Gentner

EFT-1000A

Installation and Operations Manual

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This manual was written and designed by Renee Gibson.

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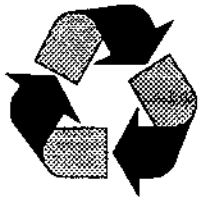

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SECTION 1

GENERAL INFORMATION

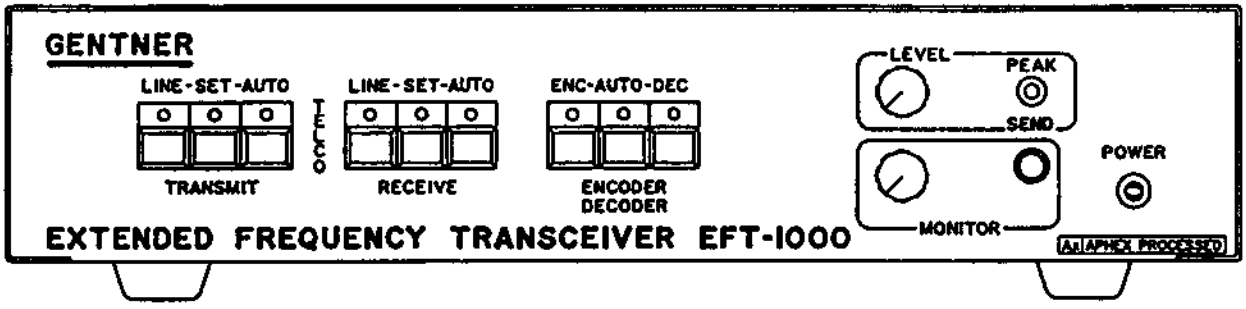
1.1 Introduction

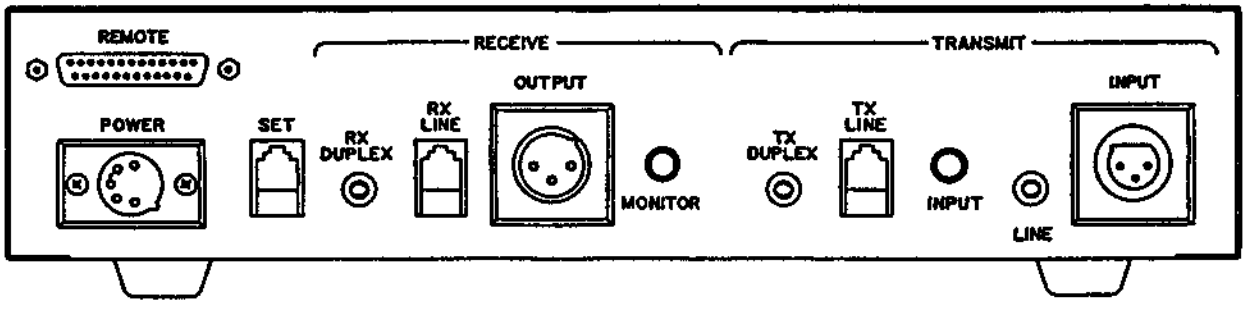
The purpose of this manual is to acquaint you with the operational characteristics and maintenance of the GENTNER EFT-1000 Extended Frequency Transcevier. Even though this manual is referenced for quick research, a careful reading of the entire manual will ensure maximum performance and ease of operation.

1.2 Purpose of Equipment

The EFT-1000 is a portable, microprocessor controlled telephone system. This transceiver improves the quality of telephone remotes by recovering the low frequencies normally lost on telephone lines. Audio frequencies are shifted up by 250 Hz on the transmitting end and back down on the recieving end. This preserves the low frequencies, dramatically improving the quality of the broadcast.

1.3 Physical Specifications





There are two telephone line buttons on the EFT-1000, one called Transmit and the other Receive. These two buttons turn the telephone couplers ON and OFF. The telephone couplers make the physical connection between the EFT-1000 and the telephone line. The Switches labeled Set connect the Transmit or Receive telephone line to the telephone set that can be connected to the EFT via the rear panel Set modular jack. When a Set button is depressed, normal calls can be made on either phone line provided each line is wired to an active line. Depression of a Line switch cancels the Set command.

When depressed, the Transmit Auto and Receive Auto switches enable the internal coupler so that when called, the EFT-1000 will auto-answer, and then auto-disconnect when the call is completed.

The Send level control, and its associated bi-color LED, control and monitor the level of audio being sent down the phone line in the encode mode. The EFT was designed so that the red/green junction of the bi-color LED indicates a send level of -2 dBm. For best performance, adjust the send level pot so that the bi-color LED flashes green most of the time, and red on program peaks. This will avoid overdriving the telephone line.

There are two headphone jacks on the EFT-1000, one on the front panel and one on the rear panel. The Monitor level control adjusts the volume of both headset jacks.

The modular telephone jacks, labeled Tx Line and Rx Line, located on the back panel, are used to connect the unit to the telephone line(s). Another jack is provided, labeled Set, for a standard single line telephone set.

The input XLR and its associated Mic/line button are sources for sending audio down the phone line. Push the mic/line button in for mic level. The auxiliary input is used when another audio source is needed.

The receive output jack is used to connect the EFT to your equipments input. If the transmit and receive Duplex switches are not depressed, the Transmit line will have your send audio on it and you will listen on the Receive line. When you depress a duplex button, you can talk and listen on the same phone line. If both duplex switches are depressed, you will be able to talk and listen on both phone lines.

1.4 Electrical Specifications

Power:	120/240 VAC 50-60Hz 6 Watts
Input:	Mic -55dBm Line 0dBm
Output:	-15dBm into Telco
Encoder:	Frequency Response 50-8KHz +/-.5dB
	Frequency +250 Hz Comrex Compatible
	Distortion < .1%
	S/N Ratio > 60 dB
Decoder:	Input -35dBm to +4 dBm Adjustable
	Output 0 dBm into 600 Ohms
	Frequency Shift -250 Hz Comrex Compatible
	Distortion < .1%
	S/N Ratio > 60 dB
	Frequency Response
	50-3.5KHz +/-.5dB W/Telco LPF In
	50-8KHz +/-.5dB W/Telco LPF Out
Encode/Decode Switching:	Automatic With internally Generated and Decoded Standard Touchtones
Telco Interface:	Auto Answer with Ring Voltage 30-120 VRMS 15-80Hz
	Auto Disconnect

1.5 Warranty

GENTNER ENGINEERING COMPANY warrants that this product is free from defects in both materials and workmanship. Should any part of this equipment be defective, Gentner Engineering Company agrees, at its option, to:

A. Repair or replace any defective part free of charge (except transportation charges) for a period of one year from the date of the original purchase, provided the owner returns the equipment to Gentner Engineering Company at the address set forth below. No charge will be assessed for parts or labor during this period.

B. Replace or furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge except for labor and transportation.

This Warranty excludes assembled products not manufactured by Gentner Engineering Company, whether or not they are incorporated in a Gentner Engineering Company product or sold under a Gentner Engineering Company part or model number.

THIS WARRANTY IS VOID IF:

A. The equipment has been damaged by negligence, accident or mishandling, or has not been operated in accordance with the procedures described in the operating instructions; or,

B. The equipment has been altered or repaired by other than Gentner Electronics Corporation personnel or an authorized service representative of Gentner Electronics Corporation; or,

C. Adaptations or accessories other than those manufactured or provided by Gentner Electronics Corporation have been made or attached to the equipment which, in the determination of Gentner Electronics Corporation, shall have affected the performance, safety, or reliability of the equipment; or,

D. The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Gentner Electronics Corporation or any other liability in connection with the sale of Gentner products.

Gentner Electronics Corporation does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Gentner Electronics Corportion at the address set forth below, in writing, giving full particulars as to the defects or unsatisfactory operation. Upon receipt of such notice, Gentner Electronics Corporation will give instructions respecting the shipment of the equipment, or such other manners as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Gentner Electronics Corporation assumes no responsibility for such damage. ALL SHIPPING COSTS SHALL BE PAID BY CUSTOMER.

THIS WARRANTY EXTENDS ONLY TO THE ORIGINAL PURCHASER AND IS NOT ASSIGNABLE OR TRANSFERABLE.

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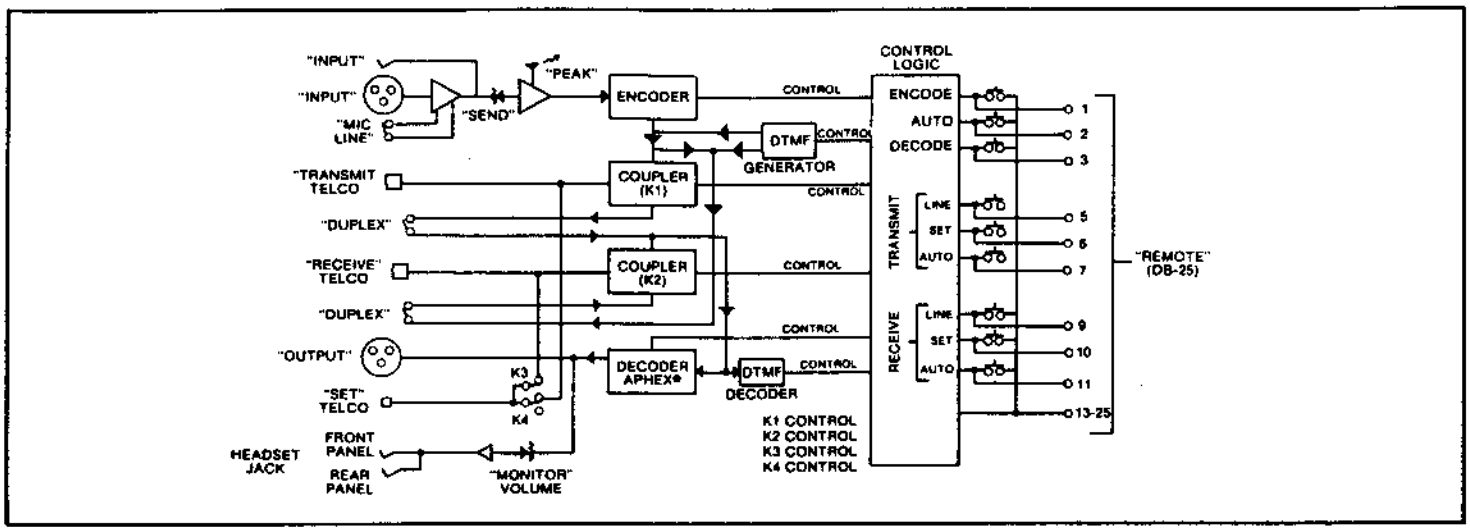
SECTION 2

BASIC THEORY

2.1 System Block Diagram



The EFT-1000 uses a MC146805 based microcomputer as its control logic. By interuputing the condition of the nine front panel switches, the microcomputer enables the proper relay to control the phone lines, routes the audio signal, and sends the necessary logic levels to control the system. The encoder and decoder circuitry use operational amplifiers to achieve the needed 250 Hz frequency shift. The microphone balanced input is mic-to-line adjustable via a gain adjustment in the send audio circuitry when the mic/line button is engaged. The EFT-1000 has a DTMF generator and decoder built in so that two EFT's can handshake control signals via touchtones. The headset amplifier is a symmetrical Class B push-pull driver using an LF351 power operational amplifier and two transistors.

2.2 Telephone Theory

A telephone line is a two-way, two wire communication transmission medium. It gives the user the ability to send and recieve information simultaneously. The two wires that make up the telephone system are called "Tip" and "Ring." These names are carried over from the early days of telephone when operators used physical patch cord connections to link calls together.

