1020/1020M

Amplified Monitor Speaker

INSTRUCTION
and
SERVICE MANUAL

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A NOTE TO CLEAR-COM USERS

This manual will acquaint you with the operation and care of your Clear-Com 1020/1020M Amplified Monitor Speaker. To help assure years of satisfaction and reliability, please read it carefully and follow the recommendations.

Upon receiving your shipment, check immediately for box damage that may have occurred during shipment. Notify the dealer and the freight carrier if you discover damages or losses, so claims may be expedited. Carefully unpack the units. We recommend you save the shipping cartons; they're useful for re-shipping.

Should you ever require service, the Clear-Com factory and your authorized Clear-Com service center knows your equipment best, and has the training and test equipment needed to restore equipment to peak performance.

Please feel free to contact your Clear-Com dealer or the Clear-Com factory for assistance at any time. **Thank you for selecting Clear-Com products. We guarantee our continuing interest in your satisfaction with them!**

1.0 Introduction to the 1020 Amplified Monitor Speaker

Clear-Com Model 1020 Amplified Monitor Speaker is a biamplified audio monitor in a rack mount enclosure that occupies a single 1-3/4" rack space. The self-contained unit enables easy monitoring of a variety of audio sources. It provides two separate channels (with individual volume controls) for a stereo signal or two discrete monaural signals. The input for the balanced signal is a 3-pin XLR-type (electronically balanced), and the unbalanced input is RCA-type. Both are line-level inputs.

For a best possible low-distortion signal, the 1020 contains input limiters. To achieve extended bass response, all frequency signals under 200 Hz from both channels are summed and fed into a single bass amplifier, which drives the baffled loudspeaker (mounted in the center of the front panel). The mid/high frequency drivers are mounted at the extreme ends of the 1020, providing the maximum amount of stereo image separation possible.

Level Meters/Model 1020M

Clear-Com's monitor speaker is also optionally available with two, multi-segment, LED bar-type peak level meter displays on the front panel, to help monitor input levels (Model 1020"M").

These peak-reading meters show the audio level present at the input connectors. They span 23dB and their sensitivity is user-adjustable. Set at the factory for "0," the meters display "0" with a 0dBv level at the balanced inputs. The volume controls do not affect the meters.

Transformer Option

Both the 1020 and 1020M are available with optional input transformers on the balanced inputs.

* * *

Applications

The 1020 Amplified Monitor Speaker is ideal for a wide variety of installations, particularly where rack space is at a premium. Monitor applications include:

- o stereo/2-channel program audio
- o video/audio tape machines
- o "off air" receivers
- o patch bay signals
- o wireless microphone receivers
- o cue/PFL audio console outputs

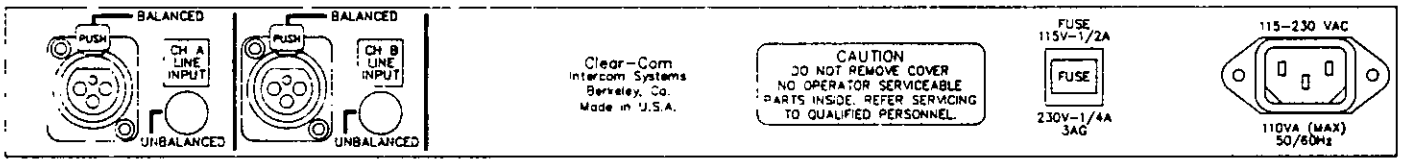
2.0 Installation

2.1 Overview

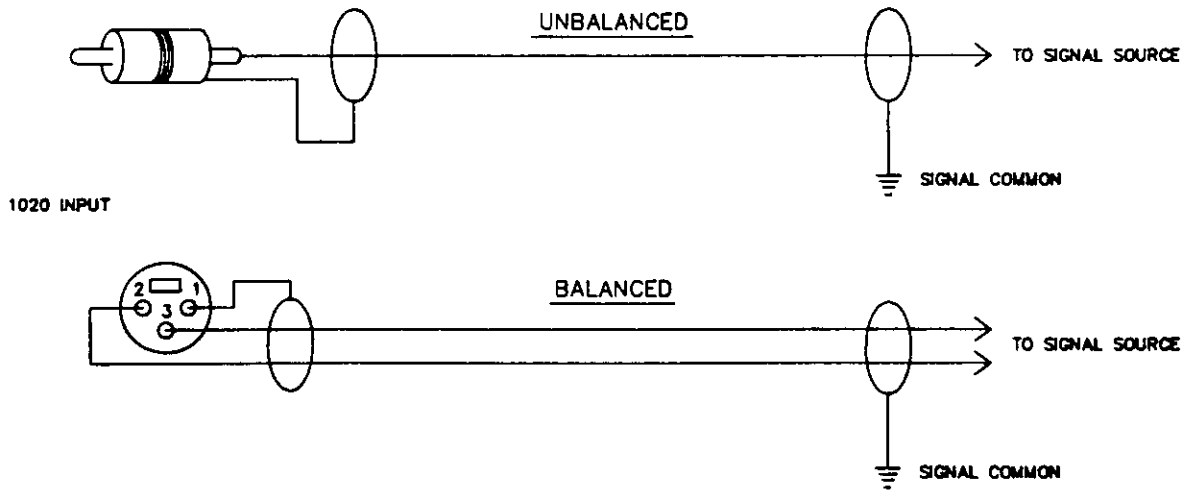
The 1020 installs in a standard, 19-inch, equipment rack.

