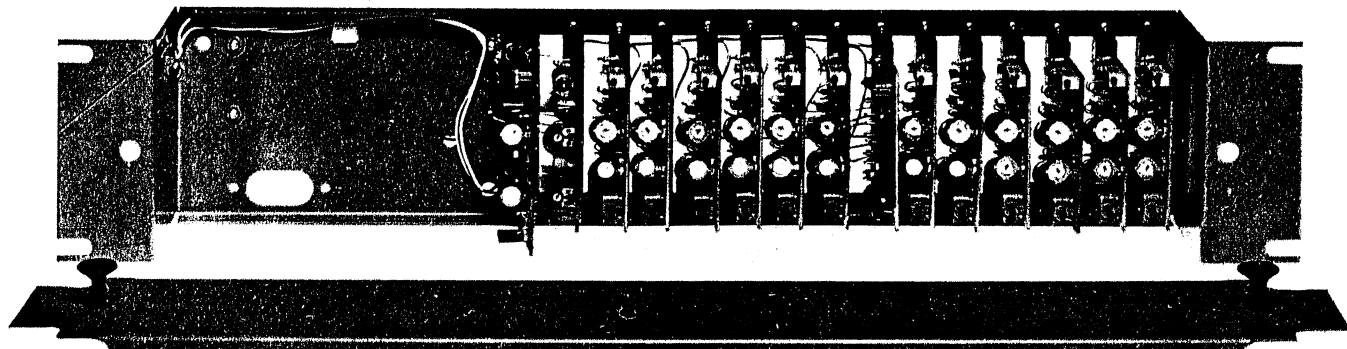


Changes

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 is 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.

