HIGH POWER WIDE BAND AMPLIFIER

MODEL CMX25

OPERATING AND MAINTENANCE INSTRUCTIONS

DOCUMENT NUMBER
CMX25MAN-00

SERIAL NUMBER

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF APPENDICES

SECTION 1.0

INTRODUCTION

Congratulations on the purchase of your new Wide Band Amplifier from Instruments For Industry, Inc. Your new Wide Band Amplifier incorporates the finest advancements in the state of the art solid state electronics technology available in a compact, portable and versatile package. Your Wide Band Amplifier's quality, performance and trouble free operation depends on you thoroughly reading through this manual and familiarizing yourself with its proper operation and usage.

Your Wide Band Amplifier comes with the following accessories, be sure to check your packaging for the items listed below before disposing of the packaging.

CONTENTS
(For a typical Wide Band Amplifier)

Quantity	Description
1	CMX25 High Power Wide Band Amplifier, P/N CMX25
1	A/C Line Cord
1	Operation and Instruction Manual, Doc. No. CMX25MAN
1	Calibration Data Sheets and Response Curves (Included in Manual)

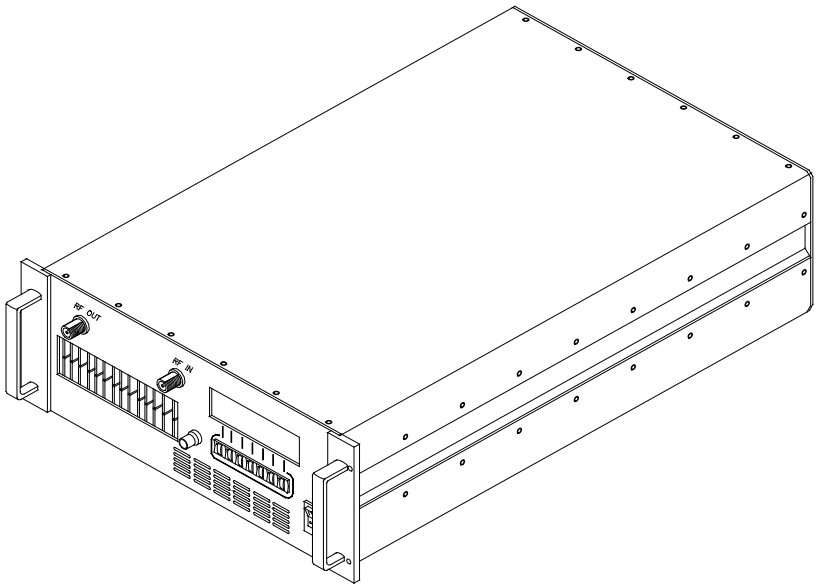

FIGURE 1.0
CMX25 ILLUSTRATION

SECTION 2.0

GENERAL DESCRIPTION

The Instruments For Industry, Inc. (IFI) manufactured CMX25 Wide Band Amplifier is a Bench Top or rack mount amplifier providing 40 Watts of linear RF power from 0.01 to 10000 MHz. The CMX25 incorporates two frequency bands of operation identified as Band 1 and Band 2 which the CMX25 features easy operator frequency band switching without changing the RF Output connections. The Band 1 frequency range is 10 kHz to 230 MHz with Band 2 frequency range being 200 MHz to 1.0 GHz. The minimum saturated output power over the entire operating frequency range is more than 25 Watts.

The CMX25 features a Liquid Crystal Display (LCD) that displays continuous forward and reflected power in four digit metering. The display also scrolls to provide the operator with operating status and self diagnostic fault indications.

The CMX25 has an internal electronic gain control of 40 dB and a built in leveling control which allows the CMX25 to level on an external controlling signal or level internally by an operator determined the Automatic leveling Control (ALC) setting.

The CMX25 is unconditionally stable and incorporates protection circuits that monitors and controls the VSWR input and outputs so the amplifier cannot be damaged by any mismatched load.

The CMX25 has an optional IEEE-488 BUS interface which allows the amplifier to be remotely controlled through the use of as computer and a GPIB BUS.

SECTION 3.0

WARRANTY INFORMATION

Instruments For Industry, Inc. (IFI) warrants each product of its manufacture to be free from any defect in material and workmanship for a period of one year from shipment to the original purchaser. All warranty returns, however, must first be authorized by our factory office representative. Refer to the Service Section for information on how to return items for warranty repair.

Warranty liability shall be limited to repair or replacement of, or part thereof, which proves to be defective after inspection by IFI. This warranty shall not apply to any IFI product that has been disassembled, modified, physically or electrically damaged or any product that has been subjected to conditions exceeding the applicable specifications or ratings.

IFI shall not be liable for any direct or consequential injury, loss or damage incurred through the use, or the inability to use, any IFI product.

IFI reserves the right to make design changes to any IFI product without incurring any obligation to make the same changes to previously purchased units.

This warranty is the full extent of obligation and liability assumed by IFI with respect to any and all IFI products. IFI neither makes, nor authorizes any person to make, any other guarantee or warranty concerning IFI Products.

SECTION 4.0

GENERAL INFORMATION

4.1 SCOPE OF THIS MANUAL

This manual is intended to inform a qualified transmitter operator or technician of the normal operating and maintenance procedures for the CMX25. It is not intended to be a course of instruction for unqualified personnel.

