Communication Receiving Multicouplers

- ULTRA LINEAR
- REDUNDANT CONFIGURATIONS
- HF TO 2400 MHZ

The list of communication receiving multicouplers included in this handbook represents AML's product line and capabilities.

For additional models and other required specifications, please contact the factory at (805) 388-1345

In the tradition of offering the highest dynamic range for its signal distribution systems, AML Communications, Inc. uses a variety of proprietary designs employing such advanced techniques as feed forward, lossless feedback, and highly balanced push-pull amplifiers.

Outstanding third order intercept points of up to +56 dBm with current consumption of 600 mA, and second order intercepts well in excess of 100 dBm are achievable in amplifiers embedded in unique multicoupler applications.

Our high performance multicouplers incorporating low noise figure with outstanding linearity, have established AML Communications as a leader in the field.

This catalog presents products with a variety of custom specifications that, over the years, have become standard products. Consequently, you will find for a given frequency range, products with identical number of outputs (for example, 8-Way) with widely varied specifications, each serving particular customer requests for performance or cost.

As large as one catalog may be, it can never include every possible configuration of multicoupler. Whenever a desired product is not found in this catalog, it is usually a simple derivative of a standard item. Therefore, we welcome your inquiries for new and unique products as you, the customer, have always been the source of our creativity.

Cost control has always been a factor in implementation of our designs. We offer therefore, most of our products in compact versions, thus enabling our customers to operate the multicoupler from an existing power supply and save cost associated with a wired rack mount chassis.

Look for our other catalogs, including our unique “High Intercept Amplifier Handbook” Second Edition.

Contents

HF Multicouplers

0.5 – 32 MHz
2-32 MHz
2-88 MHz

General Description:

In the tradition of offering outstanding intercept points for it's amplifiers, AML offers a superior line of HF Multicouplers with the highest dynamic range in the industry.

Most designs cover the popular 2-30 MHz range in 6 way, 8 way, 10 way and 12 way configurations – Custom configurations are also available.

Features:

- ▼ Outstanding intercept points
- ▼ Low noise figures
- ▼ Rack mount or compact versions
- ▼ Rugged construction
- ▼ Meet military quality and environmental specifications
- ▼ Cost effective solutions

Specifications

FREQ (MHz)	0.5-32	2-32	2-32	2-32	2-32	2-32	2-88
OUTPUTS	8	6	8	8	8	12	10
MODEL NO.	AMC0032-8	AMC0232-6	AMC0232-8	AMC0232-8C	AMC8-50400	AMC02325040	AMC288-10C
GAIN (dB)	8±1.5 max	9±1 typ	4±1 max	4±1.5 max	8±1 typ	5±1 max	0±1 max
GAIN TRACKING (dB)	±1 max	n/a	±0.25 max	± 0.25 max	±0.35 max	±0.35 max	n/a
GAIN FLAT (dB)	±1 max	± 1 typ	±1 max	±1.5 max	±2.0 max	±1 max	±1 max
PHASE TRACKING (°)	n/a	n/a	±1± max	n/a	n/a	±2max	n/a
NF (dB)	6.0 max	5.5 max	6.0 max	6.0 max	6.5 max	6.0 max	6.5 max
P1 dB (dBm) input min	+18@output	+10	+12	+11	+19@output	+13	+10
IP3 (dBm)	+36 min	+38 min	+40 min	+39 min	+36 min	+37 min	+31 min
IP2 (dBm)	+68 min	+70 min	+76 in	+76 min	+66 min	+75 min	+68 min
VSWR	2.0:1 max	2.0:1 typ	2.0:1 max	2.0:1 typ	2.0:1 max	2.0:1 max	2.0:1 max
OUT/OUT ISOL (dB)	30 min	30 min	40 min	38 min	30 min	30 min	40 min
OUT/IN ISOL (dB)	n/a	28 min	35 min	34 min	n/a	n/a	40 min
POWER	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz	28 VDC @300 mA	100-140 VAC @ 60-400 HZ	100-140 VAC @60-400 Hz	28 VDC @ 300 mA nom
OUTLINE	Rack mount CH 29	Rack mount CH 34	Rack Mount CH 29	Compact 6032014	Rack mount CH 30	Rack mount CH 35	Compact 2400
CONNECTORS IN: OUT:	BNC (F) BNC (F)	UHF (F) BNC (F)	BNC (F) BNC (F)	SMA (F) BNC (F)	SMA (F) BNC (F)	SMA (F) BNC (F)	SMA (F) BNC (F)
WEIGHT (LB)	20	15	15	6	15	12	6

All the above specifications @ 25°C

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C, Operating altitude 15,000 ft., humidity 0-95%. Shock and vibration as encountered in ground mobile and airborne applications.

VHF/UHF Multicouplers

20-500 MHz
132-174 MHz
406-512 MHz

General Description:

AML offers a distinct range of VHF/UHF multicouplers addressing both the broadband user (20-500 MHz) as well as narrowband optimized designs. These designs offer high dynamic range and excellent output isolation. Preselectors are available as an option.

Features:

- ▼ High intercept
- ▼ Optimized bands or broadband
- ▼ Rugged construction
- ▼ Meets military quality and environmental specifications
- ▼ Competitively priced

Specifications

FREQ (MHz))	20-500	20-500	132-174	132-174	132-174	406-512	406-512	406-512
OUTPUT	8	16	8	16	32	8	16	32
MODEL NO.	AMC20501-8	AMC205015040	AMC100-8	AMC100-16	AMC100-32	AMC400-8	AMC400-16	AMC400-32
GAIN (dB)	2±1 max	4±1.5 max	1±1 typ	-1±1.5 typ	1±2 typ	1±1 typ	-1±1.5 typ	1±2 typ
GAIN TRACKING (dB)	±0.5 max	±0.75 max	±0.25 max	±0.35 max	± 0.5 max	±0.35 max	±0.5 max	±0.6 max
GAIN FLAT (dB)	±1 max	±1.5 max	± 0.5 max	± 0.5 max	± 0.5 max	± 0.5 max	± 0.5 max	± 0.5 max
PHASE TRACKING (°)	n/a	±5 max	n/a	n/a	n/a	n/a	n/a	n/a
NF (dB)	7.5 max	8.5 max	7.0 max	7.5 max	7.0 max	7.0 max	7.5 max	7.0 max
P1 dB (dBm) input min	+13 min	+12@input min	+18 min	+14 min	+11 min	+17 min	+13 min	+10 min
IP3 (dBm)	+31 min	+30 min	+36 typ	+33 typ	+29 typ	+35 typ	+32 typ	+28 typ
IP2 (dBm)	+56 min	+58 min	n/a	n/a	n/a	n/a	n/a	n/a
VSWR	2.0:1 max	2.0:1 max	1.5:1 typ	1.5:1 typ	1.5:1 typ	1.5:1 typ	1.5:1 typ	1.5:1 typ
OUT/OUT ISOL (dB)	28 min	20 min	25 min	25 min	25 min	20 min	20 min	20 min
OUT/IN ISOL (dB)	34 min	n/a	n/a	n/a	n/a	n/a	n/a	n/a
POWER	115VAC 15 w. nom	115/230 VAC @47-400 Hz	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz
OUTLINE	Rack mount CH 31	Rack mount CH 32	Rack mount CH 22	Rack mount CH 23	Rack mount CH 24	Rack mount CH 22	Rack mount CH 23	Rack mount CH 24
CONNECTORS	BNC (F)	SMA (F)	N (F)	N (F)	N (F)	N (F)	N (F)	N (F)
WEIGHT (LB)	15 nom	18 nom	15 nom	20 nom	25 nom	15 nom	20 nom	25 nom

All the above specifications @ 25°C

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C, Operating altitude 15,000 ft., humidity 0-95%. Shock and vibration as encountered in ground mobile and airborne applications.

