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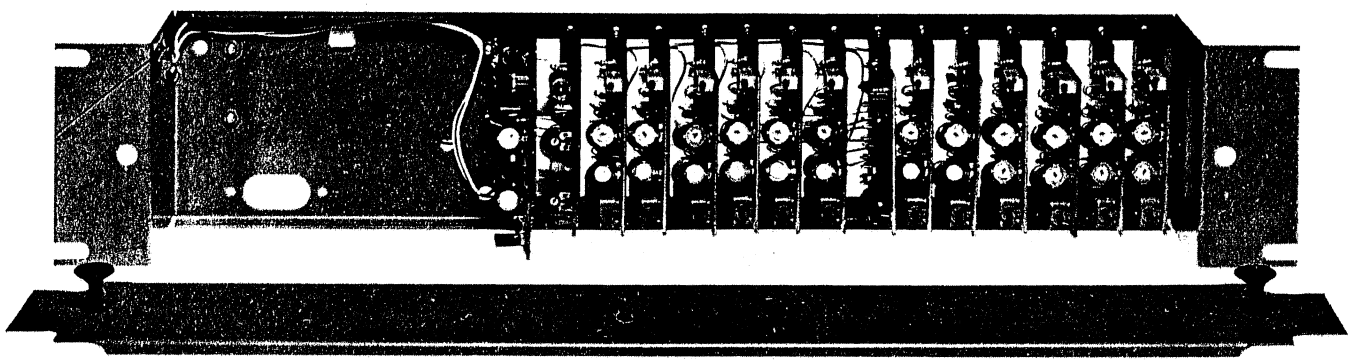
Instruction Manual

CETEC VEGA

Series 212A Shared Access Repeater Panel



INTRODUCTION

The Cetec Vega Model 212A cooperative-repeater control panel is a modular subsystem designed for CTCSS (continuous tone coded squelch system) control of multiuser radio repeater stations. One Model 212A panel can accommodate up to 28 individual users (using Model 268 dual decoders).

The Model 212A panel has 15 card slots, but is only wired to accommodate the number of modules the customer initially orders. This allows for future expansion while reducing initial costs. Upon ordering a decoder card, the connector and hardware is supplied at no additional cost for field installation into the 212A panel. All bus wires are then strapped at the rear of the panel to the connector as shown in Figures 1A through 1D.

The 212A operates from +10 to +18 Vdc (120 Vac power supply is optional) and comes with the required interface module installed. **Note:** All schematics and drawings refer to this input as 15 Vdc.

An optional three-minute timer is available to comply with FCC requirements in some radio services.

The decoder modules are continuously tunable from 67 to 251 Hz, thus allowing our customers to stock the decoder modules for immediate use for setting on any frequency.

Numerous test points and manual controls facilitate installation, set-up adjustments and maintenance. (Refer to Page 11, Adjustments.)

The Model 212A ia available in four standard configurations (refer to Page 2, Figure 1), with others available upon request.

DESCRIPTION

GENERAL

The Model 212A consists of various control modules that can be interconnected to perform any commonly required repeater control function. In Figures 1A through 1D, the signal flow and control paths may be followed to gain an understanding of the four standard versions.

As an example, in Figure 1A a repeater receiver feeds CTCSS tone to an interface module at TB2-11 (tone input). Voice may also be fed to the interface module for removal of the CTCSS tones at TB2-13 (high-pass filter in). The module then feeds processed CTCSS tone and voice back to the repeater transmitter through TB2-14 (tone output) and TB2-16 (high-pass filter output). The transmitter is also keyed under control of the interface card. Details of the operation will be provided later.

The interconnections for the four configurations of the Model 212A are shown in Figure 1 as follows:

212A-1	Up to 14 decoder modules
212A-2	Up to 13 decoder modules with time-out-timer/audio-gate module
212A-4	Two translators, up to 11 decoder modules with time-out-timer
212A-8	Two relay cards and eight decoder modules with time-out-timer/audio-gate module

Other Model 212A configurations are available upon special order.

A decoder module corresponding to each CTCSS tone utilized by a user receives the tone from the interface module. It detects its proper CTCSS tone frequency and in return feeds a keying voltage along with a filtered tone back to the interface module.

Sometimes a different tone is desired out of the repeater transmitter than was received (such as when using more than one repeater). In this case a translator module can be used.

A time-out-timer module turns off the repeater transmitter after a preset time interval (normally 3 minutes). This will prevent a transmitter locking up or will prevent a customer from talking too long. Also on this module is an off-delay timer which allows adjustment of the off-delay timer of all decoder modules in the system with a single control. The module also includes an audio gate to enable/disable an audio path in response to the presence or absence of an appropriate CTCSS tone.

An optional power supply provides 15 Vdc to all modules.