4.2 OPERATION OVERVIEW

The CMX25 is an integrated system with band switching capability for the frequency range required for operation. With the CMX25 in Low Band (BAND 1) mode of operation, the input RF signal is directed by RF Relays to the Band 1 PA and Driver section which in then to the output. With the CMX25 in the High Band (BAND 2) mode of operation, the input signal is directed by RF Relays to the Band 2 PA and Driver section which in then to the output. Both bands utilize only one input and output connector with the signal routed internally by RF Relays. Refer to Figure 2.0, the System Block Diagram, for an illustration of the CMX25 band swiching
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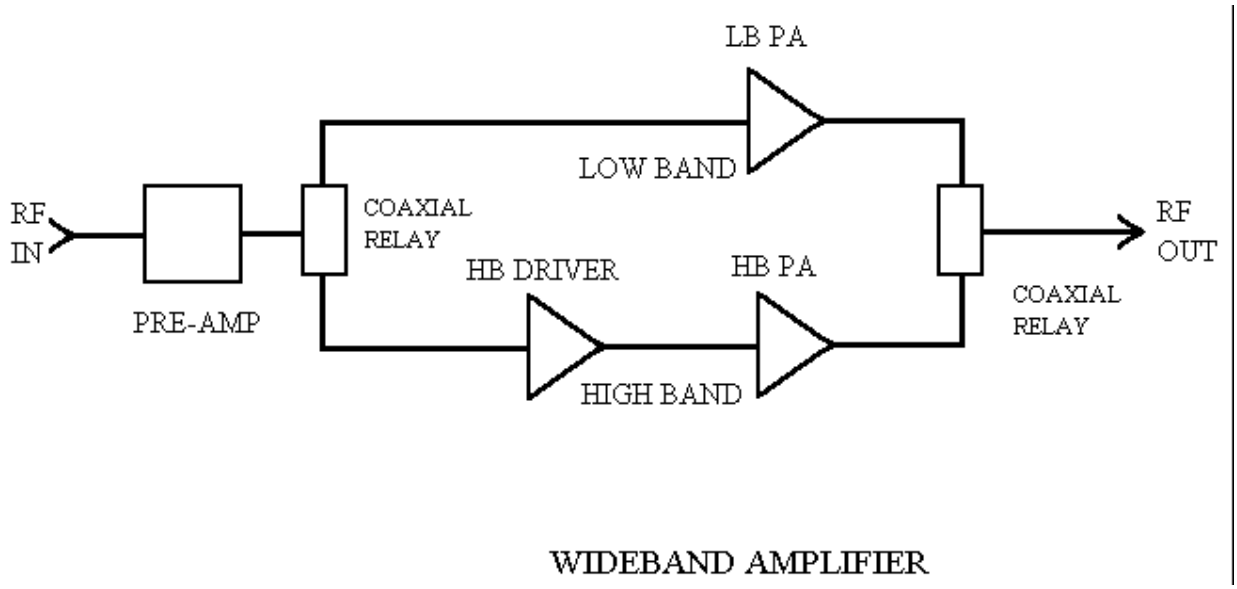

FIGURE 2.0
SYSTEM BLOCK DIAGRAM

4.3 GENERAL OPERATION WITH SYSTEM 55

SYSTEM 55 is an IBM Compatible, Windows based proprietary EMC susceptibility program specially designed to integrate the CMX25 with other IFI equipment into an efficient and flexible automated EMC Testing System for immunity testing. It is capable for IEC801-3 testing as well as a real time leveled sweep that maintains a desired preset field level across a given frequency range.

4.4 GENERAL SPECIFICATIONS

The specifications listed below represent the minimum performance characteristics at the time of delivery.

SPECIFICATIONS

Frequency Response:	
Band One:	10 kHz to 250 MHz
Band Two:	200 MHz to 1000 MHz
Bandpass Ripple:	$\pm$ 2 dB maximum
Power Output:	Minimum 25 Watts, 20W min. at $\leq$1 dB gain compression
Power Gain:	50 dB (minimum)
Input Impedance:	Nominal 50 Ohms unbalanced
Output Impedance:	Nominal 50 Ohms unbalanced
Input Signal Levels:	< 0 dBm (1.0 mW) See data sheet for specific input drive levels
Harmonic distortion:	< -20 dB at 20 Watts (Typically < -30 dB)
Gain Adjustment:	Greater than 40 dB (voltage controlled) when using Level Adjust.
Duty Factor:	No limitation
RF Rise Time:	Approximately 3 ns
Power Requirements:	5 to 10 Amps (less than 1.0 KVA)

4.5 PROTECTION CIRCUITS

The CMX25 is designed with a variety of protection circuits to provide safeguards for the amplifier should any adverse electrical conditions occur or if the amplifier is accidentally experiencing operator deviation of the design application. Listed below are the safeguards built into the CMX25.

4.5.1 Over Heat Protection

The CMX25 critical components are mounted to heat sinks which are, in turn, air cooled by four fans. Should a over heating condition occur, either through component failure or by a restricted air flow, the CMX25 contains heat sensors that will shut down the system should an over heating condition occur. As a result, the air inlet and outlet openings should be free of obstructions for proper cooling of the amplifier. Operation is restored automatically when the amplifier cools to normal temperature levels.

4.5.2 Input Protection

The CMX25 is designed to operate with less than a 0 dBm (1.0 mW) input signal however, to prevent over driving the amplifier, the Input Protection circuit will activate if the input signal exceeds 3 dBm (2.0 mW) and will automatically compensate for the increased input signal by reducing the gain of the preamplifier. Even though the amplifier has an Input Protection Circuit, overdriving the amplifier is not recommended, refer to paragraph 5.1.2 for more details.

4.5.3 Output Protection

The CMX25 incorporates a microprocessor controlled Output Protection Circuit which monitors the Forward Power Meter indication and limits the out put power to 40 Watts. This feature protects the amplifier from being over driven and causing damage to the power transistors.

4.5.4 Power Supply Faults

The Power Supply Fault circuit monitors the 28 VDC, ± 12 VDC and 5 VDC power supplies and produces a fault indication should any voltage level deviate from normal operating parameters. Each power supply voltage output is monitored and Green Status LEDs are illuminated to indicate that the power supplies are operating within design parameters. Should any power supply voltage deviate from the design parameters, the corresponding Green Status LED will extinguish. The Power Supply Fault Indication LED, located on the front panel of the Power Supply / Control Module is illuminated RED only when the 28 VDC power supply fails to meet design tolerances in addition to the extinguishing Green Status Indicator LED. A ± 12 VDC or 5 VDC power supply failure will not illuminate the Power Supply Fault Indication LED, this indicator is reserved only for the 28 VDC supply.

