

**Addendum #2
to OPTIMOD-AM® Operating Manual**

Third edition, P/N 95032-000-03

This addendum updates the 9100A Operating Manual so it can be temporarily used as an operating manual for the new Model 9100B OPTIMOD-AM, while the 9100B Operating Manual is being checked for accuracy and printed. You will be sent a copy of the finished 9100B Operating Manual only if you return the Registration Card or otherwise notify us of the unit's whereabouts.

The 9100B differs from the 9100A in that the pre-emphasis and 10kHz low-pass filtering recommended by the NRSC have been incorporated in the 9100B, and the 5kHz low-pass filter required by European broadcasters is standard on the 9100B. In effecting these changes, the optional Card #1-F (mono) or #1-S (stereo) for the 9100A has been replaced by the standard Card #1F10 (mono) or #1S10 (stereo) in the 9100B.

- The following:
- Describes the differences between the 9100A and 9100B.
 - Explains why we've incorporated the new NRSC standard.
 - Specifies how the information in this manual changes as a result.

The 9100B OPTIMOD-AM With NRSC Pre-emphasis and Filtering

The new Model 9100B OPTIMOD-AM gives you all the performance and features that have made the 9100A the choice of so many stations concerned about competing with FM. In addition, the 9100B provides the high-frequency pre-emphasis and 10kHz low-pass filtering recommended by the National Radio Systems Committee (NRSC). The 9100B increases coverage, improves source-to-source consistency, and delivers superb audio quality on both voice and music.

The 9100B is delivered with monitor rolloff filter(s) to supply a complementary de-emphasis for off-air monitoring to accurately simulate the frequency response of a "standard" NRSC receiver. 5kHz, 10kHz (NRSC), and 12kHz low-pass filters can be selected by jumper or by the 9100B's day/night logic. For those whose needs are not met by the NRSC pre-emphasis standard, the 9100B can also perform high-frequency equalization according to one of three alternative pre-emphasis curves.

The 9100B OPTIMOD-AM is available in mono and stereo versions. The 9100B/1 *mono* unit may be easily upgraded later to the 9100B/2 *stereo* OPTIMOD-AM with a plug-in retrofit kit (RET-043B). Orban also supplies retrofit kits for upgrading 9100A OPTIMOD-AM units to the equivalent of a 9100B (stereo or mono).

Why the New NRSC Standard?

Over the years, as the air waves became more crowded, interference from first and second adjacent stations became more and more of a problem. Receiver manufacturers responded by producing receivers with decreased audio bandwidth, so that the encroachment of an adjacent station's modulation extremes would not be audible as interference. This truncating of the bandwidth had the effect of diminishing the receiver's high-frequency response, but it was felt that lower fidelity would be less obnoxious than interference. As long ago as 1978, Orban proposed and implemented pre-emphasis and low-pass filtering for AM broadcast to provide brighter sound at the receiver while minimizing interference. This approach has become widely accepted. Now the NRSC has formalized a standard which is acceptable to all industry segments, and which can, if promptly implemented, result in a vast improvement in AM radio.

AM Stereo Introduces a Pre-emphasis Dilemma

Certain AM receivers manufactured since 1984, particularly those designed for domestic AM stereo reception, have a frequency response which is substantially wider than that of the typical mono AM receiver. The frequency response was widened largely to enhance the sales potential of AM stereo by presenting a dramatic, audible improvement in fidelity in the showroom. As these new receivers became more prevalent, broadcasters had to choose whether the station's pre-emphasis would be optimized for the new AM stereo receivers or for the existing conventional receivers that form the vast majority of the market. If the choice was for conventional receivers (which implies a relatively extreme pre-emphasis), the newer receivers might sound strident or exceptionally bright. If the choice favored the newer receivers (less pre-emphasis and probably less processing), the majority of receivers would be deprived of much high-end energy and would sound both quieter and duller.

NRSC Standard Pre-emphasis and Low-pass Filtering

In response to this dilemma, the National Radio Systems Committee (NRSC) undertook the difficult task of defining a voluntary recommended pre-emphasis curve for AM radio that would be acceptable to broadcasters (who want the highest quality sound on the majority of their listeners' radios) and to receiver manufacturers (who are primarily concerned with interference from first- and second-adjacent stations).

After a year of deliberation, a "modified 75-microsecond" pre-emphasis/de-emphasis standard was approved. This provides a moderate amount of improvement for existing narrowband radios, while optimizing the sound of wideband radios. Most importantly, it generates substantially less first-adjacent interference than do steeper pre-emphasis curves.

The second part of the NRSC standard calls for a sharp upper limit of 10kHz for the audio presented to the transmitter. This essentially eliminates interference to second and higher adjacencies. While some have protested that this is inadequate and that 15kHz audio should be permitted, the unfortunate fact is that interference-free 15kHz audio could only be achieved by a complete re-allocation of the AM band! The *practical* effect of widespread implementation of the 10kHz standard is that 10kHz radios will then be feasible, and the bandwidth perceived by the average consumer (now limited by the receiver to 3kHz, typically) will be dramatically improved. On much mass-market consumer equipment, it will be difficult to tell AM from FM.

The radio manufacturers participating in the NRSC stated emphatically that reduction in interference *must be demonstrated by broadcasters* before receiver manufacturers would be willing to release true wideband (10kHz audio bandwidth) receivers to the mass market. This is rational — the receiver manufacturers can lose millions of dollars if they produce receivers that are rejected as noisy or interference-prone by consumers. In contrast, broadcasters can easily change pre-emphasis and filtering with very little expense.

Therefore, although this standard is voluntary, we *strongly recommend* conformance to it. We are convinced that use of this more modest pre-emphasis and sharp 10kHz filtering by broadcasters is the only factor that will eventually induce the receiver manufacturers to build and mass-market the high-fidelity, wideband radios which would allow AM stations to compete with FM in audio quality. The commitment to do so was strongly expressed by the receiver manufacturers involved in the NRSC's deliberations.

Orban is doing its part — we have designed your 9100B to conform to the full NRSC standard, and we can supply low-cost conversion kits for every OPTIMOD-AM ever made. The ball is now clearly in the broadcasters' court.

Operating Manual Changes

While the 9100B Operating Manual is being prepared, the 9100A Operating Manual can be used in its place — as long as the following changes are kept in mind. To avoid reading irrelevant or erroneous information, we suggest marking each affected area of the manual with “see Addendum 2” *before* reading the manual.

(Page references are to the Third Edition of the 9100A Operating Manual; “Addendum #1” refers to Addendum #1 to that manual.)

- 1) NRSC pre-emphasis is supplied by a BLUE module on Card #4 in the mono 9100B/1, and by two BLUE modules, one on each of Cards #4 and #5, in the stereo 9100B/2. Addendum #1 provides information about these modules.

