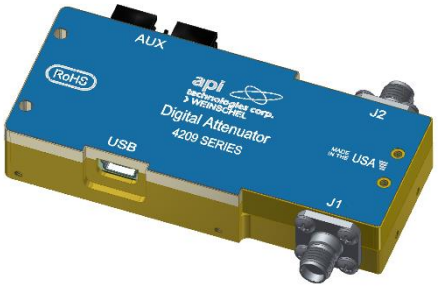
4209 Series
Model 4209-40-63-X
RoHS

Programmable Attenuator – 0.1 to 40 GHz, 63 dB

USB, PARALLEL, I2C, SPI & UART Control Modes



Features

- Low insertion loss 7.1 dB up to 30 GHz & 10 dB up to 40 GHz
- High CW power handling +28 dBm
- Excellent solid-state repeatability and performance
- Uninterrupted RF when changing attenuation values
- Extremely fast attenuation switching and very fine attenuation step resolution

Application

- Ideal for Automated Test Equipment (ATE)
- 2G/3G/4G LTE/5G fading simulators
- MIMO, WiMAX, WiFi
- engineering/production test lab environments

Description

API Weinschel's new 4209-40-63.5-X Solid-State Programmable Attenuators operate over the 0.1 to 40 GHz frequency range and are available in an attenuation range of 0 to 63 dB in 0.5 dB steps. These units can be controlled using parallel (TTL compatible), I2C, SPI, UART, or USB interfaces.

Control Configuration

Units are supplied with both an AUX connector for operation in either a parallel (TTL compatible) mode or I2C, SPI, UART modes and a USB connector (Mini-B) for USB 2.0 operation. The main mode of operation is determined internally by the source of DC power to the unit.

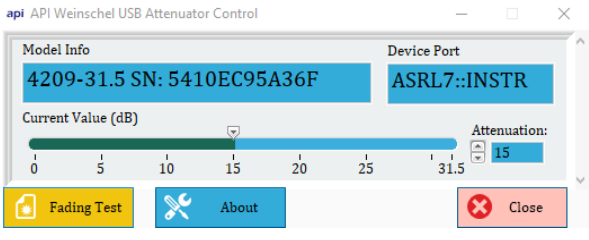
USING AUX CONTROL: Each unit is supplied with a mating 10 pin connector (Amp 746285-1). Refer to the table in page 5 for mating connector pin/wiring details. There are four user-selectable digital interface AUX modes: PIO, I2C, SPI, and UART. In addition there are three AUX application modes (PIOSW, PULSE, and FADE) that allow the generation of RF patterns when operating standalone. The AUX mode selection is done via USB command (see SET AUX) and is stored in non-volatile memory (NVM) so that changes to the mode will be automatically applied at startup. Additional information is presented in the Operating & Installation Manual, IM-672.

USING USB CONFIGURATION: In USB mode the attenuator is controlled and powered via a standard USB 2.0 connection to a USB host. The 4209 series operates as a USB CDC device (USB VID=25EA, PID=106D), so it may be controlled via any software that can communicate to a standard virtual COM port. Programming is done via simple ASCII text-based message strings to control the device.

Additional Features

Attenuation Range	63 dB in 0.5 dB steps
Switching Speed	40 NanoSec. (10% RF to 90% RF)
Control Logic	PARALLEL, I2C, SPI, UART or USB
Operating Voltage	+3.3 to +16 VDC @ 25 mA
Temperature Range	-20° C to +85° C
RF Connectors	4209-40-63-1 (2.92 mm Female) 4209-40-63-2 (2.4 mm Female
Control Connectors	The AUX control connector is an AMP-Latch 10-pin ribbon cable connector that mates with AMP P/N 746285-1 (supplied with each unit). The USB connector is a standard USB Mini-B.
Weight	85 g (3.0 oz.)
Test Data	Test data available upon request