4.5.5 Mismatch Protection

The CMX25 is designed to operate with a tuned 50 Ohm load and should any mismatching of the 50 Ohm occur, the Reverse Power, also called Reflective Power, will increase producing a high VSWR. The CMX25 microprocessor monitors the Reverse Power levels by utilizing a Dual Directional Coupler and begins to turn down the gain of the preamplifier when the Reflected Power exceeds 25%. The Reverse Power is also displayed on the LCD Display for operator monitoring for any mismatched load.

4.5.6 Modular Faults Indications

The CMX25 is a microprocessor controlled wide band power amplifier which the microprocessor is designed to control and monitor critical components within it's circuitry. If the microprocessor detects any abnormality, the microprocessor generates and stores up to 13 diagnostic fault codes which are scrolled on the LCD Display as a trouble shooting aide for the operator. The CMX25 also has a RED Status Fault Indicator LED which illuminates when any fault condition occurs.

4.5.7 Short Circuit Protection

The CMX25 utilizes three different power supply voltages, + 28 VDC, ± 12 VDC and the + 5 VDC, each of the power supplies are designed with a short circuit and overload protection device.

4.6 STATUS INDICATORS, CONTROLS AND CONNECTORS

The CMX25 has various controls and status indicators which are identified below and can be visually located on Figure 1.0, CMX25 Illustration and Figure 3.0, CMX25 Rear Panel Illustration. A narrative description for the function and purpose of each control and status indicator is provided within paragraphs 4.6.1 and 4.6.2.

CMX25 RF AMPLIFIER

Front Panel:

POWER
P.S. STATUS INDICATOR
+ 28 VDC On Led
± 12 VDC On Led
+ 5 VDC On Led
FAULT Led
LEVEL ADJUST
GPIB REMOTE Led
HI VSWR Led
LOCAL Switch
AUTO LIMIT Led
ALC INT. / OFF / EXT. Switch
BAND 1 / BAND 2 Switch
RF IN, N Type
RF OUT, N Type

Rear Panel:

AC PWR, Standard 3 Wire Recept
SAMPLE RF OUT, BNC Type
ALC INPUT, BNC Type
RF IN, N type (Optional)
RF OUT, N type (Optional)
RF Reverse Sample Port (Optional)
INTERLOCK, BNC Type (Optional)
IEEE-488, Connector
ADDRESS, Switch

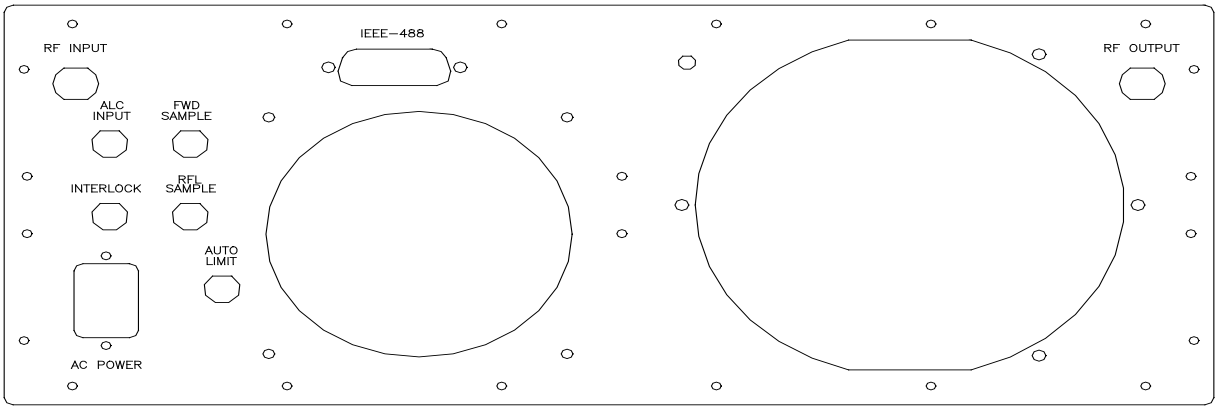

FIGURE 3.0
CMX25 REAR PANEL ILLUSTRATION

4.6.1 CMX25 PANEL STATUS INDICATORS

INDICATOR	FUNCTION
+ 28 LED the	The + 28 Green LED is provided on both the Power Supply and Amplifier sections. When these LEDs are illuminated, the + 28 VDC supply is functioning properly. When these LEDs extinguish, the +28 VDC supply has shut down. When this condition occurs, the two cooling fans will slow down to maintain cooling during the power failure and the PS Fault LED will illuminate.
± 12 and +5 LED	The ± 12 and the +5 Green LEDs are provided on both the Power Supply and the Amplifier sections. . When these LEDs are illuminated, the ± 12 and +5 VDC supplies are functioning properly. Should either power supply voltage deviate from the design parameters, the corresponding LED will extinguish