VHF/UHF/L Band Multicouplers

20-1000 MHz
20-1200 MHz
20-2000 MHz

General Description:

This group of multicouplers reflect AML's ability to design and produce extremely broad band systems for surveillance and multiple frequency coverage. All units are available in both compact or rack mount configurations. Compact units may be ordered to be produced in a particular rack mount configuration at extra cost and slightly reduced performance.

Features:

- ▼ Extremely broad band
- ▼ Very high intercepts
- ▼ Very high harmonics suppression
- ▼ Good NF's
- ▼ Compact units or rack mount
- ▼ Extremely rugged
- ▼ Meets military quality and environmental specifications

Specifications

FREQ (MHz))	20-1000	20-1000	20-1000	20-1000	20-2000	20-2000
OUTPUTS	16	4	8	8	8	10
MODEL NO.	AMC201025040	AS02010004	AS101008-S	AS10010008	A20200-101	A20202-102
GAIN (dB)	0±2 max	1±1.5 max*	1±1.5 max**	1±1.5 max***	3±2 max	10±1.5max
GAIN TRACKING (dB)	±0.5 max	n/a	1 max	1 max	n/a	n/a
GAIN FLAT (dB)	±2.0 max	±1.0 max	± 1.5 max	± 1.5 max	± 2 max	± 1.5 max
NF (dB)	10 max	10 max	10 max	10 max	5.5♦	6 max
P1 dB (dBm) input min	+12 min	+5@input min	+10@input min	+10@input min	+10 min	-5 min
IP3 (dBm)	+30 min	+23 min	+25 min	+26 min	+17 min	+12 min
IP2 (dBm)	+50 min	+43 min	+43 min	+43 min	+33 min	+22 typ
VSWR	2.0:1 max	2.0:1 max	2.0:1 max	2.0:1 max	2.0:1 max	2.0:1 max
OUT/OUT ISOL (dB)	25 min	25 min	24 min	25 min	25 min	28 min
OUT/IN ISOL (dB)	35 min	25 min	34 min	34 min	40 min	40 min
POWER	85-140VAC 47-400 Hz	24 VDC @400 mA max	24 VDC±1 @380 mA max	28 VDC @380 mA max	115 VAC @60 Hz	28VDC @300 mA nom
OUTLINE	Rack mount CH 33	Compact 2419	Compact 6048054C	Compact 2498	Rack mount CH 28	Compact 2400
CONNECTORS	SMA (F)	SMA (F)	BNC (F)	SMA (F)	SMA (F)	SMA (F)
WEIGHT (LB)	25 nom	4 nom	6 nom	6 nom	20 nom	6 nom

All the above specifications @ 25°C, * BPF included to provide rejection @ 10 MHz: 10 dB min, @ 1500 MHz: 25 dB min,
** BPF included to provide rejection @ 10 MHz: 20 dB min, @ 1500 MHz: 45 dB min,
*** BPF included to provide rejection @ 10 MHz: 18 dB min, @ 1500 MHz: 40 dB min
♦ 20-100 MHz: 7.5 dB max

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C, Operating altitude 15,000 ft., humidity 0-95%.
Shock and vibration as encountered in ground mobile and airborne applications.

Cellular Multicouplers

825-845 MHz
870-890 MHz

General Description:

The AMC850 series multicouplers offer outstanding dynamic range, low noise figure in either a low profile compact version or 19" rack mount chassis. Using GaAs FET devices and built in ceramic/combline filters, optimized performance can be achieved in RF-congested cellular site environments.

Features:

- ▼ Rugged construction
- ▼ Outstanding dynamic range
- ▼ Built in rejection filters
- ▼ Available without filters at lower cost
- ▼ Competitively priced

Specifications

FREQ (MHz))	824-849	824-849	824-849
OUTPUTS	4	8	16
MODEL NO.	AMC830-4	AMC830-8	AMC830-16
PRESELECTOR BW	25 MHz	25 MHz*	25 MHz*
PRESELECTOR REJ.	60dB@869-894	60dB@869-894	60dB@869-894
GAIN dB TYP	23	20	17
NF dB	2.5 max	2.5 max	2.5 max
ISOLATION (dB)	20.0 typ	20.0 typ	20.0 typ
IP3 (dBm)	+27 typ	+24 typ	+21 typ
POWER (50-60 Hz)	110/220 VAC	110/220 VAC	110/220 VAC
OUTLINE/CONN.	2149A / N(F)	19"x20"x3.5" / N(F)	19"x20"x3.5" / N(F)
N(F)WEIGHT (lb)	3	20	25

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C, Operating altitude 15,000 ft., humidity 0-95%. Shock and vibration as encountered in ground mobile and airborne applications.

GPS Multicouplers

1200-1600 MHz

General Description:

The AMC1216 series multicouplers offer highly isolated outputs for low power GPS signal distribution. Its low noise figure minimizes additional noise contribution when installed following an LNA. The multicoupler's internal power supply injects 10V @ 40mA through the input RF connector to power the antenna mounted LNA. Additionally, each output is DC terminated with 250 ohms to load receivers configured to sense LNA failure.

Features:

- ▼ Rugged and reliable
- ▼ High dynamic range
- ▼ Cost effective

Specifications:

FREQ (MHz)	1200-1600	1200-1600	1200-1600
OUTPUTS	4	8	16
MODEL NO.	AMC1216-4	AMC1216-8	AMC1216-16
NF (dB)	3.0 max	3.5 max	4.0 max
GAIN (dB)	10.0 typ	10.0 typ	7.0 typ
INPUT PldB (dBm)	-15 typ	-15 typ	-15 typ
ISOLATION (dB)	40 min	40 min	40 min
VSWR	1.8:1 max	1.8:1 max	1.8:1 max
POWER (@ 60 Hz)	110 VAC	110 VAC	110 VAC
OUTLINE	CH 27	CH 26	CH 41
CONNECTORS IN / OUT	SMA (F)	SMA (F)	N (F) / SMA (F)
WEIGHT (lb)	15	20	25

All the above specifications @ 25°C

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C, Operating altitude 15,000 ft., humidity 0-95%. Shock and vibration as encountered in ground mobile and airborne applications.