In the main body of the 9100A Operating Manual, the following pages are affected by this change:

- | | |
|----------|--|
| 1-4, 1-5 | “Introduction: High-Frequency Equalizer” |
| 3-10 | “Installation: Option 7” |
| 5-1, 5-2 | “Operating Instructions: Where to Start” |
| 5-4 | “Operating Instructions: HF EQ” |
| 5-7, 5-8 | “Operating Instructions: On High-Frequency Equalization” |
| 4-7 | During initial set-up, the 9100A/1's HF EQ control should be turned fully clockwise. This instruction supersedes the settings shown in Fig. 4-6. |
| 6-1 | “Proof of Performance” is <i>unaffected</i> by this change since the equalization will have been defeated. |
| D-3 | Program equalizer response will be as specified in Appendix D only if the GREEN module is installed. |

We continue to include the older RED, YELLOW, and GREEN modules mentioned in the 9100A Operating Manual for stations (particularly those outside North America) which may prefer other HF equalization. See Addendum #1 for more information.

- 2) The ACC-5 Monitor Rolloff Filters supplied with 9100A units were designed to complement the original GREEN module. The 9100B is supplied with ACC-023 Monitor Rolloff Filters (one with the mono 9100B/1, two with the stereo 9100B/2) that supply complementary de-emphasis and a 10kHz notch for off-air monitoring of NRSC standard audio. The output of this new rolloff filter accurately simulates a "standard" NRSC receiver. Alternately, an adjustable 18dB/octave rolloff to complement the GREEN module can be selected with jumpers.

Installation consists of removing any existing rolloff filters, setting jumpers and a switch, connecting the new rolloff filter(s) between your modulation monitor and your console monitor or monitor amplifier, and then grounding the rolloff filter(s).

Jumpers A and B select either the NRSC-standard de-emphasis or the adjustable de-emphasis on an 18dB/octave curve. See Fig. 1 for jumper positions. The jumpers are located on the circuit board inside the Monitor Rolloff Filter chassis. NRSC de-emphasis can be selected with or without a 10kHz notch filter. The notch filter will reduce any audible artifacts that might result from ringing introduced by the very sharp 10kHz low-pass filter specified by the NRSC, and will eliminate 10kHz carrier beats in off-air monitoring. This notch filter is disabled if the 18dB/octave rolloff is selected.

If the output impedance of the source is approximately 0 ohms (such as the output of an opamp), connect the source between the 0-OHM SOURCE and COM terminals on the Monitor Rolloff Filter chassis. If the output impedance of the source is 600 ohms, connect the source between the 600-OHM SOURCE and COM terminals.

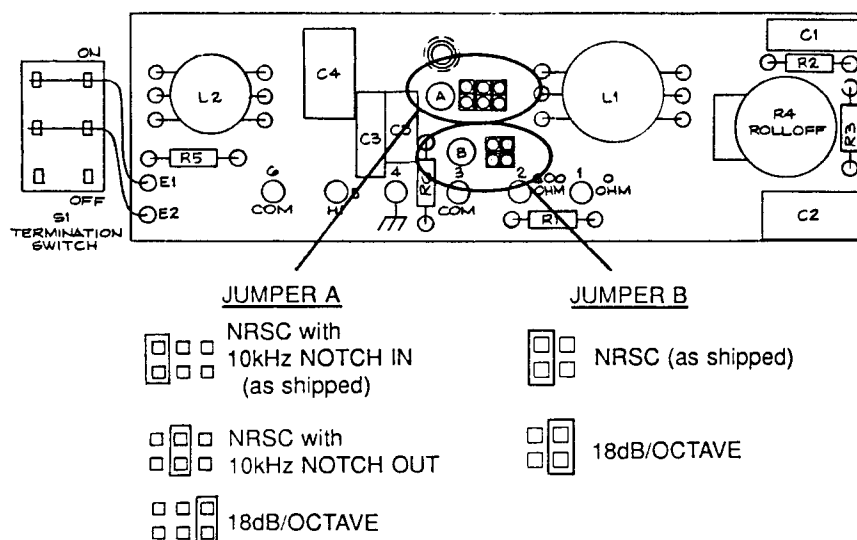


Fig. 1: Jumper Positions, ACC-023 NRSC Monitor Rolloff Filter (1 ch.)

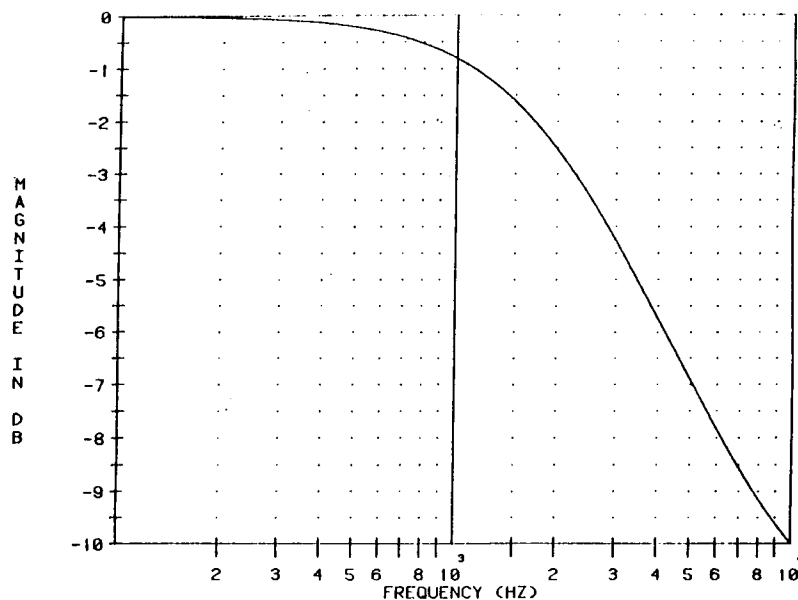


Fig. 2: NRSC-standard Rolloff Curve
ACC-023 Monitor Rolloff Filter

If your console monitor input or monitor amplifier input is bridging (like most modern amplifiers), set each Monitor Rolloff Filter's TERMINATION switch to ON. If your console monitor's or monitor amplifier's input impedance is a true 600 ohms, set the TERMINATION switch to OFF.

If you have set the jumpers for the adjustable 18dB/octave rolloff, adjust the Monitor Rolloff Filters' ROLLOFF controls for the most pleasing sound from your monitor. This control is disabled when the jumpers are positioned to select NRSC-standard de-emphasis. See Fig. 2 for the NRSC rolloff curve (Fig. 2-1 in the 9100A Operating Manual shows the 18dB/octave rolloff curves). For additional information about using this Monitor Rolloff Filter with the alternate (non-NRSC) pre-emphasis modules supplied with OPTIMOD-AM, see Addendum #1.

This change affects the following pages in the 9100A Operating Manual:

- 2-3 "Various Application Notes: Monitor Rolloff Filters"
- 3-10 "Installation: Monitor Rolloff Filter"
- 5-3 "Operating Instructions: Monitor Rolloff Filter"

- 3) **Low-pass filtering** is selected by jumpers on the 9100B/1's Card #1F10 or on the 9100B/2's Card #1S10. Day and night 10kHz low-pass filtering is specified by the NRSC standard. 5kHz and 12kHz low-pass filtering are also available. Any of these three low-pass filtering options may be chosen for day operation, and the same or either of the other two may be chosen for night operation. See Fig. 3 for jumper positions. See Appendix C for access to circuit cards.