4.6.1 CMX25 PANEL STATUS INDICATORS - continued

INDICATOR	FUNCTION
Fault LED	The Fault LED illuninates when either a Thermal, Power Supply or Module Fault occurs. A Thermal Fault occurs when the amplifier is operating outside design temperatures. Should an excessive temperature condition occur, the + 28 VDC Supply is shut down and the +28 Green LED will extinguish. Once the thermal condition returns to the operational limits, the Fault LED will extinguish, the +28 VDC will activate and the +28 Green LED will illuminate. A Power Supply Fault is illuminated when the +28 VDC Power Supply voltage shuts down. The + 28 Green LED will extinguish when this failure condition occurs. A Module Fault occurs when an anomaly was detected by the microprocessor. When this condition occurs, an error code is stored and displayed on the LCD display of the CMX25.
Hi VSWR LED	When the Hi VSWR Red LED is illuminated, the amplifier is subjected to a condition where the Reflected Power exceeds 25%. The microprocessor turns down the gain of the preamplifier and displays the Reverse Power on the LCD Display.
Band 1 / Band 2 LED	The Band 1 and Band 2 Red LEDs are status indicators identifying which band mode is in operation.
Auto Limit LED	The Auto Limit Red LED indicates, when illuminated, that the output driver is exceeding the maximum input levels for the Final Low Band Distributed Amplifier. The microprocessor turns down the gain to design operating levels and illuminates the Auto Limit LED. When the input gain is turned down to a appropriate level, the Auto Limit LED will extinguish.
GPIB Remote	The GPIB Green LED indicates, when illuminated, that the amplifier is in the remote control mode of operation via the IEEE-488 GBIP Bus.

4.6.2 CMX25 CONTROLS

CONTROL	FUNCTION
Local	The Local switch is a momentary GPIB Rest switch. When depressed, the amplifier is restored to the local control form the GPIB mode of control.
Band 1 / Band 2 Switch	The Band 1 / Band 2 switch changes the amplifier to the desired Frequency Band of operation.
ALC Switch	Automatic Leveling Control (ALC) is a three position switch which selects the method for leveling, either internal, external or manual.
Power ON/OFF	The Power On/Off switch is circuit braker that is used as an On/Off switch as well as a circuit protection device. This switch turns the CMX25 either on or off.
Level Adjust	The Level Adjust control is a ten turn pot which allows a minimum of a 40 dB range of gain. Turning the control Clockwise (CW) produces a minimum gain.

4.7 DATA SHEETS AND CURVES

Provided with each CMX25 are specific Calibration Data Sheets and Flatness Curves measured from the amplifier using a calibrated 50 Ohm Pad to assist the operator in maximizing the performance of the Wide Band Amplifier.

The accuracy of the Metering is ± .5 dB (nominal) so to provide the operator with the ability to maximize the performance of the wide band amplifier, Calibration Data Sheets are provided with each amplifier exhibiting the actual metering indication required to produce a 25 Watt output. The actual metering values were derived by measuring the power output of the amplifier using a calibrated Power Meter and a calibrated 30 dB Attenuator Pad by inducing an appropriate input signal level to obtain a 25 Watt output. Once the appropriate signal level has been determined to obtain the 25 Watt power level, the actual Front Panel Metering Indication that correlates to the calibrated 25 Watt indication was recorded for operator reference.

The Flatness Curve provides the operator with the over all frequency response of the amplifier in perspective to the amplifier operating frequency range. The Flatness Curve provides the operator with the actual gain of the amplifier over the frequency band.

The Calibration Data Sheets and Curves are located within Appendix A

SECTION 5.0

PRINCIPLES OF OPERATION

5.1 PROPER USAGE AND WARNINGS

5.1.1 Controlling Power Output

With a nominal 50 ohm resistive load and an input signal appropriate to produce a power output within the limitations specified above, the amplifier may be placed in operation. To interrupt the output, simply interrupt the input signal or increase the input attenuation setting to produce commensurate output level reduction. The amplifier may be run indefinitely at rated output. Output power is usually measured with a power meter and suitable power attenuators.

5.1.2 Input Signal Levels

The CMX25 is designed to operate with less than a 0 dBm (1.0 mW) input signal however, to prevent over driving the amplifier, the Input Protection circuit will activate if the input signal exceeds 3 dBm (2.0 mW) and will automatically compensate for the increased input signal by reducing the gain of the preamplifier.

It is not advisable to over drive any amplifier and depend on protection circuits to maintain proper gain control. IFI makes available with each shipped amplifier specific data and curves so the operator will know the proper input signal levels to more efficiently operate the amplifier, refer to Paragraph 4.7 herein.

5.1.3 Band Switching Cautions

The CMX25 amplifier incorporates two bands with one input and output connector. Switching between bands is accomplished with a front panel toggle switch which operates internal solenoid coaxial switches. Switching while driving RF power is not recommended as it may cause arcing and pitting on the coaxial relay contacts. This arcing condition can be avoided by turning down the output power before switching the bands. Taking this precaution will extend the operating life of the coaxial switches.

5.1.4 Sample RF Output Cautions

The CMX25 Sample RF Output connector located on the rear panel must be terminated with the supplied 50 Ohm load if the output is not being used. Should the CMX25 be operated without a termination on the Sample RF Output connection, the lack of loading will jeopardize the accuracy of the metering and output protection which are based on the Forward Power Readings.

5.2 FEATURES OF THE CMX25 AMPLIFIER

The CMX25 amplifier is intended for applications requiring high gain and power output to 20 Watts, over a wide range of frequencies, without tuning adjustments. Through the utilization of two frequency bands identified as Band 1 and Band 2, the CMX25 amplifies a input signal source over the frequency range from 10 kHz to 1000 MHz and at a minimum gain of 50 dB. The operational description of each frequency band is identified in Paragraph 5.2.1 and 5.2.2, refer to Figure 4.0, CMX25 Schematic Diagram for an illustration of the CMX25 circuitry.