Minimum signal level needed to drive the monitor to full volume (with volume controls set at full volume) is a -15dBv (0.40V p-p) signal on the unbalanced input, or a -4dBv signal on the balanced input.

2.2 Input Connection to Rear Panel



The following diagrams show how to properly connect unbalanced and balanced signals to the input connectors.



2.2 (CONTINUED) Input Connection

The 1020's enclosure connects directly to Earth ground through the AC power cord. To reduce the possibility of ground hum, signal common for the amplifiers is isolated from the enclosure. Do not connect signal common to Earth ground.

Clear-Com does not recommend ddriving both balanced and unbalanced inputs simultaneously. If both types of inputs are loaded simultaneously, the gain of the input amplifiers will change. This may cause a premature overload condition (although it will not damage the input stage).

2.3 Meter Sensitivity Adjustment

Model 1020M (with optional level meters) provides controls for adjusting the sensitivity of the meters. The operator can adjust a 0dB display reading for line levels of -20dBv to +8dBv (unbalanced) and -9dBv to +19dBv (balanced)

The top cover of the 1020 contains an access hole for adjusting the sensitivity controls. Use a small, flat-bladed screwdriver and the following procedure to adjust:

[1] On one channel, apply a 1kHz input signal at the level at which you desire the meters to display 0 dB;

[2] Adjust the associated trimpot until the 0dB reading is obtained;

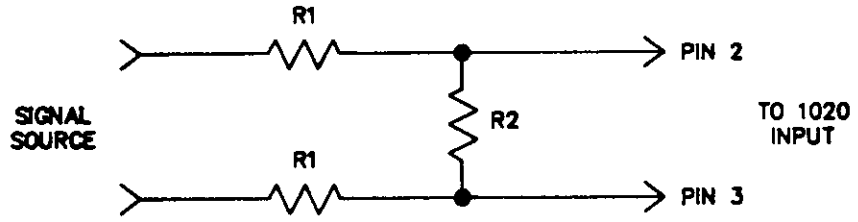
[3] Apply test signal to the remaining channel and repeat Steps [1] and [2] for second channel.

2.4 Installing Attenuators for High-Level Operation

When driving the 1020 with extremely high input signals, full volume may be achieved with only a partial turn of the volume control(s). This is due to the wide range of line levels the 1020 must accommodate. Under these conditions, Clear-Com recommends the installation of an in-line attenuator (pad).

Commercially available, in-line attenuators are suitable as long as Pin 1 of the balanced input is not connected to the shell. A pad can also be built for both balanced and unbalanced inputs; refer to the following diagrams and resistor-value charts.

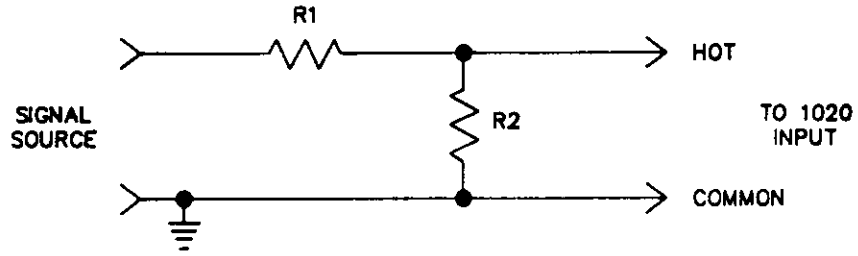
BALANCED



RESISTOR VALUE CHART
(Balanced Pad)

Attenuation	R1 Value	R2 Value
6dB	5.0k	10.0k
10dB	3.9k	3.9k
15dB	5.1k	2.2k
20dB	6.2k	1.2k

UNBALANCED



RESISTOR VALUE CHART
(Unbalanced Pad)

Attenuation	R1 Value	R2 Value
6dB	10.0k	10.0k
10dB	8.2k	3.9k
15dB	10.0k	2.2k
20dB	12.0k	1.2k

3.0 Troubleshooting

The 1020 Amplified Monitor Speaker can be tested and, if necessary, repaired with standard electronic bench equipment. Signal paths can be traced and compared with the Test Signal chart shown in this section. The technician can test the 1020 using "dummy loads" instead of speakers; these loads should be 8 ohms for the high channel and 4 ohms for the low channel. Remove load from low speaker output (J6 and J7).

3.1 Limiter Disable & Adjustment

Disable: Disable the limiter circuit before measuring stage gain. To disable it, temporarily install a 33k ohm resistor between test points 3 and 4 for channel A and test points 1 and 2 for channel B.

