

SIGMA

COMMUNICATION SYSTEMS CC

Mining and Tunnel Communication and Mining Safety Specialists



VHF SMARTTune[®] Product Data Sheets



Advanced R & D since 1995

Sigma Communication Systems cc has Design and Manufacture history in advanced military and sub-surface communication systems since 1995 with Ron Piper, our founder and Director.



Customer Focused Development

All of our designs are the result of extensive research and development into the requirements of both our customers needs as well as the technology required.



Global Footprint

We began export to Australia in 1999 and have supplied internationally ever since. We have products installed in about 15 countries world wide and we support our technologies globally.

SMARTTune[®] Controller



KEY FEATURES

- 8/16 Transmit & Receive Channels
- Diagnostics and Alarm LED's
- For use on VHF and UHF Systems

DESCRIPTION

The SMARTTune[®] controller is the processing power behind the Smart Tune Leaky Feeder system. The unit controls the multiple radio repeaters that are connected to the SMARTTune[®] Headend.

Using a Master Repeater, the Smart tune controller manages the gain levels in the system allowing for the automatic line loss compensation to take effect when necessary.

SPECIFICATIONS

Combiner Channels	Standard 8 (Model VHF 8) & Optional 16 (VHF 16)
Input Supply Voltage	12Vdc taken from Master repeater external interface
Dimensions	Standard 1U 19 inch rack mount (430mmx250mmx44mm)
Weight	3 Kg

VHF Area Coverage Amplifier

KEY FEATURES

- Voice and Data Compatible
- IP65 Enclosure
- 110/230VAC Mains powered



DESCRIPTION

The **VHF Area Coverage Amplifier** provides a wide area coverage solution to above ground communication extensions of the existing Leaky Feeder system. The provision of increased RF power level for range extension provides application solutions for areas that lack adequate communication coverage such as head-gears and workshops at the mine.

The unit consists of a high power RF amplifier with two separate communication paths for uplink and downlink RF, a mains to DC power supply with the option of battery backup all housed inside an IP65 rated steel enclosure with external connectors.

SPECIFICATIONS

Frequency	BTX 152-158 MHZ, BRX 168-172 MHZ Tunable BW = 2.5MHZ
Gain	30 dB
Impedence	50 Ohm
Dynamic Range	40 dB
Power Supply	Internal Mains to 24 VDC (optional battery backup with charging circuit)
Power requirements	86 - 265 Vac
Connectors	N-Type
Enclosure	Powder Coated Steel Enclosure
Weight	9.2 Kg

SMARTTune® VHF Head End Combiner

KEY FEATURES

- 8/16 Transmit & Receive Channels
- 4 Arterial Leaky Feeder Interfaces
- Individual Arterial Current Meters
- Metered 12, 24 or 48 V Supplies
- Diagnostics and Alarm LED's
- AGC Amplifier Fitted



The Head End Combines Surface And Under-ground Radio Channels To Form An Integrated Radio Network For Mine Communications.

DESCRIPTION

The **SMARTTune® VHF Head End Combiner** is the core of the Sigma Leaky Feeder system. The unit combines multiple radio channels on the surface and underground into one single voice and data network.

With the option of either 8 or 16 repeater channels, surface communications can be linked into the underground leaky feeder system via one or more of the arterial cables within the mine shaft, as well as underground communication, transferred to the surface in the same manner.

With the addition of the **SMARTTune®** AGC amplifier, the gain of each arterial is held at a stable level. The Head End also has the ability to feed a surface antenna or a Sigma Area Coverage Amplifier to provide enhanced local coverage above ground.

An external power supply is required in order to power the first few amplifiers connected to each arterial underground, thereafter underground power supplies are required for further amplifiers in the chain.