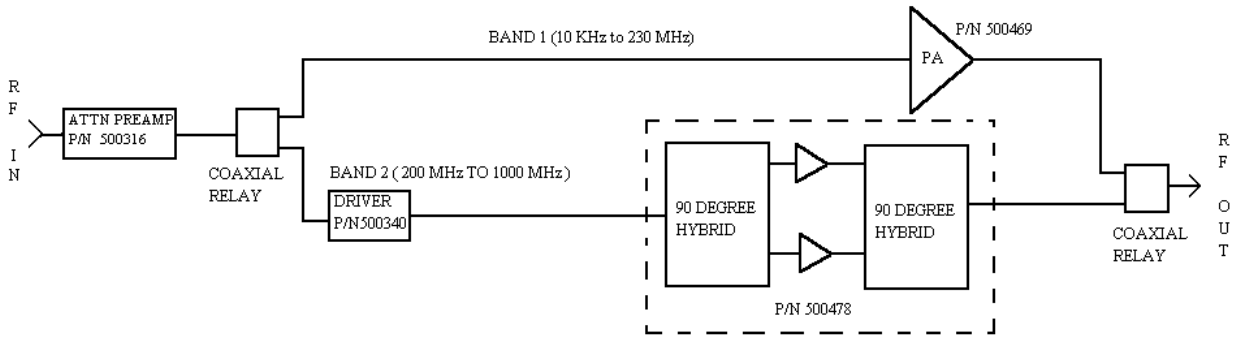

FIGURE 4.0
CMX25 SCHEMATIC DIAGRAM

5.2.1 Band 1

Band 1 is designed for operation between 0.01 to 230 MHz. Band 1 circuitry consists of a single module driven by a Preamplifier/Attenuator.

5.2.1.1 Preamplifier / Attenuator

This module is both a preamplifier and a voltage controlled, broad band attenuator. It provides the CMX25 with remote level control and leveling capability over the entire 0.01 to 1000 MHz frequency range. With the front panel level control set at maximum output it has a nominal 7 dB gain and can be adjusted with the front panel level control over a greater than 40 dB range.

The preamplifier is powered from a low voltage power supply that is independent of the main power supply.

5.2.1.2 Power Amplifier

This amplifier consists of three amplification sections, the final stage having two cascaded high-power, push-pull devices operating in parallel and combined through a transmission type impedance transformer.

5.2.2 Band 2

5.2.2.1 Preamplifier / Attenuator - Same amplifier as 5.2.1.1.

5.2.2.2 Driver Amplifier

This amplifier module consists of three cascaded single ended amplification stages and one push-pull output stage. It can provide up to 10 Watts of drive power to the Power Amplifiers (PA).

5.2.2.3 Power Amplifier

This amplifier consists of two high power push - pull devices, operating in parallel and combined through transmission type impedance transformers.

5.3 LEVEL CONTROL BOARD

All level control functions (manual and automatic), for both bands, are conditioned and processed through the circuitry contained on this board. These include:

1. Manual Level Control
2. Automatic Leveling Control (closed loop gain control)
3. Automatic Drive Limit Function (to higher power external stages)

5.3.1 Manual Level Control

Manual level control is accomplished by adjusting the front panel ten turn potentiometer, located on the power supply control unit, to a reference voltage setting between 0 to 5 volts.

5.3.2 Automatic Level Control

In this mode, the CMX25 serves as the voltage comparator and variable gain stage. It will enable the maintaining of a constant RF voltage vs. frequency at the input to an imperfect load or a virtually constant E-Field at a measurement point in space. For further information regarding the ALC operation, refer to Section 6.0

5.4 OPTIONAL FEATURES

5.4.1 Automatic Drive Limit Function (Auto Limit)

The Auto Limit is an optional feature that can be used when the CMX25 is used as a driver for higher power amplifiers available from IFI. The IFI series of high power amplifiers have provisions for continuously sampling plate and screen currents for front panel metering and to establish current limits which the amplifier will not be permitted to exceed. When either of these critical currents are reached, the power amplifier system is automatically switched from the OPERATE condition to the STANDBY condition and a status light (OVERLOAD) flashes to show that an overload condition occurred. While this is necessary for protection of the power tubes, it can be an inconvenience for the operator, particularly when sweeping through frequency to reduce testing time.

The Auto Limit feature will prevent the amplifier from exceeding the preset current limits by automatically reducing amplifier gain as necessary. This "turn down" action will prevent unnecessary overload conditions and enable maximum possible RF output power within safe operating limits. A front panel LED, on the CMX25 will light whenever the Auto Limit is acting to limit RF drive.

To determine whether the Auto Limit Feature is included in the operator's CMX25, The Auto Limit feature can be identified by a Auto Limit BNC Connector located on the rear panel of the CMX25 Power Supply / Control Module. The lack of the BNC connector means that this option has not been installed, however should the operator desire this optional feature, the amplifier can be returned to IFI for installation. Refer to Section 8.0 for Equipment Return Procedure.

5.4.2 Door Ajar Feature

The Door Ajar Feature is an option for the CMX25 that utilizes an Electro Magnetic Interference (EMI) Testing Room door switch that is mounted to the door in such a manner that when opened, the switch will automatically induce an ordered shut down of the amplifier and produce a STAND-BY MODE indication on the LCD Metering Display. When the door is closed, the amplifier resumes previous testing conditions.

The advantage to this feature is providing an additional safety feature for the growing concerns for potential hazards due to exposure to EMI Fields. With the Door Ajar option, all Testing Personnel will be protected from accidental exposure to EMI Fields. Should the operator desire this optional feature, the amplifier can be returned to IFI for installation. Refer to Section 8.0 for Equipment Return Procedure.

SECTION 6.0

AUTOMATIC LEVELING CONTROL (ALC)

6.1 ALC FEATURES

The Automatic Leveling Control (ALC) switch located on the front panel has three positions, 'INT', 'OFF' and 'EXT'. Described below are the features of each position

6.1.1 The 'INT' Position

The 'INT' or Internal position enables the amplifier to automatically level on an RF power level selected by an operator displayed on the Forward Power reading located on the Front Panel LCD display. Using the 'INT' feature, no external sources are required for leveling control and the operator determined power level will be automatically maintained even though the frequency or input signal levels might change. Refer to Paragraph 6.2 for the procedure to operate the amplifier in the 'INT' mode.