Adjust: If replacing Q1 or Q2, readjustment of the limiter set point is required. To readjust, refer to the schematic and use the following procedure:

[1] On either channel, apply -10dBv at 180Hz to the unbalanced input;

[2] With volume control to full volume, read the level at the low speaker output (J6 or J7) to ground.

[3] Adjust P5 for channel A, or P4 for channel B, to obtain a +8 reading.

[4] Apply test signal to remaining channel and repeat Steps [2] and [3].

NOTE: To enable the limiter, remove the 33k ohm resistor.

3.2 Amplifier Balance

The DC balance between IC3 and IC4 is adjusted via P1. Use a DC voltmeter between J6 and J7 to adjust P1 to read 0.0 VDC.

AMPLIFIED MONITOR SPEAKER
TEST SIGNAL CHART

CONDITIONS:

-- Unbalanced Input at J10 or J12
-- Limiter disabled; Test Points 1 and 2, 3 and 4 connected with 33k ohm resistor; P4 and P5 set fully counter-clockwise
-- Volume control set fully clockwise
-- All readings in dBv (unless otherwise stated)
-- All readings +/- 1dB

NOTES:

1. [X] refers to Channel B
2. 0dBv = 0.775V rms
3. When adjusting P4/P5, drive only channel A or B.

Input Freq.	Test Point	Reading
1kHz @ -35 dBv	IC7[6]	Pin 7...-35.0 dBv
"	IC7[6]	Pin 3...-39.0 "
"	IC7[6]	Pin 1...- 8.5 "
"	IC10[9]	Pin 5...-21.0 "
"	IC10[9]	Pin 7...-21.0 "
"	IC10[9]	Pin 1...-20.0 "
"	IC2[5]	Pin 1...-40.5 "
"	J4[8]	to Gnd...- 0.5 "
180Hz @ -35 dbv	IC1	Pin 5...-19.5 "
"	IC1	Pin 1...-18.5 "
"	IC3	Pin 1...-47.0 "
"	J6,J7	.....- 7.5 "
180Hz @ -15 dbv	J8	to Gnd...P5 adjust for +8 (Limiter enabled)
"	J8	to Gnd...P4 adjust for +8 (Limiter enabled)
None	J6	to J7...P1 adjust for 0.0V (DC)
	IC8	Pin 6...1/2 V2 [DC]

4.0 Circuit Description & Block Diagram

4.1 Amplifier Module #710190

Input

Input amplifier IC7 is a low-gain, high dynamic-range buffer amplifier. Resistors R63, R65 and R69 set the unbalanced stage gain at 0dB. The balanced stage gain is set at -11dB. This allows a maximum unbalanced input of approximately +15dBv before driving IC7 into the supply rail. The maximum balanced input is limited to approximately +18dBv by the clamping diodes, D13 through D18.

The output of the input amplifier feeds volume control P2, which, in turn, is fed to the other half of IC7, the limiter amp.

Limiter Amp

The limiter amp's function is to delay the onset of clipping of the output amplifiers (caused by large-level input signals).

Variations in Q2's transfer characteristics are accommodated by adjusting P5, the bias voltage control on IC7 Pin 3, to hit the right "spot" on Q2's curve (as previously described in Section 3.1, "Limiter Disable and Adjustment" in Chapter 3.0, Troubleshooting).

D19 provides a fast attack time on large signals, while R73 provides a linearization signal to the gate of Q2, reducing distortion when in limiting.

For measurement and troubleshooting purposes, test point 3, when tied to TP4 through a 33k ohm resistor, will defeat the limiter. When the limiter is disabled, bias adjustment P5 should be turned fully counter-clockwise to assure 1/2 V2 bias voltage on IC7.

High Channel

The first half of IC10 is a buffer amp feeding the second half of IC10, which, along with the associated precision components, serves as a three-pole, high pass filter.

This high pass filter is flat throughout the audio range, -3dB at 450Hz and -10dB at 350Hz. The output of this filter is fed to IC2, a 7-watt integrated audio power amp.

Low Channel

IC1, Pin 5, is a summing junction for the outputs of the two limiter amplifiers. Signals from channels A and B are combined here through R7 and R8. If signals in both channels are identical, a net gain of +6dB will be achieved at IC1, Pin 5.

The first half of IC1 is a buffer amp feeding the second half of IC1, which, along with the associated precision components, serves as a three-pole, low pass filter. This filter is -3dB at 250Hz, and -10dB at 350Hz.

IC1, Pin 1, feeds power amp IC3. A portion of IC3's output is fed to the inverting input of IC4. Together, they form a 14-watt, push/pull output.

Trimmer P1 adjusts IC4's output offset to match that of IC3.

4.1 (CONTINUED) Amplifier Module 710190

Power Supply
Two B+ power supply feeds are provided by V1 and V2. V1 is the high current supply; it feeds the audio power amps and the display LEDs. V2 supplies the low power circuits.