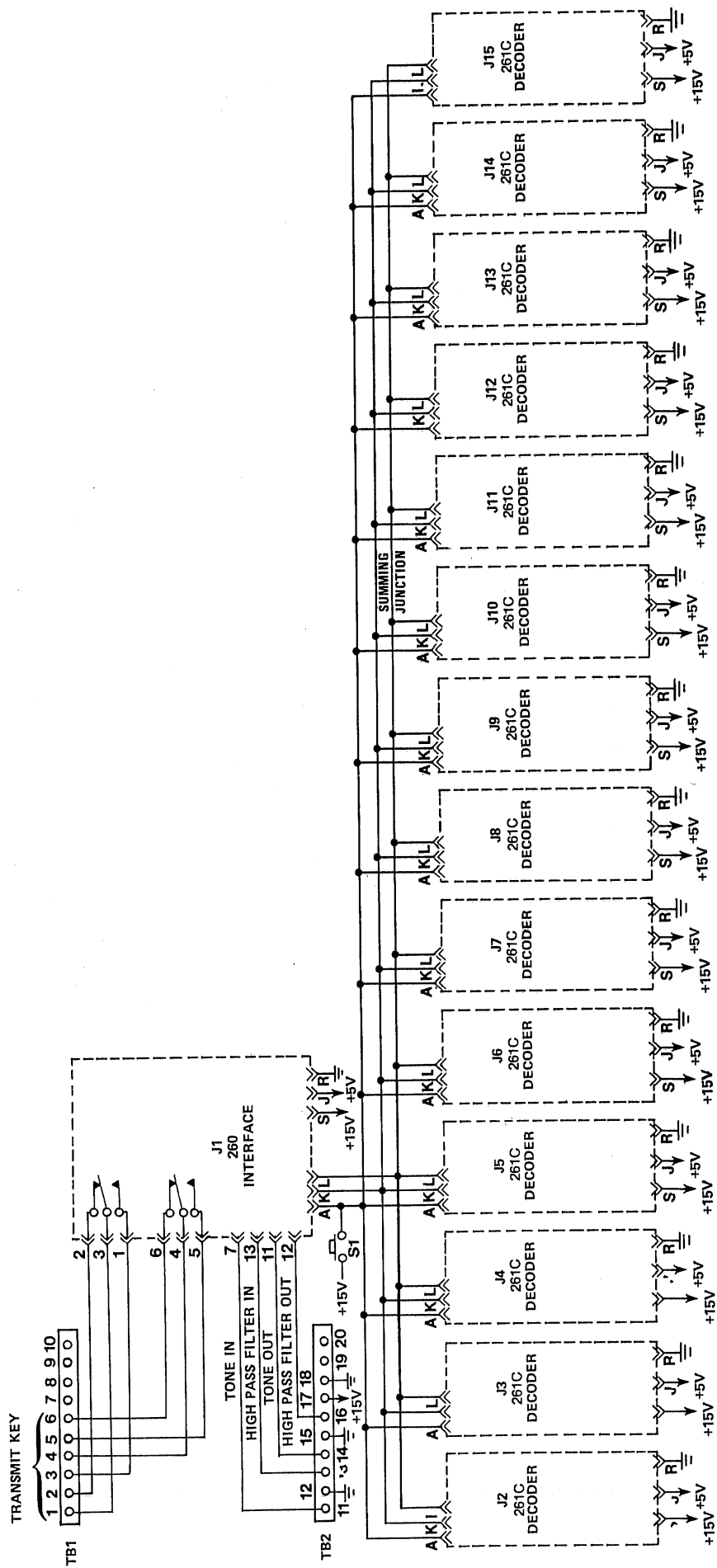


Figure 1A. Model 212A-1 with up to 14 decoder modules.