Control Software Included

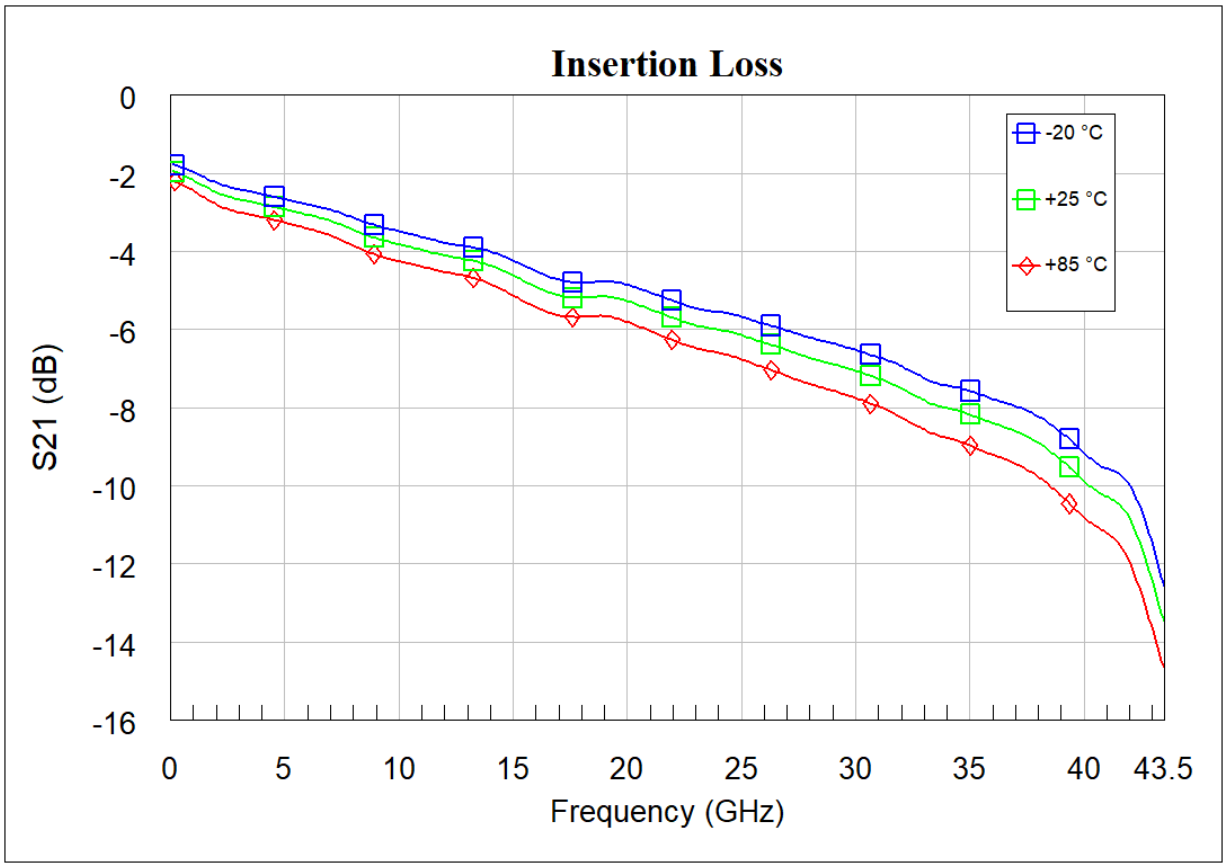


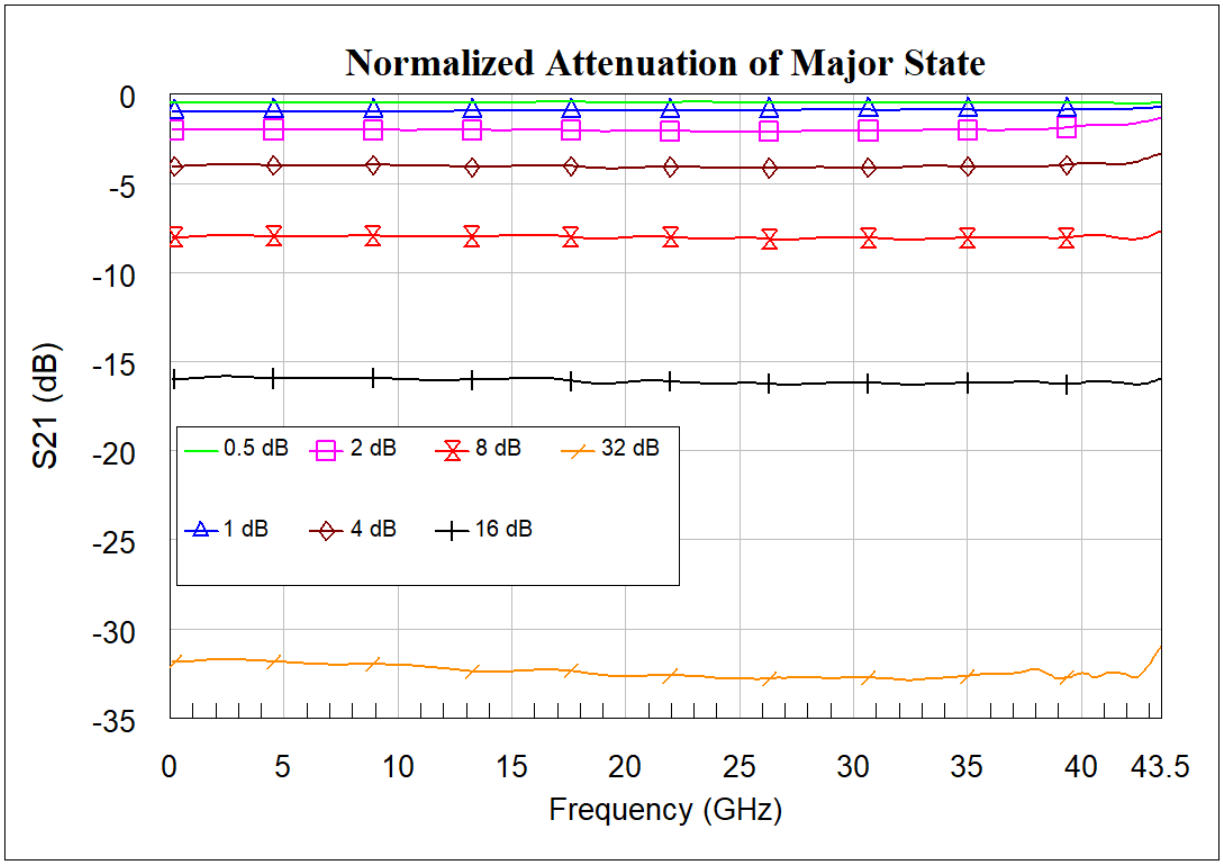
API Weinschel's LabView based USB Control Center Software (AUCS) can also