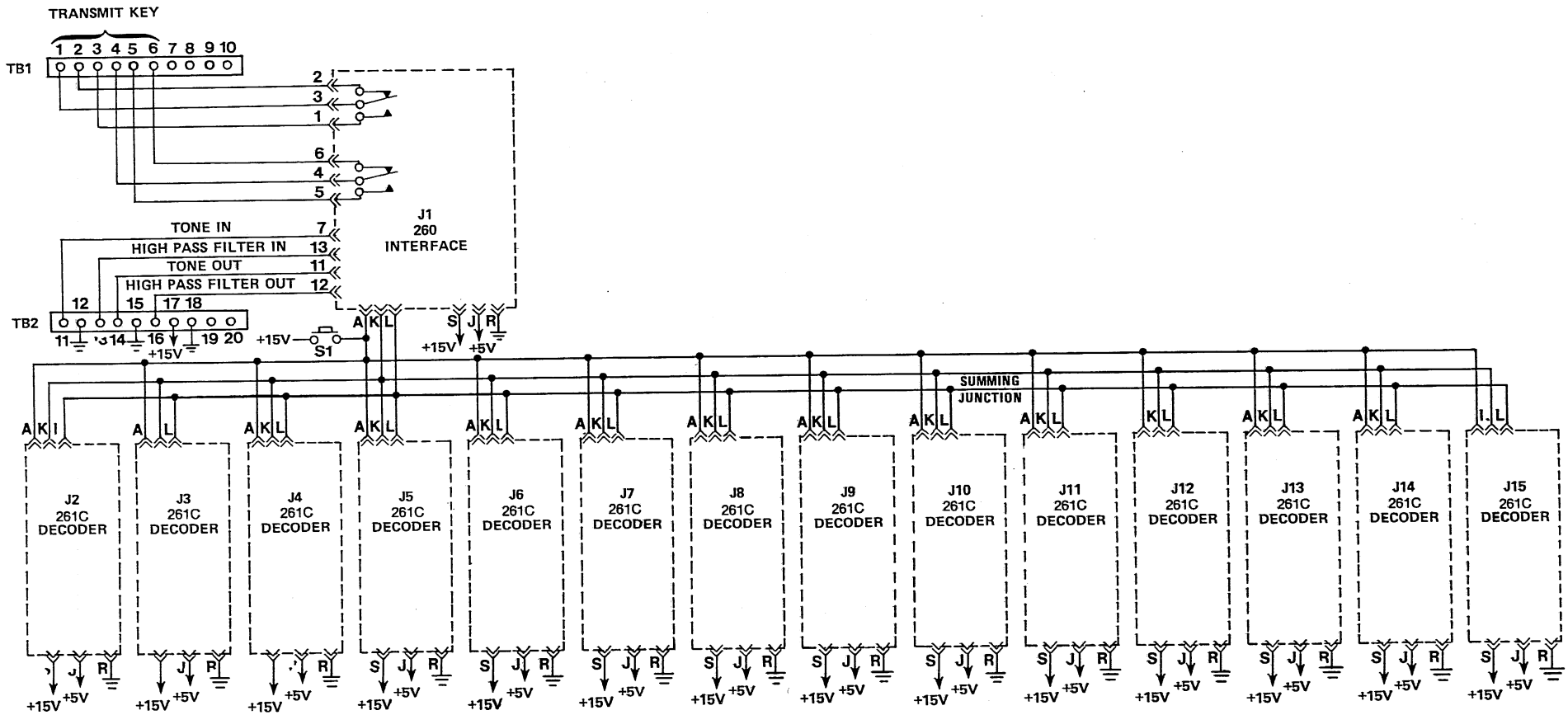


Figure 1A. Model 212A-1 with up to 14 decoder modules.

