

# Features and Benefits

**ANTRONIX®**

## E-Option Plug-In Conditioner Conditioning at the Tap

Antronix's patented E-Option conditioning multi-taps accommodate a variety of plug-in modules that provide signal conditioning in either the downstream or upstream for optimum system performance. E-Option allows each tap location to be conditioned individually, affecting only the tap ports without impacting the through insertion loss. E-Option solves design challenges such as high/low passive return loss, negative/positive tilt compensation, and return path ingress and noise reduction.

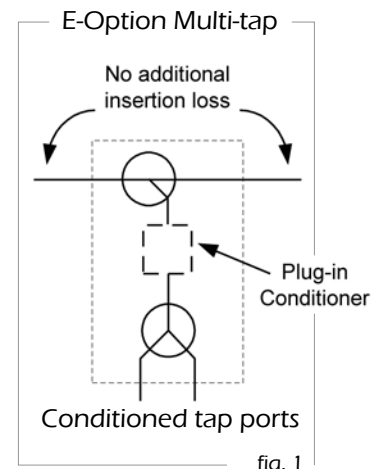
- **Compact Size**  
One plug-in affects all tap ports equally while not affecting the through path.
- **Compatible with Antronix multi-taps with E-Option Conditioning**  
Supported in all Antronix MGT and RRT series multi-taps with E-Option indicated by an "E" in the model number.
- **Does not Affect the Through Path of the Multi-Tap**
- **Available in Five Types;**  
Cable simulator, cable equalizer, high pass filter, return path attenuator and high tap value filter.
- **Cable Equalizer (CE)**  
Equalizes the full bandwidth to compensate for excessive negative tilt usually occurring at the end of the transmission line.
- **Cable Simulator (CS)**  
Simulates a fixed amount of cable to overcome large positive tilts usually found immediately following amplifiers.
- **Return Path Attenuator (RA)**  
Provides attenuation in high value taps so cable modems can run at high outputs, resulting in increase carrier to noise ratio.
- **High Tap Value (HT)**  
Provide attenuation from 54-1000 MHz and passes the return band (5-40 MHz) to overcome the large passive loss associate with high value taps.
- **High Pass Filter (HP)**  
Eliminates the return path ingress for all tap ports.



## Ordering Guide

Plug-in	Available Values
<b>CE</b>	02, 04, 06, 08, 10, 12, 14, 16
<b>CS</b>	02, 03, 04, 06, 09*, 12*
<b>RA</b>	02, 04, 06, 08, 10, 12, 14, 16, 18
<b>HT</b>	03, 06, 09, 12, 15
<b>HP</b>	54 (cutoff frequency)

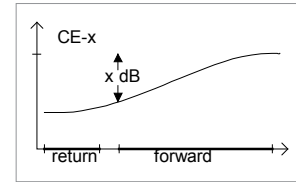
\* Please see detailed specifications.  
Patent no. 6,570,465 B2



## Cable Equalizer (CE)

The cable equalizer is used to equalized the entire bandwidth from 5 to 1002 MHz. The cable equalizer is normally used on taps toward the end of the lines. The advantages of this equalizer are:

- It equalizes the full bandwidth to overcome excessive negative tilt associated with long coaxial lines allowing the distribution line to be extended.
- It adds attenuation on the return path allowing cable modems to operate at a higher output and lowers the noise/ingress coming from the customer's premise, thus achieving a greater signal to noise/ingress ratio in the return path.
- It conditions the tap ports for the correct signal levels for proper set-top operation and to meet FCC Technical specifications.
- It is available in a variety of values to meet your design criteria.