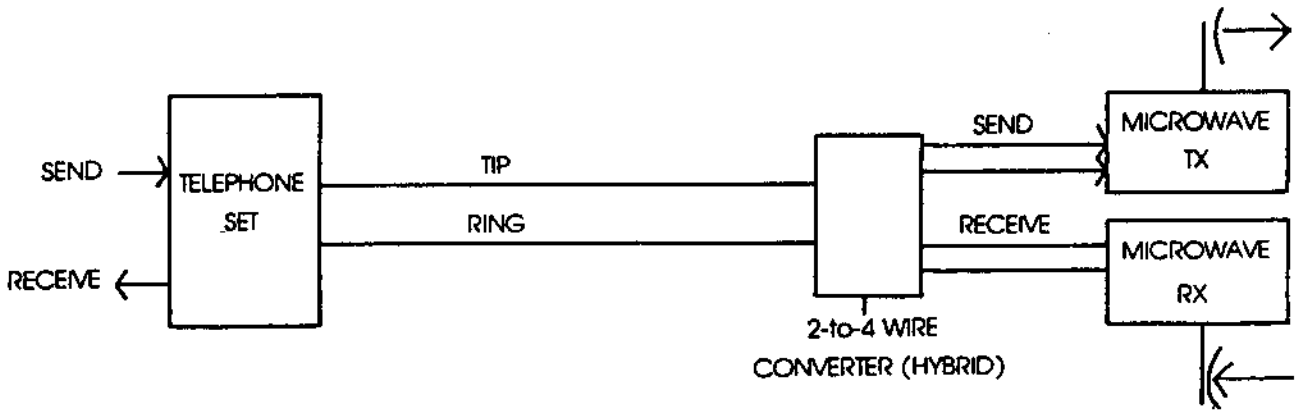


Figure 2.2 Tip and Ring Processing

Tip and Ring are brought from the local telephone central office (C.O.) to each users telephone equipment. As shown in figure 2.2 above, when the users tip and ring, the audio pair, reach the C.O. it is converted from two to four wires. This means that the send and recieve audio are separated so that the C.O. can process the two sources of audio independently. The information is then sent, usually digitally, to other C.O.'s by cable, microwave, or satellite.

Since the customer has little control over what the telephone company does with calls once they reach the central office, a more detailed look at tip and ring will help explain the telephone's operation. At the C.O. the telephone company (Telco) places a D.C. voltage on tip and ring. This D.C. voltage, varying from 20 VDC to about 48 VDC, is usually provided by a trickle-charged battery which keeps the system operational during power outages. This electromotive force provides direct current for the telephone instrument to operate. When a call is made, a ring voltage of 105 VAC is provided by the C.O. to drive the ringer inside the telephone instrument. When you pick up the handset, the hook switch disconnects the ringer and connects the telephone set to the phone line. This process is known as terminating the line. Anytime a D.C. path of 600 Ohms or less is provided to tip and ring, the line will terminate and the call will be answered. When a call is completed, the reverse sequence of events occurs. As the C.O. senses disconnect, by detecting a change in the load across tip and ring, it ususally reverses polarity of the D.C. voltage on the receiving phones tip and ring. (Some telephone systems simply supply dial tone without a D.C. reversal.) This stops the long distance billing if applicable and gives dial tone to the receiving caller. A more in-depth study of telephone basics can be obtained by purchasing a telephone theory book available through many outlets.

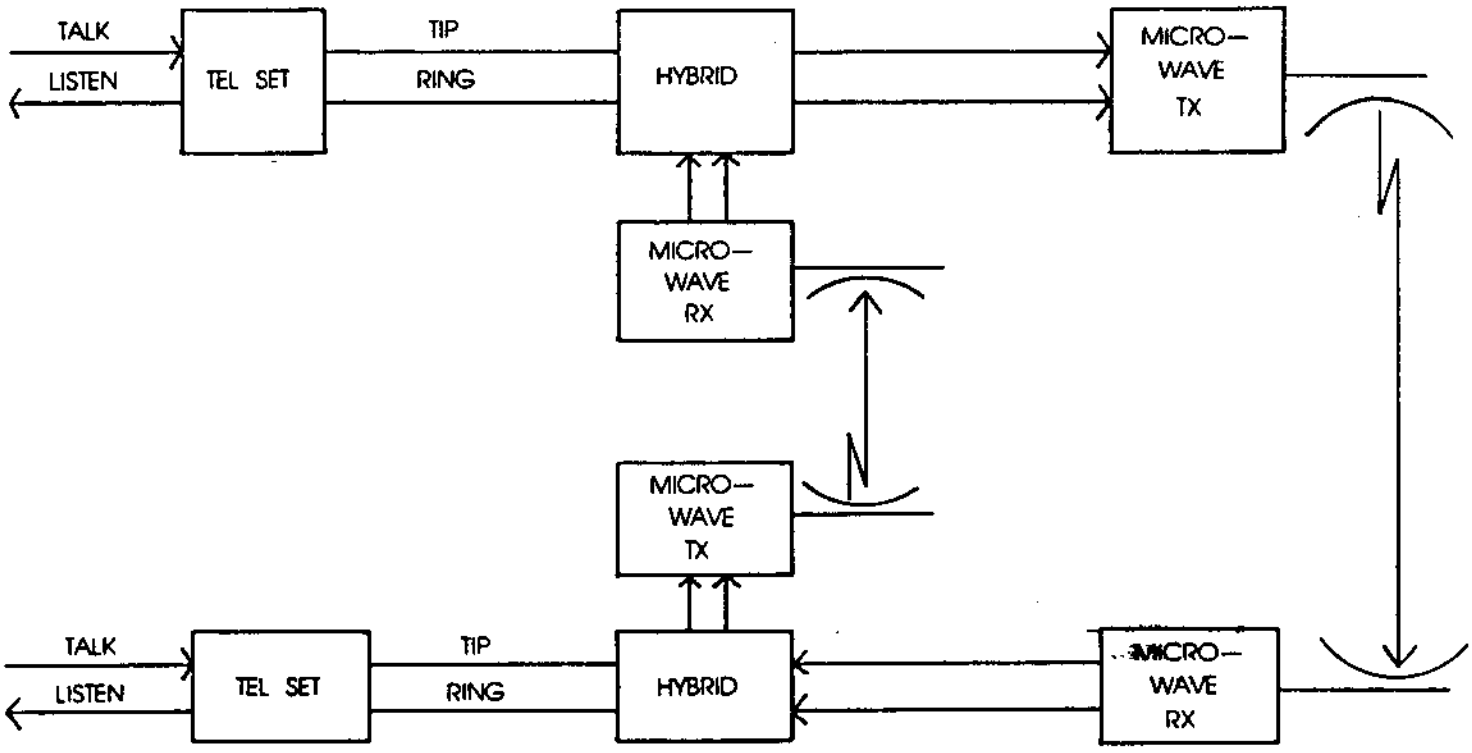


Figure 2.3 Telephone Transmission System

2.3 Hybrid Theory

An important part of any telephone system is the device that converts the two wire transmission into a separate transmit and recieve pair. This is done by a hybrid. Hybrid coils separate send and recieve audio. This allows independent control of caller and send audio.

SECTION 3

EFT-1000 THEORY OF OPERATION

3.1 Introduction

The EFT-1000 was designed to be compatible with the COMREX encode and decode system but have the added advantages of: 1. encoding and decoding with the same unit, 2. Increased frequency response because of the APHEX circuitry, 3. Two built-in telephone couplers, and 4. Ease of use. Care was taken in designing the EFT-1000 so that it would have a high signal to noise ratio, low distortion, and dissipate little power.

The EFT-1000 consists of five different printed circuit boards. Four of these boards are mounted inside the chassis of the processing unit and one board is employed as the power supply.

The EFT-1000 uses CMOS integrated circuits to create a low power consuming device. All other components were chosen because of their adherence to high standards in audio equipment.
A discussion of the building blocks of each of these systems will now be discussed.

3.2 Microprocessor Theory

The EFT-1000 incorporates a Motorola MC146805 based microcomputer, which operates at a clock rate of 3.58 MHz. The MC146805 is U13 on the microprocessor card. A 27C16 EPROM (U2) houses the machine language program which provides the central processing unit with the necessary instructions to perform the proper tasks when an input is recieved. To support the ports of the MC146805 microprocessor, two MC146823 programmable input/output chips (U5,U6) are used.

The EFT-1000's microprocessor incorporates a DTMF receiver, an SSI202 (U9), and a MK5087 touchtone encoder (U7) which enables two EFT's to have handshake capabilities. The handshake process can be described as follows:

1. The remote EFT sends a "*" touchtone when in auto and when the phone line connection is terminated.
2. The local EFT responses with a "#" tone.
3. The remote EFT begins encoding and sends a "1" tone.
4. The local EFT begins decoding.

To exit the encode/decode mode a "0" tone is sent when either EFT's Auto Enc/Dec switch is depressed (LED off). This handshake process insures that both the local and remote ends have a complete duplex communication path. By tracing the path of the DTMF generator and decoder in the schematics in a following section a complete understanding of the handshake process can be obtained.

The following tables depict the Port and Bit assignments for each of the microprocessor inputs and outputs.

Microprocessor Port Assignment Table

MC146805 Microprocessor Ports (U13)

Port Address 1A

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Transmit Line Switch	Y	14	Active Low Input
1	Transmit Set Switch	Z	13	"
2	Transmit Auto Switch	AA	12	"
3	Transmit Duplex Switch	BB	11	"
4	Recieve Line Switch	CC	10	"
5	Recieve Set Switch	DD	9	"
6	Recieve Auto Switch	EE	8	"
7	Recieve Duplex Switch	FF	7	"

Port Address 1B

Bit	Identity	Silscreen Label	IC Pin#	Description
0	Encode Switch	V	36	Active Low Input
1	Auto Enc/Dec Switch	W	35	"
2	Decode Switch	X	34	"
3	Data Valid TT Detect	K	33	Active High Signal
4	Data 0		32	
5	Data 1		31	
6	Data 2		30	
7	Data 3		29	

Microprocessor Port Assignment Table

MC146823 Parallel Interface Ports (U6)

Port Address 2A

Bit	Identity	Silkscreen Label	IC Pin #	Description
0	Transmit Auto Answer		4	Power-up Option
1	Recieve Auto Answer		5	Input From
2	Transmit Auto Disconnect		6	DIP Switches
3	Recieve Auto Disconnect		7	"
4	Transmit Start Auto		8	"
5	Recieve Start Auto		9	"
6	Enc/Dec Start Auto		10	"
7	Ring Count (1 or 6)		11	Off=1 On=6

Port Address 2B

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Ring Detect/Loop Sense Tx	L	34	Telephone Line
1	Ring Detect/Loop Sense Rx	M	33	Monitor
2	Touchtone Transmit	N	32	
3	Encoded Audio Transmit	P	31	Audio Path
4	Nonencoded Audio Transmit	R	30	Selection
5	Touchtone Recieve	S	29	"
6	Encoded Audio Recieve	T	28	"
7	Nonencoded Audio Recieve	U	27	"

Port Address 2C

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Row 1		3	Touchtone
1	Row 2		2	Encoder
2	Row 3		1	"
3	Row 4		39	"
4	Column 1		38	"
5	Column 2		37	"
6	Column 3		36	"
7	Column 4		35	"

Microprocessor Port Assignment Table

MC146823 Parallel Ports (U5)

Port Address 3A

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Transmit Hybrid Set	SS	4	Line Coupler
1	Transmit Hybrid Reset	TT	5	Line Decoupler
2	Recieve Hybrid Set	UU	6	Line Coupler
3	Receive Hybrid Reset	VV	7	Line Decoupler
4	Set to Recieve	WW	8	Enables Set
5	Set to Transmit	XX	9	Enables Set
6	Set on line	YY	10	Line Coupler
7	Set Off line	ZZ	11	Line Decoupler

Port Address 3B

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Transmit Line LED	PP	34	Report Back LED's
1	Transmit Set LED	NN	33	"
2	Transmit Auto LED	MM	32	"
3	Recieve Line LED	GG	31	"
4	Recieve Set LED	HH	30	"
5	Recieve Auto LED	JJ	29	"
6	Encode LED	KK	28	"
7	Auto Enc/Dec LED	LL	27	"