These changes in low-pass filtering options affect the following pages:

1-1	"Introduction and System Description"
1-7, 1-8	"Introduction: Output Low-pass Filter and Safety Clipper"
2-5	"Various Application Notes: 5kHz Bandwidth Limitation"
2-12 to 2-16	"Various Application Notes: The #1-S Stereo Enhancement Card"

- 4) The **single-channel limiter** limits negative peak modulation to 75%, as required by C-Quam[®] exciters. The single-channel limiter can also be useful to minimize the action of the "compatibility controller" in unconverted Harris STX-1A exciters (Harris can provide a kit for converting the STX-1A to an STX-1B, which can then transmit C-Quam). The **stereo enhancer** can be used to increase level of the stereo difference channel to up to 6dB above that of the stereo sum channel. This can substantially increase stereo loudness and apparent stereo separation. When a large amount of enhancement is used, distortion is automatically prevented by the single-channel limiter, which dynamically reduces the gain of the L-R channel as necessary. However, a large amount of enhancement can sometimes increase apparent reverberation or introduce other changes in musical balance. Enhancement should therefore be used with discretion.

If you wish to use the stereo enhancer with Kahn or Magnavox exciters, defeat the single-channel limiter by de-soldering one side of diodes CR7 and CR11 from Card #1S10 (see assembly drawing in this addendum for locations of components).

References to the single-channel limiter and stereo enhancer in the 9100A Operating Manual still apply, except that the limiter and enhancer are now located on Card #1S10. See Fig. 3 for jumper positions.

- 5) The **200Hz L-R high-pass filter**, also now located on Card #1S10, is used to keep the L-R channel clear below 200Hz, so it can be used for telemetry or low-frequency SCA. These filters are not required for conventional AM telemetry, where low-level, low-frequency amplitude modulation of the RF envelope is used to send transmitter status information to the studio. Since the 200Hz L-R high-pass filter will degrade the low-frequency dynamic separation performance of the processing system, use it *only if necessary*.

References to the 200Hz L-R high-pass filter in the 9100A Operating Manual still apply. See Fig. 3 for jumper positions.

- 6) The 9100B's Card #1F10 (*mono*) or #1S10 (*stereo*) replaces the 9100A's Card #1, #1-F, or #1-S. This change affects references to the older cards throughout the 9100A Operating Manual, notably on pages:

2-12 to 2-16	"Various Application Notes: The #1-S Stereo Enhancement Card"
A-7	"System Description: Optional Stereo Enhancement Card"
B-8, B-9, B-10	"System Description: Optional Stereo Enhancement Card"
D-3	"Field Audit-of-Performance"

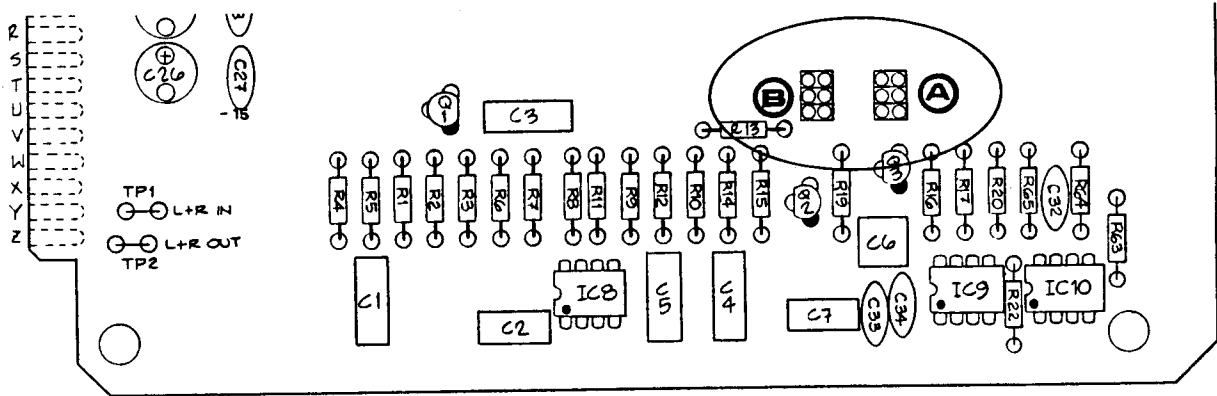
- E-8, E-9, E-10 "Field Alignment Procedure: Card #1-S Alignment and Performance Tests"
- F-5 "Trouble Diagnosis and Correction: Optional Stereo Enhance Card #1-S"
- H-1, H-2 "Installation and Operation of the Optional Filter Card"

Jumper A on Card #7 (and on Card #10, if installed) must be in the "CARD 1 INSTALLED" position when either Card #1F10 or Card #1S10 is in place.

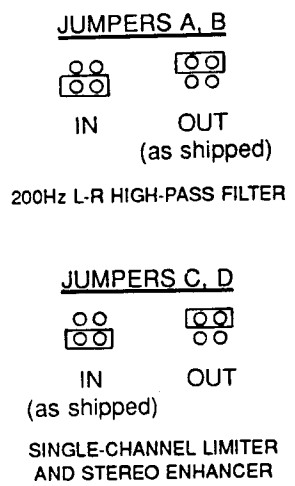
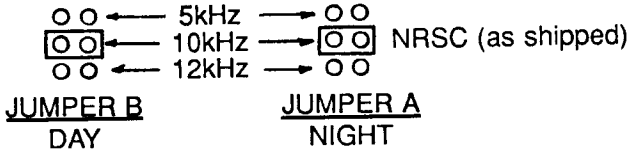
On Card #1F10, jumpers A (night) and B (day) select 5kHz, 10kHz, or 12kHz low-pass filtering in any combination for day and night filtering. On Card #1S10, jumper pairs E & F (night) and G & H (day) select the low-pass filtering. The NRSC standard specifies 10kHz low-pass filtering for both day and night. Card #1S10 jumpers C and D select or defeat the single-channel limiter and stereo enhancer. Card #1S10 jumpers A and B select or defeat the 200Hz L-R high-pass filter. Jumper positions are shown in Fig. 3 and on each card's assembly drawing.

Schematics and assembly drawings of Cards #1F10 and #1S10 are included in this addendum. Detailed descriptions of and evaluation procedures for the cards will be given in the 9100B Operating Manual.

- 7) At the request of Kahn Communications, we state that the instructions regarding installation of the **Kahn STR-84 exciter** given in Appendix I of the Third Edition of the 9100A Operating Manual *should be disregarded*. Instead, we advise contacting Kahn Communications and referring to the STR-84 Manual for advice on interfacing audio processing.
- 8) The **specifications** for the 9100B are essentially the same as those given for the 9100A in Appendix L of the 9100A Operating Manual. With the NRSC 10kHz low-pass filter in the circuit, total system frequency response is better than +0.5, -2.0dB, 50-9600Hz. System stereo separation is 30dB from 50-5,000Hz, 25dB from 5-7.5kHz.