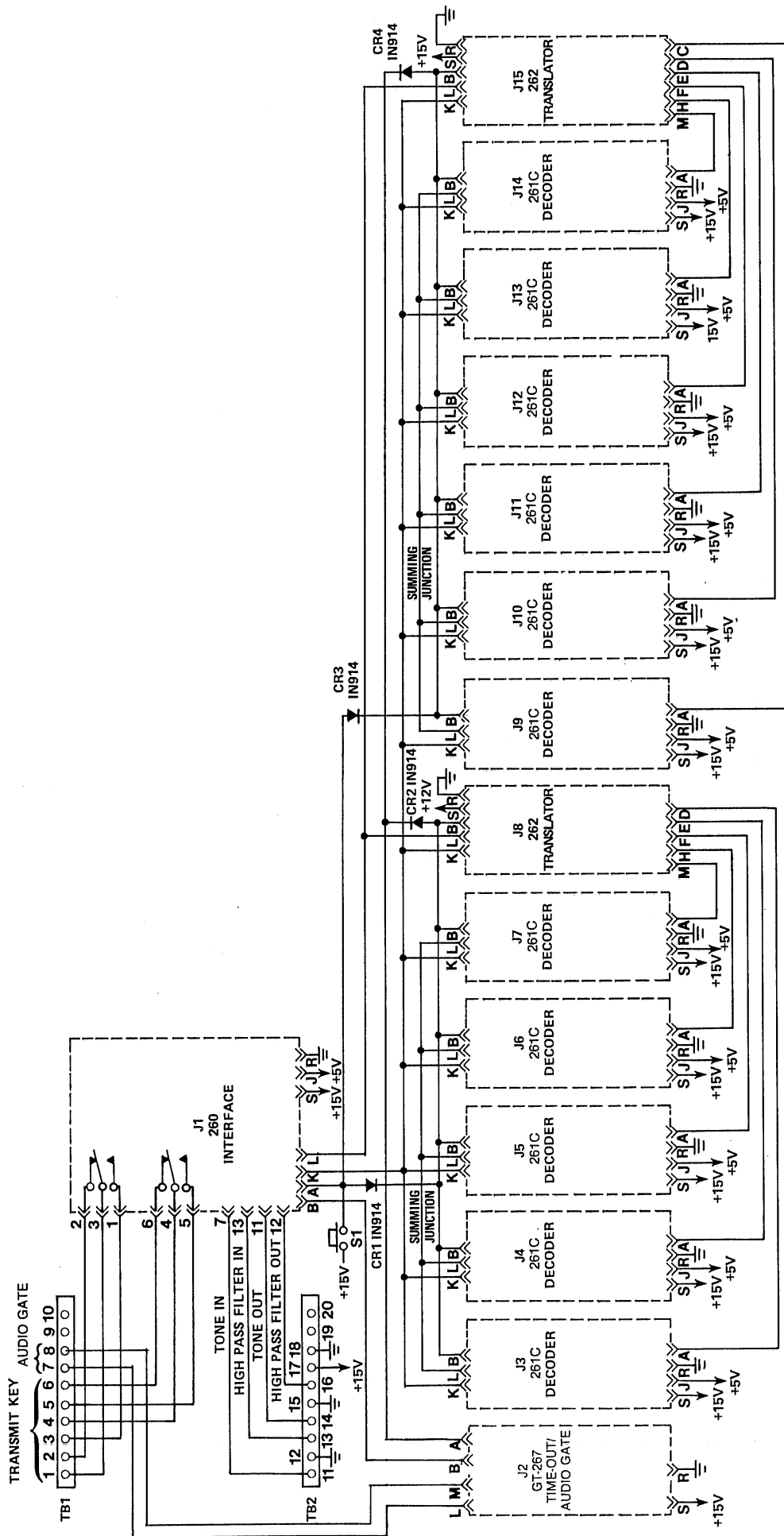


Figure 1C. Model 212A-4 with two translators, up to 11 decoder modules, and time-out-timer/audiot-gate module.

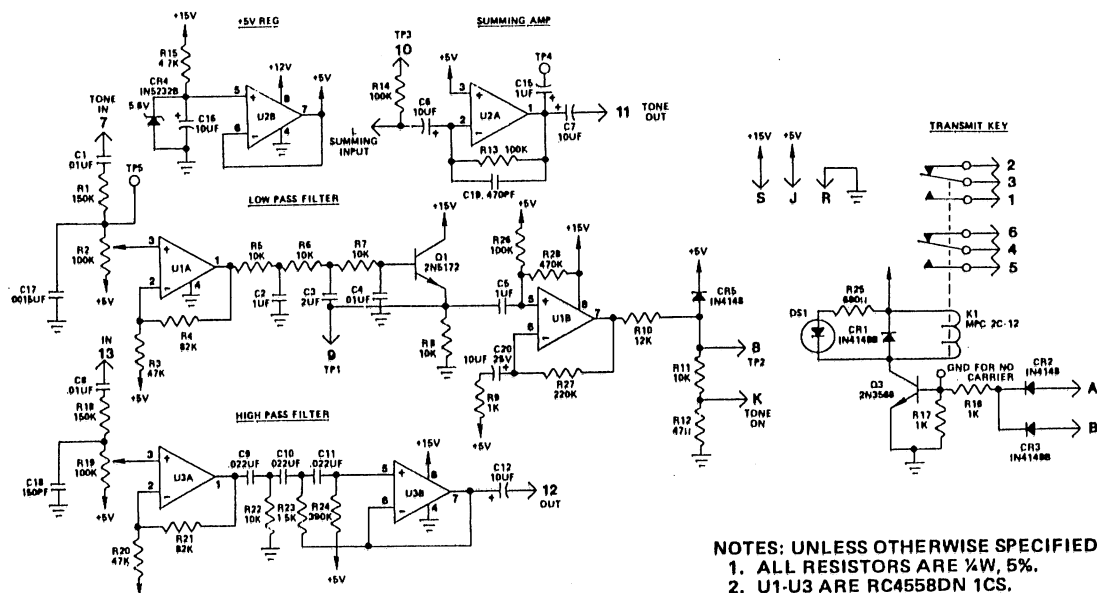


Figure 2. Schematic for Model 260 interface module.

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.

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)

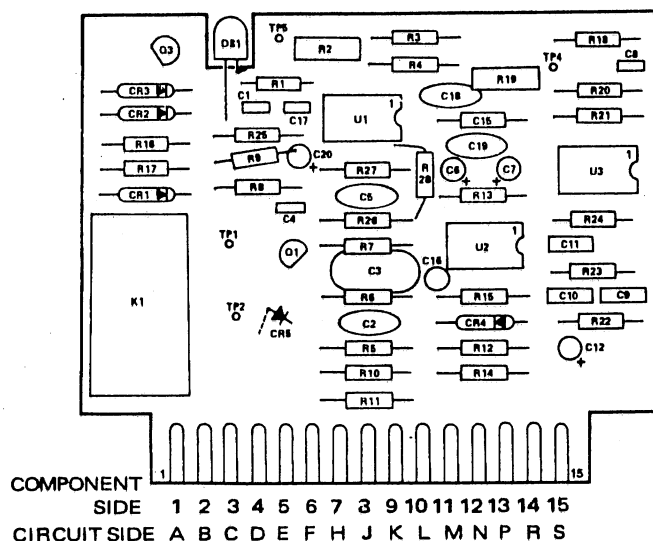


Figure 3. Parts location for Model 260 interface module.