Telemetry Multicouplers

215-320 MHz
1400-2400 MHz
2200-2400 MHz

General Description:

The telemetry multicoupler series offer the end user both broad band units as well as narrow band units covering the L band and S band frequencies.

Most units provide a high 50 dB output to output isolation, enabling easy installation of receivers.

Features:

- ▼ Rugged construction
- ▼ Broadband or optimized frequencies
- ▼ Meets military quality and environmental specifications
- ▼ Single and dual units
- ▼ Competitively priced

Specifications

FREQ (MHz)	215-320	1435-2400	1435-2400	1435-2400	1435-2400	1435-2400	2200-2300	2200-2400
OUTPUTS	12	4	4	Dual 4	Dual 4	Dual 6	12	8
MODEL NO.	P-12	AD190080	AMC1424-4E	ALC1424-4	ALC1424-4C	AMC1424-12	S-12	AMC2224-8
GAIN (dB)	1-4*	0±1 max	1±1 typ	2±1.5 max	0±1max	0±1 max	1-4*	-1±1 max
GAIN FLAT (dB)	±0.5 max	±1 max	± 1 max	±1.5 max	±1 max	0.2/10 MHz	±0.5 max	±0.5 max
PHASE TRACKING (°)	n/a	n/a	n/a	n/a	n/a	±1°/30 MHz	n/a	n/a
NF (dB)	7 max	8 max	6 max	6 max	6 max	7 max	9 max	7 max
P1 dB (dBm) input min	-6	-5	-4	+10	-4	-2	-6	-3
OIP3 (dBm)	+4 @ input min	+13 min	n/a	n/a	n/a	0 @ input min	+4 @ input min	0 @ input min
VSWR	2.0:1 max	1.5:1 max	2.0:1 typ	2.0:1 max	2.0:1 typ	1.5:1 max	2.0:1 max	1.5:1 max
OUT/OUT ISOL (dB)	50 min	18 min	35 min	18 min	35 min	50 min	50 min	50 min
OUT/IN ISOL (dB)	50 min	n/a	n/a	n/a	n/a	50 min	50 min	55 min
POWER	115 VAC @60 Hz	12 VDC @250 mA	115 VAC @60 Hz	115 VAC @60 Hz	115 VAC @60 Hz	117 VAC ±10% 47-63 Hz	115 VAC @60 Hz	115 VAC ±10% 47-63 Hz
OUTLINE	Rack mount CH 37	Compact 2149A	Rack mount CH 38	Rack Mount CH 39	Rack Mount CH 39	Rack Mount CH 36	Rack mount CH 37	Rack Mount CH 26
CONNECTORS	N (F)	N (F)	N (F)	N (F)	N (F)	N (F)	N (F)	N (F)
WEIGHT (LB)	25 nom	3 nom	15 nom	15 nom	20 nom	25 nom	25 nom	25 nom

All the above specifications @ 25°C
*Unit has gain adjust capability over this range

ENVIRONMENTAL: Operating temperature –40° to +65°C, Non operating temperature –50° to 100°C,
Operating altitude 15,000 ft., humidity 0-95%. Shock and vibration as encountered in ground mobile and airborne applications.

Application Notes

Dynamic Range Considerations In Receiving Multicouplers

Receiving multicouplers provide a user with multiple signal outputs for distribution to receivers, processors, etc. from a single signal reception point, usually an antenna. This function must be provided transparently to the system users as if no multicoupler were present and each user were the sole recipient of the signal from the source. Thus, the multicoupler must not add signal or noise, limit dynamic range, or allow interference between users, all of which would limit the system dynamic range.

Noise Implications

Additional system noise is one of the first implications which comes to mind when adding an active element to a system. Additional noise increases the minimum discernible signal (MDS) level, reducing system sensitivity. The additive noise impact of a multicoupler can be calculated from the following formula:

$$F_T = F_1 + \frac{F_2 - 1}{G_1}$$

FT= *Total system noise figure (magnitude)*

F1= *Noise figure magnitude of elements prior to multicoupler*

F2= *Noise figure magnitude of multicoupler*

G1= *Gain magnitude of elements prior to multicoupler*

The noise contribution adds to the system noise floor. In some cases, the multicoupler may be the first active device in the system, thus setting the system noise figure. In other installations, it may follow a low noise amplifier and impact the system noise floor by less then a tenth of a dB.

Extraneous signals must be prevented from contaminating the desired signal. These can appear as switching power supply noise, clock noise from adjacent digital circuitry, or local signal generation sources such as radios. To give an example of the magnitude of this problem, typical power supply noise may be present on DC voltage supply lines at amplitudes of several millivolts. Typical received RF signal levels are less than 1 microvolt. This requires rejection of greater than 60 dB just to bring the interfering signal to the same level as the received HF and VHF signal.

Externally generated noise voltage manifests itself in two different methods. HF and VHF noise which gets into an HF or UHF system is in the same spectrum as the target signal. This noise will modulate and/or mask any incoming signal by raising the system noise floor. In higher frequency telemetry systems, direct noise insertion into the receiver is unlikely due to the frequency difference between noise and signal, but signal modulation is likely to affect signal fidelity. If the multicoupler is preceded by a preamplifier, the modulation effect is less pronounced, due to the stronger signal to modulation ratio. Filtering techniques and Faraday shielding of both emitters and multicouplers can reduce the introduction of interference to the system. Ferrite beads and toroids can be used to suppress signal emission. If a compact multicoupler is desired, and the user provides DC power, a linear power supply is most desirable.

Switching power supplies can be used with proper isolation techniques (see Fig. 1). HF and UHF multicouplers are most susceptible to interference due to the abundance and spectrum of interfering sources.

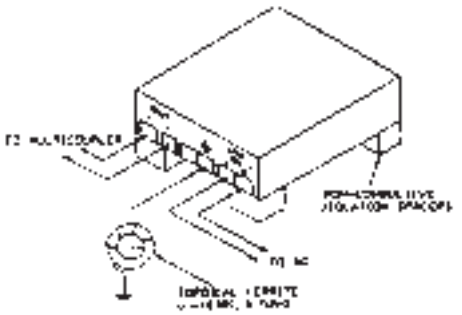


Figure 1 - Power supply isolation drawing

Strong Signal Level Implications

As with any component, the maximum signal level capability of a multicoupler is finite. Although it would be difficult to damage a multicoupler from available signal levels (they can be fitted with limiters), a multicoupler which is saturated by a local RF source will not reproduce the needed fidelity of the target signal. This is one reason input bandpass filters are often specified or provided with multicouplers.

A common example of an interfering high level signal is a television transmitter. The signal level is present from a UHF station operating at several thousand watts could easily saturate a nearby cellular base site multicoupler without an input filter.

Input filters are recommended at any installation where transmitters of any frequency may be colocated.

