

## Economical, Whole House Broadband, Addressable Scrambling Systems



MultiCipher Scrambling Systems are an integral part of California Amplifier's on-going commitment to providing innovative, cost-effective solutions for world wide Wireless Cable applications. The MultiCipher Scrambling Systems consist of the basic MultiCipher® System and MultiCipher Plus™ - an enhanced system which adds the ability to offer premium channels in individual tiers and provides pay-per-view capabilities.

### One Decoder, Multiple Points of View

Both MultiCipher Systems are whole-house broadband solutions, allowing simultaneous viewing and/or recording of different channels on multiple TVs and VCRs throughout the household. And they do it with just one MultiCipher individually addressable decoder unit per subscriber site whether a single family home or a multi-unit apartment building. Also, subscribers can select channels on their TV or VCR using their existing remote controls. No need for additional set top boxes or remote control units.

### Maximum Signal Protection Maximum Performance

MultiCipher Systems use digital signal processing to remove and disrupt essential components of analog video signals. The scrambled signals are then transmitted in PAL or NTSC formats using conventional Wireless Cable equipment (Note: Please request the list of approved headend equipment, including channel modulators, for use with MultiCipher Systems.) A microprocessor-controlled decoder unit restores picture information to its original quality while providing high signal security. The result is maximum

protection of the signal and maximum information for the subscriber. Further, MultiCipher's rack-mounted scrambling units are compact, minimizing headend space requirements.

### Minimize Headend Space and Costs

MultiCipher's headend components were designed to minimize

space requirements. At the operator's facilities, MultiCipher's rack-mounted encoder chassis and data modulator units are simple to install. Each encoder chassis can accommodate up to ten channels originating from any video source. Multiple chassis may be used to suit your system requirements. The MultiCipher system controller is an integrated system that simplifies subscriber activation/deactivation and provides a data stream for use by a billing service (SMS).

### Simple Whole-House Installation and Operation

The MultiCipher decoder's small size and whole-house service make installation and operation easy. The indoor decoder units are compact and can be mounted virtually anywhere—only one is required at each subscriber site. This significantly reduces the operator's up-front investment and cost per subscriber. Distribution at the home or MDU (Multiple-Dwelling Unit/apartment building) is accomplished using CATV distribution techniques. Best of all, different channels can be simultaneously viewed and recorded throughout the house. Subscribers select channels directly on their TV or VCR (or with TV/VCR remote controls).

### Enhanced Security

While its primary role is to guard against signal theft, the MultiCipher system incorporates other security enhancements. In addition to a unique serial number to enable or disable each unit, the MultiCipher decoder contains a system code. This factory-programmed system code ensures that the individual decoders can only be used within the specific system for which they were programmed.

### Compatible With Worldwide TV Standards

MultiCipher Systems can be used with worldwide television transmission standards. A selection of video encoder boards ensure compatibility with PAL (625 line) or NTSC (525 line) formats for applications worldwide. Additionally, a standards converter board is available to ensure compatibility when converting between any 525 line and any 625 line standard.

### Maximize Picture Quality and Reliability

With MultiCipher, each channel is scrambled separately and the entire broadcast is descrambled at once. Through this proprietary design, the picture is restored to its original quality. The small number of components required at the headend and non-interaction by subscribers with the decoder units significantly increases the overall system reliability.

### Tiered Scrambling System

The MultiCipher Plus™ system can do everything the basic MultiCipher system does PLUS it offers the ability to add premium channels in individual tiers to the programming lineup.