There are four Head End variants available:

3U 19 inch rack options

8 Channel VHF 8
8 Channel SmartTune VHF 8ST

4U 19 inch Rack options

16 Channel VHF 16
16 Channel SmartTune VHF 16ST

SPECIFICATIONS

Combiner Channels	Standard 8 (Model VHF 8) & Optional 16 (VHF 16)
Input Supply Voltage	12V, 24V and an optional 48V versions
Arterial Current	3A per Arterial Feed (Four Feeds Total)
Transmit Frequency	150-160Mhz
Receive Bandwidth	165-175 Mhz
Bandwidth	2.5 MHz (for both transmit and receive)
Input RF Power	3W PEP (Maximum)
Port - Port Isolation	Better than -20dB
Input Impedance	50/75 Ohms
Output Impedance	50/75 Ohms

SMARTTune® VHF Mini Line Amplifier (VSTLAD)

KEY FEATURES

- Adjustable Line Length Compensation
- High Noise immunity
- IP66 Enclosure
- Digital Diagnostic
- Voice and Data Capable
- 12, 24 and 48VDC versions



SCS1000 series VHF SMARTTune In-Line Amplifier with Adjustable LLC®

DESCRIPTION

The **VSTLAD SMARTTune®** is a quantum step forward in amplifier design, offering a very SMART attenuator, which means that you can literally install **SMARTTune®** amplifiers anywhere in the leaky feeder cable and the amplifier will set its gain according to the level of input signal received from the previous amplifier. As all amplifiers include AGC in the common path, the level of output signal in the Base TX direction will be constant. This constant output of power is used by the next amplifier in the system as a measure of the gain required. If the cable is longer, then more gain will be applied etc. Voice and Data capable and is packaged in an IP66 heavy duty enclosure. The amplifier is powered from leaky feeder cable; no special tools are required to splice it into the leaky feeder cable.

The **SMARTTune®** amplifier incorporates 2 separate amplifiers, TX Down-Link and RX Up-Link. The **VSTLAD** line amplifier also offers Digital Drive-By Diagnostics®, in the form of 11 high intensity LED's, which indicate the condition of the amplifier. Simply by walking or driving past the amplifier you can determine its condition - VOLTAGE - 3 LED Volt Meter, CURRENT drain - 3 LED Amp meter and Amplifier Gain - 5 LED meter. The amplifier was specially designed for the transmission of high speed Data, it utilises 6 filters whereas some manufacturers only offer 2 filters. The VSTLAD amplifier offers a high level of sideband immunity, as well as a high level of immunity from external noise.

SPECIFICATIONS

Frequency	Uplink 168 to 175 Mhz. Downlink 152 to 158 MHz
Bandwidth	Uplink 2.5 MHz, Downlink 2.5 MHz
Gain	26dB min
Connection	Brass Screw Terminals
Impedance	75 Ohm standard, 50 Ohm option
Through Current Capacity	1.5 Amps
Operating Voltage	12, 24 or 48V versions
Current drain	Less than 200mA at 12 VDC
Enclosure	IP66 heavy duty enclosure c/w IP66 cable glands
Weight and dimensions	1 Kg, 190 x 75 x 57mm, excluding glands

Power Supply Unit

KEY FEATURES

- IP65 Rated
- Ruggedized Steel Enclosure
- Includes Switch Mode Power supply/charger
- Backup Battery
- Wide Range Input Voltage 88 - 264 VAC
- Status Indicators
- 12V and 24V versions available



DESCRIPTION

The Power Supply consists of a Mains to DC power converter/charger and a heavy duty standby battery. The unit has been designed to supply the requirements of the Sigma range of Leaky Feeder systems on both 12 and 24 volts. 110 or 220 Volt input options can be selected on ordering.

SPECIFICATIONS

Input Voltage	88 - 264 VAC (Select 110 or 220 Volt on ordering)
Output Voltage	12V or 24V
Rated Current	4 Amps @ 12V, 2 Amps @ 24V
Battery Backup	12V 12Ah, 24V 7Ah
Enclosure	IP65, Steel, Colour Light Grey
Weight and Dimensions	14 kg Maximum, 400 x 300 x 200mm

VHF Power Coupler

KEY FEATURES

- Voice, Data and Video Compatible
- IP66 Enclosure
- Brass Terminal Connectors
- Intrinsic Safe Versions Available
- Rated at 4KV

Power Coupler operating on UHF and VHF.



DESCRIPTION

The **Power Coupler** is a 75 Ohm VHF/UHF Power Coupler is designed to allow for the coupling of DC power into the leaky feeder cable to power the bi-directional amplifiers in the vicinity.