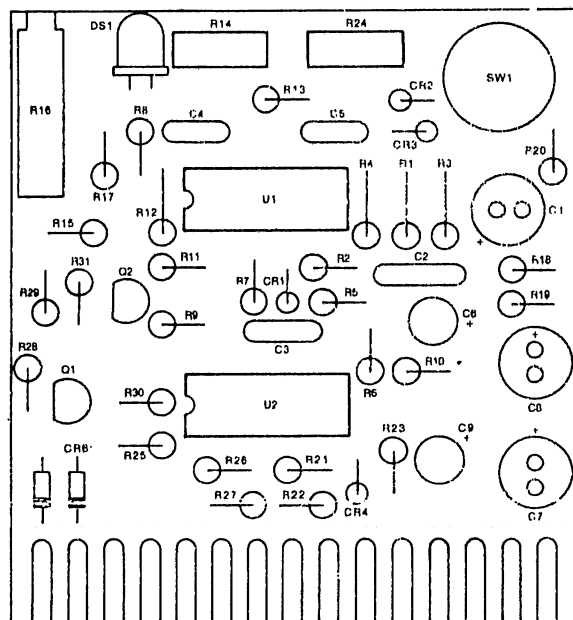


Figure 5. Parts location for Model 261C decoder module.

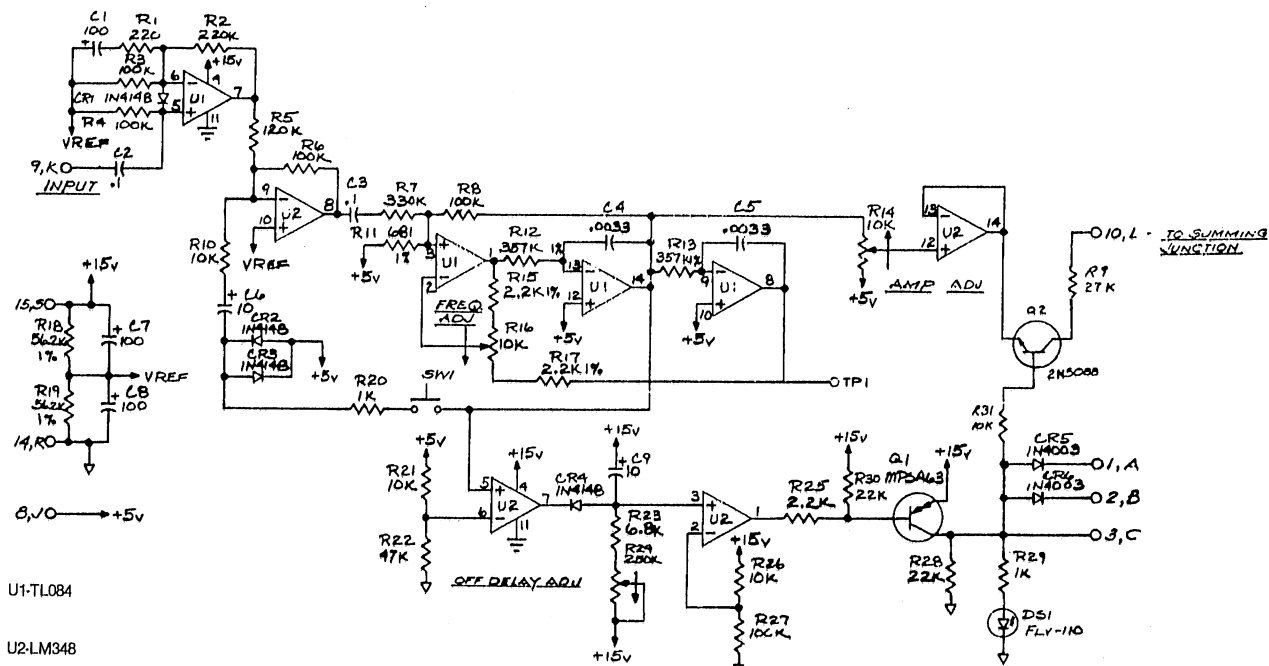


Figure 4. Schematic for Model 261C decoder module.