Port Address 3C

Bit	Identity	Silkscreen Label	IC Pin#	Description
0	Decode LED	RR	3	Report Back LED
1	Clear Ready TT Detect		2	TT Reciever Set
2	Dim Transmit	F	1	
3	Dim Recieve	E	39	
4	Monitor Decode	D	38	Monitor ON
5	Monitor Not Decode	C	37	Monitor OFF
6	Recieve line	B	36	Rx to monitor
7	Transmit line	A	35	Tx to monitor

Microprocessor Controls

Silkscreen Label*	
A	Receive Line to Monitor
B	Transmit Line to Monitor
C	Monitor Not Decoded
D	Monitor Decoded
E	Dim Receive Line
F	Dim Transmit Line
G	DTMF Tones
H	+5 VDC Supply
J	Logic GND
K	Touchtone Decoder Data Verify
L	Ring Detect/Loop Sense Transmit Line
M	Ring Detect/Loop Sense Receive Line
N	Touchtone Transmit Line
P	Encoded Transmit Line
R	Nonencoded Transmit Line
S	Touchtone Receive Line
T	Encoded Receive Line
U	Nonencoded Receive Line
V	Encode Switch
W	Auto Encode/Decode Switch
X	Decode Switch
Y	Transmit Line Switch
Z	Transmit Set Switch
AA	Transmit Auto Switch
BB	Transmit Duplex Switch
CC	Receive Line Switch
DD	Receive Set Switch
EE	Receive Auto Switch
FF	Receive Duplex Switch
GG	Receive Line LED
HH	Receive Set LED
JJ	Receive Auto LED
KK	Encode LED
LL	Auto Encode/Decode LED
MM	Transmit Auto LED
NN	Transmit Set LED
PP	Transmit Line LED
RR	Decode LED
SS	Transmit Hybrid Set
TT	Transmit Hybrid Reset
UU	Receive Hybrid Set
VV	Receive Hybrid Reset
WW	Set to Receive
XX	Set to Transmit
YY	Set on Line
ZZ	Set Off Line

** All EFT PC boards are clearly marked with this silkscreen.

3.3 Telephone Interface

The EFT-1000 has connections for two separate telephone lines. Just because one line is labeled "transmit" and one "receive" it doesn't mean that the lines need to be dedicated for that purpose. The transmit and recieve telephone circuitry are mirror images. The main parts of an EFT-1000's telephone interface are the relays, the hybrid coils, and the opto-isolators.

The EFT-1000 uses four DIP Omron G6AK234-P dual coil relays to provide the connection to the phone line(s). The two coils are needed because of the need to set and reset each relay. On the transmit and receive lines, relays K1 and K2, one side of the coil is pulled to +5VDC and the other is used by the microprocessor to couple onto the tip and ring. Since there is only one Set jack the relays K3 and K4 perform a slightly different task. Relay K3 enables either the receive or the transmit set to be energized when the front panel control is depressed and relay K4 provides the physical connection to the line.

The EFT-1000 utilizes two PREM SPT-183 coils as its transformer couplers. The discrete components around the coils, and the phase relationship between windings, account for a 10 dB attenuation between the receive and transmit audio. This null adequately blocks most return loss to provide an undistorted send audio path.

The opto-isolators, MCA 11G1's, designed into the EFT are used to detect when loop current is flowing through the primaries of the coils. These isolators convert the loop current into a logic level to inform the microcomputer of the status of each line. Refer to the electrical drawings for a better perception of the telephone interface circuitry.

3.4 Inputs

The EFT-1000 implements the following inputs: 1. An XLR for a microphone, 2. A 1/4" phono jack for an auxillary input, 3. Three standard modular telephone jacks, and 4. A DB-25 connector to provide remote control.

The send XLR balanced input, J11, can be either line level or microphone level. The choice between mic or line level is determined by the position of the mic/line switch (S1A). This switch determines the amount of gain the input has, either 55dB for mic level input or 0dB for line input. The auxiliary input, J10, is line level and is only adjustable by the external gear you are using.

The modular telephone jacks, RJ-11's, are made for a slim wire, four conductor line. These are readily available from any electronics outlet.

The EFT-1000 is remotable with the exception of level controls. The rear panel DB-25 connector has all of the front panel controls brought out as well as a connection to each front panel LED and the digital supply. The following table shows the pinouts of this connector.

Remote Pin Out

Pin #	Function	Pin #	Function	Pin #	Function
1	Line Sw Xmit	9	Decode Switch	17	Line LED Rcv
2	Set Sw Xmit	10	GND	18	Set LED Rcv
3	Auto Sw Xmit	11	+5VDC	19	Auto LED Rcv
4	Line Sw Rcv	12	N.C.	20	Encoder LED
5	Set Sw Rcv	13	N.C.	21	Auto Enc/Dec LED
6	Auto Sw Rcv	14	Line LED Xmit	22	Decode LED
7	Encode Sw	15	Set Led Xmit	23	GND
8	Auto Enc/Dec Sw	16	Auto LED Xmit	24	+5VDC
				25	N.C.

*Note: The Switches (Sw) are active LOW and the Remote LED's should be pulled HIGH through a current limiting resistor.

3.5 Outputs

The EFT-1000 contains the following outputs: two balanced 1/4" stereo headphone jacks, J3 and J8, and a three pin male XLR, J7. The level of both monitor jacks is controlled by the audio tapered pot located on the front of the EFT. This headphone amplifier circuitry consists of U16, a LF351 Op Amp, a MJE180 NPN power transistor, and a MJE 170 PNP power transistor. It is constructed in a common Class B push-pull arrangement.

The Output XLR on the rear of the EFT is driven by a balanced mixer comprised of two 5532 operational amplifiers, U3A and U3B. It is the connector provided to make the connection between your equipment and the EFT-1000.

3.6 Switches and LEDs

To be user friendly the EFT-1000 incorporates switches and report back LEDs to relay instructions to the microcomputer and indicate status. The nine front panel switches tie directly to ports of the microprocessor. They are momentary ITT Shadow switches. The mic/line switch and both duplex switches are two pole-double throw latching switches. The power switch is a four pole double throw latching switch. A discussion of the mic/line and duplex switches has already been given in previous sections. The power switch connects the rectified power supply to the input PC boards +15 VDC, -15 VDC, and +5 VDC regulators.

The LEDs are of an assorted color. They have series current limiting resistors of 330 Ohms to limit the current flow to between 10-20 milliamps.

A two position switch is included on the power supply itself if the unit is to be used in a 240VAC setting.

3.7 Upshift and Downshift

The EFT-1000 employs the phasing method to create a single sideband transmission and applying this to balanced mixers for modulation. This is done by phase shifting the carrier and the intelligence 90 degrees.

The various building blocks of the EFT-1000's Encode/Decode board include clock/divider circuitry, data stored in a 27C16 EPROM, latches, phase filters, digital to analog converters, balanced mixers, and an APHEX hybrid integrated circuit.

The master clock of the Encode/Decode process is set by a 4.032 MHz Crystal. This input frequency is tuned to +/-10 Hz by a paralled trimmer capacitor C1. The clock frequency is divided by 64 by U1 a 74HC4060 binary divider, to have an output frequency of 63 KHz. This pulse is sent to two more binary counters, U8 and U14 the 74HC163's, for further frequency division. The resultant clock rates are used in the creation of both a 126 sample digital sine and digital cosine wave. These two waves are also controlled by the data stored inside the 27C16 EPROM which is U2.

Two eight bit latches, U9 and U10 (74HC374's), are used to distinguish between the cosine and sine waveforms. On a positive transition of the clock the sine waveform is being latched onto the inputs of the digital to analog converters, U5, U6, U11 and U12 which are all PM-7533 DAC's. On the negative transitions the cosine waveform is latched on the DAC's inputs.

The physical trigometric frequency shift is performed by operational amplifiers, LF347's, biased as all-pass filters. The poles of each filter were chosen so that the necessary 90 degrees of phase shift occurs over the entire audible frequency spectrum. By using trigometric identities the calculations for each capacitor and resistor value needed were obtained. The programmable DIP's installed with one percent resistors are used to set the corner frequencies because of the tolerance levels of electronic capacitors.

The digital-to-analog converters used on the EFT-1000 give ten bits of resolution when used as implemented. This along with the latching process of distinguishing between sine and cosine waves, and the implementation of a compander, mathematically drops the noise floor to -54dB. The resistor feed back properties of DAC's help exact the cancellation of the unused sideband.

The APHEX circuitry was added to the EFT to enhance the restoration of frequencies lost over telephone transmission mediums. The APHEX in essence restores two more octaves of otherwise lost intelligence.

SECTION FOUR

DIAGRAMS

4.1 Introduction

This section of this manual contains information proprietary to Gentner Engineering Company. Some diagrams are only shown in block form.

A discussion of each integrated circuit used in the EFT-1000 will also be given.

These diagrams are also included in the following pages:

4-1. EFT-1000 Interconnection Diagram
4-2. EFT-1000 Input Card Electrical Schematic (2)
4-3. EFT-1000 Microprocessor Card Electrical Schematic
4-4. EFT-1000 Encode/Decode Card Block Diagram
4-5. EFT-1000 Power Supply Electrical Schematic
4-6. EFT-1000 Switch Card Electrical Schematic

4.2 Component Pin Outs

This section details the connections of the integrated circuits used in the EFT-1000. It is included as a reference guide as well as a troubleshooting help.

Part	Manufacturer	Application

AN7805 +5V Regulator
Pinout: 1: Input, 2: GND, 3: Output

AN7815 +15V Regulator
Pinout: 1: Input, 2: GND, 3: Output

AN7915 -15V Regulator
Pinout: 1: GND, 2: Input, 3: Output

CD4066 RCA, National Quad Bilateral Switch

Pinout: 1:	In/OutA	14: VDD
2:	Out/InA	13: Ctrl A
3:	Out/InB	12: Ctrl B
4:	In/OutB	11: In/OutD
5:	Ctrl B	10: Out/InD
6:	Ctrl C	9: Out/InC
7:	Vss	8: In/OutC

LF347 National Quad Op Amp

Pinout: 1:	OutputA	14: OutputD
2:	+A Input	13: -D Input
3:	-A Input	12: +D Input
4:	+V Supply	11: -V Supply
5:	+B Input	10: +C Input
6:	-B Input	9: -C Input
7:	OutputB	8: OutputC

LF351 National Op Amp

Pinout: 1:	Balance	8: N.C.
2:	- Input	7: +V Supply
3:	+ Input	6: Output
4:	-V Supply	5: Balance