6.1.2 The 'OFF' Position

The 'OFF' position enables the amplifier to operate in a passive mode with no automatic features controlling input drive levels or output power levels. In this mode, the operator has full manual control of the amplifier including the input signal gain, frequency and power output. As a result, the operator must be fully knowledgeable of the effects of these variables in relationship to the operating characteristics of the amplifier. With this in mind, the two most important factors are the dB flatness of the amplifier over the operating frequency range and the rated output power of the amplifier.

Depending on the response curve provided on the S21 Parameter Plot for the amplifier flatness, which is located within Appendix A, and the size of the frequency steps of the signal generator can increase or decrease the power level by as much as 4 dB. This is the result of the design tolerance of the amplifier to operate within a ± 2 dB over the rated frequency range. A ± 2 dB tolerance means that the maximum deflection from minimum to maximum of the flatness curve can represent a delta change up to 4 dB. With this factor in mind, it is advisable to identify the specific frequencies that represent the greatest change from the nominal 0 dB level and adjust the input signal accordingly in so that the amplifier is not over driven beyond the rated power specification. Taking these precautions will prolong the reliability on the amplifier.

6.1.3 The 'EXT' or External Position

The CMX25 serves as the voltage comparator and variable gain stage. It will enable the maintaining of a constant RF voltage vs. frequency at the input to an imperfect load or a virtually constant E-Field at a measurement point in space.

The front panel, ALC control, switches direct level control from the front panel Level Control potentiometer to the output of a linear comparator. The comparator output level is dependent on the reference input from the front panel Level Control and the input from the aforementioned detected voltage or E-Field. The total gain of the leveling loop serves to maintain the output of the comparator virtually constant and thus maintain the desired test level at the remote detector or remote E-Field sensor.

The 'EXT' position enables the amplifier to automatically control an operator determined power level by means of an external 0.0 to 5.0 VDC reference source connected to the External Source connector. An example of an 0.0 to 5.0 VDC external input would be the output of a LDI or an EFS. Refer to Paragraph 6.3 for procedures on leveling with an external voltage level.

6.2 LEVELING USING THE 'INT' MODE

When in the INT position, no outside controls are required, the only equipment required is a frequency generator and the intended load. The procedure to use Internal ('INT') Leveling is described below:

1) Turn the RF Level Potentiometer fully counter clockwise to Full Attenuation.

2) Set the ALC Switch to the 'INT' position.

3) Set the Signal Generator to the proper input drive level to obtain the desired power level. Identify the desired testing parameters and determine the required input drive levels from the Calibration Data Sheets provided within Appendix A It is important to determine that sufficient signal drive signal is generated to obtain and maintain the desired programmed power level. An adequate load capable to operate within the power requirements should also be selected.

4) Adjust the RF Level Potentiometer until the desired Forward Power Level is displayed on the front panel LCD display.

5) The amplifier is now ready to sweep a frequency range and automatically maintain the desired power level with no further adjustments required. The power level will be maintained at the operator set level and remain independent of changes to the input frequency or input signal level.

6) When sweeping the frequency range, best results are obtained at a sweep rate that is slower than 500 ms.

6.3 LEVELING USING THE 'EXT' MODE

When operating the amplifier in the External (EXT) mode, it is important to understand that the power output levels are determined by the external voltage reference source and that the applicable Calibration Data Sheets should be reviewed to determine the appropriate drive signal level so that the amplifier does not exceed the specified power output rating. As described in paragraph 6.1.2, due to the flatness curve tolerances at certain frequencies, the rated power output power could be exceeded by an additional 40% and jeopardize the longevity of the amplifier. The amplifier should not be over driven and should a particular application require additional power beyond the rated power of the CMX25, contact IFI's Customer Service for additional high powered amplifiers.

Detailed below are specific applications for using the External (EXT) Mode with a variety of external inputs.

6.3.1 Constant RF Voltages Verses Frequency At A Remote Load

With remote detectors suitably rated for power and frequency, the CMX25 provides the means for feeding a mismatched load with constant RF drive voltage over the entire frequency range. Full leveling, at half the CMX25 rated output power, is realizable with most reasonable load variations. Extremely mismatched loads, particularly those presenting near short circuit conditions to the amplifier, will reduce the maximum voltage leveling capability of the system. Load impedance variation from 50 Ohms to an open circuit will permit peak voltage leveling within the VSWR capability of the amplifier. Variations in impedance from 50 Ohms down to a short circuit will rapidly diminish the peak voltage leveling capability toward zero. Amplifier VSWR limitations will, of course, further limit the maximum leveled voltage into mismatched low impedance loads.

To operate in this mode, after selecting the desired band, place the ALC switch in the EXT position. Connect the ALC on the rear panel to the detected output port on the remote detector. Connect the remote detector in series with the CMX25 output and at the input to the load. The system is now ready for operation. Amplitude adjustments can be made with the level control as in manual operation.

NOTE: When the CMX25 is used as a driver for higher power amplifiers, automatic level control can be accomplished in the same manner but at the power and frequency limitations of the driven amplifier.

6.3.2 Leveling On A Constant E-Field Using Sensors

In order to avoid a potential RF radiation hazard condition during these initial set up procedures, it is best operate on the lowest field intensity range (0 to 3 V/M). It is also advisable to use an initial test frequency less than 10 MHz. This will avoid the complications of reflected fields and room resonances.

The Test Set-Up Procedure, refer to Figure 5.0 for a Typical 'E' Field Leveling set-up

1) Connect the RF Output of the Signal Generator to the RF Input of the CMX25, refer to Figure 1.0, CMX25 Illustration, for location of the RF Input Connector.

2) Connect the RF Output of the CMX25, located on the same panel as the RF Input connector, to the antenna.

3) Connect the ALC Input, located in the rear panel of the CMX25, to the output of the Light Demodulator Indicator, IFI P/N LDI. Refer to Figure 3.0, CMX25 Rear Panel Illustration, for location of the ALC Input.