be used in the operation of this series of digital attenuators. The AUCS will allow the user to setup, control, and perform test and measurements over a standard USB 2.0 communication interface. Additional information is available in the Operating & Installation Manual, IM-611.

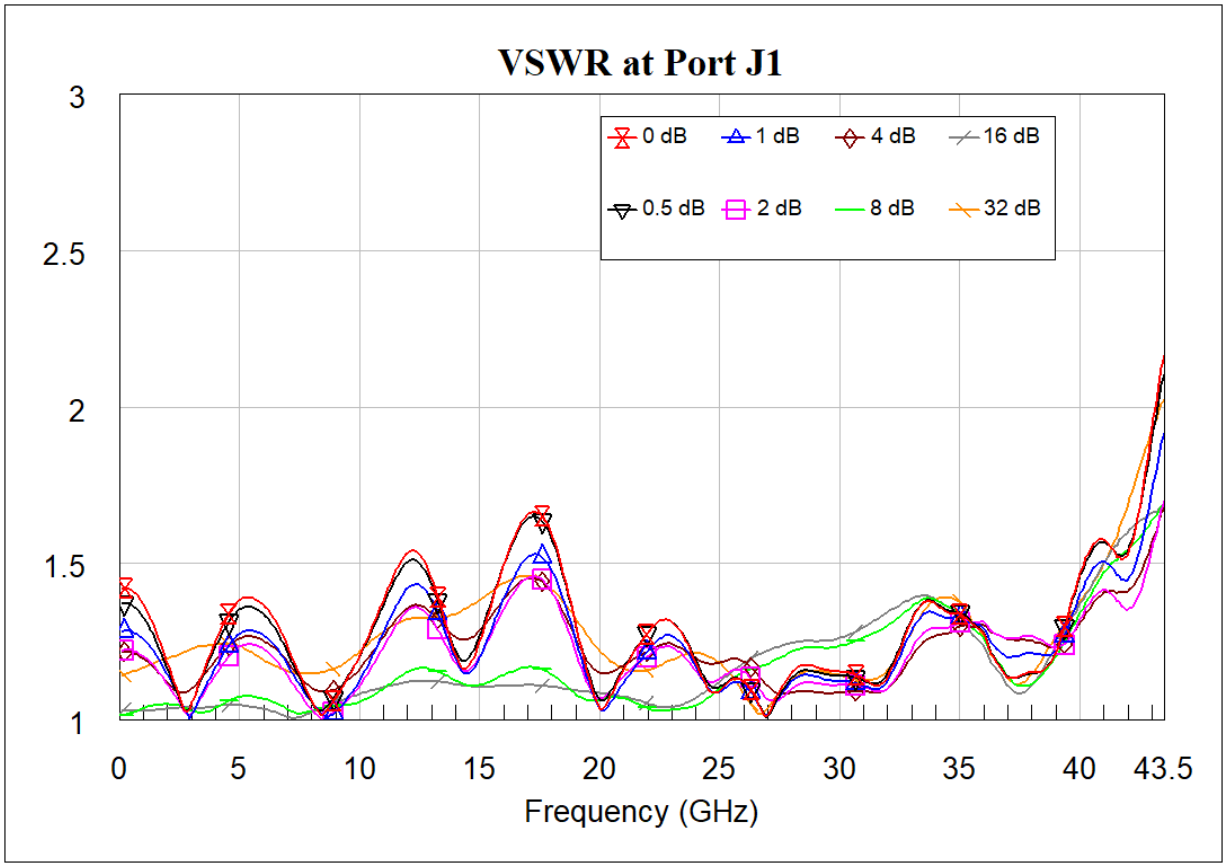
Electrical & Environmental Specifications