MCA11G1 Opto-Isolator

Pinout: 1:	+V Supply	6: NC
2:	-V Supply	5: Vout
3:	NC	4: GND

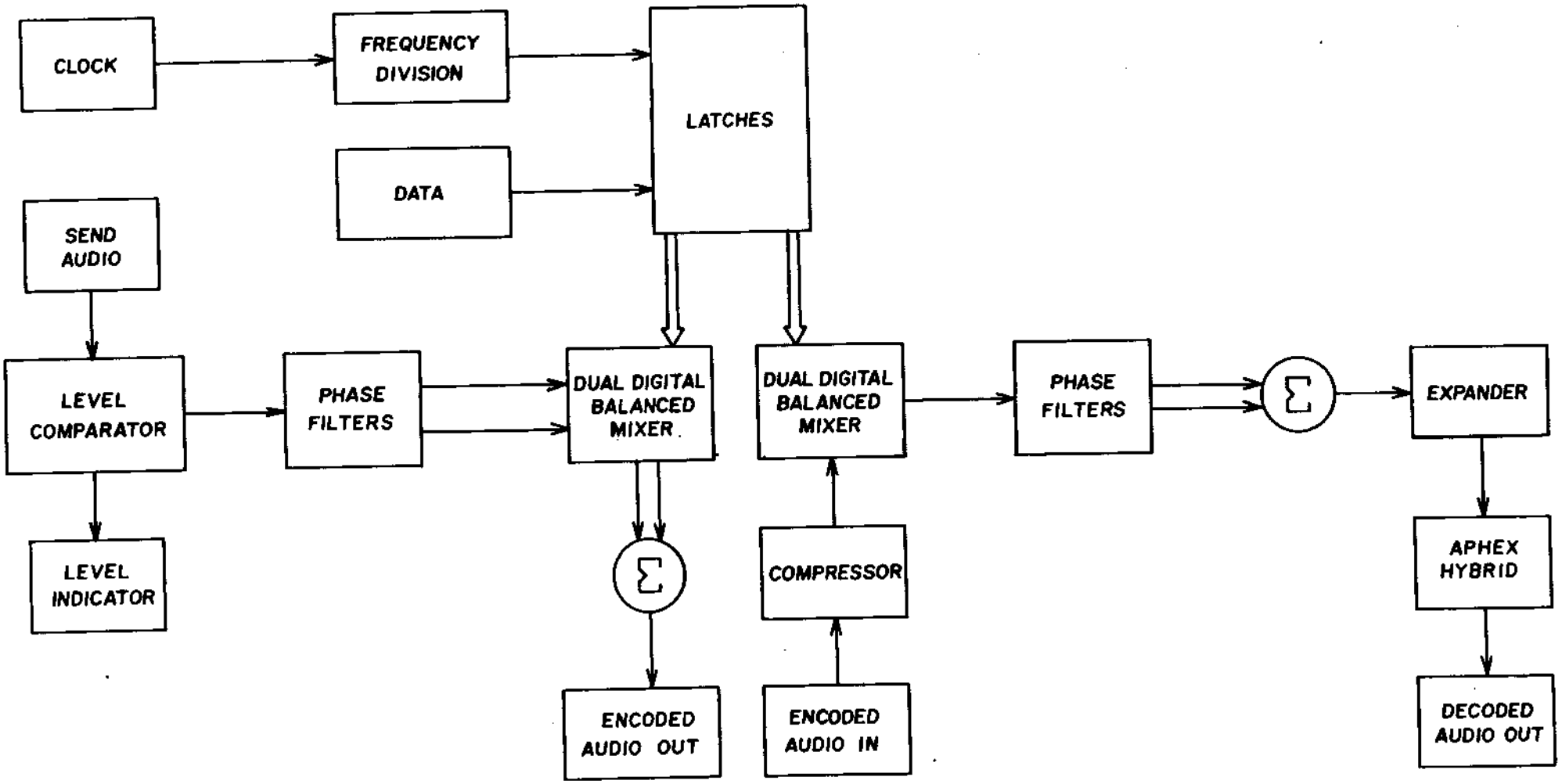
MC146805 Motorola Microprocessor

Pinout: 1:	Reset	6: AS	29-36: PB7-PB0
2:	IRQ	7-14: PA7-PA0	37: Timer
3:	LI	15-19: A12-A8	38: OSC1
4:	DS	20: GND	39: OSC2
5:	R/W	21-28: B7-B0	40: +V Supply

Part	Manufacturer		Application	
MC146823	Motorola		Programmable I/O	
Pinout:	1-3: PC2-PC0	21: CE	25: Reset	40: VDD
	4-11: PA0-PA7	22: AS	26: IRQ	
	12-19: AD0-AD7	23: R/W	27-34: PB7-PB0	
	20: GND	24: DS	35-39: PC7-PC3	
MJE170			PNP Transistor	
Pinout:	1: Emitter, 2: Base, 3: Collector			
MJE180			NPN Transistor	
Pinout:	1: Emitter, 2: Base, 3: Collector			
MK5087	Intel		Touchtone Generator	
Pinout:	1: +V Supply		16: Output	
	2:		15: ST1	
	3: Column 1		14: Row 1	
	4: Column 2		13: Row 2	
	5: Column 3		12: Row 3	
	6: GND		11: Row 4	
	7: OSC		10:	
	8:		9: Column 4	
NE5532	Signetics		Dual Op Amp	
Pinout:	1: Output A		8: +V Supply	
	2: -A Input		7: Output B	
	3: +A Input		6: -B Input	
	4: -V Supply		5: +B Input	
SSI202	Silicon Systems		DTMF Reciever	
Pinout:	1: D0	6:	11:	16: D3
	2: Hex	7: GND	12: XIn	17: D2
	3: EN	8: XEN	13:	18: D1
	4: In633	9: ANA In	14: DV	19:
	5: VP	10: GND	15: CRLDY	20: Vcc
ULN2003	Sprague, TI		Transistor Array	
Pinout:	1: InA		16: OutA	
	2: InB		15: OutB	
	3: InC		14: OutC	
	4: InD		13: OutD	
	5: InE		12: OutE	
	6: InF		11: OutF	
	7: InG		10: OutG	
	8: Common		9: Common	
27C16	Intel		2K x 8 EPROM	
Pinout:	1: 1-8: A7-A0	18: CE	22: A9	
	9-11: O0-O2	19: A10	23: A8	
	12: GND	20: OE	24: Vcc	
	13-17: O3-O7	21: Vp-p		

Part	Manufacturer	Application
74HC04	National	CMOS Inverter
Pinout:	1: A1	14: Vcc
	2: Y1	13: A6
	3: A2	12: Y6
	4: Y2	11: A5
	5: A3	10: Y5
	6: Y3	9: A4
	7: GND	8: Y4
74HC74	National	Dual D Flip-Flop
Pinout:	1: CLR1	14: Vcc
	2: D1	13: CLR2
	3: CLK1	12: D2
	4: PR1	11: CLK2
	5: Q1	10: PR2
	6: Q1	9: Q2
	7: GND	8: Q2
74HC123A	National	Dual Regriggerable Multivibrator
Pinout:	1: A1	16: Vcc
	2: B1	15: RExt/CExt1
	3: CLR1	14: CExt1
	4: Q1	13: Q1
	5: Q2	12: Q2
	6: CExt2	11: CLR2
	7: RExt/CExt	10: B2
	8: GND	9: A2
74HC132	National	Quad 2-Input NAND
Pinout:	1: A1	14: Vcc
	2: B1	13: B4
	3: Y1	12: A4
	4: A2	11: Y4
	5: B2	10: B3
	6: Y2	9: A3
	7: GND	8: Y3
74HC138	National	3-to-8 Line Decoder
Pinout:	1: Select A	16: Vcc
	2: Select B	15: DO 0
	3: Select C	14: DO 1
	4: Enable G2A	13: DO 2
	5: Enable G2B	12: DO 3
	6: Enable G1	11: DO 4
	7: Y7 Output	10: DO 5
	8: GND	9: DO 6

Part	Manufacturer	Application
74HC163	National	Synchronous Binary Counter
Pinout:	1: Clear	16: Vcc
	2: Clock	15: RC Output
	3: DI A	14: Output A
	4: DI B	13: Output B
	5: DI C	12: Ouptut C
	6: DI D	11: Output D
	7: Enable P	10: Enable T
	8: GND	9: Load
74HC373	National	Tri-State Octal D-Type Latch
Pinout:	1: Output Control	20: Vcc
	2: 1Q	19: 8Q
	3: 1D	18: 8D
	4: 2D	17: 7D
	5: 2Q	16: 7Q
	6: 3Q	15: 6Q
	7: 3D	14: 6D
	8: 4D	13: 5Q
	9: 4Q	12: 5D
	10: GND	11: Latch Enable
74HC374	National	Tri-State Octal D-Type Flip-Flip
Pinout:	1: Output Control	20: Vcc
	2: 1Q	19: 8Q
	3: 1D	18: 8D
	4: 2D	17: 7D
	5: 2Q	16: 7Q
	6: 3Q	15: 6Q
	7: 3D	14: 6D
	8: 4D	13: 5D
	9: 4Q	12: 5Q
	10: GND	11: Clock
74HC4060	National	14 Stage Binary Counter
Pinout:	1: Q12	16: Vcc
	2: Q13	15: Q10
	3: Q14	14: Q8
	4: Q6	13: Q9
	5: Q5	12: Reset
	6: Q7	11: Clock
	7: Q4	10: Clock 1
	8: GND	9: Clock 2
7533	PM	DAC
Pinout:	1-2: I Out	14: Vcc
	3: GND	15: VRef
	4-13: Bit1-Bit10	16: RFB


CLOCK
FREQUENCY DIVISION
LATCHES
DATA
SEND AUDIO
LEVEL COMPARATOR
PHASE FILTERS
DUAL DIGITAL BALANCED MIXER
DUAL DIGITAL BALANCED MIXER
PHASE FILTERS
Σ
EXPANDER
LEVEL INDICATOR
Σ
COMPRESSOR
APHEX HYBRID
ENCODED AUDIO OUT
ENCODED AUDIO IN
DECODED AUDIO OUT

SECTION 5

MAINTENANCE

5.1 Introduction

The EFT-1000 is a highly specialized, and sophisicated device. Its repair and maintenance should be left to qualified technicians. The EFT-1000 contains CMOS integrated circuits so great care must be taken to static ground yourself before servicing.

5.2 General Treatment

The EFT-1000 is made for remote broadcasts and the people who work remotes. Care should be taken in transporting this equipment. We suggest investing in a foam packed briefcase if your EFT-1000 is to travel extensively.

5.3 Encoded Source

Gentner Engineering maintains a demo rack with an EFT-1000 on line fed with a audio source. This EFT will auto-answer when phone number (801) 974-3746 is accessed. This source will allow EFT owners to decode upshifted audio on a phone line per normal operating conditions.

5.4 Troubleshooting

A short study of problems encountered with EFT-1000 operation will now be given. Please call Gentner Engineering Customer Service at (801) 975-7200, if problems arise with your EFT that don't have a simple cure.

Problem	Possible Cause(s)	Repair Procedure
No Monitor Audio	Duplex not Enabled	Engage Duplex Switch
	Bad Regulator	Check Supply Levels
	Dead Input Card CMOS	Replace CD4066's
Front Display Dead	Loose Connector	Check Placement of Ribbon Cables
	Microprocessor Card Installed Incorrectly	Correct Installation
	Dead Latch	Change 74HC373
Display Won't Power Up to Programmed Options	DIP Switch not Enabled	Check Programming
	Remote Shorted	Check Input Card-Microprocessor Card Continuity

Problem	Possible Causes:	Repair Procedure
No SET Dial Tone	Relay not Energizing	Replace Relay
	Bad Supply	Check Supply Levels
	Bad Port Chip	Replace U5 MC146823
	Bad Line Connection	Check Installation
No LINE Dial Tone	Relay Not Energizing	Replace Relay
	Bad Port Chip	Replace U5 MC146823
	Bad Line Connection	Check Installation
EFT's Won't Handshake	Double Terminated Telephone Line	Rx and Tx Lines Cannot Have Handset Off Hook
	Dead CMOS Logic	Replace U12, U13 CD4066's
	Check Send Level	Send Level Can't Over Power TT
	Bad TT Generator	Replace MK5087
	Bad TT Reciever	Monitor U9 SSI202 Pin #14 (DV) HIGH Level should be seen as TT's are recieved
Distorted Audio	Bad Latches	Replace 74HC374's
	Poorly Adjusted APHEX	Readjust APHEX
	Poorly Adjusted Master Clock Trimmer Cap	Tune Clock Freq. =4.032 MHz Pin #9 of U1 (74HC4060)

SECTION 6

PARTS DATA

6.1 Introduction

The EFT-1000 contains low noise, low power integrated circuits. This section includes a complete parts list as well as the parts associated GENTNER Part number.

The order replacement parts contact Gentner Engineering Customer Service in Salt Lake City, Utah at (801) 268-1117.

6.2 Recommended Spare Parts

The following parts should be kept on hand to decrease down time should a system fail.