In the absence of local transmitters, multicoupler input preselector filters still perform valuable functions by extending the effective dynamic range of the unit. Any signal, in or out of the multicoupler bandwidth, above the spurious signal generation threshold*, has the capability to cross modulate with other signals, producing detectable in band spurious signals. For example, two television signals, channel 4 at 67.235 MHz and channel 7 at 172.25 MHz may be present at –30 dBm levels at the input to the multicoupler. Depending on the multicoupler linearity, intermodulated signal products may be present at 242.5 MHz , 108 MHz, 40.75, 309.75 and 417.75 MHz at levels between the noise floor and –80 dBm** These intermods can mask or distort desired signals, interfering with legitimate information transmission.

If the undesired television signals are outside the operating bandwidth of the system, a bandpass filter can be used to attentuate the unwanted signals with minimal degradation of desired signals. In the previous example, just 20 dB of signal attentuation reduces the possible intermod levels from –80 dBm to –120 dB. Further attentuation of spurious signals can be achieved by increased filtering. The minimum acceptable attentuation is determined by the maximum signal levels present which will result in inband intermodulation products, and the sensitivity of the system.

In very wide band signal monitoring applications, such as a 20- 10000 MHz system, rejection or attenuation of strong signals by filtering may not be an acceptable solution. Filtration in these applications would cause blind areas in any of the filtered spectra. Depending upon the application, two techniques used in conjunction may present an acceptable resolution to this. These options are: (1) switchable preselection, and (2) use of ultra linear amplification in the multicoupler.

Switchable preselection functions as a user selectable filter placed prior to signal amplification. The user can look at the entire band with degraded performance due to intermodulation, or defined spectra can be observed sequentially by switching in desired filtering. This allows pseudo wide band operation in an extremely high power signal environment, but real time monitoring of the entire band may be sacrificed.

Multicouplers which utilize ultra linear amplification can be used successfully for wide bandwidths in applications where moderate signal levels may be found. Typical semiconductor (GaAs or Si) amplifiers have third order intercept points (30IP) 10 dB higher than the 1 dB compression level, second order intercept points (20IP) are 20 dB above the 1 dB compression point. Ultra linear amplifiers have intercept points which exceed those of standard amplifiers by 5 to 30 dB, depending upon the amplifier architecture (see AML's High Dynamic Range Amplifier Handbook).

Again, an example readily illustrates the significance of ultra linear amplification in a multicoupler. Referring to the previous television signals present at –30 dBm, but these are now incident upon an high dynamic multicoupler with IP2+ 50dBm, and IP3+30 dBm. This will produce intermodulation levels at less than –110 dBm, compared to the intermod levels of –80 dBm achieved in the prior example.

The noise figure filtering and intermodulation intercept points of a multicoupler will be stipulated by the application and environment of the unit. Unnecessary features can be eliminated to reduce costs without jeopardizing system performance, however, a thorough understanding of the intended RF environment is needed to insure that the multicoupler fulfills its requirements.

* System noise floor in dBm+ spurious free dynamic range in dB

** Assumes multicoupler IIP2 20 dBm, IIP3 10 dBm, 0 dB gain multicoupler

Understanding Multicoupler Specifications and Practical Installation Considerations

The function fulfilled by the receiver multicoupler requires the end user to consider its impact on other system components. With a whole set of input and output parameters, a receiver multicoupler will impact both the signal source (the antenna) as well as its multiple loads (the receivers).

At the input port, receiving multicouplers must provide a good impedance match to the antenna to preserve radiation patterns and overall antenna gain. Since antennas are designed to work into loads like front end mixers, a degree of insensitivity to mismatch is expected. Concluding, an input VSWR of 2.0:1 is adequate for many wideband multicoupler applications. Narrowband applications can demand better than1.5:1 VSWRs. Another input port parameter of interest is the maximum safe input RF level the multicoupler will tolerate with no damage. Proximity of receiving antennas to transmitting antenna may produce antenna currents developing significant RF levels.

A Proper Limiter

Most multicouplers can handle up to +20 dBm (100mW) of RF power without damage. Should power bursts over this level be encountered, an integral input limiter that can handle up to several watts can be incorporated. This, at a slight noise figure expense (typically less than 0.5 dB) will guarantee high power signal protection. Costs for limiters vary from $100 to $300. For HF multicouplers, as they are usually directly coupled to the antenna without the need of a low noise amplifier, a major concern is the survivability to an indirect lightning hit. It is therefore recommended that whenever installations of HF multicouplers are performed in lightning prone areas, adequate protection arrestors should be installed.

A Proper Lightning Arrestor

It is common for lightning hits to generate currents in excess of 5000 amps. To protect against such surges a constant impedance gas discharge tube will limit voltage surges to under 50 volts in about 100 nanoseconds — much faster than the voltage rise time of lightning. The replaceable gas discharge tube will provide an easy path to ground for the energy carried by lightning. Should the same antenna be used for both receive and transmit, one must pay attention to the rating of the arrestor for carrying the full transmit power level. Arrestors normally come in 100W and 1000W transmit power levels. Cost of lightning arrestors vary from $100-$350 depending on transmit power level and ruggedness. Proper grounding of the arrestor is important. A ground rod connection is preferred.

Good Output to Output Port Isolation

Multicoupler output parameters address the ability to handle multiple receivers simultaneously without receiver to receiver cross modulation and L.O. injection.At HF frequencies a receiver's input is actually a mixer RF port (no RF amplifiers are usually employed from dynamic range considerations). (See Figure 1).

Since the first mixer is usually an upconverter (subsequently two or more down conversions are used before signal demodulation) and input LPF/BPF, plus the LO/RF mixer isolation guarantee extremely low LO emissions from the input port (less than 100 dBm). It is for this reason that multicoupler requirements at HF frequencies do not require exceptional output/output ports isolation (typically 20-30dB).

Unlike at HF frequencies, telemetry L and S band receivers have higher levels of LO leakage, requiring receiver to receiver isolations in excess of 50 dB.

Noise Figure

Key to proper multicoupler operation is its ability to introduce the least amount of additive white noise. At HF bands where considerations of