IC8 and resistors R35 and R36 comprise VB, the 1/2 B+ bias supply. VB is fed to the non-inverting inputs of all signal-carrying op amps. This allows AC-coupled input signals to be biased at mid-supply on the output.

Miscellaneous
For measurement and troubleshooting purposes, test point 5 should be used as a ground-reference point.

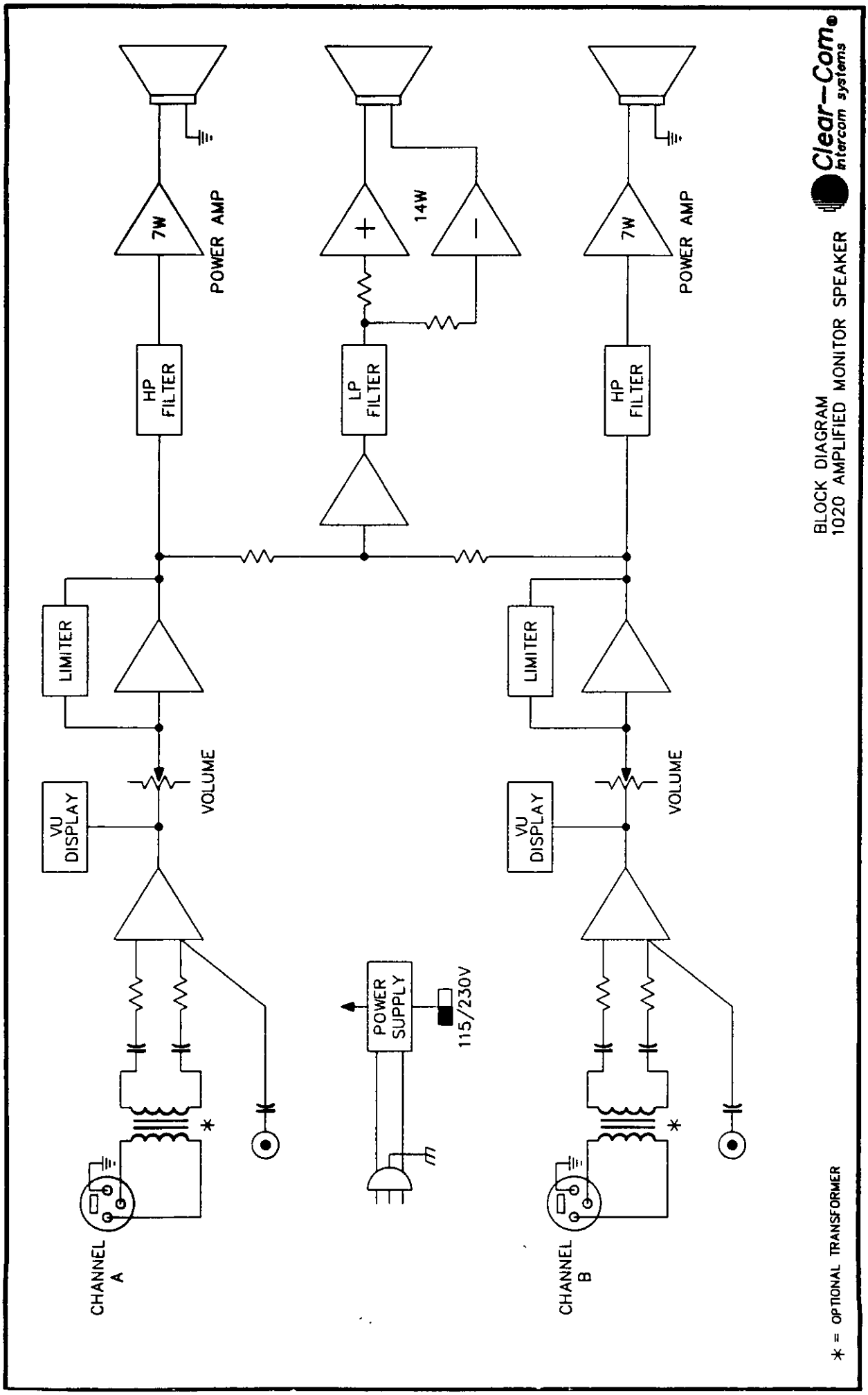
The mains selector switch is located near the AC power jack on the main amplifier circuit board. This switch allows powering of the unit from 115 or 230 VAC mains.

4.2 Optional Display Module #710191

The optional display module is provided for line level indication.

Input amplifier IC3 has an adjustable gain of approximately -9 to +21 dB. Bias supply voltage for IC3 is provided by resistors R16 and R17.

IC2 is a precision, full wave peak detector. Its output is integrated by R9 and C3 which determine the speed (attack and decay) of the display driver IC1. IC1 displays "0" when a 0dBv signal appears at Pin 5.


Clear-Com
intercom systems
BLOCK DIAGRAM
1020 AMPLIFIED MONITOR SPEAKER
7W
POWER AMP
14W
+
−
HP FILTER
LP FILTER
LIMITER
VOLUME
VU DISPLAY
POWER SUPPLY
115/230V
CHANNEL A
CHANNEL B
* = OPTIONAL TRANSFORMER

5.0 Specifications

General

Amplifier Design: 2-channel, 2-way, bi-amplified; two high-frequency amplifiers and one summed low-frequency amplifier.