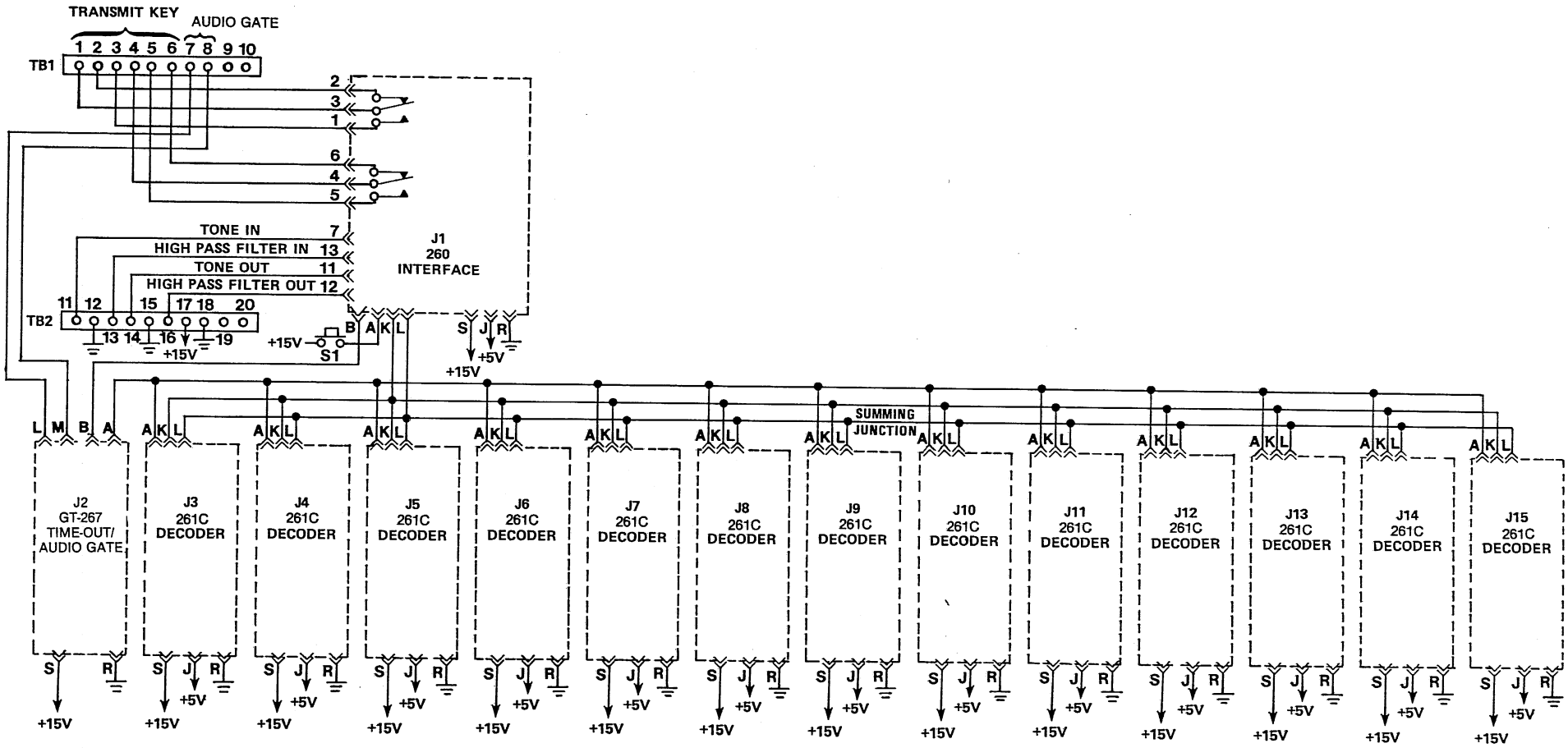


Figure 1B. Model 212A-2 with up to 13 decoder modules and time-out-timer/audio-gate module.