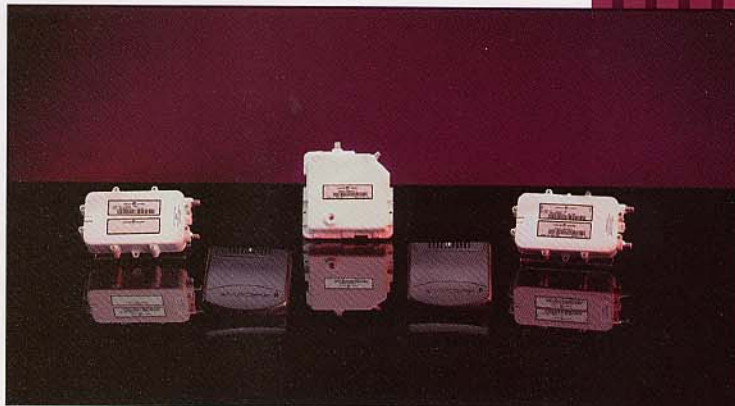
### Subscribers Can Buy All of Them, Some of Them, or None of Them

MultiCipher Plus provides the opportunity to offer premium channels as well as basic programming, while packaging and pricing the tiers individually or in various combinations. It even adds pay-per-view capability. The standard MultiCipher Plus system provides for six tiers. Typically, a system is configured to offer a tier of basic channels and up to five\* premium programming or pay-per-view channels. Subscribers get more choices while system operators generate additional revenues.

\*For configurations featuring more than five tiered channels, please contact a California Amplifier representative

# MultiCipher Whole House Decoders

- Frequency agile data receiver allows the operator to change data channels while system is operational in the event of transmitter failure
- Frequency agile scrambler allows operator to change premium channel assignments through the system controller computer
- Data transmission format allows stereophonic audio to be broadcast on all channels including data channels
- Available in NTSC and PAL broadcast standards in VHF and UHF operating frequencies
- Patented, proprietary system design



The MultiCipher Decoder receives the scrambled broadcast signal either directly or through a microwave downconverter, confirms subscriber authorization, performs descrambling and outputs all channels for routing to multiple TVs or VCRs. Each decoder contains a unique serial number in non-volatile memory allowing individual addressing from the system controller. Installation is simple, a single 75 ohm coax cable delivers the scrambled signal from the downconverter. A second 75 Ohms coax cable sends output to TVs or VCRs. The output is fully compatible with popular television features including Picture-in-picture. The MultiCipher decoder features an LED which, through various blinking patterns, instantly confirms DC power, authorization status and diagnostic check. This feature is an excellent trouble shooting tool.

Part Number	408 Plus 170223-400	848 Plus 170224-100	656 Plus 170225-100
<b>RF Performance</b>			
Input Frequency Range (Consult factory for other input frequencies)	100 - 450 MHz	662 - 848 MHz	470 - 656 MHz
Input Frequency Range for data channel	671.25 - 807.25 MHz (8 MHz spacing)		494 - 656 MHz (8 MHz spacing)
Input Dynamic Range			
31 channels	0 - +20 dBmV	0 - +20 dBmV	0 - +20 dBmV
1 channel	0 - +25 dBmV		
Output Level *	+12 - +14 dBmV	+6 - +10 dBmV	+9 - +13 dBmV
Composite Triple Beat (CTB) (31 channels, each at +20 dBmV)	-53 dBc	-55 dBc	-55 dBc
Input / Output Impedance	75 ohms, Type F	75 ohms, Type F	75 ohms, Type F
Input Return Loss	11 dB or greater		
Output Return Loss	9 dB or greater		
Input/Output VSWR	2.6:1	2.5:1	
<b>Video Performance:</b>			
Interdiction Capability	Up to three channels in the band of 295 - 405 MHz (Channel 36 to Channel 54)	Up to three channels in the band of 663 - 800 MHz	Up to three channels in the band of 470 - 624 MHz
Differential Phase	2° or less	2° or less	2° or less
Differential Gain	2% or less	2% or less	2% or less
Chrominance to Luminance:			
Gain Distortion	1% or less	1% or less	1% or less
Delay	20nsec	20nsec	20nsec
Line Time Distortion	2% or less	2% or less	2% or less
Frequency Response to 4.1MHz	-0.6 dB	-0.6 dB	-0.6 dB
Video Signal to Noise Ratio	50 dB (Weighted)		
<b>Environmental:</b>			
Operating Temperature	(-40° - +75° C)	(-20° - +75° C)	(-20° - +75° C)
Voltage Supply	18V - 30V	18V - 30V	18V - 30V
Dimensions	5.9 x 5.22 x 1.4 in.	3.8 x 6.5 x 1.5 in.	5.8 x 3.2 x 1.8 in.
Weight	23 oz.	19 oz.	19 oz.
* Average Composite Video			
Available without tiering capability	Part No. 170003	Part No. 170004	Part No. 170005