Input

Impedance @ 1kHz:
45k ohm, unbalanced
100k ohm, balanced
20k ohm, balanced w/input transformer

Minimum Level for Max. Output:
-15dBm, unbalanced .40Vp-p
-4dBm, balanced

Max. Level (input overload):
+15dBm, unbalanced 14.4Vp-p
+18dBm, balanced

Input Connectors:
Balanced: 3-pin female XLR
Unbalanced: RCA

Amplifier

Max. Power Output:
High amp, 7W @ 4 ohms
Low amp, 14W @ 4 ohms

THD: <0.5% before compression
Residual Noise: -65 dB
Channel Separation: >30 dB above 800 Hz

Level Meters/1020M (Option)

Multi-segment LED bar-type; peak reading
Display Range: -20 to +3 dB
Sensitivity: adjustable from -20 to +8dBv (unbalanced input) and -9 to +19dBv (balanced input)
Accuracy: +/-0.2dB, from -3 to +3 reading
Frequency Response: 100 - 10k Hz

Power Requirements

Voltage: 115/230 VAC input, 50/60 Hz
Current @ 120VAC: .17A (idle), .3A (full power)
Consumption: 48 VA
Stray magnetic field; 3.5 gauss maximum

Operating Temperature Range: 0 - 50 degrees C (32-122 degrees F)
Dimensions: 1.75" H x 19" W x 12" D (44 x 483 x 304 mm)
Weight: 13 pounds (5.85 kg)

0 dBv is referenced to 0.775 volts RMS.
Specifications subject to change without notice.

6.0 Parts Lists

1020/M AMPLIFIER MODULE
ASSEMBLY 710190 REV C

CCPN	DESCRIPTION	REF DESIGNATORS
RESISTORS		
410001	CF 1/4W 5% 3.9 OHMS	R25 R20 R13 R31
410005	CF 1/4W 5% 390 OHMS	R28 R24 R17 R16 R10
410010	CF 1/4W 5% 1K OHMS	R75 R51
410011	CF 1/4W 5% 2.2K OHMS	R84 R60
410013	CF 1/4W 5% 4.7K OHMS	R37 R61
410016	CF 1/4W 5% 10K OHMS	R32 R82 R58 R21 R5 R14
410017	CF 1/4W 5% 15K OHMS	R85 R86 R11 R29
410018	CF 1/4W 5% 22K OHMS	R74 R50 R78 R54
410019	CF 1/4W 5% 39K OHMS	R18 R87 R88
410021	CF 1/4W 5% 47K OHMS	R6
410022	CF 1/4W 5% 27K OHMS	R42 R66
410024	CF 1/4W 5% 100K OHMS	R36 R35 R43 R67
410025	CF 1/4W 5% 68K OHMS	R53 R8 R7 R77
410026	CF 1/4W 5% 150K OHMS	R38 R62
410030	CF 1/4W 5% 470K OHMS	R23 R52 R76
410033	CF 1/4W 5% 330K OHMS	R26
410035	CF 1/4W 5% 1.8K OHMS	R19 R12 R30
410063	CF 1/8W 1% 6.81K OHMS	R56 R80
410065	CF 1/2W 5% 22 OHMS	R34
410073	CF 2W 5% .39 OHMS	R33
410089	MF 1/8W 1% 10K OHMS	R70 R39 R64 R63 R46 R40
410105	CF 1/8W 1% 47.5K OHMS	R69 R68 R45 R44
410111	MF 1/8W 1% 39.2K OHMS	R65 R41
410139	CF 1/4W 5% 1 OHM	R9 R27 R22 R15
410140	MF 1/4W 1% 12K OHMS	R3 R2 R1
410141	MF 1/4W 1% 23.7K OHMS	R4
410142	MF 1/4W 1% 47 OHMS	R59 R83
410144	MF 1/4W 1% 8.25K OHMS	R55 R79
410145	MF 1/4W 1% 90.9K OHMS	R57 R81
410147	MF 1/4W 1% 150K OHMS	R71 R72 R47 R48
410150	CF 1/4W 5% 1.5M OHMS	R73 R49
470018	50K TRIMPOT PIHER#PT-10V-50K	P4 P5
470034	50K TRIMPOT BECKMAN #91AR50K	P1
470039	50K POT, LINEAR CTS#KL925	P2 P3
CAPACITORS		
150005	.047 UF 10% 50V	C66 C49
150006	100 PF DISC 10%	C71 C54 C32 C13
150009	1 UF TANTALUM 35V	C56 C38
150019	2.2 UF TANTALUM 35V	C65 C39 C48
150029	.01 UF DISC 150VAC UL APPROVED	C73
150033	150 PF DISC 5% 50V	C63 C62 C46 C45
150035	.1 UF MONOLYTHIC 10% 50V	C60 C43