#1F10



#1S10

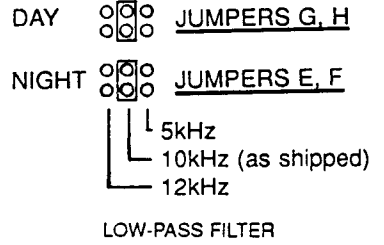
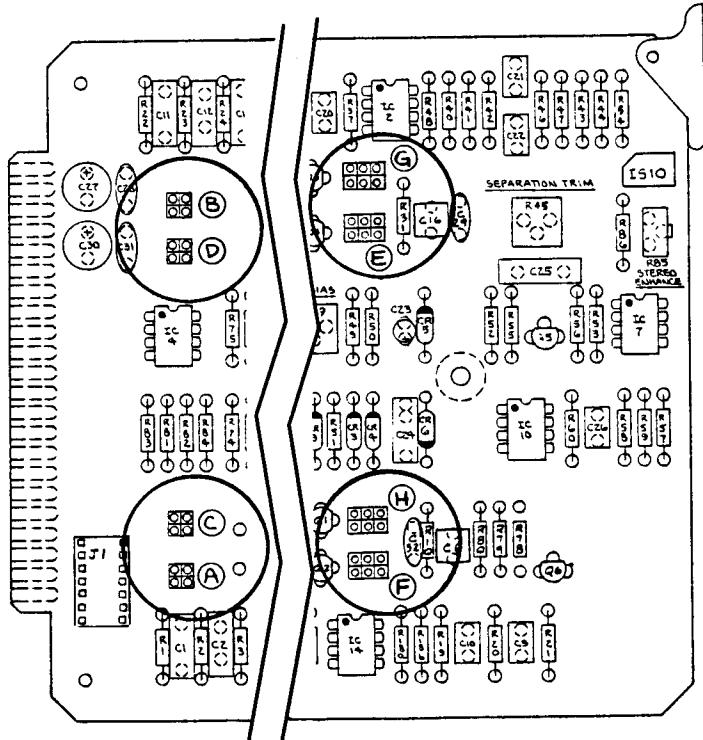
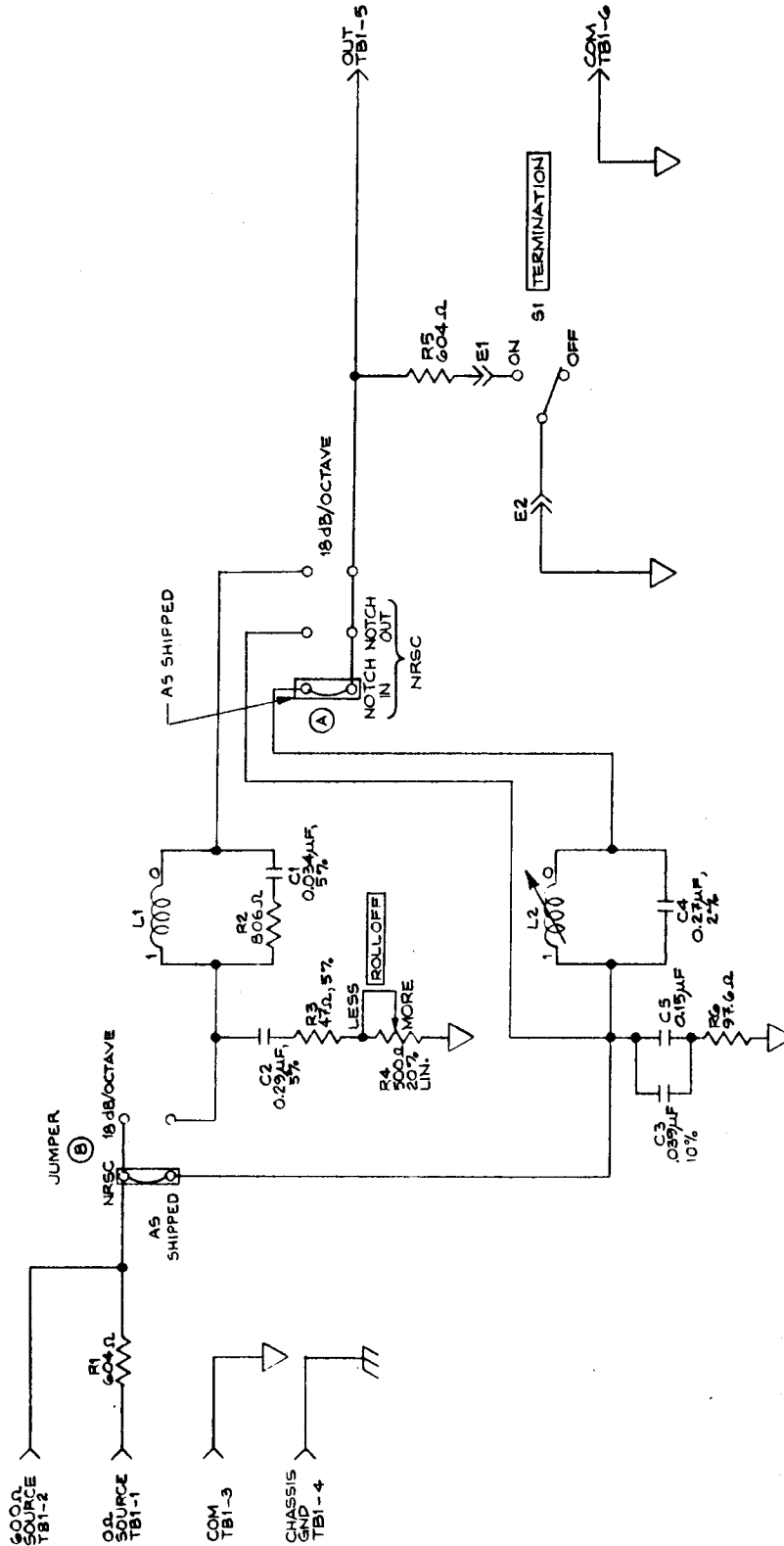