# MultiCipher® Systems

## Data Modulator

170.051



- Separate data channel not required
- Does not interfere with closed caption teletext or other vertical interval transmissions
- Microprocessor controlled
- Status display panel provides information to confirm operational status
- Slim design requires minimal rack space
- One year warranty

The MultiCipher Data Modulator sends authorization and deauthorization commands to individual MultiCipher Decoders in a digital format. Functionally, the Data Modulator passes system controller commands to a channel modulator for broadcast using industry-standard transmission equipment. The unique MultiCipher modulation format does not cause the performance degradation to video or audio seen in traditional systems. The Data Modulator is rack-mountable in standard 19-inch video equipment racks.

Data Modulator	
<b>Interface (channels A and B):</b>	
Inputs:	
I.F.	32 - 39 MHz PAL, +45 dBmV, 75Ω, Type F 41 - 47 MHz NTSC, +45 dBmV, 75Ω, Type F
Reference Video	1.0Vp-p, 75Ω, BNC, Video Reference, Type F
Parallel Data	TTL Logic, DB25 - Female
Serial Data	RS232, DB9 - Male
Outputs:	
I.F.	32 - 39 MHz PAL, +45 dBmV, 75Ω, Type F 41 - 47 MHz NTSC, +45 dBmV, 75Ω, Type F
Serial Data (5 outputs)	RS232, DB9 - Male
Serial Data (loop-thru)	RS232, DB9 - Female
<b>Performance:</b>	
Insertion Loss or Gain	±2 dB
Phase Noise	-60 dBc minimum
Spurious Products	-55 dBc minimum
Carrier Deviation	±25 KHz, ±2 KHz
Frequency Response Over Channel	NTSC or PAL ±1 dB
<b>Environmental:</b>	
Ambient Operating Temperature	0° - +45° C (+32° - +113° F)
Operating Humidity	10% - 95% RH, non-condensing
Power Supply	117 VAC or 220 VAC (±10%), 50 or 60 Hz (switch selectable)
Power Dissipation	15 Watts
<b>Physical Dimensions:</b>	
Width	48.3 cm (19 in)
Height	13.34 cm (3.5 in)
Depth	38.1 cm (15 in)
Weight	9.1 Kg (20 lb.)

# Encoder Card

170172

Encoder Card	
<b>Interface (each channel):</b>	
Inputs:	
Video (composite)	1.0 Vp-p, 75 ohm, BNC
Genlock In	High impedance, looping 2 BNCs (Common for all 10 channels or independent for each channel)
Outputs:	
Video (composite)	1.0 Vp-p, 75 ohm, BNC
Y/C	TTL logic level 0-5 VDC, 4-pin S-connector
Y=Horizontal blanking	
C=Composite sync	
Monitor Out	1.0 Vp-p, 75 ohm, BNC (selected channel)
<b>Performance (each channel):</b>	
RS-232 Interface	25-pin D-connector, female
Window	525 lines (NTSC)      625 lines (PAL)
Bandwidth	5.0 MHz (NTSC)      5.5 MHz (PAL)
Signal to Noise Ratio	58 dB
Differential Phase	1°
Differential Gain	2%
K Factor (2T)	1%
Sampling	8 bit luma, 8 bit chroma
Residual Time Base Error	15 nsec
Composite Auto Bypass (each channel)	If channel card is removed
Composite Auto Bypass (full unit)	If AC power or power supply fails or is removed

- Broadcast quality video performance
- Full-featured video frame synchronizer
- Proprietary scrambling technology
- Available for NTSC and PAL video formats
- One year warranty