## Specifications

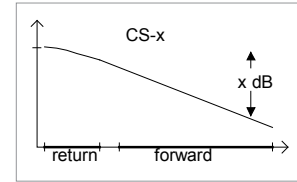
### Electrical

Equalizer Value	CE-02	CE-03	CE-04	CE-06	CE-08	CE-09	CE-10	CE-12	CE-14	CE-16	
<b>Freq (MHz)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	
<b>Nominal Equalization (dB)</b>	870	2.0	3.0	4.0	6.0	8.0	9.0	10.0	12.0	14.0	16.0
<b>Insertion Loss</b>											
<b>Maximum (dB)</b>	5	3.1	3.8	4.3	6.2	7.5	8.6	9.4	11.0	12.9	14.4
	1002	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	1.0
<b>Drop Insertion Loss</b>											
<b>Nominal (dB)</b>	5	2.9	3.6	4.1	6.0	7.3	8.3	9.2	10.8	12.6	14.1
	10	2.9	3.6	4.1	6.0	7.3	8.3	9.2	10.8	12.6	14.1
	40	2.9	3.6	4.0	5.9	7.2	8.2	9.0	10.6	12.3	13.7
	50	2.8	3.6	4.0	5.9	7.1	8.2	8.9	10.5	12.2	13.6
	300	2.3	2.6	2.9	3.7	4.5	5.3	5.4	6.3	6.9	7.3
	450	1.8	1.9	2.0	2.4	3.0	3.6	3.6	4.4	4.8	5.1
	550	1.5	1.4	1.4	1.6	2.0	2.5	2.4	3.1	3.3	3.6
	750	0.9	0.8	0.7	0.8	0.9	1.3	1.2	1.7	1.7	1.9
	870	0.6	0.6	0.5	0.6	0.6	0.8	0.7	1.2	1.1	1.2
1002	0.6	0.6	0.5	0.5	0.5	0.7	0.6	0.8	0.8	0.9	
<b>Flatness</b>											
<b>Maximum (dB)</b>	5-1002	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5

## Cable Simulator (CS)

The cable simulator is used in the latest system designs that incorporate high output amplifiers allowing the full use of the amplifier gain and large positive tilts. The cable simulator is normally used in the first few taps after an amplifier. The advantages of the cable simulator are:

- It simulates a fixed amount of cable thus overcoming excessive positive tilts.
- It provides lower return path attenuation in high value taps so cable modems can overcome the large passive loss associated with high value taps.
- It conditions the tap ports for correct signal levels for proper set-top operation and to meet FCC Technical Specifications.
- It is available in a variety of values to meet your design criteria.



## Specifications

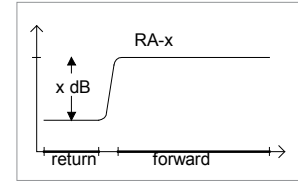
### Electrical

Equalizer Value	CS02	CS-03	CS-04	CS-06	CS-09	CS-09	CS-12	CS-12	
(Tap Value)	(2, 4, 8)	(2, 4, 8)	(2, 4, 8)	(2, 4, 8)	(2, 4)	(8)	(2, 4)	(8)	
<b>Freq (MHz)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	
<b>Nominal Equalization (dB)</b>	870	2.0	3.0	4.0	6.0	9.0	10.2	12.0	13.4
<b>Insertion Loss</b>									
<b>Maximum (dB)</b>	5-108	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	1002	2.0	3.3	4.0	5.8	9.3	10.7	11.5	13.9
<b>Drop Insertion Loss</b>									
<b>Nominal (dB)</b>	5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	10	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	40	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	50	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	108	0.2	0.3	0.2	0.2	0.3	0.3	0.4	0.4
	300	0.8	1.4	1.4	1.6	1.9	2.0	2.5	2.7
	450	1.1	2.1	2.3	2.9	3.7	3.9	4.7	5.2
	550	1.3	2.4	2.7	3.7	4.9	5.3	6.3	6.9
	750	1.6	2.9	3.4	5.0	7.5	8.1	9.5	11.0
	870	1.8	3.1	3.7	5.6	9.2	10.2	11.4	13.4
1002	1.9	3.3	3.9	6.1	11.2	12.1	14.3	15.1	
<b>Return Loss</b>									
<b>Minimum (dB)</b>	5-750	20	20	20	20	20	20	20	20
	750-1002	17	20	20	20	20	20	20	20
<b>Flatness</b>									
<b>Maximum (dB)</b>	5-1002	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5	±0.5

## Return Path Attenuator (RA)

The return path attenuator is used in systems deploying high-speed data services that are utilizing the return path. The return path attenuator is normally used in low value taps toward the end of the distribution system that have low loss in the return path. The advantages of the return path attenuator are:

- It adds step attenuation in the return path without affecting the forward path allowing cable modems to operate at a higher output level, thus increasing the signal to noise/ingress ratio.
- It attenuates any ingress or noise coming from the subscriber premise.
- It prevents the return fiber transmitters from clipping while operating the cable modem at full power.
- It is available in a variety of values to meet your design criteria.