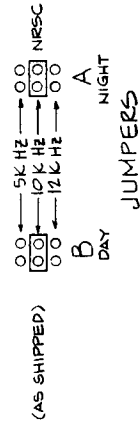
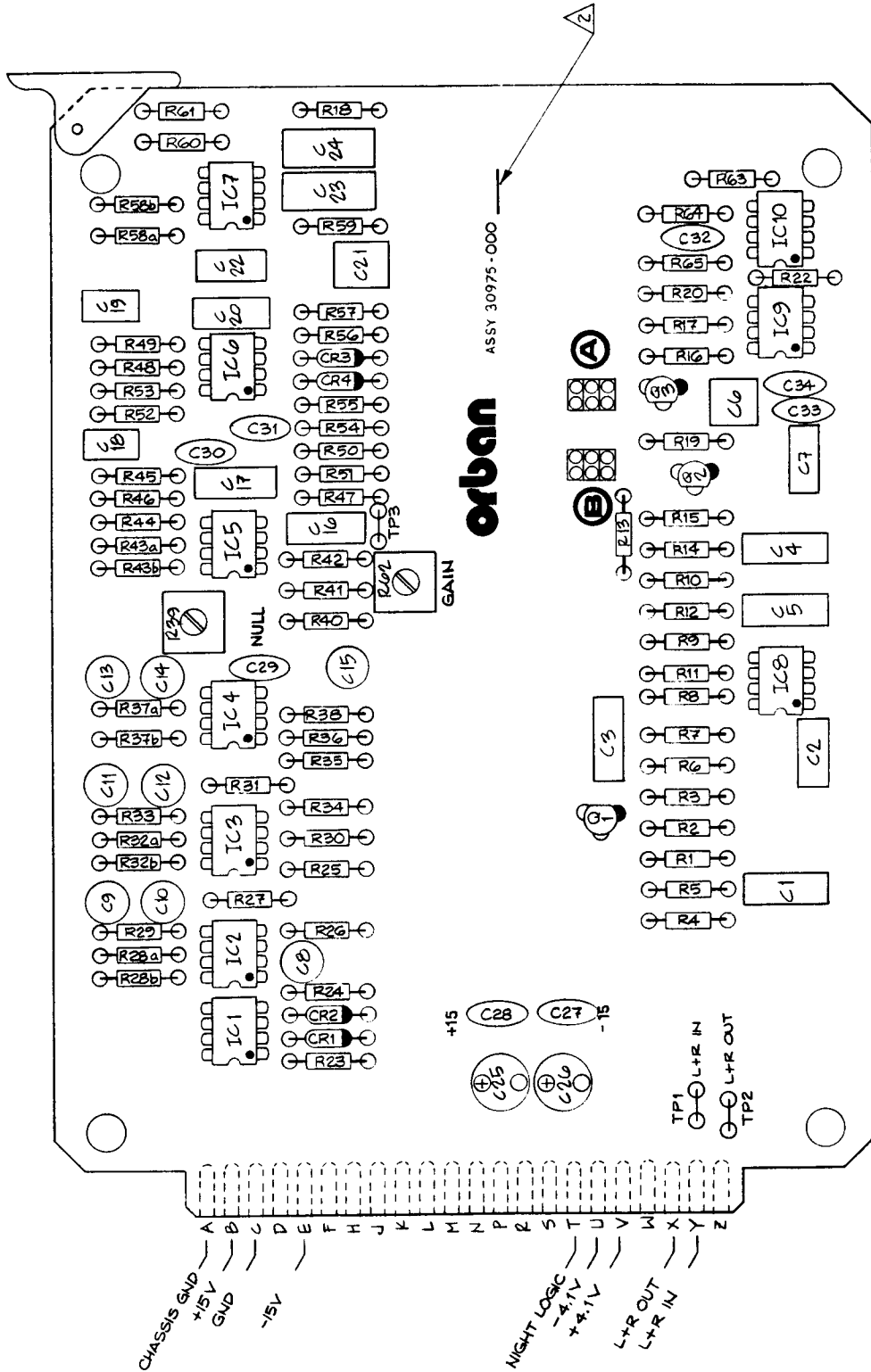
Fig. 3: Jumper Positions, Cards #1F10 and #1S10

Schematics, Assembly Drawings — ACC-023, Cards #1S10 and #1F10



Orban Associates Inc.
TITLE: SCHEMATIC ACC-023 MONITOR ROLLOFF FILTER 61016-000-01

See Fig. 1 for ACC-023 assembly drawing.



Orban Associates Inc.

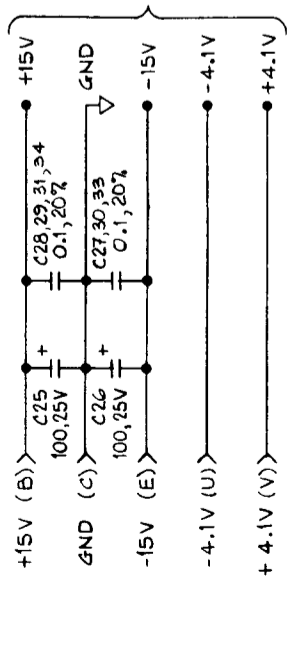
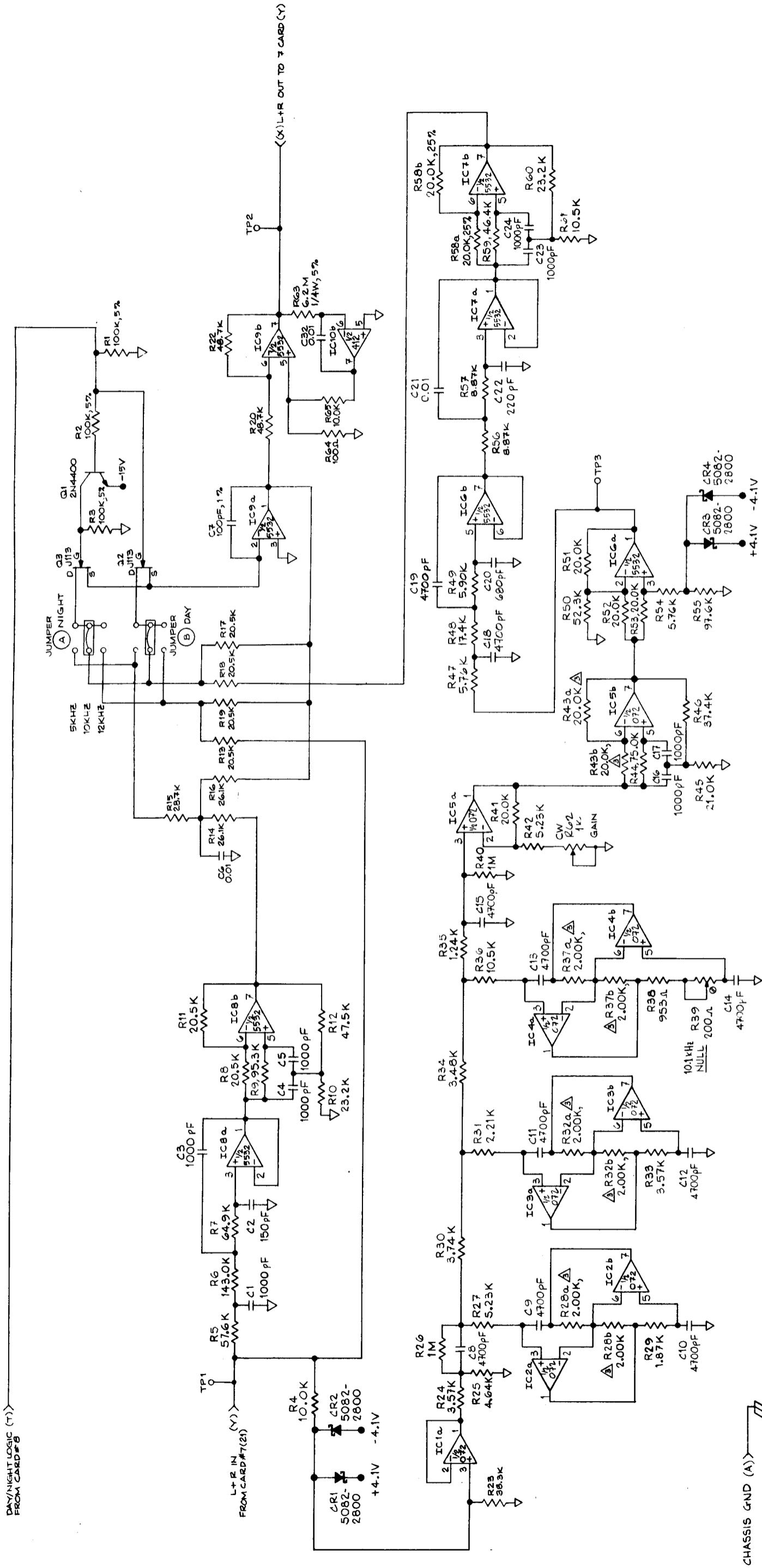
ASSEMBLY DRAWING
IF10 CARD
30975-000-01

3. REFERENCE SCHEMATIC 61012-000

MARK ASSY REV LEVEL IN SPACE PROVIDED.