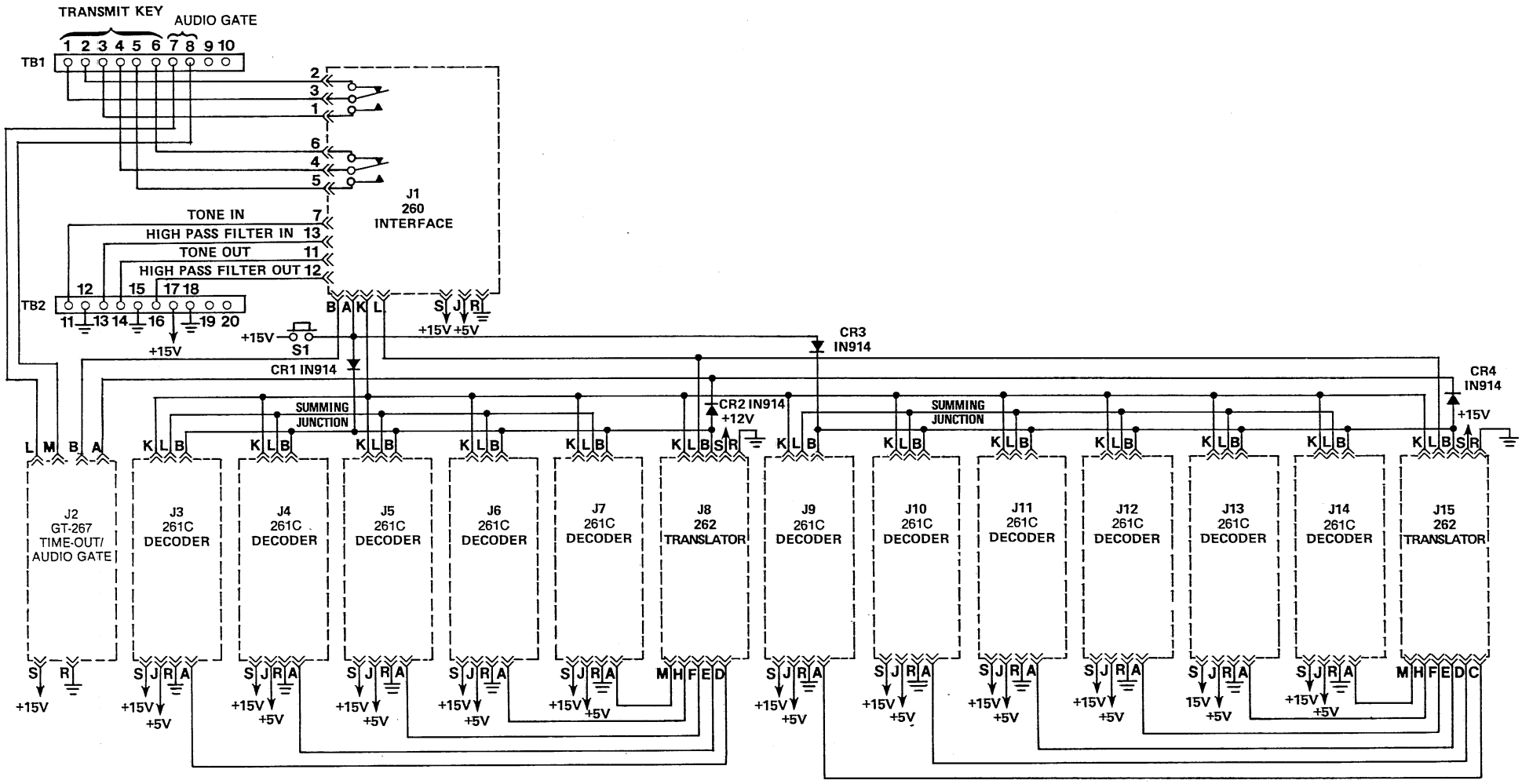


Figure 1C. Model 212A-4 with two translators, up to 11 decoder modules, and time-out-timer/audio-gate module.

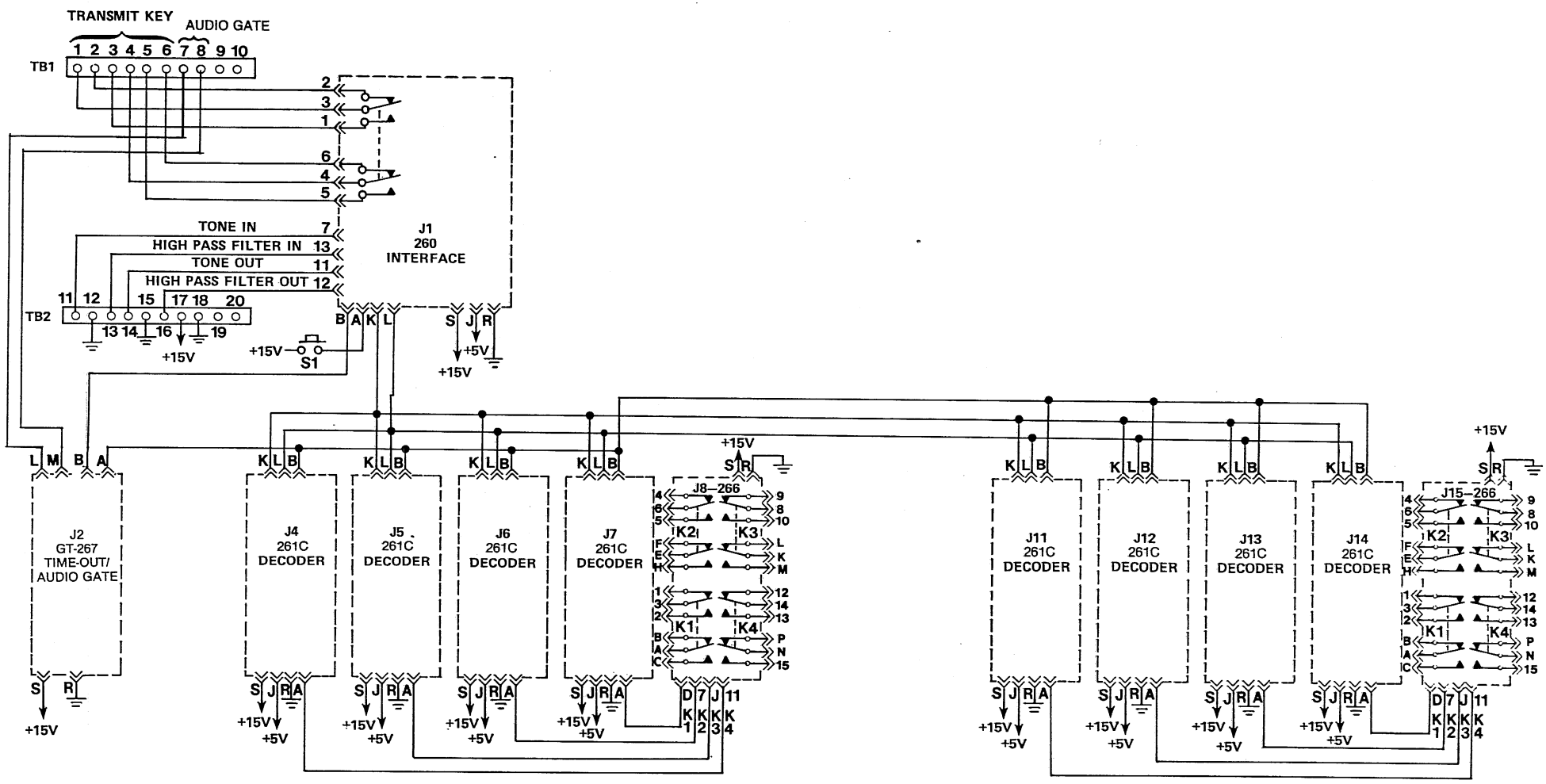


Figure 1D. Model 212A-8 with two relay cards and eight decoder modules with time-out-timer/audio-gate module.