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 k Ω (was 10 k Ω). For increased limiting gain to be directly compatible with older 261 decoders, change R2 to 300 k Ω (was 220 k Ω). 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 $\pm 1.5\%$ (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 k Ω increases the standard bandwidth by almost 50% to approximately $\pm 2.2\%$. A value of 1.3 k Ω approximately doubles the detection bandwidth to almost $\pm 3.0\%$. Use a 1% metal film resistor for best stability and accuracy.

MODEL 261C SPECIFICATIONS

Frequency Range:	67 to 251 Hz, continuously adjustable
Selectivity:	$\pm 1.5\%$ of selected frequency
Frequency Stability:	$\pm 0.25\%$
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:	2-1/2 in. (6.3 cm) $\times$ 2-3/4 in. (7.0 cm) $\times$ 3/4 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 adjustable 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 potentiometers, 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

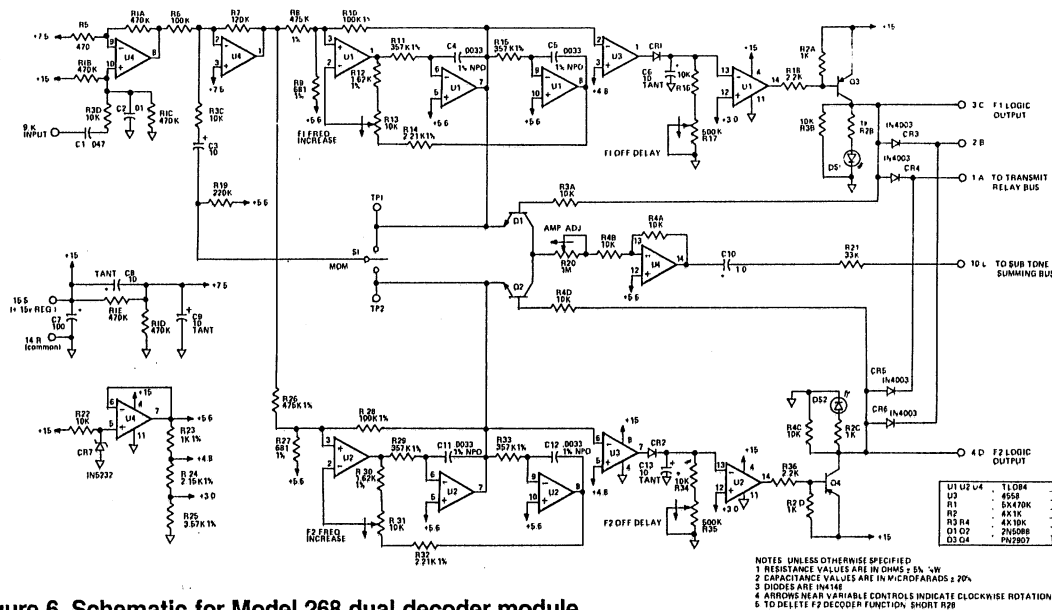


Figure 6. Schematic for Model 268 dual decoder module.

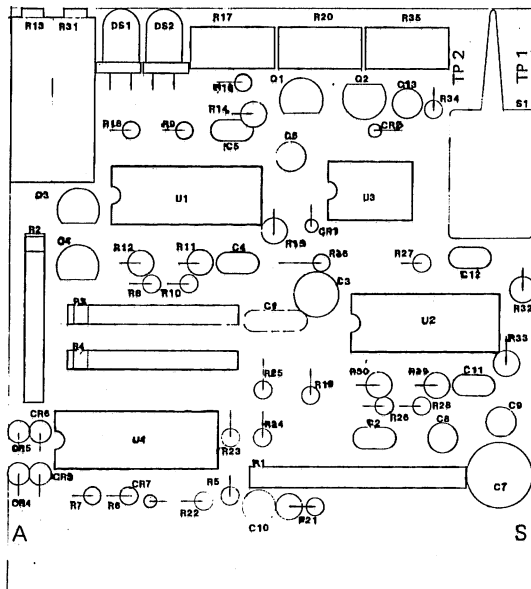


Figure 7. Parts location for Model 268 dual decoder module.