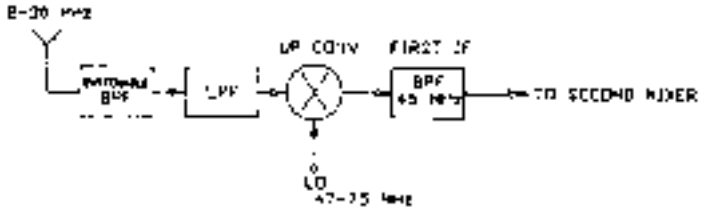


Figure 1 - Typical HF Receiver front-end employed first mixer as upconverter

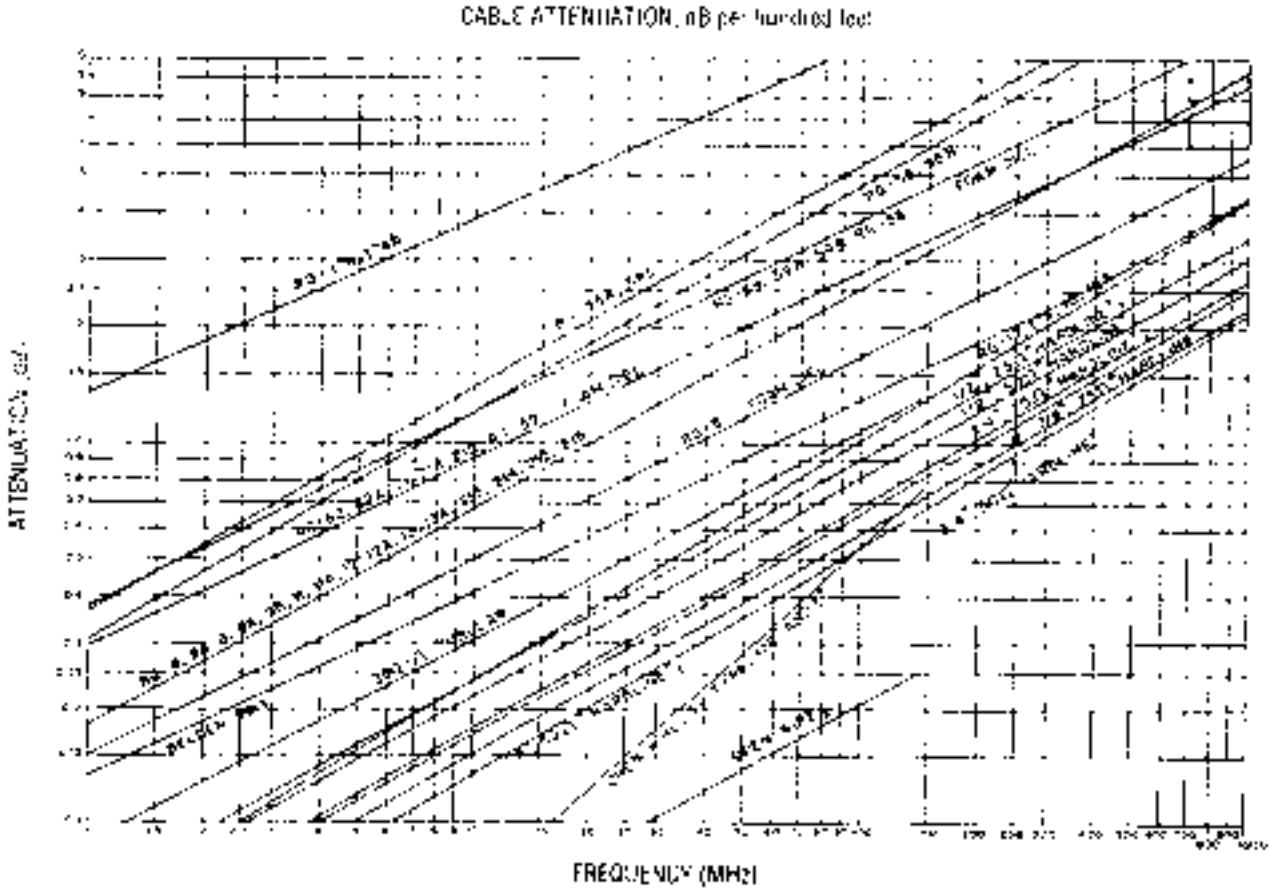


*Table 1 - This graph displays the attenuation in decibels per 100-foot lengths of many popular transmission lines.**

dynamic range surpass those of noise figure, and thus not permitting the use of low noise amplifiers, the noise figure of the multicoupler is increasing the system's noise floor dB for dB. Unfortunately, noise figure of HF multicouplers is limited by use of high dynamic range amplifiers which are able to provide noise figures in the 4-6 dB range. At VHF/UHF frequencies these figures climb to approximately 8-10 dB.

Overall Gain

To be as "transparent" as possible, most multicouplers offer gains in the vicinity of 0 dB. Close attention must be paid to the cable lengths associated with the input/output multicoupler connections, as they can significantly impact overall gain (loss).

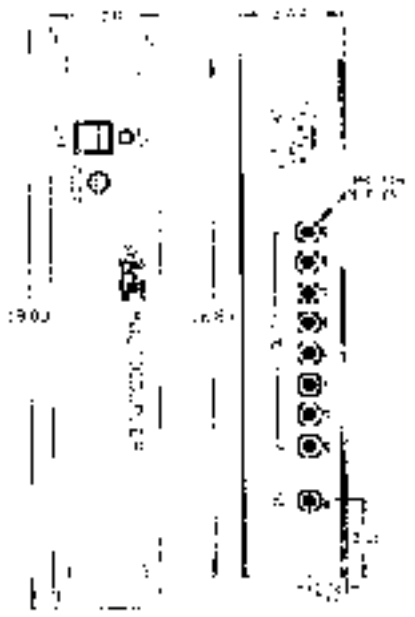
At HF frequencies, one can use literally 100's of feet of cable (assumes RG-8/U type) before cable losses will reach meaningful levels. At L and S band, even for relatively short runs, cable lengths must be taken into account when preparing a system's gain budget. (See Table 1 for losses associated with most popular cables).

For extremely broadband multicouplers, i.e. covering 10-2000 MHz, the end user must be aware of the negative gain slope associated with long cable runs. For example, using 50 ft. of RG-8/U at the input and output of a multicoupler will create a gain slope of nearly 10 dB (from 10-2000MHz).

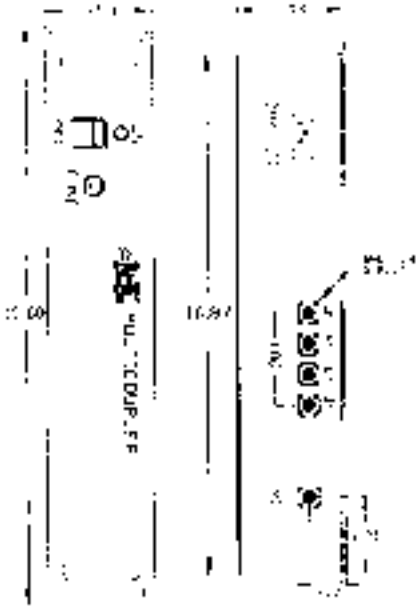
While budgeting insufficient gain for a particular multicoupler installation will reduce overall system sensitivity, too much gain will impact negatively overall dynamic range. (See AML application note in this catalog entitle "Dynamic Range Considerations in Receiving Multicouplers).