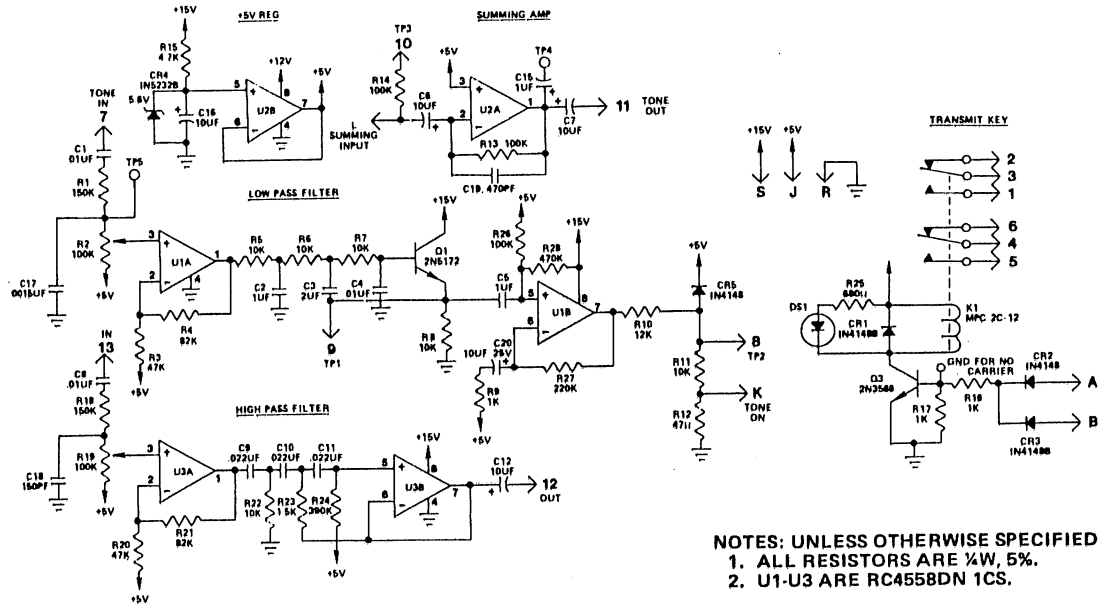


Figure 2. Schematic for Model 260 interface module.

MODEL 260 INTERFACE MODULE (Figures 2 & 3)

The 260 module provides the interface connections from the repeater receiver to the 212A circuits and to the repeater transmitter.

The tone input at pin 7 is adjusted by R2 and fed into an active low-pass filter consisting of integrated circuit U1A, Q1, and associated components. This filter removes audio-frequency energy that might be present at the input. Integrated circuit U1B feeds the CTCSS band of frequencies out to pin K on all connectors to the inputs of the decoders. Audio input at pin 13 is fed through a high-pass filter to remove all CTCSS tones, preventing interference of CTCSS tones in the two transmitter inputs. There may be a number of decoders and translators all capable of generating tones. These are summed at pin L and fed through a summing amplifier U2A to the tone output to the transmitter through pin 11.

A combining function is brought about at Q3 where all decoders, translators, or the timer join together to pull in the keying relay, K1, whenever one decoder is receiving a tone. A light-emitting diode, DS1, is lit whenever the keying circuit is actuated and the keying relay is pulled in.

The last circuit on the interface PCB is a 5-volt regulator. This regulator circuit drops the + 15 V to a low-impedance source of + 5 V for use in other modules in the 212A panel.

All setup procedures and proper readings are located in the adjustment section of this manual.

Location of parts on the Model 260 interface card is shown in Figure 3.

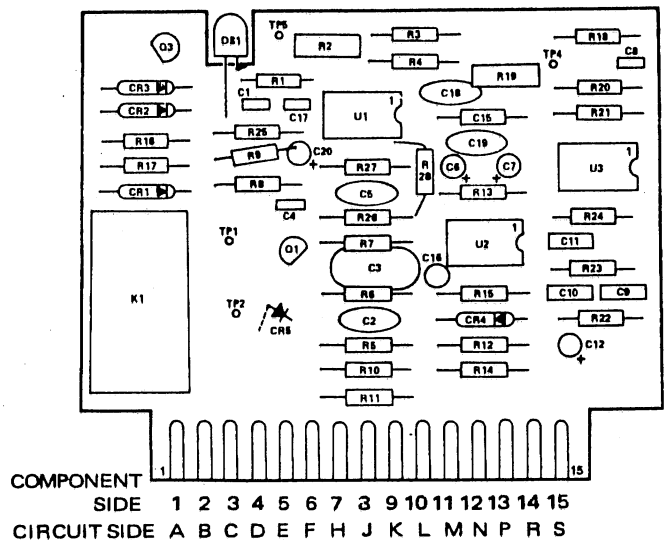


Figure 3. Parts location for Model 260 interface module.