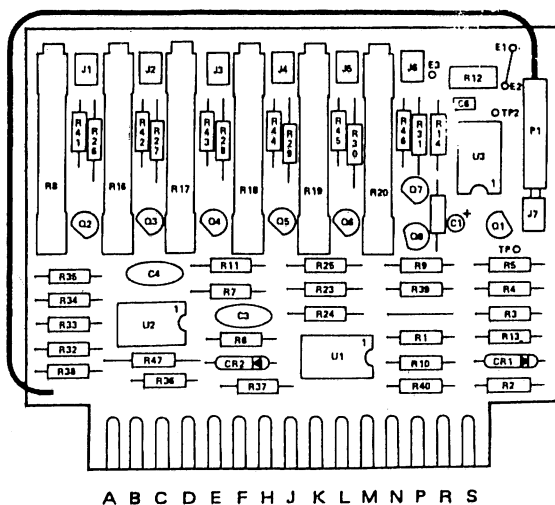


Figure 8. Parts location for Model 262 translator module.

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 $\pm 1.5\%$ (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 $\pm 1.5\%$ to about $\pm 2.2\%$. 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: $\pm 1.5\%$ of selected frequency
In 67 to 251 Hz range

Frequency Stability: $\pm 0.25\%$

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) $\times$ 2.75 in. (7.0 cm)
 $\times$ 0.75 in. (1.9 cm)

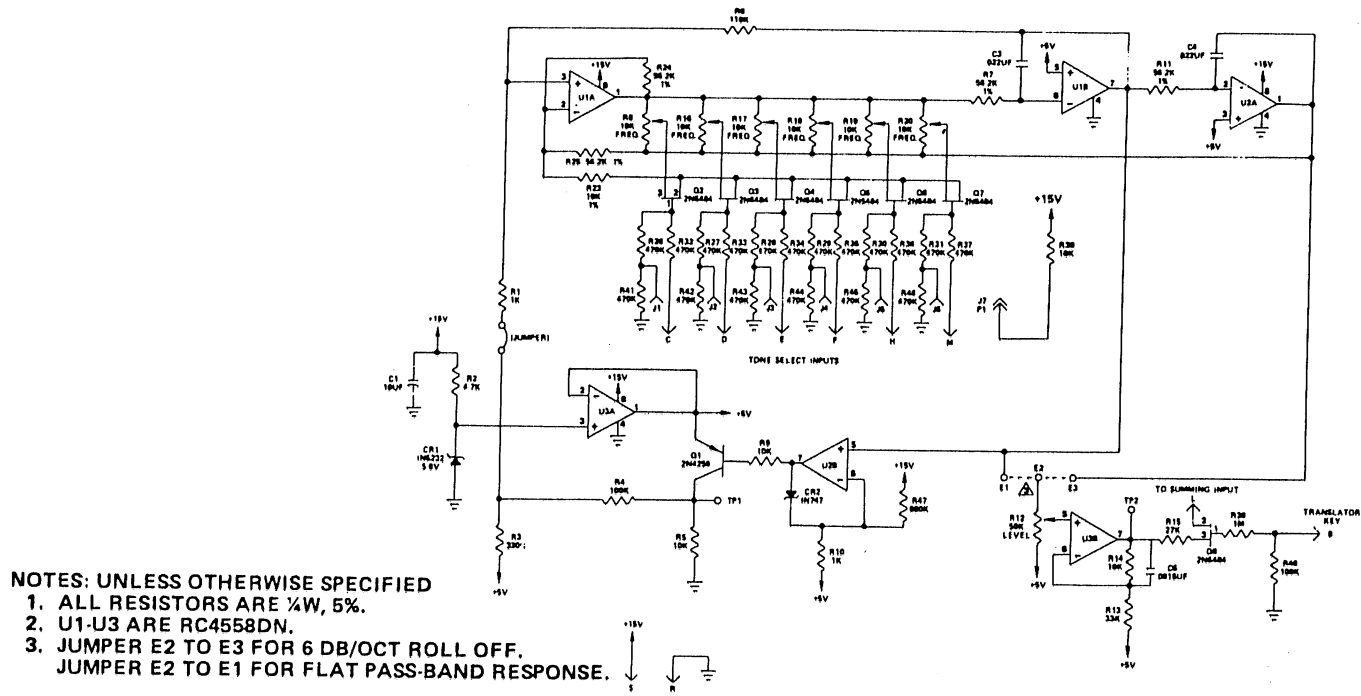


Figure 9. Schematic for Model 262 translator module.