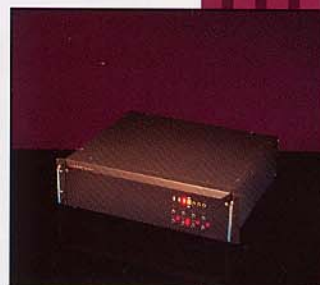
The MultiCipher encoder cards are mounted in the MultiCipher encoder chassis (See below for description and specifications). Ten cards can be installed in a single chassis - one encoder card per channel to be broadcast. These plug-in synchronizer/encoder cards scramble the NTSC or PAL - only (625 line) operation while a second model (optional per system requirements) provides conversion capability between NTSC (525 line) and PAL (625 line) formats. The encoder cards are interchangeable between channels (plug-in replacement) as required.

# Encoder Chassis

170171

Encoder Chassis	
<b>Environmental:</b>	
Operating Temperature	0° - +45° C (+32° - +113° F)
Operating Humidity	10% - 95% relative humidity non-condensing
Power Supply	117 VAC or 220 VAC (±10%) 50 or 60 Hz
Power Dissipation	65 Watts (per 10 channels)
<b>Physical Dimensions:</b>	
Width	48.3 cm (19 in)
Height	13.34 cm (5.25 in)
Depth	38.1 cm (15 in)
Weight	16.0 Kg (35 lbs)

- Accommodates up to 10 encoder cards
- Integrated Power Supply with field configurable voltage setting: 120-240 VAC, 50 or 60 Hz
- Front panel access to video controls
- Front panel access to scrambling controls
- Monitor port for system alignment
- One year warranty



The MultiCipher Encoder Chassis consists of a rack-mountable chassis, power supply and controller card. Each chassis will accommodate ten encoder cards to control ten video sources. Multiple chassis may be used to suit system requirements. Each channel is controlled by a single encoder card that synchronizes/encodes one video channel. Each card features its own input and output and can be genlocked to a reference source.

# MultiCipher® Systems System Controller

170150



- Windows-based Operating System
- Low cost PC computer system
- Software designed for simple and quick individual subscriber authorization and deauthorization as well as a global "full system" authorization and deauthorization command
- Direct interface to a Billing Service (Some customization and or programming required)

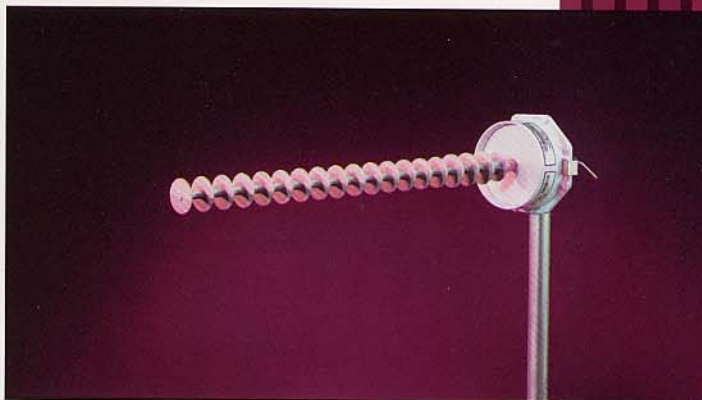
The MultiCipher System Controller is used to process operator commands and to continuously send a string of digital information to the Data Modulator for transmission to subscriber decoders. The System Controller consists of two components: The Controller Computer and System Controller Software. The Controller Computer is a high end "PC" computer system. By using currently available "PC" technology, the MultiCipher system offers operators a simple and cost-effective solution for decoder control. The System Controller software is a proprietary program supplied by California Amplifier, Inc. as part of the System Controller Package. The software is based on the Microsoft Windows™ operating system and is configurable to interface directly with cable billing software packages.