1. TL MARK INDICATES PIN 1 OF IC'S, CATHODE OF DIODE, POS. SIDE OF CAP'S, EMITTERS OF TRANSISTORS.

NOTES: (UNLESS OTHERWISE SPECIFIED)



REF DES	ITEM	LAST	NOT USED
C	24		
CR	4		
IC	10	16/100	
G	3		
R	65	21	
TP	3		

IC PWR & GND PIN	+V	-V	GND
TL072	6	4	
7412CN	B	4	

LOCAL SOURCE (AS SHIPPED)
 0.05KHZ 0.0
 0.010KHZ 0.0
 0.012KHZ 0.0
 B A
 JUMPERS

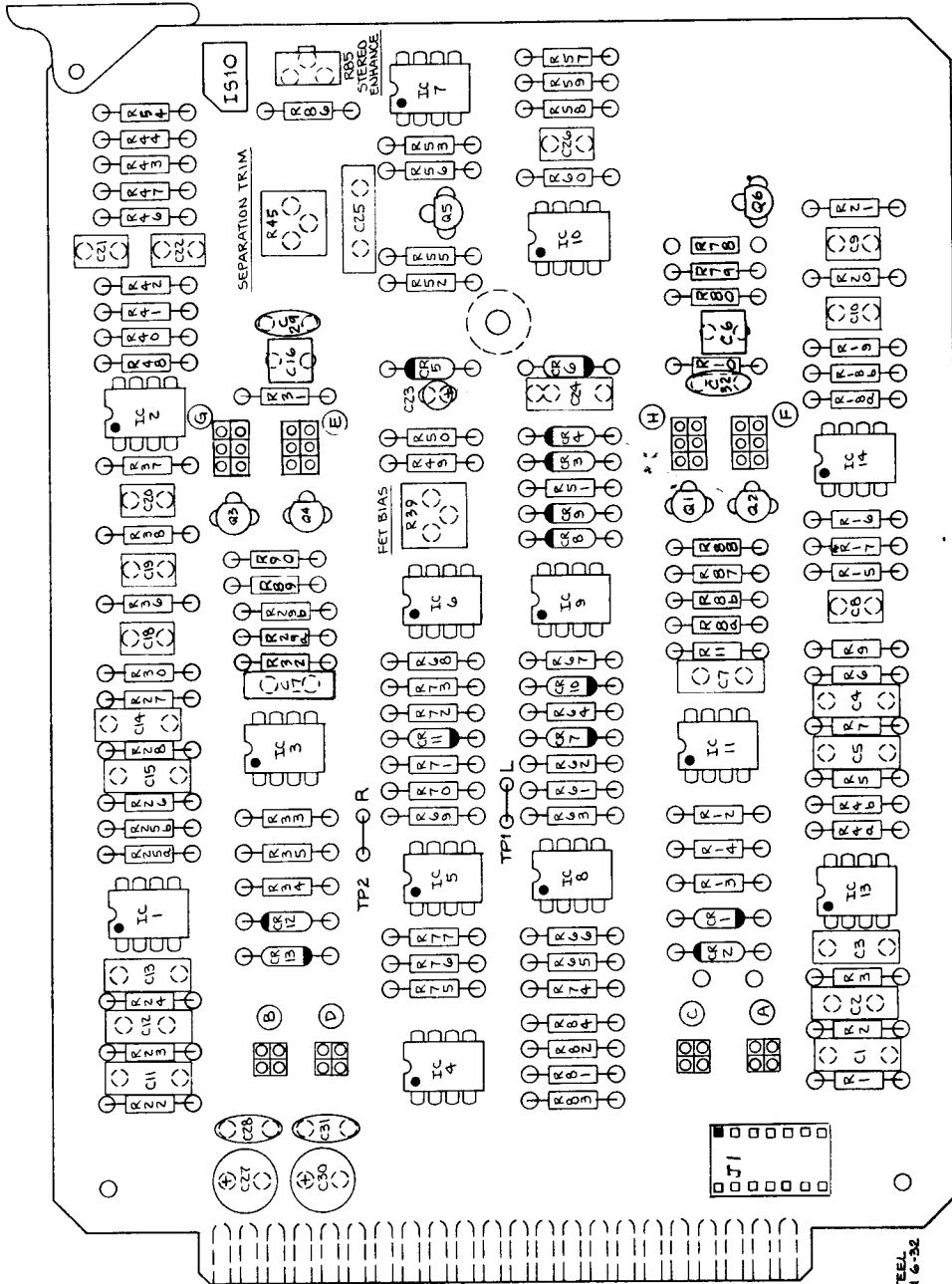
NOTES: (UNLESS OTHERWISE SPECIFIED)
 1 ALL CAPS ARE IN μ F, 1%.
 2 ALL RESISTORS \pm 1% 1/3W MF.

Orban Associates Inc.
 TITLE: SCHEMATIC
 IF10 CARD
 61012-000-01

Orban Associates Inc.



TITLE:
ASSEMBLY DRAWING
IS10 CARD
31013-000-01



COMPONENT SIDE

LOW-PASS FILTER JUMPERS

DAY 00 00 (D)
NIGHT 00 00 (E)

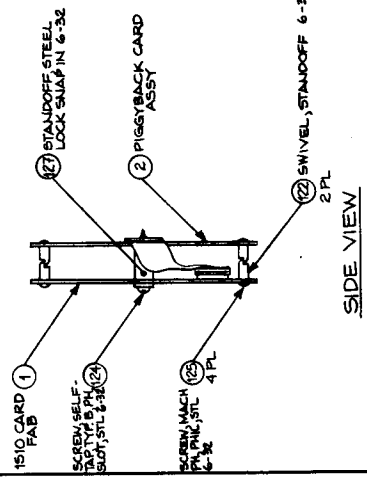
2000 Hz HIGH-PASS FILTER JUMPER
IN 00 00
OUT 00 00 (AS SHIPPED)

DAY 00 00 (H)
NIGHT 00 00 (E)