MODEL 262 TRANSLATOR MODULE (Figures 8 & 9)

The translator can generate any six CTCSS tones. Six multi-turn potentiometers, R8, R16, R17, R18, R19, and R20, can each selectively set the encoder frequency. The desired potentiometer is selected by FET switches Q2 through Q7. The gates of the FET switches are controlled by driving the selected FET gate to a positive voltage either from a decoder connected to C, D, E, F, H, or M, or manually for test by connecting P1 to J1, J2, J3, J4, J5, or J6.

The tone output is taken from E1 for fixed level or from E3 for a 6-dB-per-octave drop as frequency is increased. Output tone level is set by R12 and is fed through amplifier U3B to another FET switch, Q8. When the transmitter key circuit is actuated, a decoder control output connected to B turns on the FET switch feeding tone to the summing amplifier

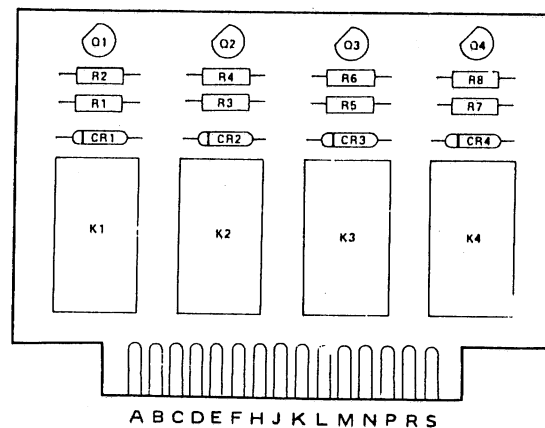


Figure 10. Parts location for Model 266 relay module.