6.0 Parts Lists, continued

1020/M AMPLIFIER MODULE
ASSEMBLY 710190 REV C, continued

CCPN	DESCRIPTION	REF DESIGNATORS
CAPACITORS		
150043	.47 UF MONOLYTHIC 10% 50V	C17 C68 C15 C51 C61 C44 C64 C59 C58 C47 C42 C41 C31 C24 C19 C12 C25
150080	.22 UF MONOLYTHIC 10% 100V	C7 C29 C10 C6 C5 C26 C21 C14
150082	.022 UF MONO CK05 10% 50V	C20
150095	.022 UF 2% 100V POLY	C72 C70 C67 C55 C53 C50
150098	22 PF 10% 50V	C57 C40
150099	100 UF ELECTROLYTIC 25V 20% R.L	C30 C23 C18 C11
150120	2200 UF 25V LYTIC R.L.	C36 C35 C34 C33 C37
150121	1000 UF 25V LYTIC R.L.	C8 C27 C28 C22 C16 C9
150122	.01 UF 2% 100V POLY	C4 C69 C52
150123	.047 UF 2% 100V POLY	C3
150124	.1 UF 2% 100V POLY	C1 C2
DIODES		
480000	1N4148 SIGNAL DIODE	D16 D19 D18 D17 D15 D14 D13 D12 D11 D10 D9 D8 D7 D6 D5
480005	1N5401 RECTIFIER DIODE 3A 100PIV	D3 D2 D1 D4
TRANSISTORS		
480079	J174 P-CHANNEL JFET	Q1 Q2
INTEGRATED CIRCUITS		
480018	LM741 IC OP AMP 8-PIN DIP	IC8
480070	NE5532 DUAL LO NOISE OP AMP	IC10 IC7 IC6 IC1 IC9
480113	LM383T AUDIO POWER AMP	IC4 IC3 IC2 IC5
TRANSFORMERS		
560019	POWER XFMR SIGNAL#LP-24-2000	T1
560020	10K-10K AUDIO TRANSFORMER	T3 T2
CONNECTORS		
210080	P.C. QUICK-CONNECT TAB 3/16"	J4 J5 J6 J7 J8
210112	MULTI PIN HEADER .1" CTR	J14 J15 J18 J19
210157	XLR 3 PIN FEMALE INSERT	J11 J13
210170	RCA PC MOUNT	J10 J12
SWITCHES		
510053	LINE VOLTAGE SELECTOR, DPDT	S1
HARDWARE		
140002	HEATSINK FOR POWER AMPLIFIER	
280157	1/4 IN. X .200 #4 ALUMINUM SPACER	
280158	1/4 IN. X .500 #4 NYLON SPACER	

6.0 Parts Lists, continued

1020M DISPLAY MODULE
ASSEMBLY 710191 REV C

CCPN	DESCRIPTION	REF DESIGNATORS
RESISTORS		
410010	CF 1/4W 5% 1K OHMS	R7
410016	CF 1/4W 5% 10K OHMS	R12 R13
410024	CF 1/4W 5% 100K OHMS	R16 R17
410032	CF 1/4W 5% 18K OHMS	R15
410038	CF 1/4W 5% 82 OHMS	R8
410041	CF 1/4W 5% 1.2K OHMS	R1
410071	CF 1/4W 5% 100 OHMS	R11
410096	CF 1/4W 5% 820 OHMS	R9
410137	CF 1/4W 5% 6.2K OHMS	R14
410148	MF 1/4W 1% 100K OHMS	R4 R3 R2
410149	MF 1/4W 1% 200K OHMS	R5 R10
470019	50K TRIMPOT PIHER#PT-10H-50K	P1
CAPACITORS		
150003	.22 UF MYLAR 100V 20%	C1
150019	2.2 UF TANTALUM 35V	C5 C3
150081	47 UF 35V ELECTROLYTIC CAP	C2
150116	1 UF 35V 20% R.L.	C4
DIODES		
480000	1N4148 SIGNAL DIODE	D6 D5 D4 D3 D2 D1 D7
480115	LED DISPLAY HP#HDSP-4832	LED1
TRANSISTORS		
480006	2N2222 TRANSISTOR	Q2
480007	2N2907 OR 2N4143 TRANSISTOR	Q1
INTEGRATED CIRCUITS		
480018	LM741 IC OP AMP 8-PIN DIP	IC3
480075	LM358 DUAL GND SENSING OP AMP	IC2
480114	LM3916N BAR DISPLAY DRIVER	IC1
HARDWARE		
210155	10 PIN RT ANGLE HEADER .1" CTR	J2
210172	20 PIN RT ANG SOCKET ARIES#20-823-90	J1
280151	ANGLE BRACKET #4-40	