The **VHF Power Coupler** can be configured to couple power in a single direction or both directions with the fitment of a jumper.

- RF passes through with minimal loss
- Well matched impedances
- DC power can be supplied to Down link or Uplink and Downlink
- Robust enclosure with IP66 Rating

SPECIFICATIONS

Frequency	100 to 500Mhz
Insertion Loss	1 dB
Impedence	75 Ohm
VSWR	Less than 1.5:1
Through current capacity	3 Amps
Power requirements	None
Connectors	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	0.8kg. 190 x 75 x 60mm

VHF Single Branch Coupler

KEY FEATURES

- Voice, Data and Video Compatible
- Internal Switching Jumpers
- IP66 Enclosure
- Brass Terminal Connectors
- Intrinsic Safe Versions Available



VHF Single Branch Coupler which is also known as a 3 way splitter.

DESCRIPTION

The **Single Branch Coupler** is a passive signal splitter that is used to branch off the main Leaky Feeder arterial to link into a side tunnel. The **Single Branch Coupler** is configured to provide both minimal loss as well as a well matched impedance to all ports of the unit. The branch can be configured to pass DC voltage to power the down line amplifiers as well as the single branch line amplifiers.

The jumpers in the branch can be configured to allow the unit to be configured in the field to:

- Isolate or terminate the branch.
- Allow both RF as well as DC to pass through the branch.
- DC isolate the branch whilst still allowing RF to pass.

SPECIFICATIONS

Frequency	20 to 175Mhz
Insertion Loss	4 dB
Impedence	75 Ohm
VSWR	Less than 1.4:4
Through current capacity	2 Amps
Power requirements	None
Connectors	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	1.0kg. 160 x 75 x 60mm

VHF Double Branch Coupler

KEY FEATURES

- Voice, Data and Video Compatible
- Internal Switching Jumpers
- IP66 Enclosure
- Brass Terminal Connectors
- Intrinsic Safe Versions Available

VHF Double Branch Coupler which is also known as a 4 way splitter.



DESCRIPTION

The **Double Branch Coupler** is a passive signal splitter that is used to branch off the main Leaky Feeder arterial to link into a side tunnel. The **Double Branch Coupler** is configured to provide both minimal loss as well as a well matched impedance to all ports of the unit. The branch can be configured to pass DC voltage to power the down line amplifiers as well as the single branch line amplifiers.

The jumpers in the branch can be configured to allow the unit to be configured in the field to:

- Isolate or terminate the branch.
- Allow both RF as well as DC to pass through the branch.
- DC isolate the branch whilst still allowing RF to pass.

SPECIFICATIONS

Frequency	20 to 175Mhz
Insertion Loss	4 dB
Impedence	75 Ohm
VSWR	Less than 1.4:4
Through current capacity	2 Amps
Power requirements	None
Connectors	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	1.0kg. 160 x 75 x 60mm

VHF Line Splice

KEY FEATURES

- RF Passes Through with Minimal Loss
- Robust Enclosure with IP66 Rating
- Well Matched Impedances

VHF Line Splice (Joint Box)



DESCRIPTION

The **Line Splice** is a 75 Ohm impedance line splice designed for joining 75 Ohm Leaky Feeder cable with minimal loss and excellent impedance matching. No components are used in the device other than the connectors and the circuit board.

The **LS75 Line Splice** is designed using co-planar transmission line techniques to produce a joint with exceptionally low losses and excellent impedance characteristics.

- . RF passes through with minimal loss
- . Well matched impedances
- . Robust enclosure with IP66 rating

SPECIFICATIONS

Frequency	20 to 500Mhz
Insertion Loss	0.5 dB Maximum
Impedence	75 Ohm
VSWR	Less than 1.2:1
Through current capacity	3 Amps
Power requirements	None
Connectors	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	0.8Kg. 110 x 75 x 60mm

VHF Stopes Antenna

KEY FEATURES

- Voice Compatible
- No Internal Switching or Tuning
- IP66 Enclosure
- Brass Terminal Connectors
- Intrinsic Safe Versions Available
- Stainless Steel Radials
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VHF Stopes Antenna

DESCRIPTION

The **VST Stopes Antenna** is an Antenna designed to be fitted in place of the line termination normally fitted at the end of a Leaky Feeder cable. The Stopes Antenna will increase the radiated signals from the Leaky Feeder by a factor of about 40dB.