* Graph reprinted with permission from "The 1992 ARRL Handbook for Radio Amateurs"©ARRL

Outline Drawings



CH 20 - Chassis depth: 13.09"



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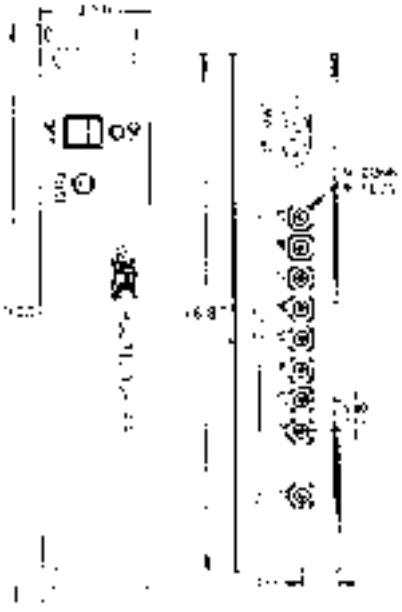

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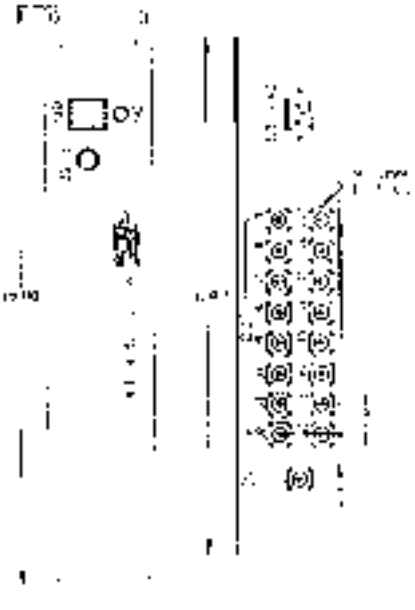

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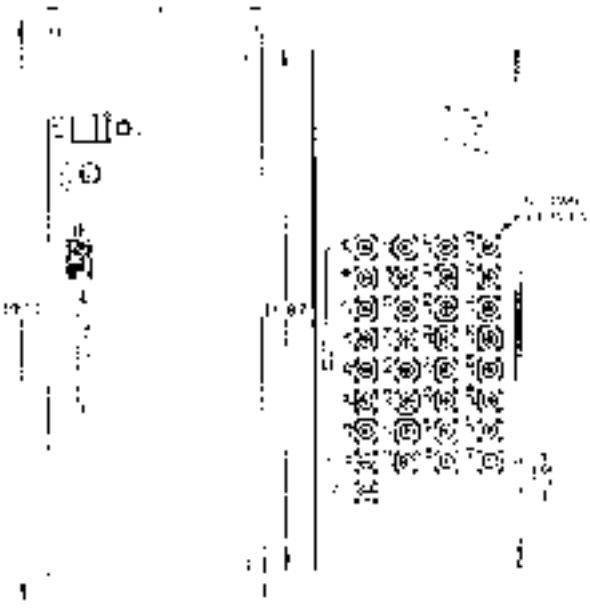
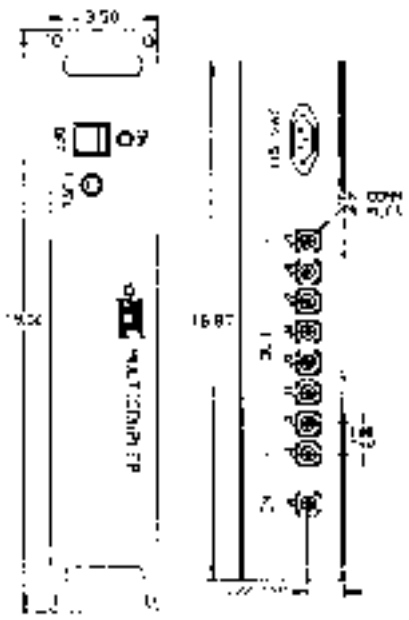


CH 24 - Chassis depth: 19.25"

CH 25 - Chassis depth: 13.09"



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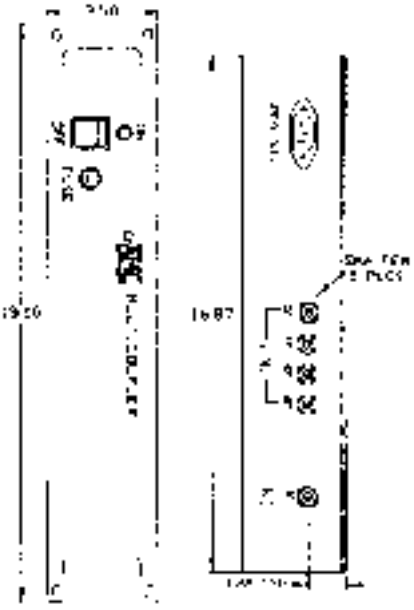

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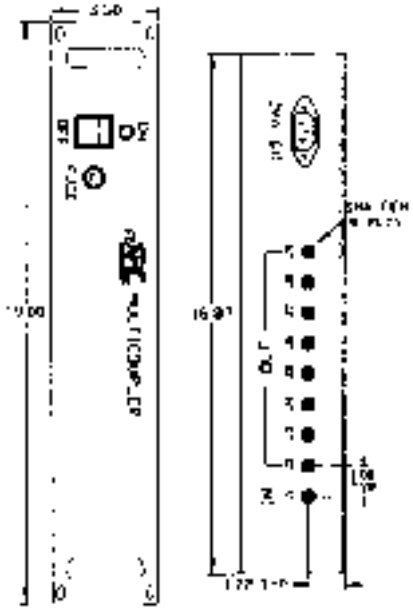

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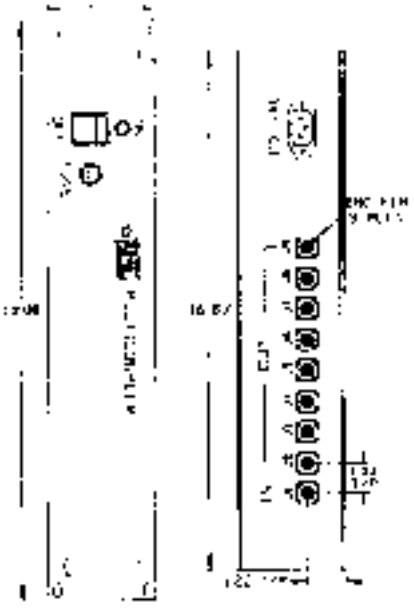

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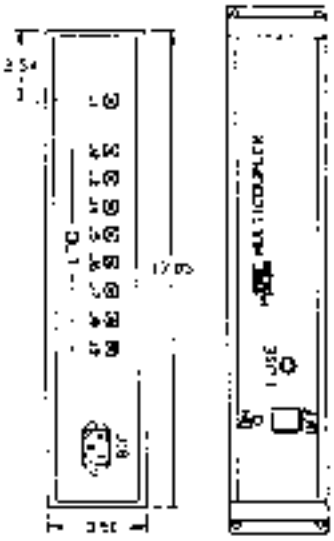