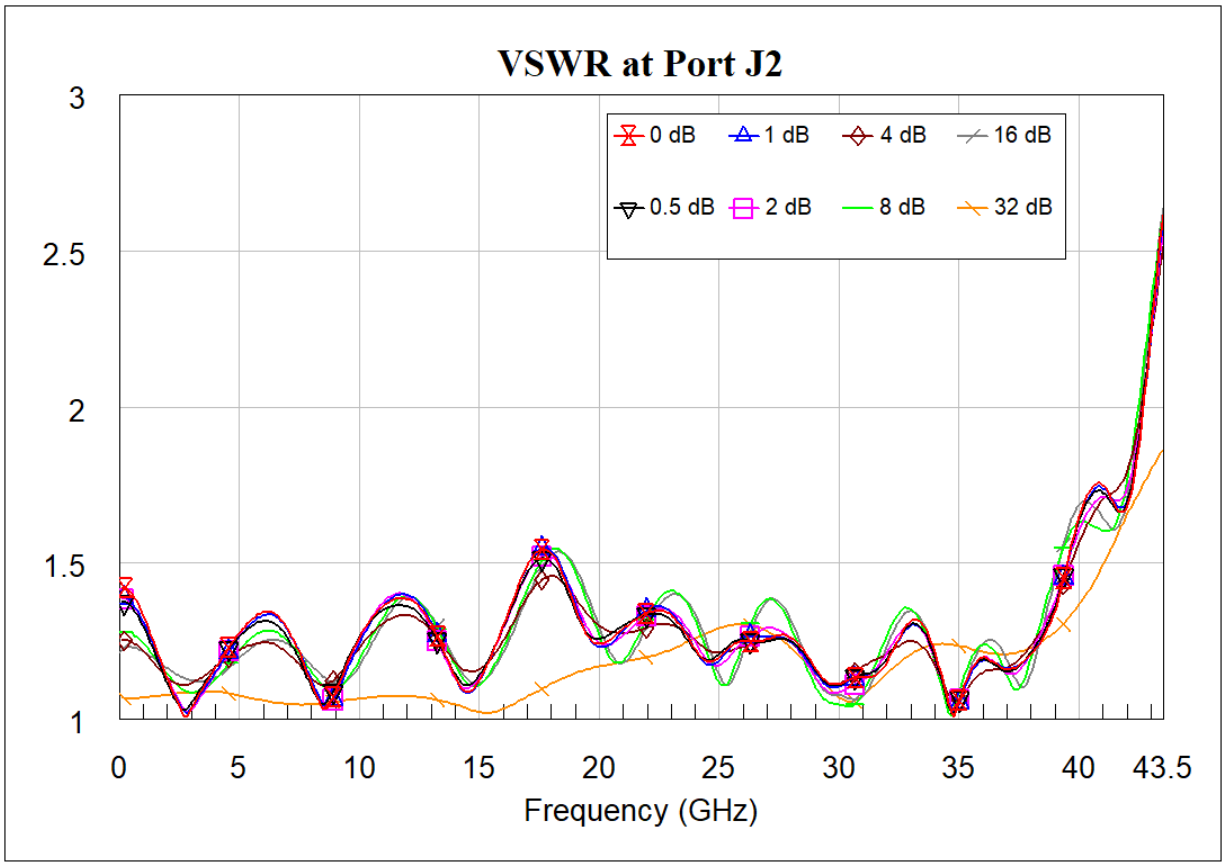
Parameter	Frequency Range	Condition	Minimum	Typical	Maximum	Units
Operating Frequency	-	-	0.1	-	40	GHz
Nominal Impedance	0.1 – 40 GHz	-	-	50		Ohm
Attenuation Range	0.1 – 40 GHz	0.5 dB Steps	0	-	63	dB
Insertion Loss	0.1 – 6 GHz	@ 0dB	-	3.1	3.8	dB
	6 – 12 GHz		-	4.1	4.9	
	12 – 24 GHz		-	6.0	6.9	
	24 – 30 GHz		-	7.1	8.0	
	30 – 40 GHz		-	10	11.8	
	40 – 43.5 GHz		-	13.5	-	
VSWR (All Ports)	0.1 – 12 GHz	0 – 63 dB	-	1.6:1	1.9:1	-
	12 – 40 GHz		-	2.0:1	2.5:1	
	40 – 43.5 GHz		-	2.5:1	-	
Attenuation Accuracy[1]	0.1 – 18 GHz	0 – 63 dB	-	±(0.25 + 0.8%)	±(0.5 + 1.0%)	dB
	18 – 26 GHz		-	±(0.4 + 2.0%)	±(1.0 + 2.5%)	
	26 – 35 GHz		-	±(0.5 + 2.5%)	±(1.0 + 3.0%)	
	35 – 40 GHz		-	±(0.4 + 2.0%)	±(1.0 + 2.5%)	
	40 – 43.5 GHz		-	±(1.0 + 10%)	-	
Monotonicity	-	0 – 63 dB	-	0.1 - 40	-	GHz
J1 (RF Input Power, CW)[5]	0.1 – 30 GHz	Steady State	-	-	28 (See Note 5)	dBm
	0.1 – 30 GHz	Hot Switching			25	dBm
J2 (RF Input Power, CW)[5]	0.1 – 30 GHz	Steady State	-	-	19 (See Note 5)	dBm
	0.1 – 30 GHz	Hot Switching			16	dBm
Input IP3	0.1 – 40 GHz	0 – 63 dB	-	50	-	dBm
Switching Time	0.1 – 40 GHz	RF Trise/Tfall (10%/90%)	-	0.04	0.055	Micro Sec.
		50% PIO CTRL to 90% RF	-	7	8	
Operating Temperature	0.1 – 40 GHz	-	-20	-	85	°C
Storage Temperature	-	-	-55	-	125	°C