4) Connect a Light Pipe to the Input of the Light Demodulator Indicator, IFI P/N LDI, and to the LMT output of an IFI 'E' Field Sensor.

Leveling Procedure

1) Turn on all equipment shown in Figure 5.0 and allow a three minute warm-up period.

2) Turn the RF Level Adjust fully clockwise to the maximum gain setting and set the tracking of the EFS and LDI to a suitable input drive level required to obtain a full scale reading.

3) Turn the RF level adjust fully counter clockwise to the minimum gain setting and set the ALC switch to the EXT position making sure that the LDI is properly attached to the ALC port located in the rear of the unit.

4) Turn the RF Level Adjust on the front panel to the desired field level for leveling. The desired level should automatically be maintained within 1 dB for each 20 dB change in the input drive.

5) If the leveling loop should exhibit an unstable condition, vary the RF Signal Generator output until the indication stabilizes and is maintainable.

6) The system is now ready to be tested with a swept analog or stepped frequency input signal. All IFI component blocks shown in Figure 5.0 are capable of operating continuously from 10 kHz to 220 MHz. Extended frequency coverage, over the full range of the unit, can be provided by substituting an EFS-5 for the EFS-1 and adding a second log periodic or ridged horn antenna.

Set a sweep rate that enables good level control with the field gradients encountered in the test room. This may be anywhere from 15 seconds to 2 minutes depending on the field conditions and the bandwidth of continuous sweep. Dwell time, a user determined specification, will also determine the proper sweep or step rate.

7) Electric Null Fields, or E Null Fields, are a phenomena that may be observed when performing a sweep test. In a typical EMI/EMC Set Up where an amplifier and a frequency generator are used to generate an E Field, a E Null Field can be noted when the generated E Field is swept through a frequency range and at certain frequencies the field level will drop. These nulls are due to antenna pattern nulls and/or out of phase reflections from screen room walls or other obstacles that cancel or nullify the generated E Fields at the precise location of the E Field Sensor. This phenomena is a natural occurrence and can be corrected by temporarily relocating the E Field Sensor with the test sample for those specific noted frequencies where this phenomena occurred.

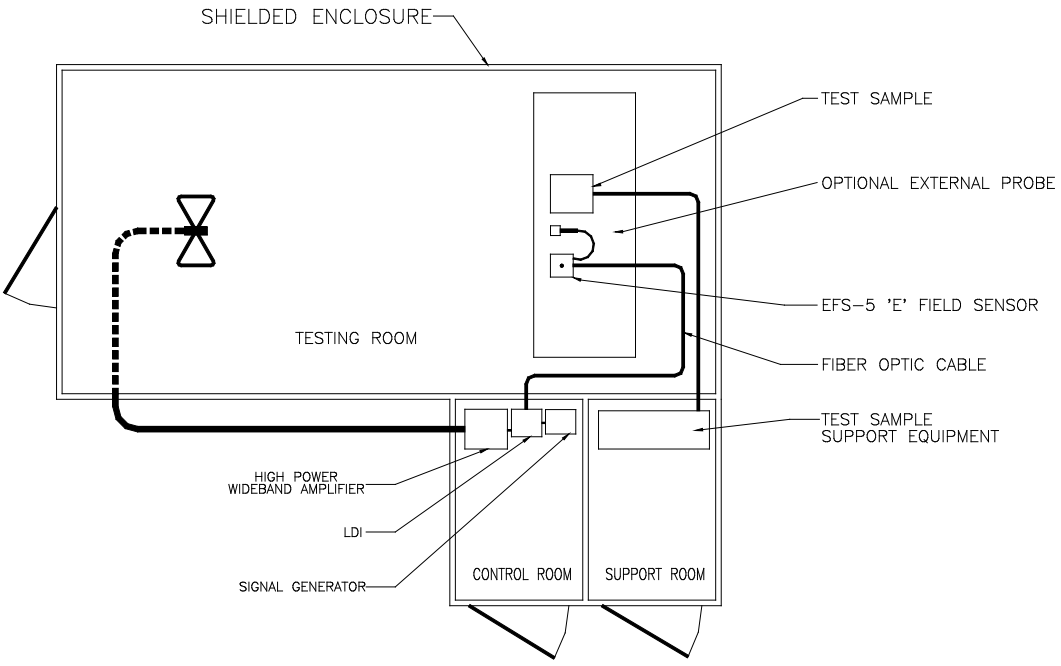

FIGURE 5.0

E-FIELD LEVELING SET-UP

SECTION 7.0

IEEE-488.2 INTERFACE

7.1 INTRODUCTION

The Instruments For Industry, Inc. (IFI) Amplifiers can be operated remotely from a personal computer having an IEEE-488 interface. This interface allows the amplifier to be remotely controlled over the General Purpose Interface Bus (GPIB) by sending commands to the amplifier. Additionally, amplifier status and forward and reverse power readings may be read over the GPIB. All functions can be controlled by coded messages sent over the interface bus via the 24-pin socket connector on the rear panel of the unit. IEEE-488.2 Standard is implemented, which defines the protocols and syntax of commands. The GPIB command codes for the IFI Amplifier series are discussed on subsequent pages and, for ease of identification; the command codes are identified within the text by bold capital characters. For full information on the IEEE protocols and syntax the IEEE-488.2 Standard should be consulted.

7.2 REMOTE INITIALIZATION

When the amplifier receives a command over the GPIB, it automatically switches to REMOTE operation, pressing the LOCAL key on the front panel returns the unit to normal manual local operation.

7.3 GPIB ADDRESS

The GPIB address of the amplifier is set by via the Front panel using the Control knob at the start up menu..

NOTES ON USING NATIONAL INSTRUMENTS' GPIB CONTROLLERS:
In order for the amplifier to operate correctly with a National Instruments GPIB controller card, the following must be done: (Items 1-5 are done in the IBCONF program.)