SINGLE-CHANNEL JUMPER STEREO-ENHANCER JUMPER
IN 00 00 (C) 00 00 (D)
OUT 00 00 00 00

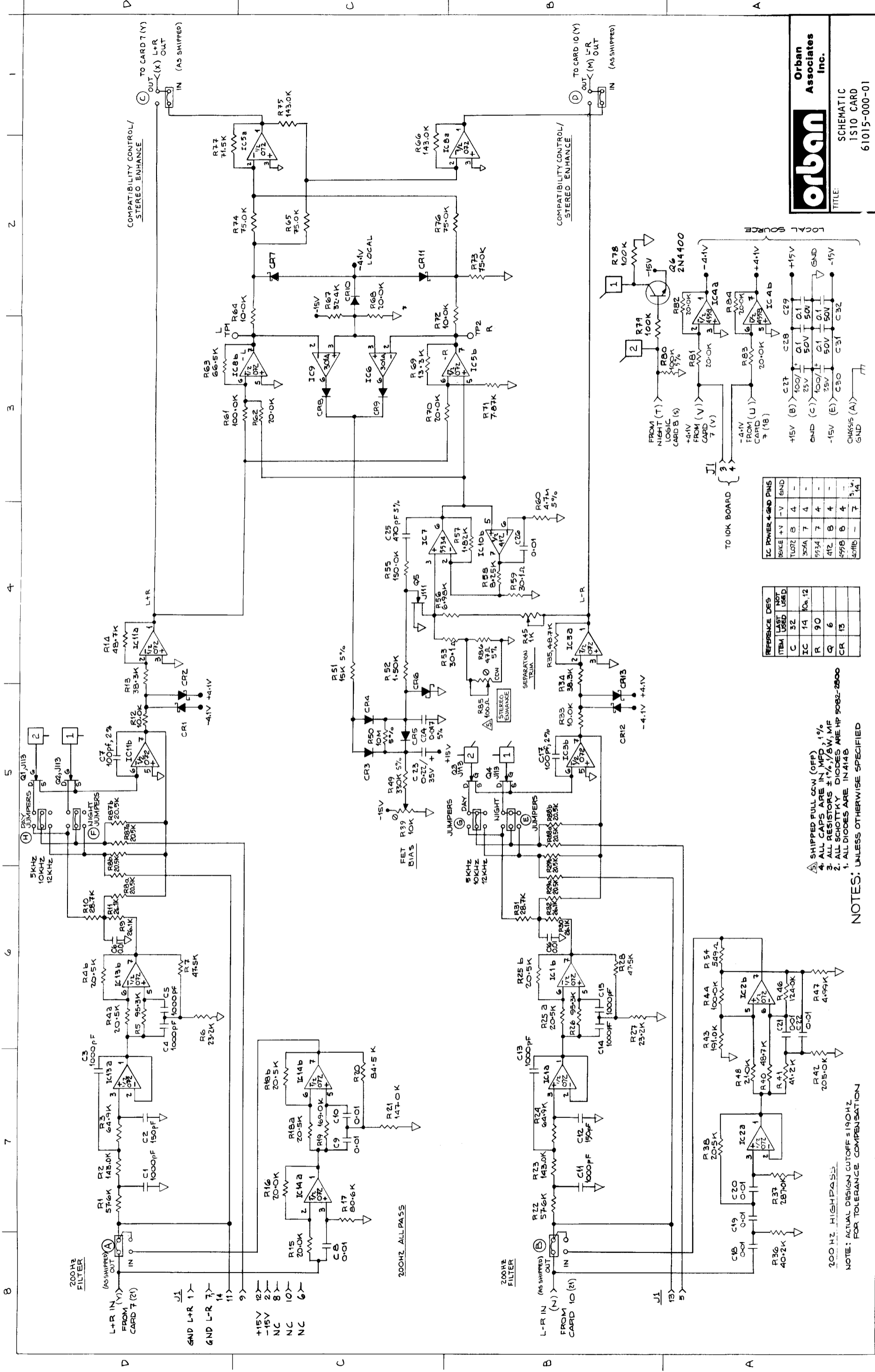
5 KHZ
10 KHZ (AS SHIPPED)
12 KHZ

SOLDER	COMPONENT
A	CHASSIS GND
B	+15V
C	GND
D	-15V
E	
F	
H	
J	
K	
L	
M	L-R OUT
N	L-R IN
P	
R	
S	
T	NIGHT LOGIC
U	-4.1V
V	+4.1V
W	
X	L-R OUT
Y	L-R IN
Z	



SIDE VIEW

3. I.C MARKS INDICATE PIN ONE OF IC'S AND MODULES, CATHODE OF DIODES, POSITIVE SIDES OF CAPACITORS, EMITTER OF TRANSISTORS.
 2. USE COMPONENT MFG. PADS, P/N 15051-000 FOR C27, C30.
 1. REF. SCHEMATIC P/N 61015-000
- NOTES: (UNLESS OTHERWISE SPECIFIED)



ITEM	LAST USED	NOT USED
C	32	
IC	14	10, 12
R	90	
Q	6	
CR	13	

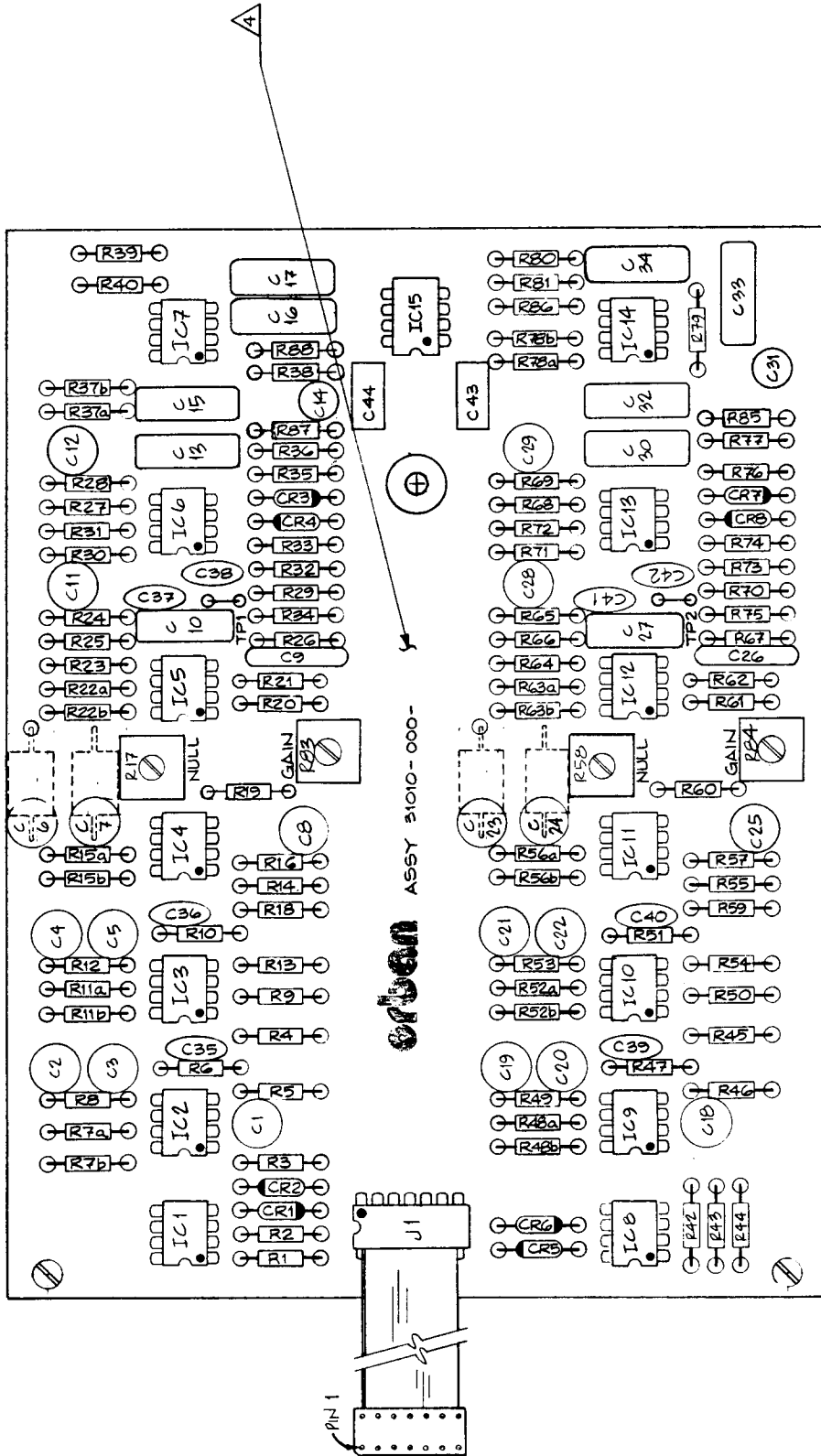
IC	V+	V-	GND
TL072	B	4	-
304A	7	4	-
5534	7	4	-
412	B	4	-
4558	B	4	-
4011B	-	7	5, 14