Quantity	Part	Gentner Part Number
2	250V Varistors	544-150-001
10	CD4066 Bilateral Switches	533-204-066
1	AN7805 +5V Regulator	543-007-805
1	AN7815 +15V Regulator	543-007-815
1	AN7915 -15V Regulator	543-007-915
4	74HC374 Latches	533-200-374
1	74HC4060 Divider w/Clock	533-204-060
1	74HC373 Latch	533-200-373
5	LF347 Op Amps	540-300-347
1	MC146805E2 Microprocessor	533-146-805
2	MC146823 I/O Chips	533-146-823
1	SSI202 DTMF Reciever	533-551-202
1	MK5087 TT Generator	533-105-087

6.3 Input PC Board Parts

Designation Symbol	Gentner Part Number	Description
CR1-CR13	501-004-148	IN4148 Diode
V1-V2	544-150-001	V250LA2A Varistor
R1	514-010-273	27K Ohm Resistor
R2	514-010-104	100K Ohm Resistor
R3	514-010-104	100K Ohm Resistor
R4	514-010-823	82K Ohm Resistor
R5	514-010-103	10K Ohm Resistor
R6	514-010-823	82K Ohm Resistor
R7	514-010-103	10K Ohm Resistor
R8	514-010-273	27K Ohm Resistor
R9	514-010-103	10K Ohm Resistor
R10	514-010-103	10K Ohm Resistor

** All Resistors are 1/4, 5% Unless Otherwise Specified

Designation Symbol	Gentner Part Number	Description
R11	514-010-103	10K Ohm Resistor
R12	510-013-100	10K Ohm Resistor 1%
R13	510-013-100	10K Ohm Resistor 1%
R14	510-011-301	301 Ohm Resistor 1%
R15	510-013-100	10K Ohm Resistor 1%
R16	510-013-100	10K Ohm Resistor 1%
R17	510-011-301	301 Ohm Resistor 1%
R18	521-400-103	10K Audio Taper Mod Pot
R19	514-010-153	15K Ohm Resistor
R20	514-010-331	330 Ohm Resistor
R21	514-010-153	15K Ohm Resistor
R22	514-010-303	30K Ohm Resistor
R23	514-010-103	10K Ohm Resistor
R24	514-010-100	100 Ohm Resistor
R25	514-010-100	100 Ohm Resistor
R26	514-010-151	150 Ohm Resistor
R27	514-010-151	150 Ohm Resistor
R28	510-013-200	20K Ohm Resistor 1%
R29	510-014-100	100K Ohm Resistor 1%
R30	510-013-100	10K Ohm Resistor 1%
R31	510-013-200	20K Ohm Resistor 1%
R32	510-014-100	100k Ohm Resistor 1%
R33	510-013-100	10K Ohm Resistor 1%
R34	510-013-249	24.9K Ohm Resistor 1%
R35	510-013-249	24.9K Ohm Resistor 1%
R36	514-010-203	20K Ohm Resistor
R37	510-013-100	10K Ohm Resistor 1%
R38	510-011-604	604 Ohm Resistor 1%
R39	510-013-249	24.9K Ohm Resistor 1%
R40	514-010-103	10K Ohm Resistor
R41	510-013-249	24.9K Ohm Resistor 1%
R42	510-011-301	301 Ohm Resistor 1%
R43	514-010-103	10K Ohm Resistor
R44	514-010-103	10K Ohm Resistor
R45	514-010-222	2.2K Ohm Resistor
R46	514-010-203	20K Ohm Resistor
R47	514-010-124	120K Ohm Resistor
R48	514-010-124	120K Ohm Resistor
R49	514-010-273	27K Ohm Resistor
R50	510-011-604	604 Ohm Resistor 1%
R51	514-010-391	390 Ohm Resistor
R52	514-010-104	100K Ohm Resistor
R53	514-010-562	5.6K Ohm Resistor
R54	510-011-604	604 Ohm Resistor 1%
R55	514-010-103	10K Ohm Resistor
R56	514-010-010	1 Ohm Resistor
R57	514-010-010	1 Ohm Resistor
R58	514-010-390	39 Ohm Resistor

** All Resistor are 1/4W, 5% Unless Otherwise Specified

Designation Symbol	Gentner Part Number	Description
R59	514-010-103	10K Ohm Resistor
R60	514-010-203	20K Ohm Resistor
R61	514-010-124	120K Ohm Resistor
R62	514-010-124	120K Ohm Resistor
R63	514-010-273	27K Ohm Resistor
R64	510-011-604	604 Ohm Resistor 1%
R65	514-010-391	390 Ohm Resistor
R66	514-010-104	100K Ohm Resistor
R67	514-010-562	5.6K Ohm Resistor
R68	510-011-604	604 Ohm Resistor 1%
R69	514-010-103	10K Ohm Resistor
R70	514-010-010	1 Ohm Resistor
R71	514-010-010	1 Ohm Resistor
R72	514-010-390	39 Ohm Resistor
R73	514-010-103	10K Ohm Resistor
R74	510-011-604	604 Ohm Resistor 1%
R75	510-012-665	6.65K Ohm Resistor 1%
C1	601-900-002	100uF N.P. Cap
C2	601-900-002	100uF N.P. Cap
C3	605-100-064	.001uF 100V Cap
C4	601-900-002	100uF N.P. Cap
C5	605-100-604	.001uF 100V Cap
C6	603-050-044	100pF 50V Cap
C7	601-016-158	10uF 16V Cap
C8	601-900-002	100uF 16V Cap
C9	601-900-002	100Uf 16v Cap
C10	605-100-064	.001uF 100V Cap
C11	605-100-064	.001uF 100V Cap
C12	605-100-064	.001uF 100V Cap
C13	605-100-064	.001uF 100V Cap
C14	605-100-064	.001uF 100V Cap
C15	601-900-001	2.2uF 50V N.P. Cap
C16	612-050-032	220pF 50V Cap
C17	605-100-064	.001uF 100V Cap
C18	601-900-001	2.2uF 50V N.P. Cap
C19	612-050-032	220pF 50V Cap
C20	601-900-001	2.2uF 50V N.P. Cap
C21	601-900-001	2.2uF 50V N.P. Cap
C22	603-050-112	.1uF 50V Cap
C23	601-025-180	100uF 25V Cap
C24	603-050-112	.1uF 50V Cap
C25	603-050-112	.1uF 50V Cap
C26	601-025-180	100uF 25V Cap
C27	603-050-112	.1uF 50V Cap
C28	603-050-112	.1uF 50V Cap
C29	601-025-180	100uF 25V Cap
C30	603-050-112	.1uF 50V Cap
C31	603-050-112	.1uF 50V Cap

** All Resistors are 1/4W, 5% Unless Otherwise Specified

Designation Symbol	Gentner Part Number	Description
C32	601-900-001	2.2uF 50v Cap
C33	601-900-001	2.2uF 50V Cap
C34	601-900-001	2.2uF 50V Cap
C35	603-050-112	.1uF 50V Cap
C36	603-050-128	.47uF 50V Cap
C37	603-050-112	.1uF 50V Cap
C38	603-050-128	.47uF 50V Cap
C39-C60	603-050-112	.1uF 50V Cap
Q1	561-400-186	MJE180 NPN Transistor
Q2	561-400-187	MJE170 PNP Transistor
T1-T2	552-100-003	PREM SPT-183 Transformer
FB1-FB14	558-073-101	10-50 MHz Shield Ferrite Bead
K1-K4	556-702-005	Omron G6AD234-P Dip Relay
U1	540-300-347	LF347
U2	540-300-347	LF347
U3	540-305-532	NE5532
U4-U5	535-201-101	MCA11G1
U6	533-204-066	CD4066
U7	533-200-004	74HC04
U8	533-204-066	CD4066
U9	540-300-347	LF347
U10	533-204-066	CD4066
U11	540-300-347	LF347
U12-U14	533-204-066	CD4066
U15	533-200-004	74HC04
U16	540-300-351	LF351
VR1	543-007-815	AN7815
VR2	543-007-915	AN7915
VR3	543-007-805	AN7805
J1	678-200-013	26 Post Pin Strip
J2	673-002-009	9 Post .10C Header
J3	662-200-001	1/4" Phone Jack
J4	673-002-006	6 Post .10C Header
J5-J6	676-000-006	PCB Mount Tele Jack
J7	664-400-003	3 Pin PCB Mount XLR
J8	662-200-001	1/4" Phone Jack
J9	676-000-006	PCB Mount Tele Jack
J10	662-200-001	1/4" Phone Jack
J11	664-300-003	3 Pin PCB Mount XLR
A-G	678-150-007	7 Pin Strip
HJK	678-150-003	3 Pin Strip
L-U	678-150-008	8 Pin Strip
V-ZZ	678-150-028	28 Pin Strip

Designation Symbol	Gentner Part Number	Designation
S1-S3	621-250-001	2 Pole Double Throw Sw
S4	621-250-002	4 Pole Double Throw Sw
	570-000-008	8 Pin Tin IC Socket
	570-000-014	14 Pin Tin IC Socket
	570-000-016	16 Pin Tin IC Socket
	573-200-015	TO-220 Heat Sink
	681-010-404	PPH 4-40 1/4" Screw
	681-010-606	PPH 6-32 3/8" Screw
	682-010-060	6-32 Nut
	683-040-612	6-32 3/4" Round Standoff
	684-050-060	#6 Washer Internal Tooth
	720-055-001	PCB EFT-1000 Input Board
	740-055-006	Pot Bracket

6.4 Encode/Decode Board Parts List

Designation Symbol	Gentner Part Number	Description
R1	514-010-102	1K Ohm Resistor
R2	514-010-106	10M Ohm Resistor
R3	510-013-100	10K Ohm Resistor 1%
R4	510-012-255	2.55K Ohm Resistor 1%
R5	514-010-513	51K Ohm Resistor
R6	514-010-133	13K Ohm Resistor
R7	510-012-825	8.25K Ohm Resistor 1%
R8	514-010-224	220K Ohm Resistor
R9	514-010-104	100K Ohm Resistor
R10	514-010-224	220K Ohm Resistor
R11	514-010-104	100K Ohm Resistor
R12-R13	510-013-100	10K Ohm Resistor 1%
R14	514-010-221	220K Ohm Resistor
R15-R22	510-013-100	10K Ohm Resistor 1%
R23-R26	510-013-121	12.1K Ohm Resistor 1%
R27-R34	510-013-100	10K Ohm Resistor 1%
R35-R38	510-013-121	12.1K Ohm Resistor 1%
R39-R43	510-013-100	10K Ohm Resistor 1%
R44	510-013-121	12.1K Ohm Resistor 1%
R45	510-013-100	10K Ohm Resistor 1%
R46	510-013-121	12.1K Ohm Resistor 1%
R47-R48	510-013-100	10K Ohm Resistor 1%
R49	510-013-121	12.1K Ohm Resistor 1%
R50-R51	510-013-100	10K Ohm Resistor 1%
R52	510-013-121	12.1K Ohm Resistor 1%
R53-R58	510-013-100	10K Ohm Resistor 1%
R59	510-013-121	12.1K Ohm Resistor 1%
R60	510-013-100	10K Ohm Resistor 1%