212A & 260 SPECIFICATIONS

High-Pass Output:	CTCSS tones filtered (– 25 dB at 100 Hz)
Tone Output Level:	2 Vrms at 2 mA peak current, adjustable
Power Required:	+ 10 to 18 Vdc (pos. or neg. gnd.); 115 Vac opt.
Maximum Current Drain:	75 mA
Repeater Key Interface:	Two form C relays; rated 0.5 A, 115 V
External Connections:	Screw terminal barrier strips
Operating Temperature Range:	– 30° to + 70°C
Panel Dimensions:	Height—3.5 in. (8.9 cm); width—19 in. (48.3 cm); depth—6 in. (15.2 cm)
Input Sensitivity:	10 mV to 5 V, adjustable
Input Impedance:	Greater than 150 kohms
Dynamic Range:	20 dB (for input level of at least 10 mV)

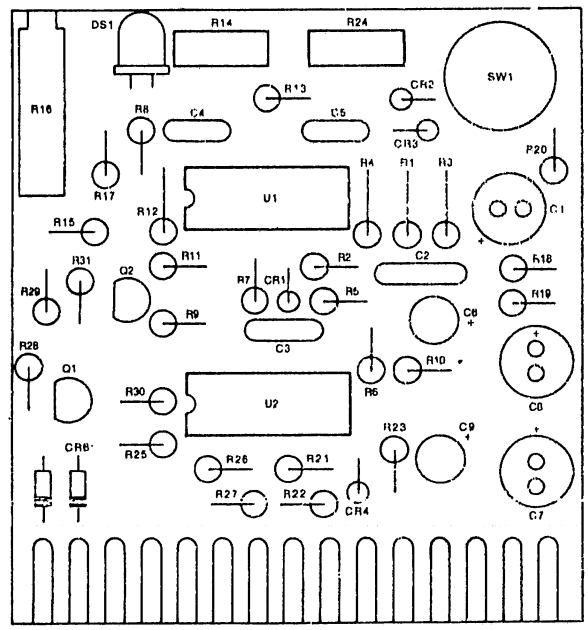


Figure 5. Parts location for Model 261C decoder module.

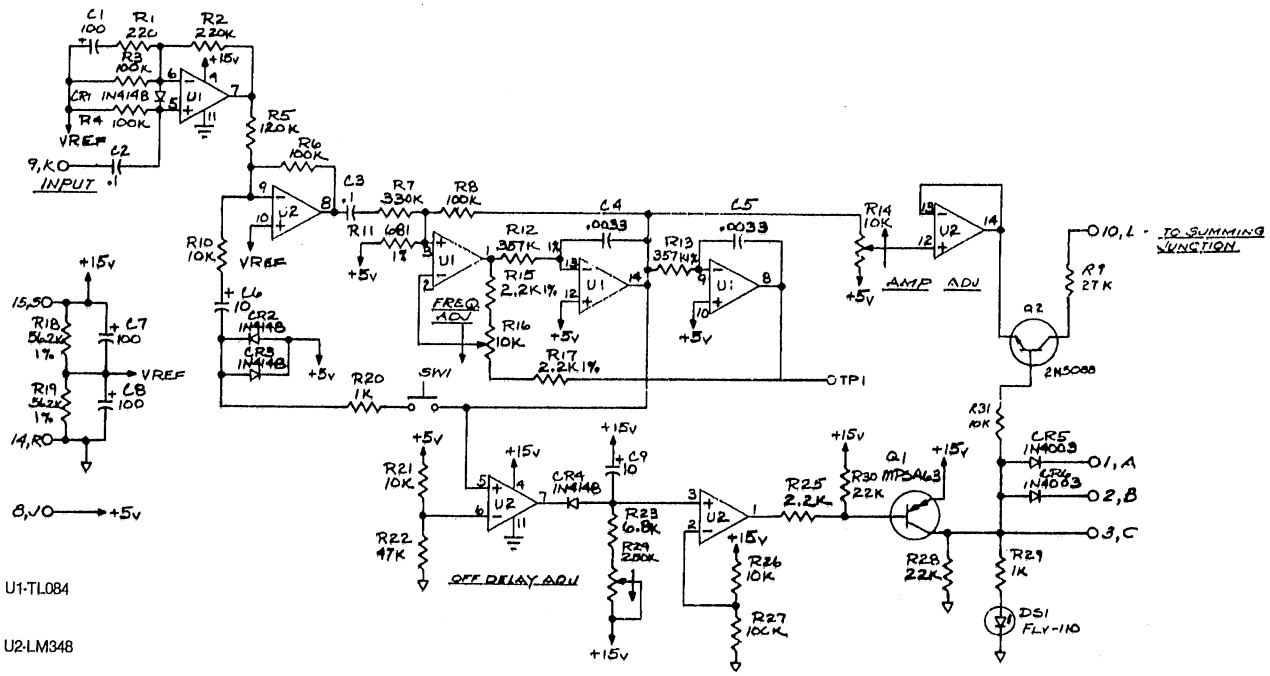


Figure 4. Schematic for Model 261C decoder module.

MODEL 261C DECODER MODULE (Figures 4 & 5)

The 261C decoder with tone gate is a direct replacement for the original 261 and 261B decoders. The 261C decoder provides a push-button encode mode for easy tuning and testing. The hold delay time of the decoder is adjustable (R24) to up to five seconds if desired.