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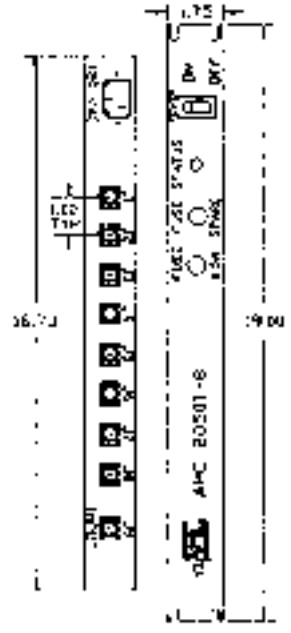

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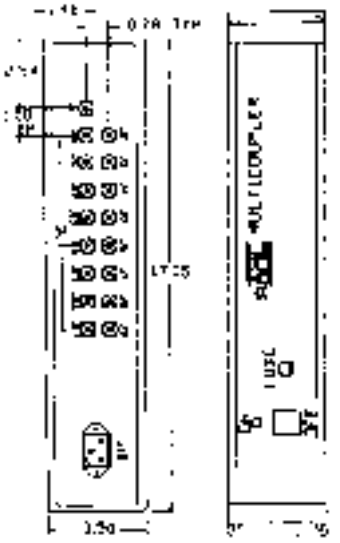

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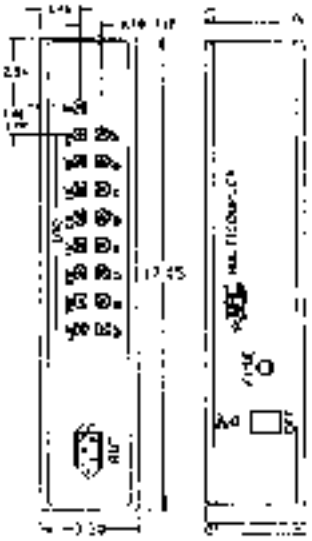

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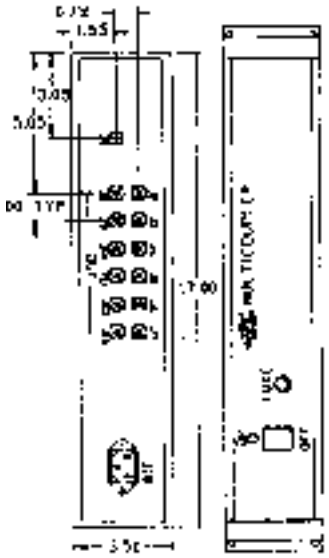
CH 34 - Chassis depth: 12.02"



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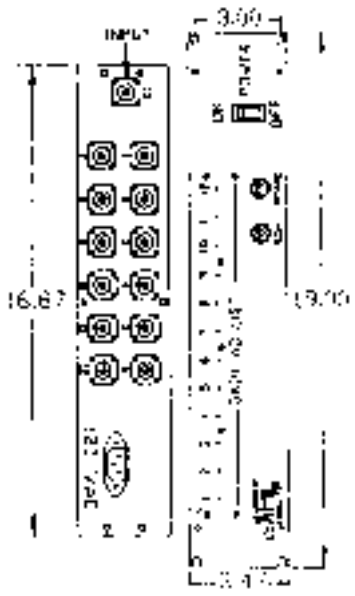
CH 36 - Chassis depth: 16.67"



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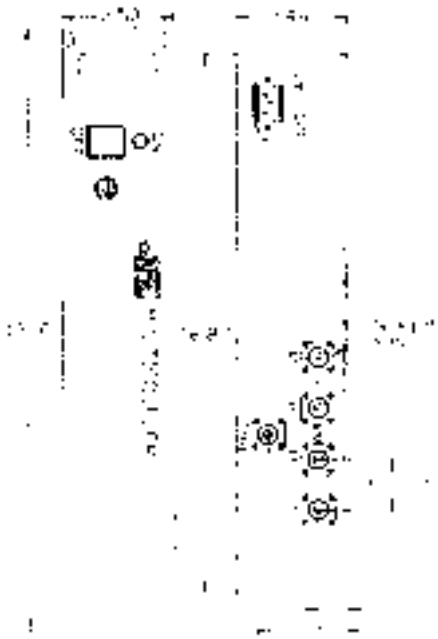

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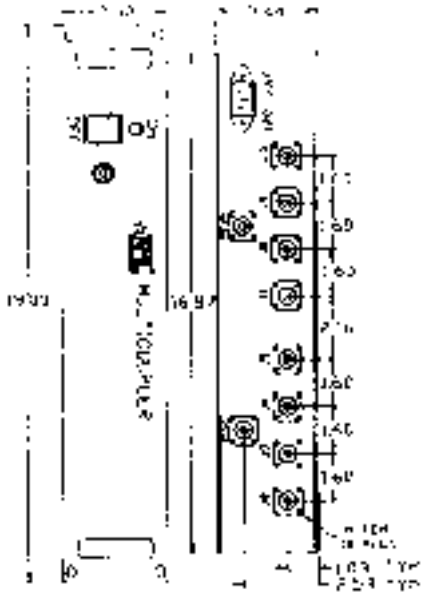

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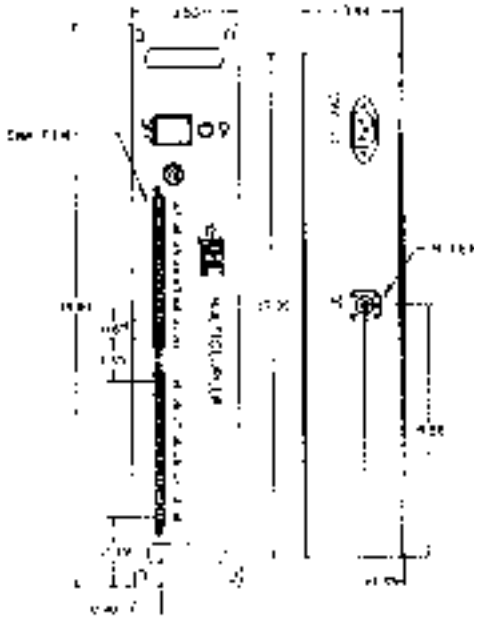

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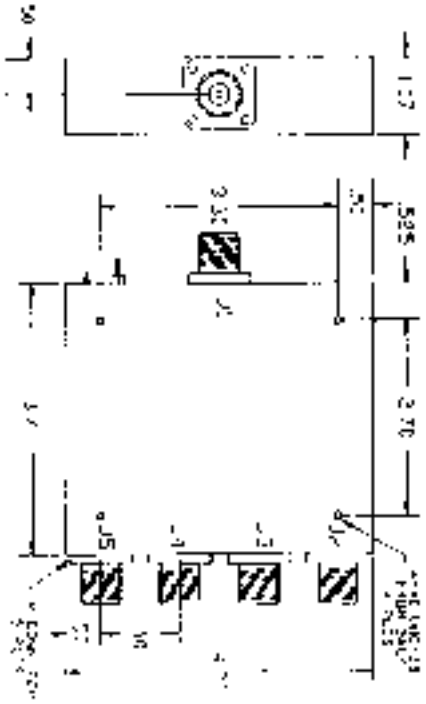