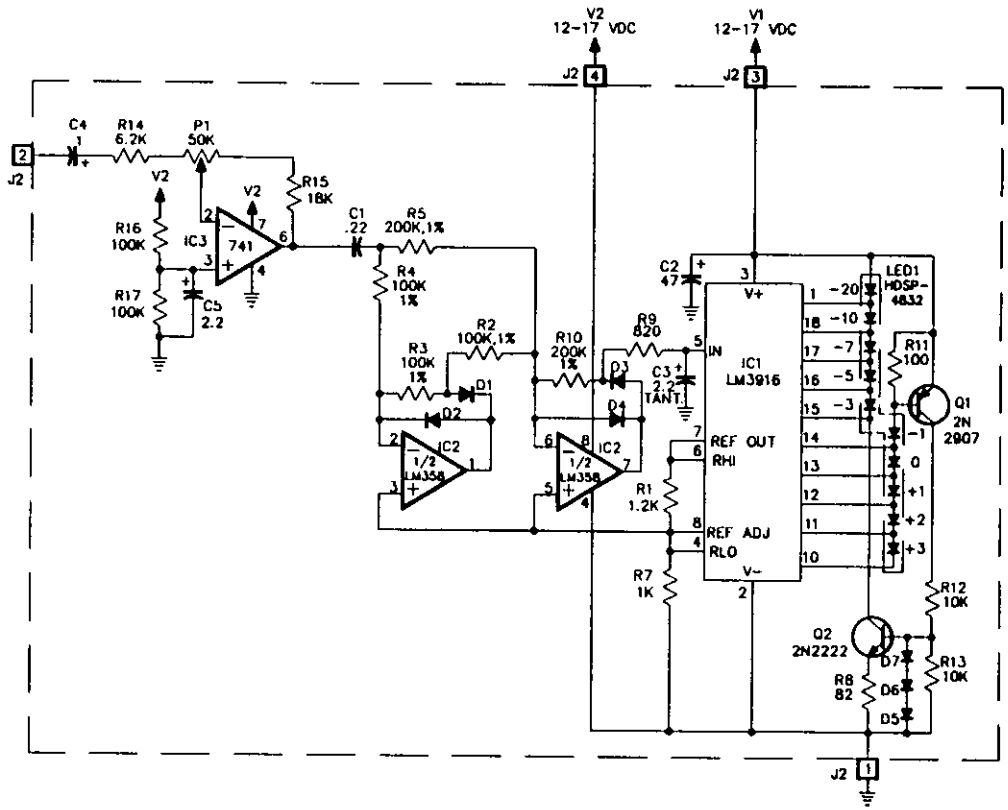
6.0 Parts Lists, continued

1020/M CHASSIS

CCPN	DESCRIPTION
HARDWARE	
240015	KNOB, VOLUME
250378	PLASTIC LENS FOR DISPLAY
280151	ANGLE BRACKET #4-40
280156	TINNERMAN FASTENER #4
MISC.	
210157	XLR 3 PIN FEMALE CONNECTOR
210171	AC JACK SWITCHCRAFT #EAC-311
500089	3INCH SQUARE SPEAKER
500102	6 IN SPEAKER FOR 1020
520025	3AG 1/2 AMP S.B.
520027	SQ BEZEL FUSEHOLDER
610002	AC POWER CABLE
810110	INSTRUCTION & SERVICE MANUAL

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL DIODES ARE 1N4148.
2. ALL CAPACITORS VALUES ARE LISTED IN MICROFARADS.
3. ALL RESISTORS ARE 1/4W, 5%, LISTED IN OHMS.
4. REFERENCE DRAWINGS: ASY. DWG P/N 710191-ASY-B-, BOM P/N 710191
   AMP MODULE: ASY. DWG P/N 710190-ASY-C-, BOM P/N 710190, SCH P/N 710190-SCH-D-