** Resistors are 1/4W, 5% Unless Noted Otherwise

Designation Symbol	Gentner Part Number	Description
R61	510-013-121	12.1K Ohm Resistor 1%
R62-R63	510-103-100	10K Ohm Resistor 1%
R64	510-013-121	12.1K Ohm Resistor 1%
R65-R66	510-013-100	10K Ohm Resistor 1%
R67	510-013-121	12.1K Ohm Resistor 1%
R68-R74	510-013-100	10K Ohm Resistor 1%
R75-R76	514-010-682	6.8K Ohm Resistor
R77	510-013-100	10K Ohm Resistor 1%
R78-R81	510-012-825	8.25K Ohm Resistor 1%
R82	510-013-100	10K Ohm Resistor 1%
R83	514-010-682	6.8K Ohm Resistor
R84	514-010-562	5.6K Ohm Resistor
R85	514-010-133	13K Ohm Resistor
R86-R87	510-013-100	10K Ohm Resistor 1%
R88	514-010-154	150K Ohm Resistor
R89	514-010-202	2K Ohm Resistor
R90	522-400-103	10K Linear Trim Pot
R91	510-013-100	10K Ohm Resistor 1%
S01-S03	510- -	Selected 1% Resistors
C1	604-000-002	40pF Trimmer Cap
C2	607-050-010	22pF 50V Cap
C3	603-050-112	.1uF 50V Cap
C4	601-050-136	1uF 50V Cap
C5	601-050-146	3.3uF 50V Cap
C6	608-050-134	.82uF Metal Film Cap
C7	608-050-112	.1uF Metal Film Cap
C8	608-050-092	.015uF Metal Film Cap
C9	608-050-074	.0027uF Metal Film Cap
C10	608-050-120	.22uF Metal Film Cap
C11	608-050-102	.039uF Metal Film Cap
C12	608-050-084	.0068uF Metal Film Cap
C13	607-050-040	680pF 50V Cap
C14-C17	601-900-002	100uF 16V N.P. Cap
C18	608-050-120	.22uF Metal Film Cap
C19	608-050-102	.039uF Metal Film Cap
C20	608-050-084	.0068uF Metal Film Cap
C21	608-050-040	680pF Metal Film Cap
C22	608-050-134	.82uF Metal Film Cap
C23	608-050-112	.1uF Metal Film Cap
C24	608-050-092	.015uF Metal Film Cap
C25	608-050-074	.0027uF Metal Film Cap
C26	605-100-084	.0068uF 100V Cap
C27	605-100-076	.0033uF 100V Cap
C28	605-100-084	.0068uF 100V Cap
C29	605-100-076	.0033uF 100V Cap
C30	605-100-084	.0068uF 100V Cap
C31	605-100-076	.0033uF 100V Cap

** Resistors are 1/4W, 5% Unless Otherwise Noted

Designation Symbol	Gentner Part Number	Description
C32-C33	605-100-084	.0068uF 100V Cap
C34	601-050-158	10uF 50V Cap
C35	603-050-112	.1uF 50V Cap
C36	601-050-158	10uF 50V Cap
C37-C71	603-050-112	.1uF 50V Cap
Q1-Q2	561-103-906	2N3906 PNP Transistor
Y1	583-180-400	4.032MHz Crystal
U1	533-204-060	74HC4060
U2	537-201-002	Programmed 27C16
U3-U4	540-300-347	LF347
U5-U6	535-300-001	PM7533GP DAC
U7	540-300-347	LF347
U8	533-200-163	74HC163
U9-U10	533-200-374	74HC374
U11-U12	535-200-001	PM7533GP DAC
U13	540-300-347	LF347
U14	533-200-163	74HC163
U15	533-200-004	74HC04
U16-U17	533-200-074	74HC74
U18-U20	540-300-347	LF347
U21	533-200-123	74HC123
U22-U23	540-300-347	LF347
J1	673-005-009	9 Post .10C RA Header
J2	673-005-006	6 Post .10C RA Header
LPF	678-200-002	2 Post Berg Pin Strip
LPF	678-250-001	Berg Strip Jumper Block
S01	678-600-008	8 Pin DIP Jumper Plug
S02-S03	678-600-016	16 Pin DIP Jumper Plug
	570-000-008	8 Pin Tin IC Socket
	570-000-014	14 Pin Tin IC Socket
	570-000-016	16 Pin Tin IC Socket
	570-000-020	20 Pin Tin IC Socket
	570-450-002	24 Pin Gold IC Socket

6.5 Microprocessor Board Parts

Designation Symbol	Gentner Part Number	Description
R1	514-010-102	1K Ohm 5%,1/4W Resistor
R2	514-010-106	10M Ohm 5%,1/4W Resistor
R3	518-010-103	100K SIP
R4	514-010-103	10K Ohm 5%,1/4W Resistor
R5	514-010-104	100K Ohm 5%,1/4W Resistor
R6	514-010-472	4.7K Ohm 5%,1/4W Resistor
C1-C2	612-025-011	30pF 25V Cap
C3	601-050-146	303uF 50V Cap
C4	605-050-088	.01uF 50V Cap
C5-C17	603-050-112	.1uF 50V Cap
Y1	583-180-358	3.58MHz Crystal
U1	533-200-138	74HC138
U2	537-201-003	Programmed 27C16
U3	533-200-373	74HC373
U4	533-200-132	74HC132
U5-U6	533-146-823	MC146823P
U7	533-105-087	MK5087
U8	533-204-060	74HC4060
U9	533-551-202	SSI202P
U10-U12	535-102-003	ULN2003
U13	533-146-805	MC146805E2
A-G	678-160-007	7 Pin Socket Strip
HJK	678-160-003	3 Pin Socket Strip
L-U	678-160-008	8 Pin Socket Strip
V-ZZ	678-160-028	28 Pin Socket Strip
S1	620-100-008	8 Switch DIP
	570-000-016	16 Pin Tin IC Socket
	570-000-018	18 Pin Tin IC Socket
	570-450-014	14 Pin Gold IC Socket
	570-450-016	16 Pin Gold IC Socket
	570-450-020	20 Pin Gold IC Socket
	570-450-024	24 Pin Gold IC Socket
	570-450-040	40 Pin Gold IC Socket

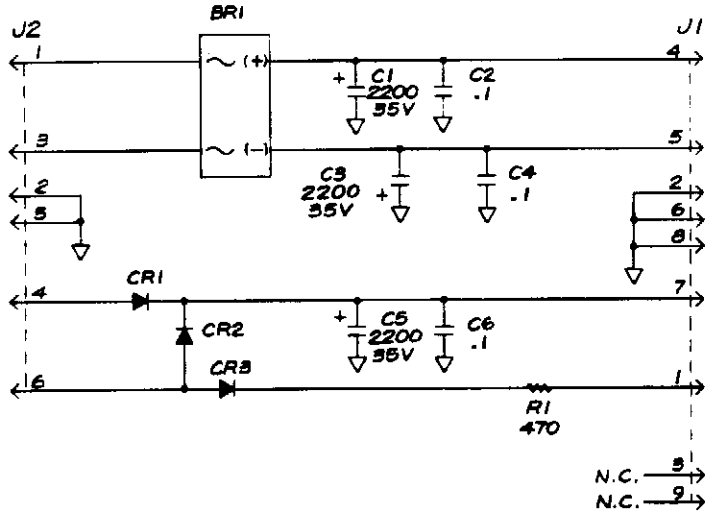
6.6 Switch Board Parts

Designation Symbol	Gentner Part Number	Description
R1	518-010-104	100K SIP
R2-R10	514-010-331	330 Ohm 5%, 1/4W Resistor
J1	678-200-013	13 Post Pin Strip
S1	621-221-002	ITT Shadow Sw Red LED
S2	621-221-008	ITT Shadow Sw Yellow LED
S3	621-221-004	ITT Shadow Sw Green LED
S4	621-221-002	ITT Shadow Sw Red LED
S5	621-221-008	ITT Shadow SW Yellow LED
S6	621-221-004	ITT Shadow Sw Green LED
S7	621-221-002	ITT Shadow Sw Red LED
S8	621-221-004	ITT Shadow Sw Green LED
S9	621-221-002	ITT Shadow Sw Red LED

6.7 Power Supply Board Parts

Designation Symbol	Gentner Part Number	Description
CR1-CR3	500-004-004	1N4004 Diode
BR1	506-200-002	2A 200V Rectifier
R1	514-010-471	470 Ohm 5%, 1/4W Resistor
C1	600-035-208	2200uF 35V Cap
C2	603-050-112	.1uF 50V Cap
C3	600-035-208	2200uF 35V Cap
C4	603-050-112	.1uF 50V Cap
C5	600-035-208	2200uF 35V Cap
C6	603-050-112	.1uF 50V Cap
J1	673-002-009	9 Post .10C Header Strip
J2	673-002-006	6 Post .10C Header Strip

ENGINEERING CHANGE ORDER STATUS				
REV.	DESCRIPTION	CHECKED	DRAWN	APPR.
—	PROD. RELEASE	H.D.	H.D.	



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   - A. FIXED RESISTORS ARE 1/4 WATT.
   - B. RESISTANCE VALUES ARE IN OHMS, ± 5%.
   - C. CAPACITANCE VALUES ARE IN MICROFARADS.
   - D. DIODES ARE IN4004.

ITEM NO.	QTY.	DESCRIPTION	REF. DESIG.	REMARKS

UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCES ARE:
XX = ± .03
XXX = ± .001
ANGLES = ± 1°
(DO NOT SCALE THIS DWG)

DRAWN BY: Henry Pettersen
CHECKED BY: Henry Pettersen
APPROVED BY:

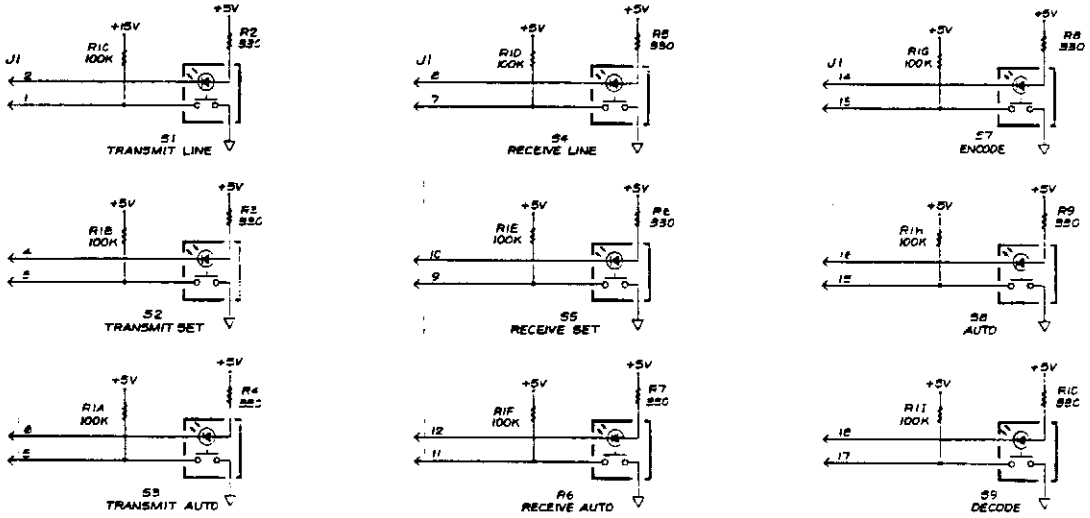
USED ON: EFT-1000
SCALE: —

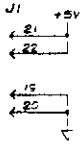
GENTNER ENGINEERING COMPANY, INC.

TITLE: ELECT. SCHEM., EFT-1000 POWER SUPPLY CARD

DWG. NO. 710-055-005 | SIZE C | SHT. 1 OF 1 | REV. —

ENGINEERING CHANGE ORDER STATUS				
REV	DESCRIPTION	CHECKED	DRAWN	APPR.
–	PRODUCTION RELEASE	MF 11/1	MF 11/2	





NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   A. FIXED RESISTORS ARE 1/4 WATT.
   B. RESISTANCE VALUES ARE IN OHMS, ± 5% TOLE..
   C. VOLTAGE IS D.C..

ITEM	QTY	DESCRIPTION	REF. DESIG	REMARKS

UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCES ARE:
XX ± .03
XXX ± .001
ANGLES ± 1°
(DO NOT SCALE THIS DWG.)