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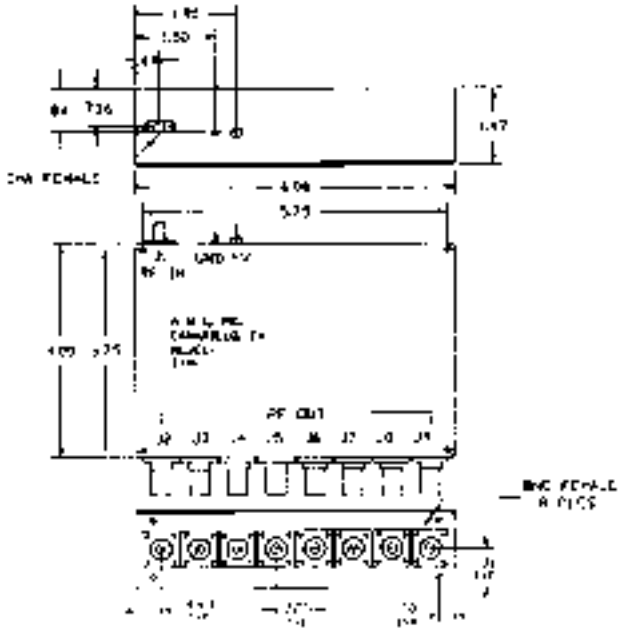

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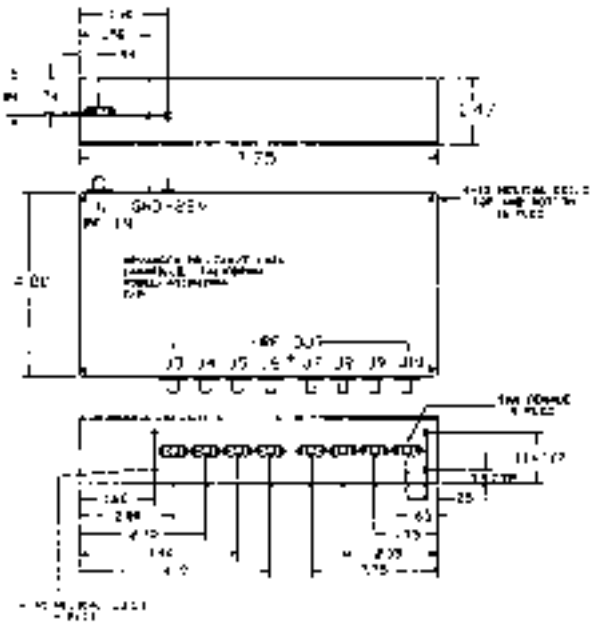

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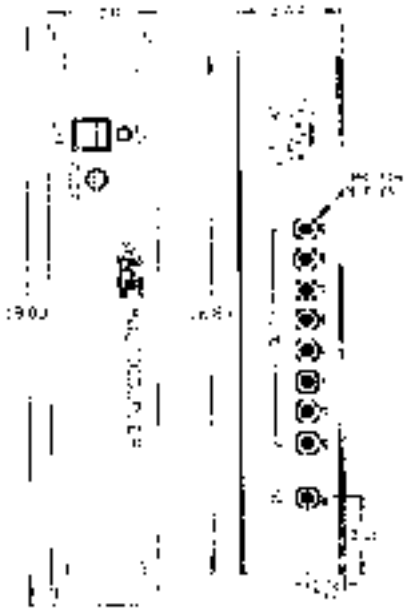

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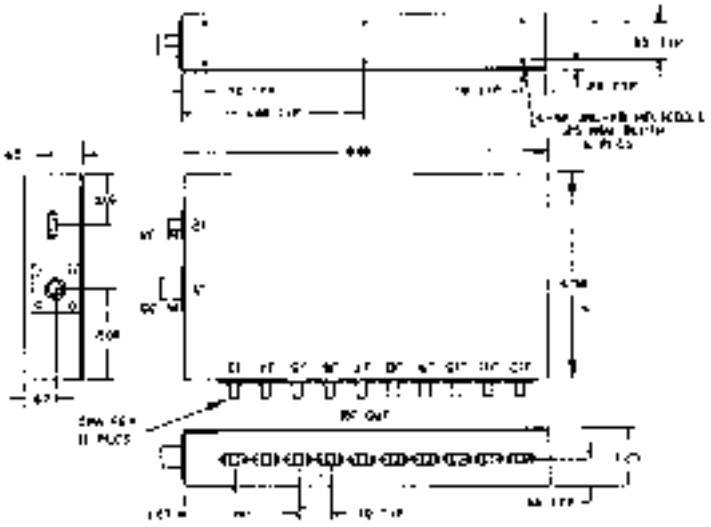

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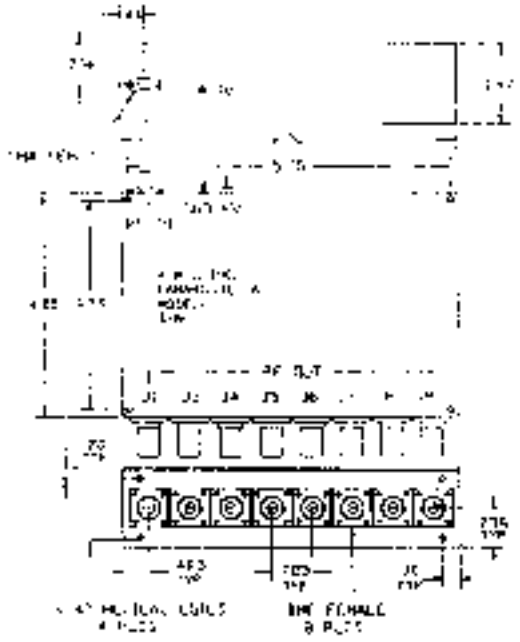

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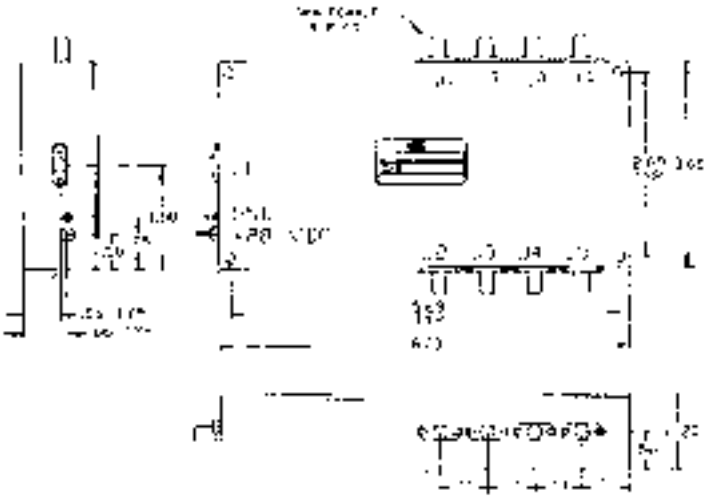

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