System Controller	
<b>Operating System:</b>	
Software	Microsoft® Windows 95® California Amplifier System Controller Software Package
<b>Processor Type:</b>	
CPU	Pentium 75 MHz or faster
<b>Storage Capacity:</b>	
RAM	16 MB minimum
Hard Drive	1.2 GB
Disk Drive	3.5"
ZIP Drive	100 MB
<b>Communications:</b>	
Serial Ports	COM1, COM2 (standard settings) DB9 connectors
Parallel Ports	LPT1 configured: Port=378h, IRQ=7
Internal Modem	28.8k BAUD modem, (COM3, IRQ5)
Mouse	PS2 Compatible
<b>Video:</b>	
Monitor	SVGA 15"
<b>Environmental:</b>	
Operating Temperature	+32° - +113° F (0° - +45° C)
Operating Humidity	10% - 95% RH non-condensing
Power Supply	117Vac or 220Vac, ±10%, 50 - 60Hz
Power Dissipation	65 Watts

# LNBY

## Addressable Downconverter

- Uses MultiCipher data modulator and system controller
- Compatible with most billing systems (SMS Subscriber Management Systems)
- Initialization system option available
- Refreshes authorization commands several times per minute
- Downconverters will remember status even during power outages or if the data channel is down
- Data channel is FSK modulated with a 40 dB range
- Allows stereo transmission on the data channels
- Automatic database backup



California Amplifier introduces the LNBY Addressable Downconverter which offers the best performance and value for controlling subscriber viewing. The Addressable Downconverter features proven LNBY integrated antenna/downconverter technology with the added benefit of on/off addressability. It is compatible with existing infrastructure and allows upgradability to MultiCipher basic and plus decoders. In addition, systems can use the the MultiCipher System controller and in many case use the MultiCipher data modulator for seamless system integration.

Part Number	170230-100	170230-200
Integrated Gain	42 dB (±3 dB)	50 dB (±3 dB)
<b>Downconverter Specifications:</b>		
RF Input Frequency	2500 - 2686 MHz	2500 - 2686 MHz
IF Output Frequency	102 - 288 MHz	222 - 408 MHz
Data Channel:		
Visual Carrier	229.25 MHz	223.25 MHz
Data Sub Carrier	228.25 MHz	222.25 MHz
LO Frequency Set	2398 MHz ±15 KHz	2278 MHz ±15 KHz
LO Frequency Stability	±50 KHz (-20° C - +70° C)	±50 KHz (-20° C - +70° C)
Noise Figure	3.5 dB	2.5 dB
Gain	25 dB ±2 dB	33 dB ±2 dB
Gain Flatness	±1.5 dB, ±0.25 dB/6 MHz	±1.5 dB, ±0.25 dB/6 MHz
LO Leakage @ I.F. Port	-45 dBm	-45 dBm
Phase Noise	-85 dBc/Hz @ 10 KHz	-85 dBc/Hz @ 10 KHz
Image Rejection	45 dB	45 dB
In band output spurious	-85 dBm	-85 dBm
IF Rejection	-75 dB	-75 dB
I.M.D.*	-50 dBc	-50 dBc
Third Order Intercept Point	24 dBm	25 dBm
RF Output Level (Max.) with 31 channels each	30 dBmV	32 dBmV
Output Connector	'F' Type Female, 75 Ohms	
Supply Voltage	+16 - +24 VDC (through output connector)	
Current	365 mA max	400 mA max
Operating Temperature	-20° C - +70° C	
Weatherproof Housing	100% Leak Test per CAI TP-00003	
Finish	Polyester Powder Coat	Chem Film, MIL-C-5541 Class III
<b>Physical Dimensions:</b>		
Size	7.0 x 4.7 x 3.0 in., (178 x 119 x 76 mm)	
Weight	16 oz., (455 grams)	
Warranty	2 years	
<b>Antenna Specifications:</b>		
Gain	17 dBi	17 dBi
Front to Back Ratio	25 dB	25 dB
Side Lobe Level	-13 dB	-13 dB
3-dB Beam Width	24°	24°
Cross Polarization	28 dB	28 dB
* Two equal tones @ 0.0 dBm each at Output.		
All specifications are typical @ 25° C unless otherwise specified.		