An adjustment of 0.5 second to 1 second is recommended. The tone from the interface module is fed through pin 9,K to the active filter network of the decoder. Upon receiving its correct tone frequency the decoder will provide a dc voltage out at pins A,1, B,2, and C,3 and light a light-emitting diode (DS1).

The frequency of the decoder is determined by adjusting R16, a 15-turn potentiometer. Install the decoder module into the appropriate socket, connect a frequency counter to TP1, and depress SW1 while adjusting R16 for the desired center frequency.

The output level is adjusted by R14 and is fed to the summing amplifier of the interface card through R9 pin 10,L. (See adjustment procedure for proper setting.) The tone gate (Q2) is turned on by the keyed output to disconnect the output (L,10) except when tone is present. This procedure avoids a small additive noise output that might exist if a large number of encoders were connected in parallel with no isolating tone gate. A narrow band-pass filter removes all noise, impulses, and distortion presented at the receiver tone output to provide a pure CTCSS tone to the transmitter.

Location of parts for the Model 261C is shown in Figure 5.

NOTE: For operation from + 10.0 to + 11.5 Vdc, change R21 to 5.6 kΩ (was 10 kΩ). For increased limiting gain to be directly compatible with older 261 decoders, change R2 to 300 kΩ (was 220 kΩ). Necessary only when operating with very old 260 cards, or when 260 is adjusted to be below limiting (as when very low system deviation is used).

Detection bandwidths wider than the specified ± 1.5% (for use with older reed-type and other less stable encoders) may be achieved by increasing the value of R11. A value of 1.0 kΩ increases the standard bandwidth by almost 50% to approximately ± 2.2%. A value of 1.3 k Ω approximately doubles the detection bandwidth to almost ± 3.0%. Use a 1% metal film resistor for best stability and accuracy.

MODEL 261C SPECIFICATIONS

Frequency Range:	67 to 251 Hz, continously adjustable
Selectivity:	± 1.5% of selected frequency
Frequency Stability:	± 0.25%
Detect Time:	200 ms typical at 100 Hz
Maximum Current Drain:	LED on, 30.5 mA; LED off, 10 mA @ 15 Vdc
Output Distortion:	0.8% worst case, 0.3% typical
Off Delay:	Adjustable from 200 ms to 5 s
Dimensions:	2-½ in. (6.3 cm) × 2-¾ in. (7.0 cm) × ¾ in. (1.8 cm)

MODEL 268 DUAL DECODER MODULE (Figures 6 & 7)

The Model 268 dual decoder is a direct replacement for Model 261 decoders used in Model 212A shared-access repeater panels. It requires no rewiring when used in the 212A unless it is used with the 271/272 repeater lockout feature. The Model 268 is plug-compatible with previous 261 type decoders. All functions are on one printed-circuit board no larger than previous models. When either of the two selected tones are received, the repeater system responds in the normal way.

See Figures 6 and 7 for parts location and schematic for the Model 268. The decode frequency is determined by either of two 15-turn linear potentiometers adjustible on the end of the PCB. Install the module into an appropriate socket, connect a frequency counter to TP1, and press the handle of S1 towards the potentiometers. Adjust R13 for the desired center frequency. Connect the frequency counter to TP2, press the handle of S1 away from the potentimeters, and adjust R31 for the second desired frequency. If only one frequency (F1) is used, disable the decoder section not used (F2) by shorting out R28.

Whenever test or adjustments are needed, the decoder can be put into an encode mode by pressing the handle of S1 in the proper direction to activate one decoder section or the other. Holdover time can also be adjusted using S1. Press handle of S1 toward potentiometers and release, checking holdover time. Adjust R17 to obtain the desired holdover period. Usually ½ to one second will be satisfactory. Repeat