1. Set "Terminate reads on **EOS**" to **yes**.

2. Set "Set **EOI** with **EOS** on Writes" to **yes**.

3. Set the **EOS** byte to **0Ah** (an ASCII line feed character).

4. Set "Send **EOI** at end of writes" to **yes**.

5. Set "Enable **repeat addressing**" to **yes** at the board level.

6. When sending command strings to the amplifier, a carriage return character (**0Dh**) followed by a line feed character (**0Ah**), must always be appended to the command, otherwise the amplifier will wait indefinitely for the **CR-LF** combination. If this happens the unit will have to be powered off and back on to reset this condition. (The interface device will automatically assert the **EOI** line during the **LF** if items 2 - 4, above, are set to yes in the IBCONF program.) As an example, when issuing the zero attenuation command using the IBIC or WIBIC program, the command string would look like this: "**ZA\r\n**". (The \r is National Instruments' notation for the carriage return, and the \n is the line feed or 'new line' character.) Notice that the commands are upper case only.

Code	Amplifier Function
STBY	Standby
OPRT	Operate
RESET	Fault Reset
ATTU	Increase Attenuation [Response with Gain value](optional)
ATTD	Decrease Attenuation [Response with Gain value](optional)

REQUEST STATUS

Code	AMPLIFIER STATUS
STATUS	
	STANDBY
	OPERATE
	FAULT
FAULT	DETIALED MESSAGE

REQUEST AMPLIFIER STATUS (POWER AND METERING)

CODE	Amplifier FUNCTION
POWERFWD	Returns Forward Power Value
POWERRFL	Returns Reflected Power Value
PS1V	Returns Power Supply 1 Volts Value
PS1I	Returns Power Supply 1 Current Value
PS2V	Returns Power Supply 2 Volts Value
PS2I	Returns Power Supply 2 Current Value
TOTALH	Returns Filament Hours Value
OPERATEH	Returns Beam Hours Value
BAND1	Selects Band 1 of Operation [In Dual Band units only]
BAND2	Selects Band 2 of Operation [In Dual Band units only]
NOLEV	Selects NO Leveling [Optional]
INTLEV	Selects INTERNAL Leveling [Optional]
EXTLEV	Selects EXTERNAL Leveling [Optional]
ZEROATT	Sets the Amplifier for ZERO Attenuation
FULLATT	Sets the Amplifier for FULL Attenuation
GAIN	Returns Gain Value in percentage
***IDN?**	Returns ASCII response comprising of four data fields in the format <Manufacturer>, <Model>, <Serial Number>, <Firmware Version>
***RST**	Reset Command, Sets the Amplifier to the factory default power up state

NOTES:

1. ALL GPIB COMMANDS AND REQUESTS MUST CONSIST ENTIRELY OF UPPER CASE ALPHANUMERIC CHARACTERS.

2. WHEN SENDING COMMAND STRINGS TO THE AMPLIFIER, A CARRIAGE RETURN CHARACTER **(0Dh)** FOLLOWED BY A LINE FEED CHARACTER **(0Ah)**, MUST ALWAYS BE APPENDED TO THE COMMAND, and OTHERWISE THE AMPLIFIER WILL WAIT INDEFINITELY FOR THE **CR-LF** COMBINATION.

SECTION 8.0

MAINTENANCE AND SERVICING

8.1 PERIODIC MAINTENANCE

The only periodic maintenance required on the CMX25 amplifier system is insuring that the cooling vents are not obstructed in such a manner that the air flow is restricted. Periodic cleaning of the vents may be required depending on the degree of dust in the atmosphere.

8.2. SERVICING THE AMPLIFIER

Servicing of the amplifier by the operator is not recommended. Most of the internal circuitry requires special and unique test instruments to trouble shoot, align and calibrate the circuits. Should servicing be required, refer to Paragraph 8.3.

8.3 EQUIPMENT RETURN PROCEDURE

Should such an event arise that the CMX25 requires repair or calibration, it is recommended that the reader follows the Equipment Return Procedure so the equipment can be repaired or calibrated and returned in a efficient and timely manner.

8.3.1 Request a RMA Number

Contact the IFI Service Department either in writing or by calling (631) 467-8400 and request a Return Material Authorization (RMA) Number.

The RMA Number is the method IFI uses to prepare its' services for returned material in transit and acts as a tracking document for the returned material through the repair or calibration process.

The RMA also documents the customers' specific instructions or reason related to the return of the material.

8.1.2 Return All Accessories

In the interest of saving time and expediting the repair or calibration process, return all the associated accessories described in Section 1.0 when returning the equipment for repair or calibration.

In many cases, a faulty accessory could give an illusion that the equipment itself has failed. For this reason it is important to return the all the accessories with the equipment. It is also IFI's policy to verify performance of all associated accessories of Section 1.0 before returning the equipment to service.

8.1.3 Packaging The Equipment

When returning equipment to the manufacturer, always wrap each accessory separately and provide sufficient protective material around each item to prevent damage from handling and shipping conditions.

8.3.4 Reference The RMA Number

As detailed in Paragraph 8.3.1, always reference the IFI assigned RMA Number on your Packing List and Purchase Order and also when any inquiries are made.

APPENDIX A

CALIBRATION DATA SHEETS
AND
RESPONSE CURVES

APPENDIX A

SCHEMATICS

CMX25	**INTERCONNECT DIAGRAM**
CMX25	**BOM**
100216	**ATTENUATOR PRE-AMPL. ASSEMBLY DRAWING**
500469-1	**SCHEMATIC**
700259-3	**SPLITTER/DETECTOR ASSEMBLY**
500515	**DRIVER SCHEMATIC**
500466	**SCHEMATIC POWER VSWR METERING BOARD**
500516	**SCHEMATIC, HB DUAL PA/IPA**