1. X% is the percentage of the nominal attenuation setting i.e. the accuracy of 30 dB @ 32 GHz is ± (0.4+0.02x30) dB. This equates to ±1.0 dB which means when setting the attenuator at 30 dB, the actual measured normalized value could be between 29 dB and 31 dB.
2. Measured with two tones at +14 dBm, 1 MHz spacing.
3. The values in the table apply at room temperature unless otherwise specified.
4. DC blocking is required when the RF input or output DC line potential is not 0 V.
5. Power handling degrades linearly from 30 GHz to 40 GHz by 3 dB.









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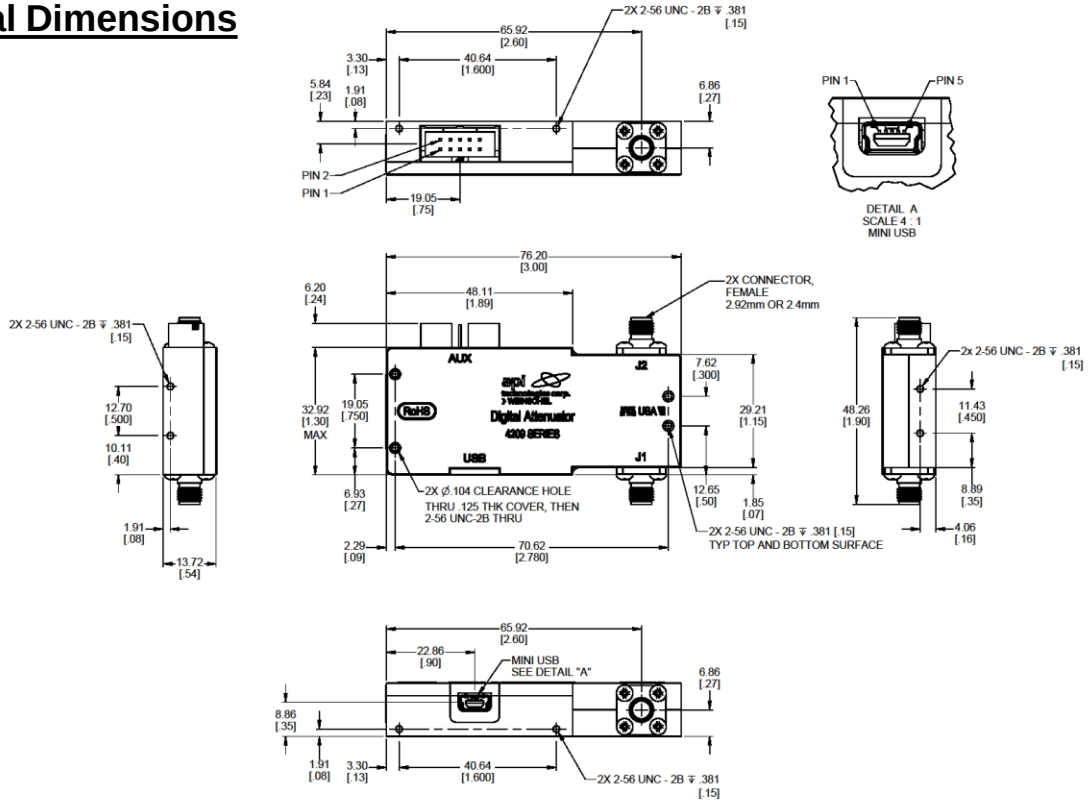
Control & Power Specifications

Parameter	Condition	Minimum	Typical	Maximum	Units
Supply Voltage (VDC)	10 Pin Aux	+3.3	3.3 to +5	+16	Volt
	USB	+4.4	+5	+5.25	
Digital input low voltage	VDC = 3.3V to 4.5V	-0.3	-	0.15VDC	Volt
	VDC = 4.5V to 16V	-0.3	-	0.8	
Digital input High voltage	VDC = 3.3V to 4.5V	2	-	VDC+0.3	Volt
	VDC = 4.5V to 16V	2	-	5	
Supply Current	-	-	15	25	mA

Mechanical Dimensions



NOTES:

1. ALL DIMENSIONS ARE GIVEN IN MM [INCH].
2. ALL MATERIALS AND PROCESSES ARE TO BE IN COMPLIANCE WITH THE EUROPEAN DIRECTIVE RESTRICTION OF HAZARDOUS SUBSTANCES (RoHS) (REF: WEINSCHEL 080-638).
3. CONTROL CONNECTORS:
   - A: AMP LATCH 10 PIN RIBBON CABLE CONN MATES WITH AMP P/N 746285-1 SUPPLIED WITH EACH UNIT
   - B: USB - MINI B

10 PIN Aux Control Connecter:

PIN#	POI[5]	IC2	SPI	UART
1	0.5 dB Digital Input	A0	NC	NC
2	1.0 dB Digital Input	A1	NC	NC
3	2.0 dB Digital Input	A2	NC	RXD
4	4.0 dB Digital Input	A3	NC	TXD
5	8.0 dB Digital Input	TRIG	SCLK	NC
6	16 dB Digital Input	RESETN	SDI	NC
7	32 dB Digital Input	SCL	NC	NC
8	NC	SDA	NC	NC
9	Supply Voltage (VDC)			
10	Ground			

5. Parallel Input Mode:
Digital input Low turns OFF desired attenuator bit
Digital input High turns ON desired attenuator bit