The **Stopes Antenna** is a passive device and does not draw any power from the Leaky Feeder cable. It has a good impedance match over the full VHF range of the Leaky Feeder.

FEATURES:

- . 2 KV isolation between each of the radials as well as the cable
- . Good impedance match
- . Improved radiation efficiency
- . Wide band impedance match

SPECIFICATIONS

Frequency	150 to 175Mhz
Impedance	75 Ohm
VSWR	Less than 3:1, 150 to 175Mhz
Current Consumption	None
Voltage Rating	2 KV
Connectors	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	2.0Kg. Enclosure: 160 x 75 x 60mm. Radials: 16mm diameter x 450mm, 2 Off

VHF Line Termination Unit

KEY FEATURES

- Terminates RF signals into matched load
- Robust Enclosure with IP66 Rating
- Provides cable impedance match

VHF Line Termination Unit



DESCRIPTION

The **VHF Line Termination Unit** is a 75 Ohm impedance unit that terminates the Leaky Feeder in a matched impedance unit. The impedance match is AC coupled so there is no DC power lost in the circuit.

Matching the Leaky Feeder cable in its characteristic impedance of 75 Ohms eliminates possible reflection of RF signals that would occur if the line was mismatched. This is important where certain modulation schemes may be used on the RF signals.

SPECIFICATIONS

Frequency	20 to 175Mhz
RF Power Rating	100mW Maximum
Impedence	75 Ohm
VSWR	Less than 1.2:1
Connector	Brass screw terminal and saddle clamp
Enclosure	IP66,GRP,Colour Grey
Weight and Dimensions	0.8Kg. 110 x 75 x 60mm

VHF Refuge Bay Radio

KEY FEATURES

- IP65 Secure Steel Enclosure
- External Amplified Speaker
- Link Isolated Radio Nets by Fibre
- (Optional) Drop Bar Locking Tab
- (Optional) RX Indicator LED

The Refuge Bay Radio was developed to be utilized in areas allocated as places of refuge within the mine. The Refuge Bay Radio allows communication on a pre-set frequency into the Leaky Feeder System.



DESCRIPTION

Refuge Bay Radio System Components

- A steel enclosure which securely houses the radio, power supply and battery.
- A VHF radio
- External high power speaker
- 220V AC Power supply with battery backup
- Optional drop bar locking tab
- Optional Rx indicator LED

The entire unit is fitted into an IP65 rated steel enclosure. The front panel of the unit has a PTT switch, microphone position and High Power audio speaker which enables miners to communicate in the high noise environments effectively.

SPECIFICATIONS

Frequency	VHF 174MHz	FM Hum and Noise	46/40db typ. (Wide/Narrow)
Number of channels	16 Channels	Hum and noise _(Without CCITT filter)	VHF 75dB typ.
Type of emission	16K0F3E/11K0F3E	Audio harmonic distortion _(AF 1kHz 40% dev)	1.0%/1.5% typ. (Wide/Narrow)
Channel spacing	12.5/25kHz	Sensitivity (at 12dB SINAD)	0.25µV typ.
PLL channel step	VHF 2.5/3.125kHz	Adjacent channel selectivity	VHF 78/70db typ.
Antenna impedance	50 Ohms	Spurious response rejection	70dB min.
Operating temperature range	-30 deg C to +55 deg C	Intermodulation rejection	VHF 54/50db typ. _(WIN)
Output power (at 7.2 V DC)	VHF 5W, 2W, 1W	Transmitter power	30 dBm (1 Watt)
Max frequency deviation	± 5.0 kHz/± 2.5 kHz (Wide/Narrow)	Power supply requirements	86 - 240 Vac
Frequency stability	± 2.5ppm	Unit size (Excluding Antenna)	230 x 210 x 250mm
Spurious emissions	70 db min.	Weight	8.4 kg