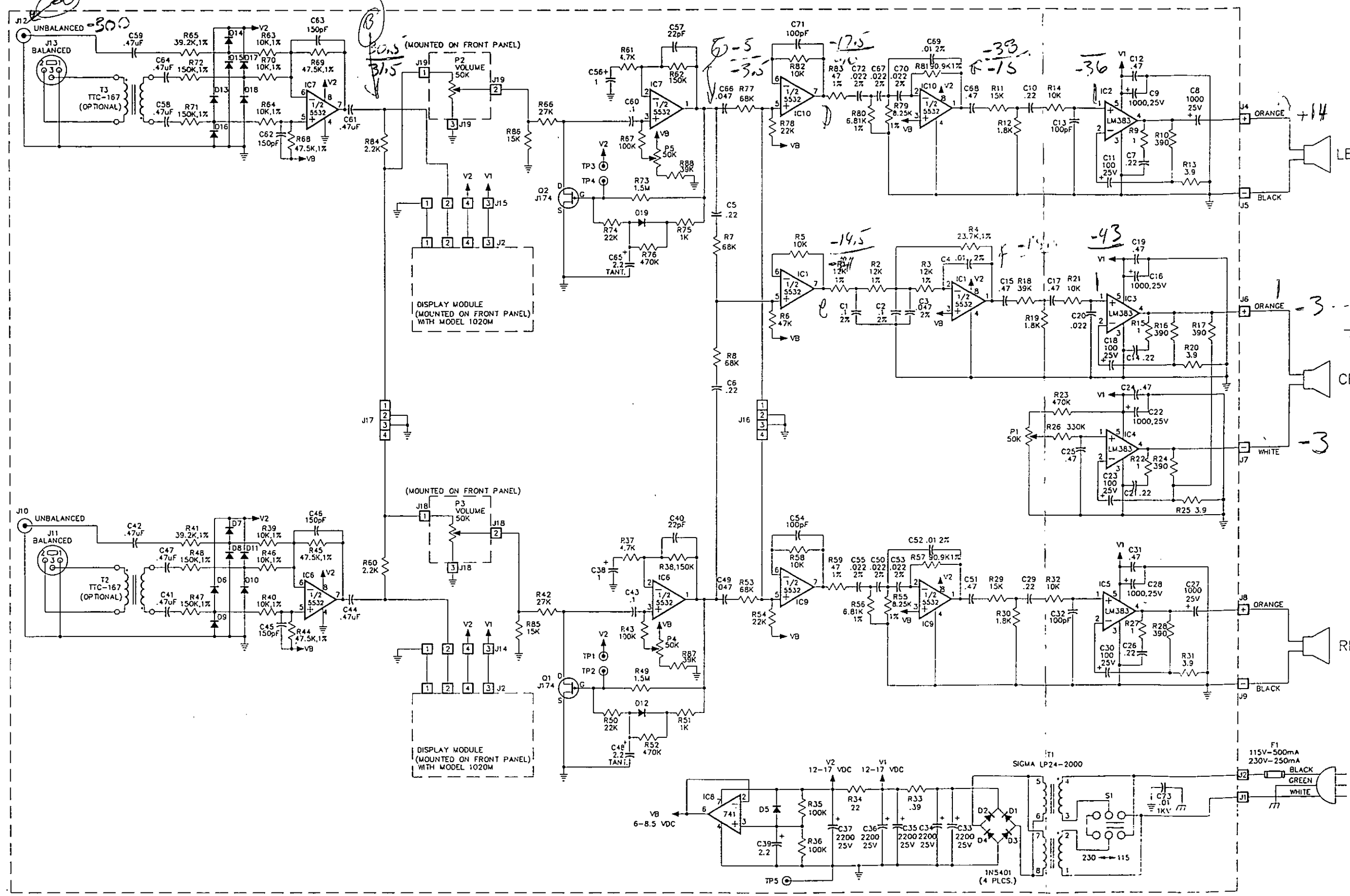
REFERENCE DESIGNATORS

	LAST USED	NOT USED
IC	3	
R	17	6
C	6	
D	7	
Q	2	
J	2	
LED	1	
P	1	

TOLERANCE: UNLESS OTHERWISE SPECIFIED .XXX +/- .015	DWN B. DOUGLAS	DATE 9/29/88	Clear-Com Intercom systems
ANGLE +/- 1°	CHK	DATE	
HOLES +/- .003 BEFORE PLATING	APP	DATE	TITLE: SCHEMATIC 1020 AMS DISPLAY MODULE
DO NOT SCALE DRAWING	ACAD P/N - 710191SC PLOT SIZE- 1=1 ACAD ARCHIVE		
	SCALE 1=1	SIZE C	DWG NO. 710191-SCH-C- REV C

CHANNEL A

CHANNEL B



5. REFERENCE DRAWINGS: AMP MODULE: ASY. DWG P/N 710190-ASY-C-, BOM P/N 710190
DISPLAY MODULE: ASY. DWG P/N 710191-ASY-B-, BOM P/N 710191, SCH. P/N 710191-SCH-C-
4. XLR CONNECTORS: UNFILLED CIRCLES INDICATE FEMALE.
3. ALL RESISTORS ARE 1/4W, 5% LISTED IN OHMS.
2. ALL CAPACITOR VALUES ARE LISTED IN MICROFARADS.
1. ALL DIODES ARE 1N4148.

NOTES: (UNLESS OTHERWISE SPECIFIED)

REFERENCE DESIGNATORS

	LAST USED	NOT USED
IC	10	
R	88	
C	73	
D	19	
S	1	

REFERENCE DESIGNATORS

	LAST USED	NOT USED
Q	2	
J	19	3
P	5	
T	3	
F	1	

REFERENCE DESIGNATORS

	LAST USED	NOT USED
TP	5	

TOLERANCE: UNLESS OTHERWISE SPECIFIED .XXX +/- .015 ANGLE +/- 1° HOLES +/- .003 BEFORE PLATING DO NOT SCALE DRAWING	DWN B. DOUGLAS	DATE 8/25/88	Clear-Com intercom systems
	CHK	DATE	TITLE: SCHEMATIC 1020 AMPLIFIED MONITOR SPEAKER
	APP	DATE	
	ACAD P/N - 710190SC PLOT SIZE- 1=1 ACAD ARCHIVE		
	SCALE 1=1	SIZE D	DWG NO. 710190-SSD-D REV C