1. ALL DIODES ARE IN 4148
 2. ALL SHOTTKY DIODES ARE MP 5062-2500
 3. ALL RESISTORS ARE IN MFD, 1%, 1/8W, MIF
 4. ALL CAPS ARE IN MFD, 1%, 190HZ
 5. SHIPPED FULL GCM (OFF)

NOTE: ACTUAL DESIGN CUTOFF = 190HZ FOR TOLERANCE COMPENSATION

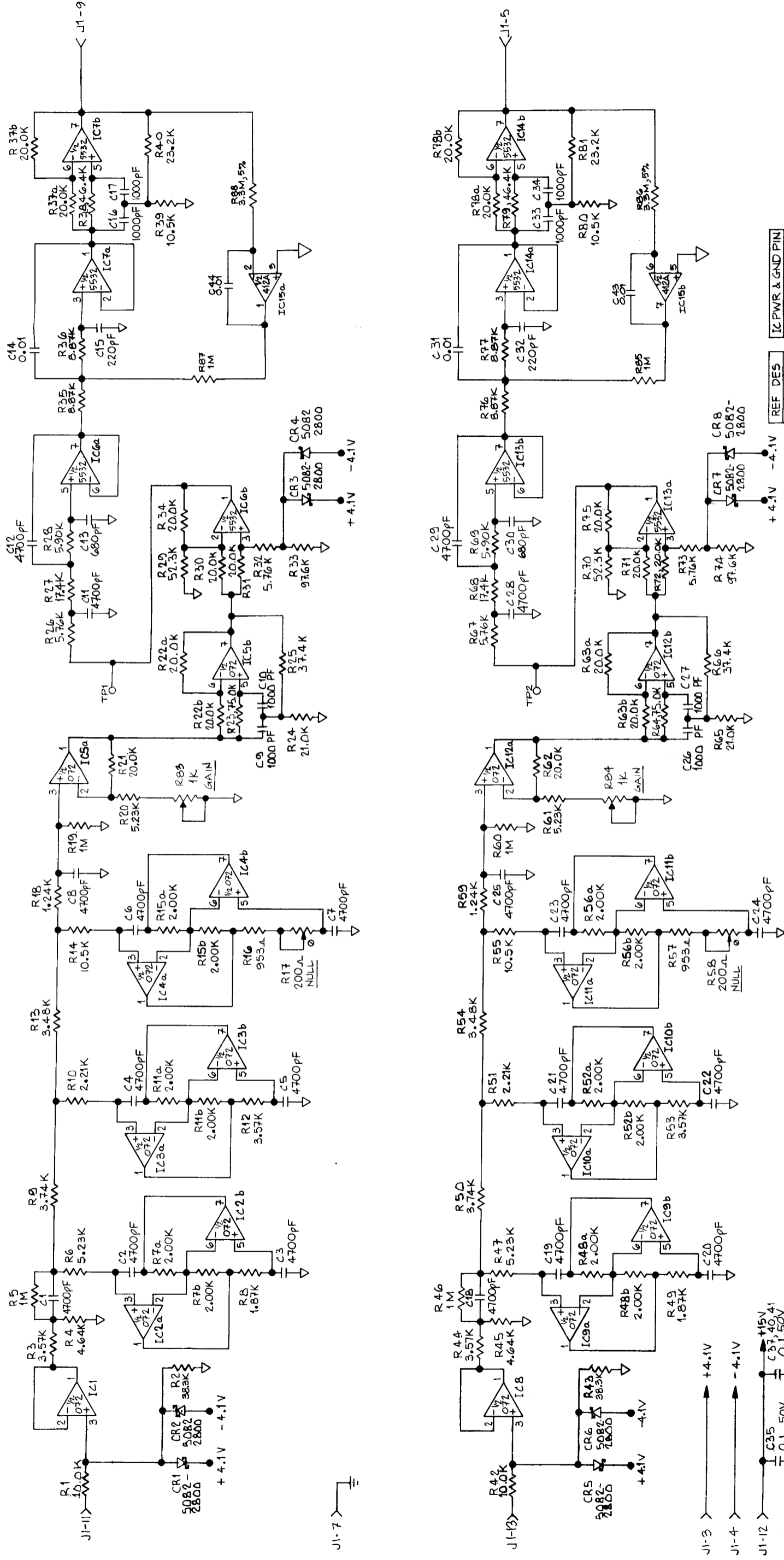
Orban Associates Inc.

TITLE: SCHEMATIC 1S10 CARD 61015-000-01



TITLE: ASSEMBLY DRAWING
 1S10's AUXILIARY CARD
 31030-000-01 (10KHZ FILTER)

- ▲ MARK ASSY REV LEVEL IN SPACE PROVIDED.
3. ALTERNATE PACKAGE MAY BE USED FOR C6,7,13,24 INDICATED BY DASHED LINES.
 2. TIC MARKS INDICATE PIN 1 OF IC'S, CATHODE OF DIODES.
 1. REF. SEE SCHEMATIC P/N 61013
- NOTES: (UNLESS OTHERWISE SPECIFIED)



REF	DES	ITEM	LAST	UNISH	IC	PWR	&	GND	PIN
C	44	072	8	4					
CR	8	5532	8	4					
IC	15	412	8	4					
R	88								
TP	2								

Orban Associates Inc.

Orban

TITLE: SCHEMATIC
1S10's AUXILIARY CARD
61013-000-01 (10KHZ FILTER)

3. THIS BOARD IS PIGGYBACK TO SCHEMATIC 61015.
 2. ALL CAPACITORS ARE IN μ F, 1%.
 1. ALL RESISTORS \pm 1%, 1/8W, MF.
- NOTES: (UNLESS OTHERWISE SPECIFIED)