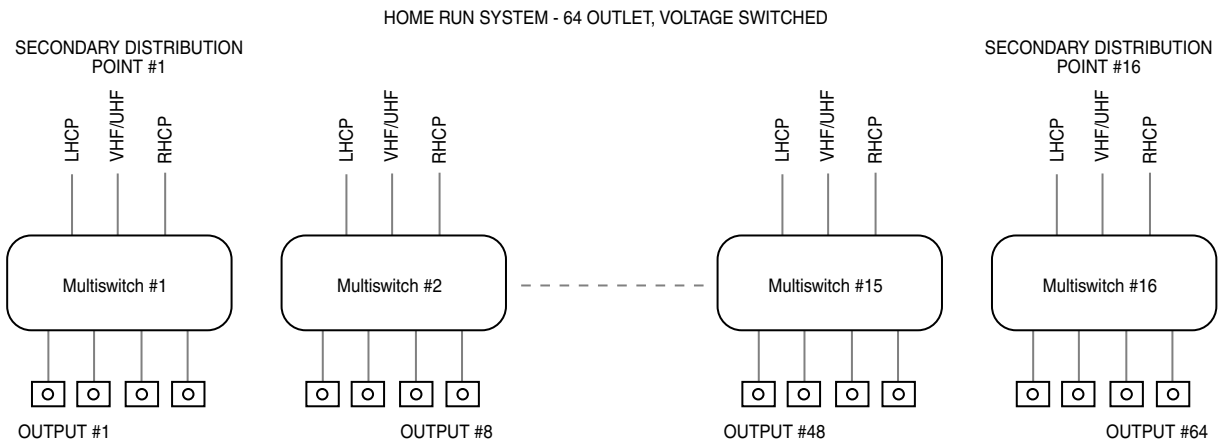


Figure 2



5. Cascade Tapped-Trunk Distribution Systems

Refer to the example in Figure 3. These systems are particularly convenient for serving several floors with a secondary distribution point on each floor. An example of such a system is shown in Figure 4. In voltage switched systems, multiswitches are located at the secondary distribution points, forming a “tree and branch” structure. When only two voltage switched outputs are required on each floor, multiswitch taps models 6222IFD and 6232IFD as described on Page 46 provide an economical and attractive solution.

When calculating the level at the output of each tap, consider:

- The tap loss.
- The thru loss of previous taps in the cascade.
- Prior cable losses.
- The gains of a headend amplifier and any line extender amplifiers.

An example of signal level calculations for a cascade, tapped trunk system is shown on Page 46.

When it is required to install a multiswitch or single output switch on each floor, dual polarization directional tap, Model 2112IFD is recommended. When the -12 dB tap value is too low, an attenuator can be placed on the tap output. Attenuator Models 2803IFD, 2806IFD and 2810IFD are recommended.

In cascade systems it is of extreme importance to use only components having high return loss characteristics in the trunk path. This is to minimize ripple in the passband. Dual directional tap model 2112IFD and the two output multiswitch taps Models 6222IFD and 6232IFD have excellent return loss characteristics.

When system losses are such that amplification is required in a cascade system, dual polarization line extender, Model 5213IFD is recommended. Amplifier, Model 5213IFD, may be cascaded with an amplifier placed in the line after losses equivalent to the amplifier gain at the highest system frequency (1450 MHz in the US), ie. after each 14 dB of cable loss and tap thru loss, place an amplifier. Such a system is shown in Figure 5.

Care must be taken to keep intermodulation distortion products down to an acceptable level. IMD products of -40 dBc out of the final amplifier are generally considered the limit of acceptability. This will limit the number of amplifiers in a cascade and/or the signal level into each amplifier. Channel Master products are specified at an input level for -40 dBc IMD products, reducing the input level will significantly reduce the IMD products.

In cascade systems particularly, the slope or tilt of the signals can become a problem. This is the difference in level between the highest frequency transponder and lowest frequency transponder. The coaxial cable loss verses frequency characteristic is the main reason why transponders near the high end of the spectrum (1450 MHz) tend to become attenuated relative to transponders at the low end (950 MHz). Coaxial cable loss in dB at frequencies F2 and F1 follows the rule:

$$F2 \text{ loss (dB)} = F1 \text{ loss} \times \text{square root (F2/F1)}$$

Typical cable loss data is shown on Page 42. Try to keep the signal flatness within 7 dB at the customer outlet. Channel Master headend amplifiers, line amplifiers and high level line extenders include cable slope compensation to minimize this problem.

Figure 3

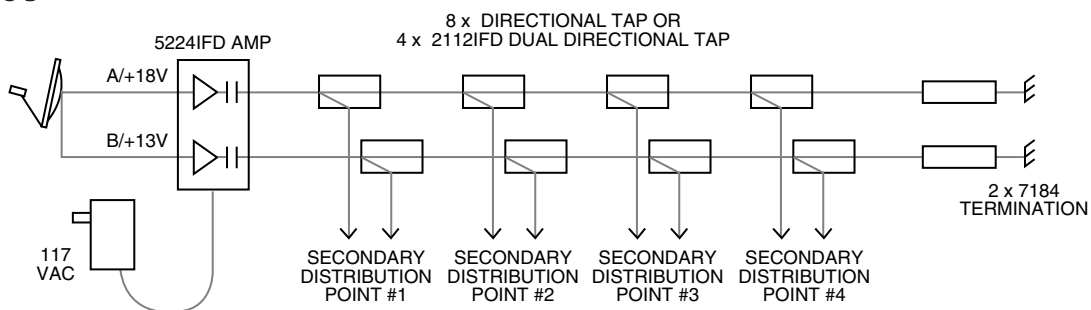


Figure 4

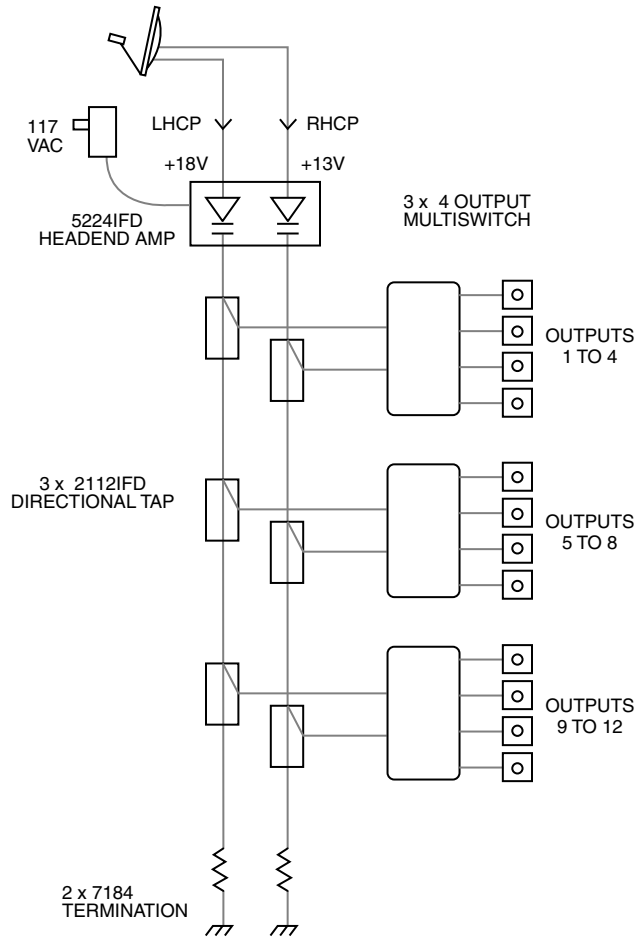


Figure 5