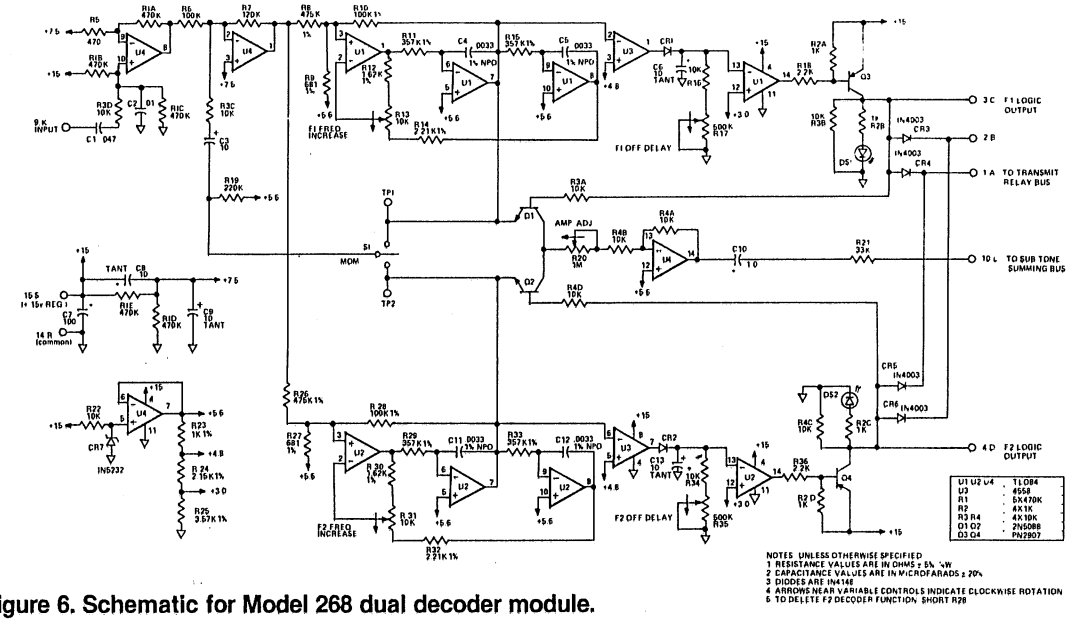


Figure 6. Schematic for Model 268 dual decoder module.

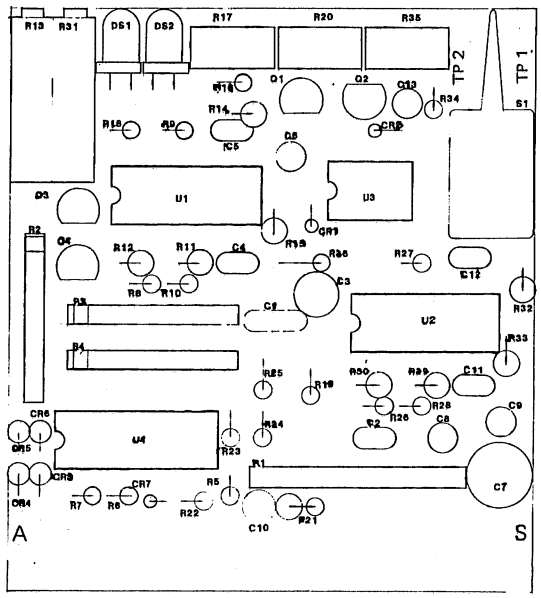


Figure 7. Parts location for Model 268 dual decoder module.

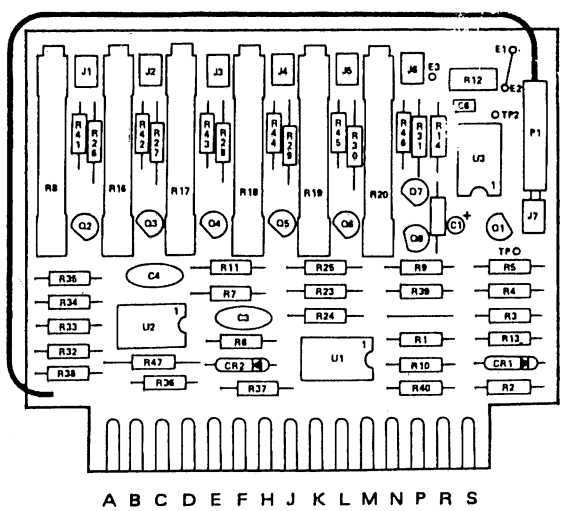


Figure 8. Parts location for Model 262 translator module.

with S1 pushed in the opposite direction to adjust R35.

Output level is adjusted by pushing the handle of S1 in either direction while adjusting R20 to obtain the desired tone level at pin 10,L of the connector. Usually, this tone is adjusted for 10% of normal transmitter deviation.

A tone gate (Q1 and Q2) is provided at each decoder output to avoid the additive noise that might be present if a large number of decoders were connected together.

When either one of the two tones (to which the 268 is tuned) is received, the module will provide an output dc voltage at connector pins A,1 and B,2 plus a logic output at either pin C,3 or C,4. LED DS1 or DS2 will glow, indicating the decoder detecting a CTCSS tone.

When operating with very early 260 modules or when the 260 is adjusted to be below limiting level (as when a very low system deviation is used), increased Model 268 limiter gain may be obtained by decreasing R5 from 470Ω to 330Ω.

A frequency spacing between tones of at least 6% is recommended for most reliable operation but adjacent tones from the EIA list can be used if necessary.

Detection bandwidths wider than the specified ±1.5% (for use with reed-type and other less stable encoders and decoders) may be achieved by increasing the value of R9 for frequency one and R27 for frequency two. A one-thousand-ohm resistance value increases the bandwidth from ±1.5% to about ±2.2%. To widen the bandwidth to about 3.0%, use 1300-ohm resistors. Use only 1% metal film resistors.

MODEL 268 SPECIFICATIONS

Frequency Range:	55 to 285 Hz, continuously adjustable
Selectivity:	±1.5% of selected frequency in 67 to 251 Hz range
Frequency Stability:	±0.25%
Detect Time:	200 ms typical at 100 Hz
Off Delay:	200 ms to 5 s, adjustable
Output Distortion:	0.8% worst case, 0.3% typical
Power Requirements:	
Voltage:	+10 to + 18 Vdc regulated 27 mA
Current at 15 V:	LED off, 50 mA plus external relay current with LED on.
Dimensions:	2.5 in (6.35 cm) × 2.75 in. (7.0 cm) × 0.75 in (1.9 cm)