## Specifications

### Electrical

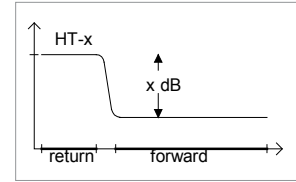
Return Attenuation	RA-2	RA-4	RA-6	RA-8	RA-10	RA-12	RA-14	RA-16	RA-18	
<b>Freq (MHz)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	<b>Typ (dB)</b>	
<b>Nominal (dB)</b>	5-40	2.5	4.5	6.5	8.5	10.5	12.5	14.5	16.5	18.5
<b>Return Tolerance</b>										
<b>Maximum (±dB)</b>	5-30	1.0	1.0	1.0	1.0	1.5	1.5	1.7	1.8	2.5
	31-40	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
<b>Drop Insertion Loss</b>										
<b>Nominal (dB)</b>	5	2.5	4.5	6.6	8.6	10.9	12.8	14.6	16.5	18.8
	30	3.4	5.2	7.1	8.9	11.0	12.8	14.5	16.0	17.8
	40	5.7	7.5	9.7	11.4	13.8	15.9	17.8	19.7	21.7
	52	1.5	1.5	1.5	1.4	1.6	1.4	1.7	1.7	1.7
	54	1.2	1.2	1.2	1.1	1.2	1.1	1.2	1.2	1.2
	100	0.3	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3
	300	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.1	0.2
	450	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2	0.3
	550	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.4
	750	0.4	0.4	0.4	0.3	0.4	0.3	0.3	0.3	0.4
	870	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
1002	0.5	0.5	0.5	0.4	0.5	0.4	0.4	0.4	0.5	
<b>Insertion Loss</b>										
<b>Maximum (dB)</b>	52	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
	1002	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

## High Tap Value Plug-in (HT)

The High Tap Value Plug-in is used in system designs that are utilizing amplifiers with high outputs, high value taps and cable modems. The advantages of the High Tap Value Plug-in are:

It provides lower return path attenuation in high value taps so cable modems can overcome the large passive loss associated with high value taps.

- It increases the carrier to noise/ingress of the cable modem signal.
- It is available in a variety of values to meet your design criteria.



## Specifications

### Electrical

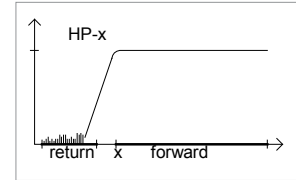
Forward Attenuation		HT-03	HT-06	HT-09	HT-12	HT-15
	Freq (MHz)	Typ (dB)	Typ (dB)	Typ (dB)	Typ (dB)	Typ (dB)
<b>Nominal</b> (dB)	54-1002	3.0	6.0	9.0	12.0	15.0
Forward Tolerance						
<b>Maximum</b> (dB)	54-100	1.3	1.4	1.3	1.3	1.1
	101-300	1.0	1.0	1.0	1.0	1.0
	301-1002	1.2	1.0	1.0	1.0	1.0
Insertion Loss						
<b>Nominal</b> (dB)	5	0.6	0.6	0.6	0.6	0.6
	30	1.0	1.0	1.0	1.0	1.0
	40	1.7	1.7	1.7	1.7	1.7
Drop Insertion Loss*						
<b>Nominal</b> (dB)	5	0.4	0.3	0.3	0.3	0.3
	10	0.5	0.5	0.4	0.4	0.4
	30	0.6	0.6	0.7	0.7	0.7
	40	0.8	0.8	0.9	0.9	0.9
	54	4.0	6.7	9.3	11.8	13.7
	100	3.1	6.1	9.0	12.2	14.6
	300	2.9	5.9	8.9	12.0	14.4
	1002	3.9	6.3	9.2	12.0	14.1

\*Drop insertion loss specifications shown are in addition to the nominal tap value loss. Other dB values are available upon request.

## High Pass Filter (HP)

The high pass filter is used to eliminate ingress generated from the subscriber premise from entering the system. The advantages of the high pass filter are:

- It allows high pass filtering on all tap ports using one filter.
- Cost savings, one filter verses 2, 4 or 8.
- Can be used as a troubleshooting tool to locate and eliminate ingress.



## Specifications

Electrical		
	Freq (MHz)	Typ (dB)
<b>Insertion Loss</b> (54-1000 MHz)		
<b>Nominal</b> (dB)	54	1.2
	100	0.6
	1002	0.5
<b>Rejection</b> (5-40 MHz)		
<b>Minimum</b> (dB)	5-30	45.0
	30-40	16.0
<b>Drop Insertion Loss*</b>		
<b>Nominal</b> (dB)	5	53.0
	10	49.0
	40	17.0
	50	1.7
	100	0.3
	300	0.2
	450	0.2
	550	0.2
	750	0.2
	870	0.3
1002	0.3	

\*Drop insertion loss specifications shown are in addition to the nominal tap value loss.

### General

Nominal Impedance	75 Ω
Operating Temperature	-40 °C to 60 °C

### Related Documentation

For more information regarding the Antronix E-Option and how it can help solve your network problems, please see document# AN-1007-TM-A02, E-Option Multi-taps