DRAWN BY:
CHECKED BY:
APPROVED BY:

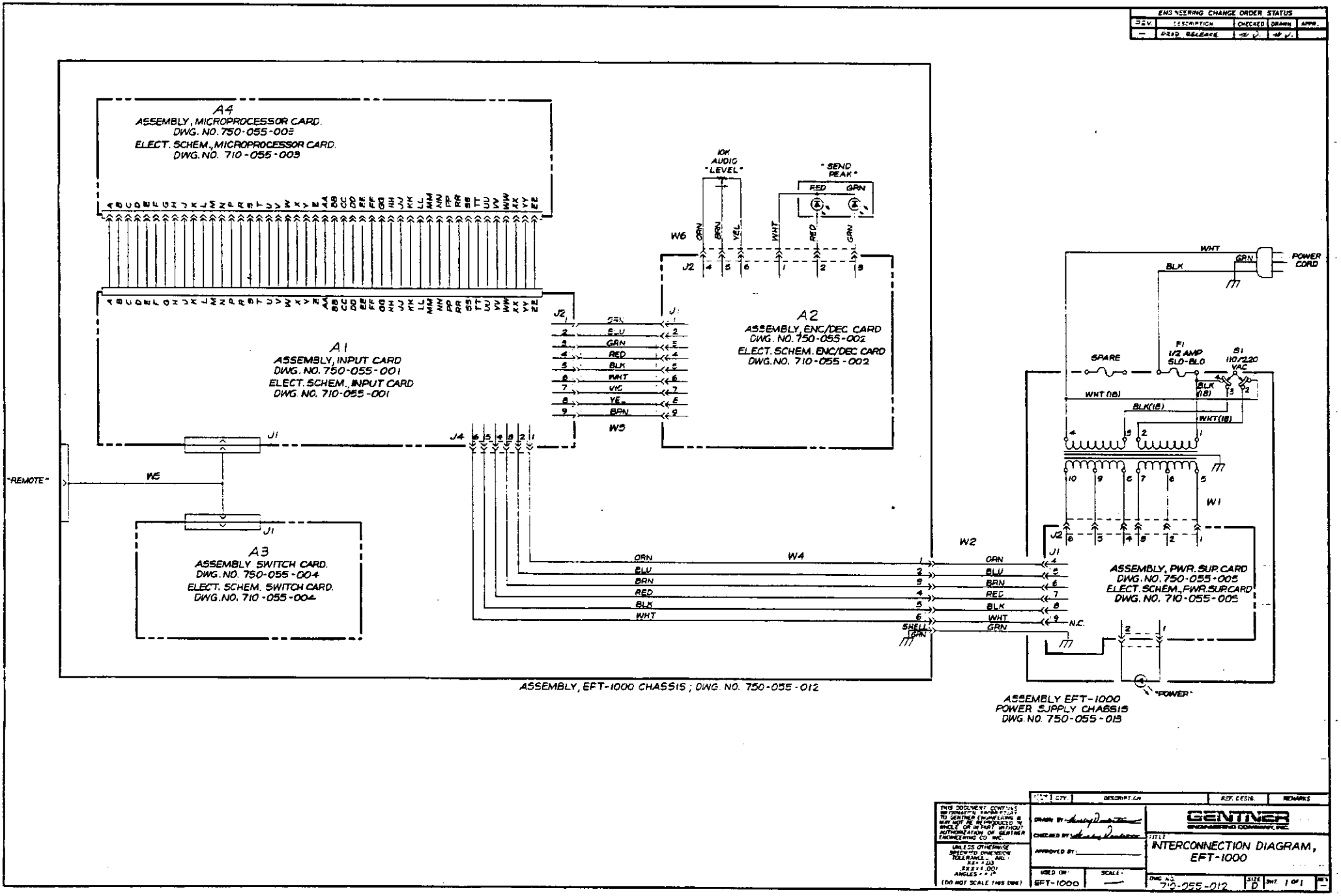
USED ON: EFT-1000
SCALE:

GENTNER ENGINEERING COMPANY, INC.

TITLE: ELECT. SCHEM., EFT-1000 SW. CARD

DWG NO. 710-055-004 | SIZE D | SHT. 1 OF 1 | REV –

ENGINEERING CHANGE ORDER STATUS				
REV.	DESCRIPTION	CHECKED	DRAWN	APPR.
—	PROD. RELEASE	4-11-V.	4-15-V.	



NO.	QTY.	DESCRIPT. CN	REF. DESIG.	REMARKS

THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY TO GENTNER ENGINEERING & MAY NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT AUTHORIZATION OF GENTNER ENGINEERING CO. INC.

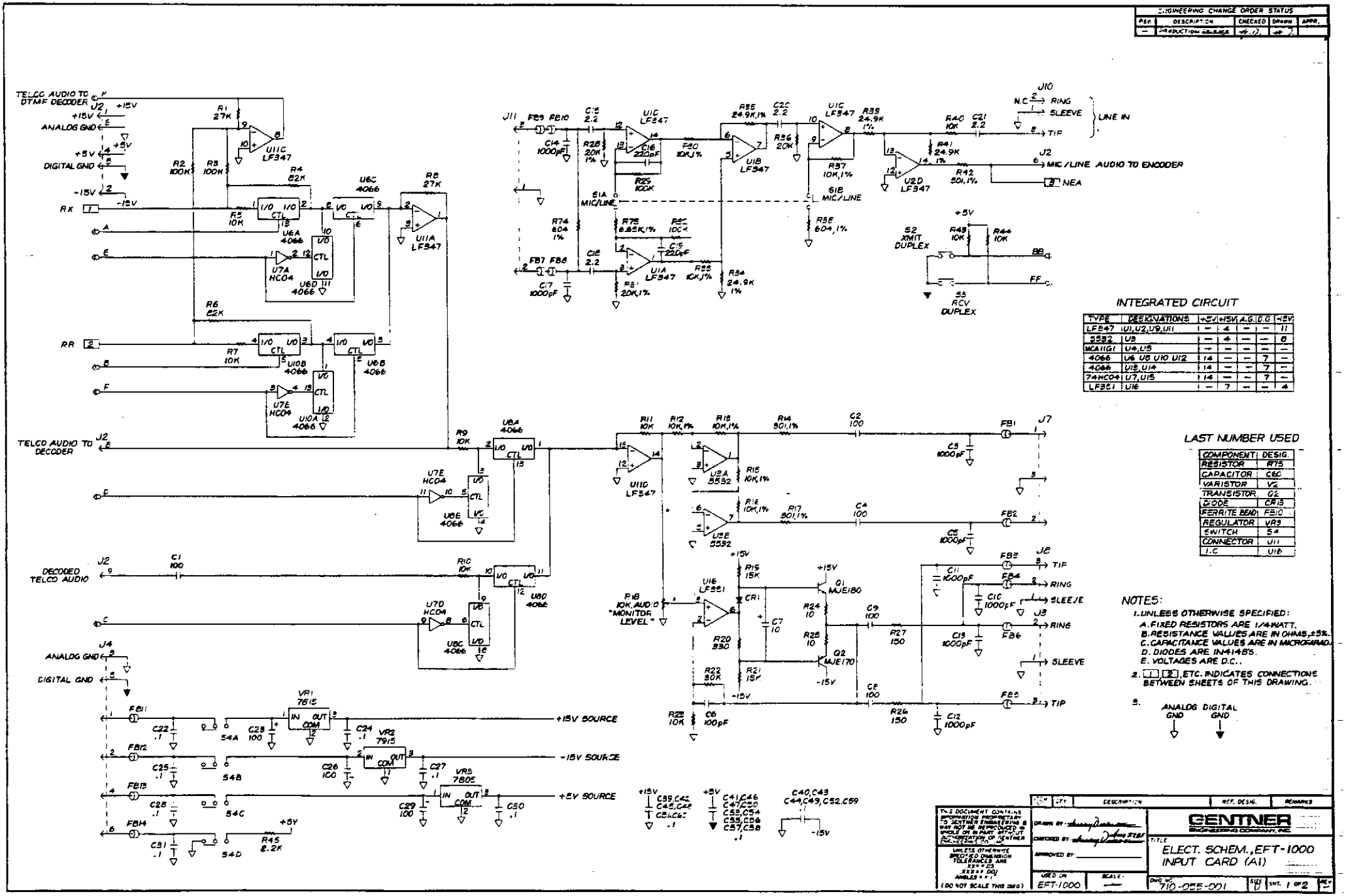
UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCE ARE: .XX = ±.03, .XXX = ±.010, ANGLES = ±1° (DO NOT SCALE THIS DWG.)

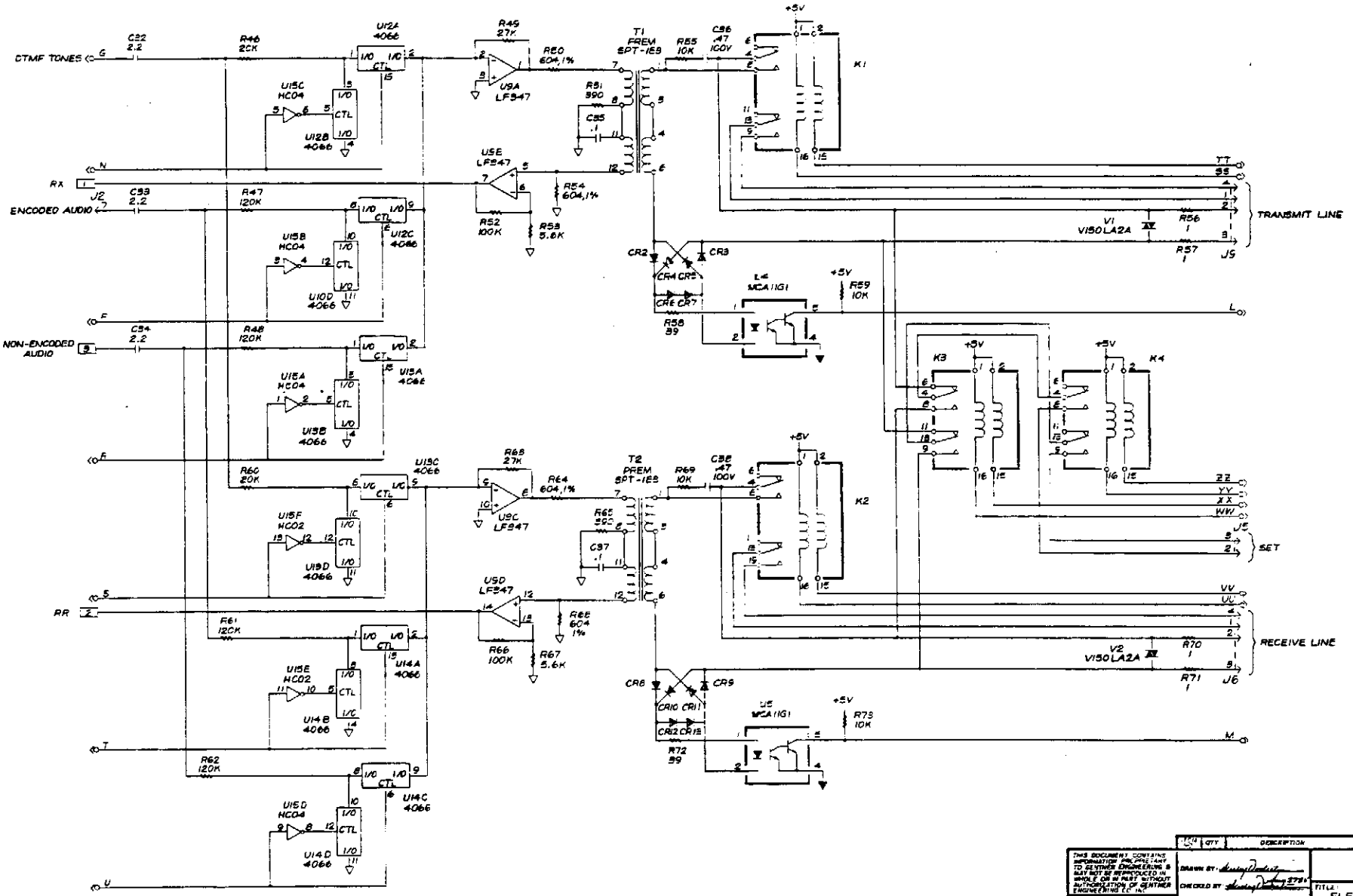
DRAWN BY: [illegible]
CHECKED BY: [illegible]
APPROVED BY:

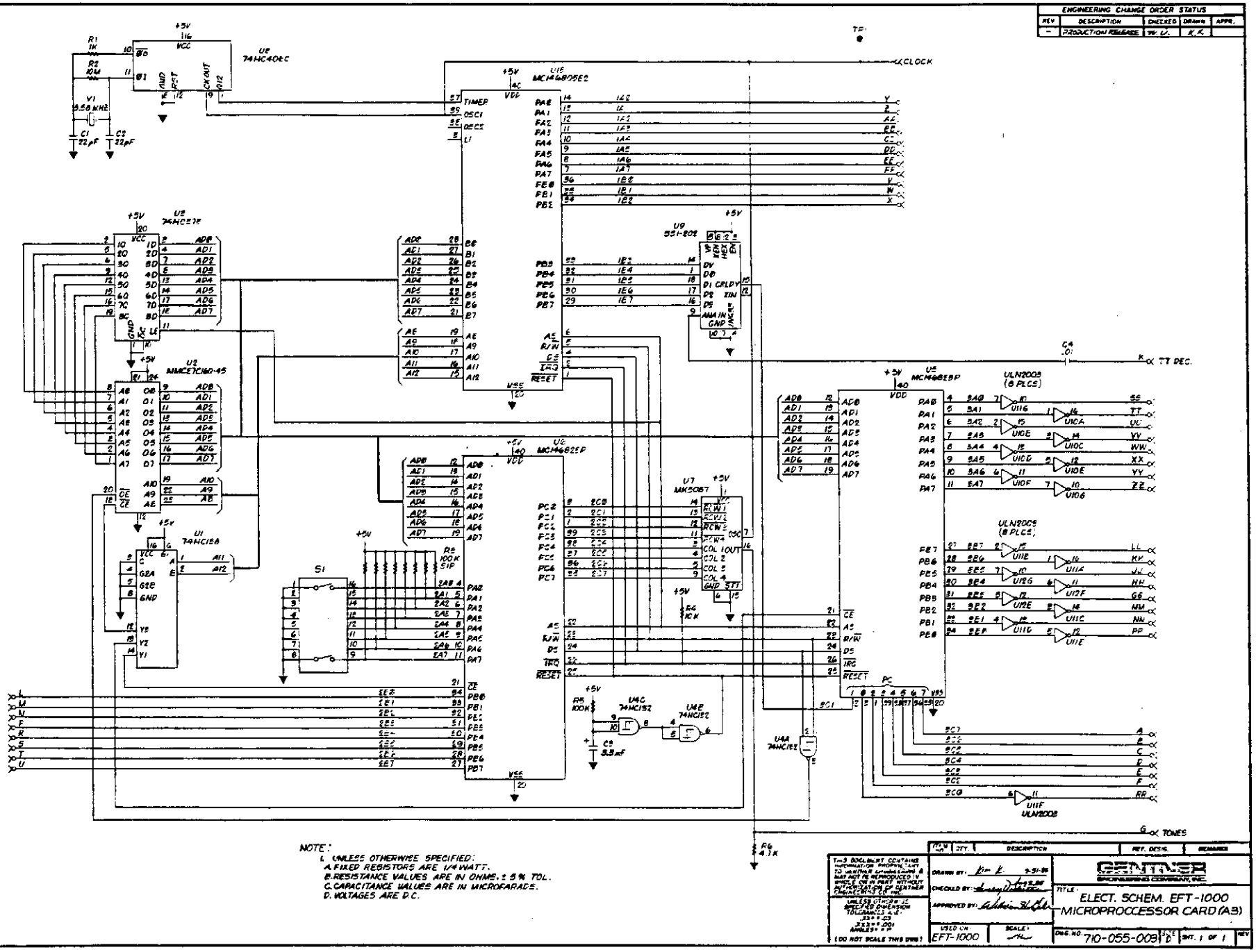
GENTNER
ENGINEERING COMPANY, INC.

TITLE: INTERCONNECTION DIAGRAM, EFT-1000

USED ON: EFT-1000
SCALE: —
DWG. NO. 710-055-012
SIZE D
SHT. 1 OF 1
REV.


ENGINEERING CHANGE ORDER STATUS
REV. | DESCRIPTION | CHECKED | DRAWN | APPR.
— | PRODUCTION RELEASE
TELCO AUDIO TO DTMF DECODER
ANALOG GND
DIGITAL GND
+15V
-15V
+5V
RX
RR
U1C LF347
U6A 4066
U6B 4066
U6C 4066
U6D 4066
U7A HC04
U7B HC04
U10A 4066
U10B 4066
U11A LF347
TELCO AUDIO TO DECODER
DECODED TELCO AUDIO
U6E 4066
U6F 4066
U7D HC04
U7E HC04
U8A 4066
U8B 4066
U8C 4066
U10C LF347
U2A 5532
U2B 5532
U16 LF351
Q1 MJE180
Q2 MJE170
FB1 10K, AUDIO "MONITOR LEVEL"
U11B LF347
U1A LF347
U1B LF347
U2D LF347
J10
N.C.
RING
SLEEVE
TIP
LINE IN
MIC/LINE AUDIO TO ENCODER
NEA
S1A MIC/LINE
S1B MIC/LINE
S2 XMIT DUPLEX
S3 RCV DUPLEX
INTEGRATED CIRCUIT
TYPE | DESIGNATIONS | +5V | +15V | A.G. | D.G. | -15V
LF347 | U1, U2, U9, U11 | 1 | 4 | — | — | 11
5532 | U3 | — | 4 | — | — | 8
MCA1161 | U4, U5 | — | — | — | — | —
4066 | U6 U8 U10 U12 | 14 | — | — | 7 | —
4066 | U13, U14 | 14 | — | — | 7 | —
74HC04 | U7, U15 | 14 | — | — | 7 | —
LF351 | U16 | — | 7 | — | — | 4
LAST NUMBER USED
COMPONENT | DESIG.
RESISTOR | R75
CAPACITOR | C60
VARISTOR | VR
TRANSISTOR | Q2
DIODE | CR15
FERRITE BEAD | FB10
REGULATOR | VR9
SWITCH | S4
CONNECTOR | J11
I.C | U16
NOTES:
1. UNLESS OTHERWISE SPECIFIED:
A. FIXED RESISTORS ARE 1/4 WATT.
B. RESISTANCE VALUES ARE IN OHMS, ±5%.
C. CAPACITANCE VALUES ARE IN MICROFARAD.
D. DIODES ARE IN4148'S.
E. VOLTAGES ARE D.C..
2. [1] [2] ,ETC. INDICATES CONNECTIONS BETWEEN SHEETS OF THIS DRAWING.
3. ANALOG GND DIGITAL GND
+15V SOURCE
-15V SOURCE
+5V SOURCE
VR1 7815
VR2 7915
VR5 7805
THIS DOCUMENT CONTAINS INFORMATION PROPRIETARY TO GENTNER ENGINEERING & MAY NOT BE REPRODUCED IN WHOLE OR IN PART WITHOUT AUTHORIZATION OF GENTNER ENGINEERING CO., INC.
UNLESS OTHERWISE SPECIFIED DIMENSION TOLERANCES ARE
.XX ± .03
.XXX ± .010
ANGLES ± 1°
(DO NOT SCALE THIS DWG.)
REV | QTY | DESCRIPTION | REF. DESIG. | REMARKS
DRAWN BY
CHECKED BY
APPROVED BY
USED ON EFT-1000
SCALE
GENTNER
ENGINEERING COMPANY, INC.
TITLE
ELECT. SCHEM., EFT-1000 INPUT CARD (A1)
DWG. NO. 710-055-001
SIZE B
SHT. 1 OF 2
REV


DTMF TONES
ENCODED AUDIO
NON-ENCODED AUDIO
RX
RR
TRANSMIT LINE
RECEIVE LINE
SET
T1 PREM SPT-1E8
T2 PREM SPT-1E8
K1
K2
K3
K4
U9A LF347
U9B LF347
U9C LF347
U9D LF347
U12A 4066
U12B 4066
U12C 4066
U12D 4066
U13A 4066
U13B 4066
U13C 4066
U13D 4066
U14A 4066
U14B 4066
U14C 4066
U14D 4066
U15A HC04
U15B HC04
U15C HC04
U15D HC04
U15E HC02
U15F HC02
U1 MCA1IG1
U2 MCA1IG1
V1 V150LA2A
V2 V150LA2A
+5V
TITLE: ELECT. SCHEM., EFT-1000 INPUT CARD (A1)
GENTNER
DRAWN BY:
CHECKED BY:
APPROVED BY:
USED ON EFT-1000
SCALE:
DWG. NO. 710-055-001
SIZE D
SHT. 2 OF 2
REV.


ENGINEERING CHANGE ORDER STATUS
REV | DESCRIPTION | CHECKED | DRAWN | APPR.
- | PRODUCTION RELEASE | W. U. | K.K.
U8 74HC40EC
U15 MCM68B05E2
U2 74HC273
U3 MMCE7C160-45
U1 74HC158
U9 551-808
U5 MCM6826P
U7 MK5087
U4A 74HC132
U4C 74HC132
U4E 74HC132
ULN2003 (8 PLCS)
ULN2003 (8 PLCS)
U11F ULN2003
CLOCK
TT DEC.
TONES
S1
NOTE:
1. UNLESS OTHERWISE SPECIFIED:
A. FIXED RESISTORS ARE 1/4 WATT.
B. RESISTANCE VALUES ARE IN OHMS, ± 5% TOL.
C. CAPACITANCE VALUES ARE IN MICROFARADS.
D. VOLTAGES ARE D.C.
GENTNER ENGINEERING COMPANY, INC.
TITLE: ELECT. SCHEM. EFT-1000 MICROPROCESSOR CARD (A3)
DRAWN BY:
CHECKED BY:
APPROVED BY:
USED ON: EFT-1000
SCALE:
DWG. NO. 710-055-003
SIZE D
SHT. 1 OF 1
REV

WARRANTY

GENTNER COMMUNICATIONS CORPORATION (Manufacturer) warrants that this product is free of defects in both materials and workmanship. Should any part of this equipment be defective, Manufacturer agrees, at its option, to:

A. Repair or replace any defective part free of charge (except transportation charges) for a period of one year from the date of the original purchase, provided the owner returns the equipment to the Manufacturer at the address set forth below. No charge will be made for parts or labor during this period;

B. Furnish replacement for any defective parts in the equipment for a period of one year from the date of original purchase. Replacement parts shall be furnished without charge, except labor and transportation.

This Warranty excludes assembled products not manufactured by Manufacturer whether or not they are incorporated in a Manufacturer product or sold under a Manufacturer part or model number.

THIS WARRANTY IS VOID IF:

A. The equipment has been damaged by negligence, accident, act-of-God or mishandling, or has not been operated in accordance with the procedures described in the operating and technical instructions; or,

B. The equipment has been altered or repaired by other than Manufacturer or an authorized service representative of Manufacturer; or,

C. Adaptations or accessories other than those manufactured or provided by Manufacturer have been made or attached to the equipment which, in the determination of Manufacturer, shall have affected the performance, safety or reliability of the equipment; or,

D. The equipment's original serial number has been modified or removed.

NO OTHER WARRANTY, EXPRESS OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR USE, APPLIES TO THE EQUIPMENT, nor is any person or company authorized to assume any warranty for Manufacturer or any other liability in connection with the sale of Manufacturer's products.

Manufacturer does not assume any responsibility for consequential damages, expenses or loss of revenue or property, inconvenience or interruption in operation experienced by the customer due to a malfunction in the purchased equipment. No warranty service performed on any product shall extend the applicable warranty period.

In case of unsatisfactory operation, the purchaser shall promptly notify Manufacturer at the address set forth below in writing, giving full particulars as to the defects or unsatisfactory operation, upon receipt of such notice, Manufacturer will give instructions respecting the shipment of the equipment, or such other matters as it elects to honor this warranty as above provided. This warranty does not cover damage to the equipment during shipping and Manufacturer assumes no responsibility for such damage. All shipping costs shall be paid by customer.

This warranty extends only to the original purchaser and is not assignable or transferable.

Gentner

GENTNER COMMUNICATIONS CORPORATION
1825 West Research Way
Salt Lake City, Utah 84119
Telephone: (801) 975-7200
Facsimile: (801) 977-0087