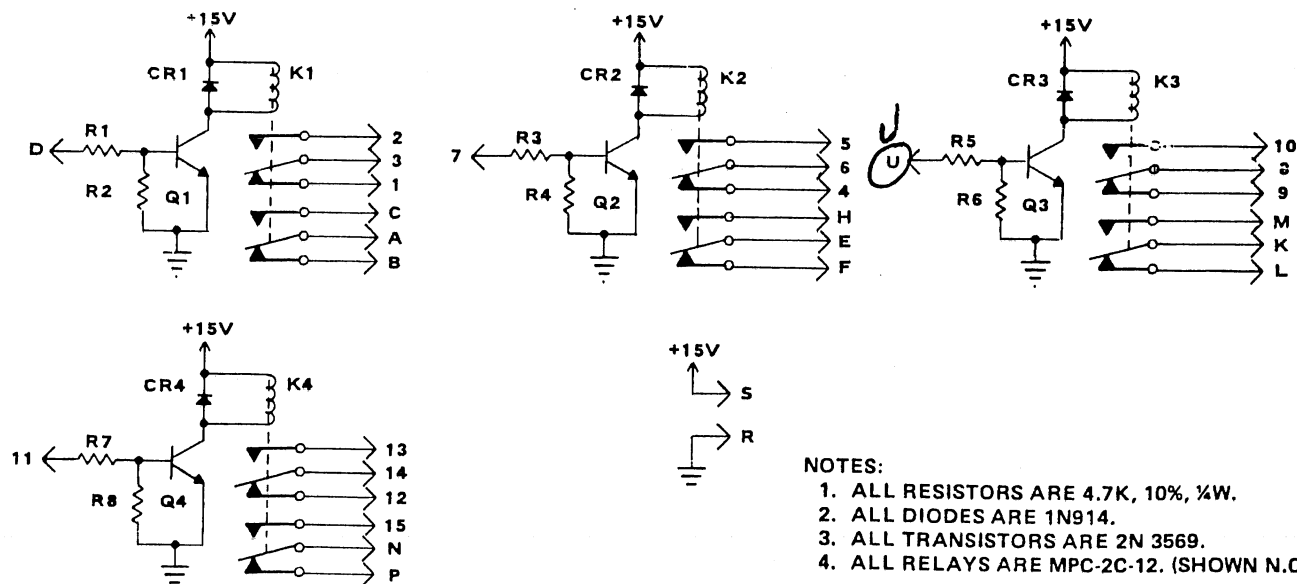


Figure 11. Parts location for Model 266 relay module.

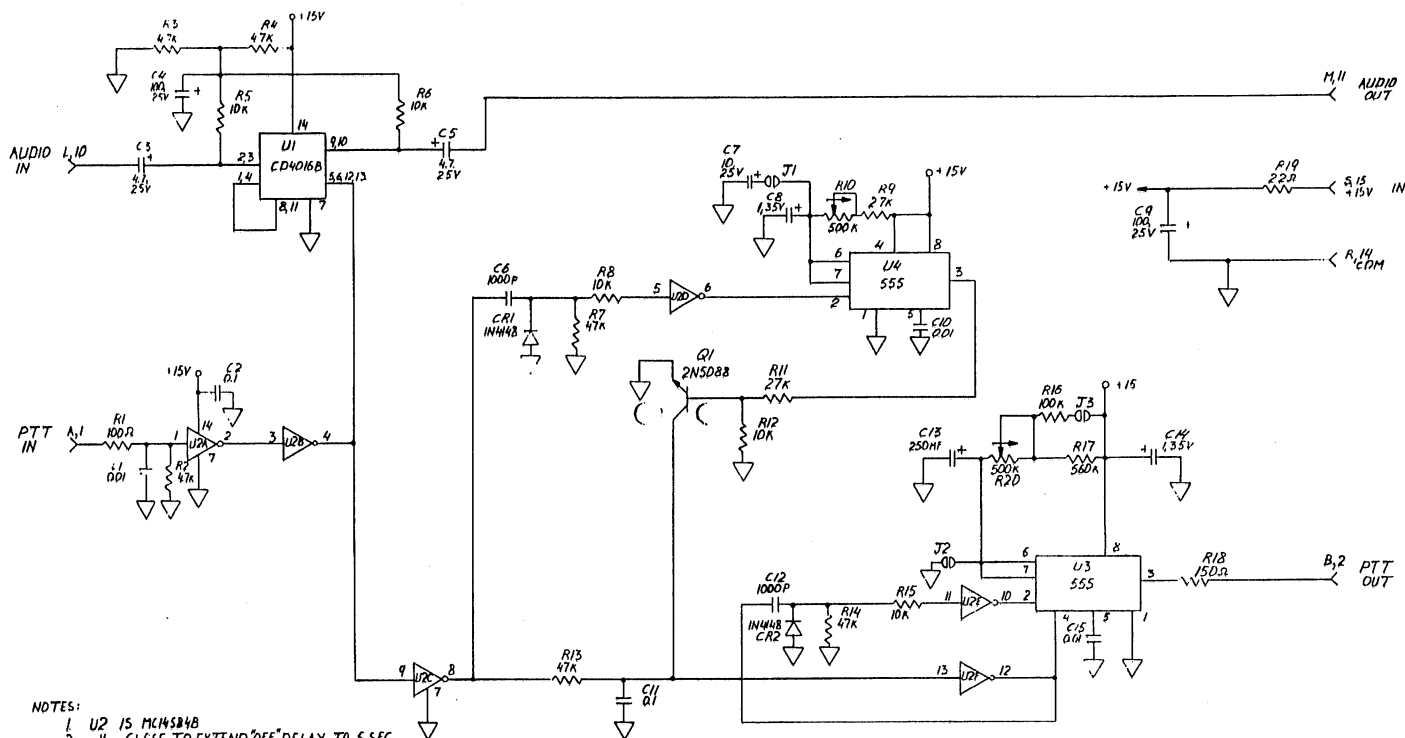


Figure 12. Schematic for Model GT-267 audio gate/timer.

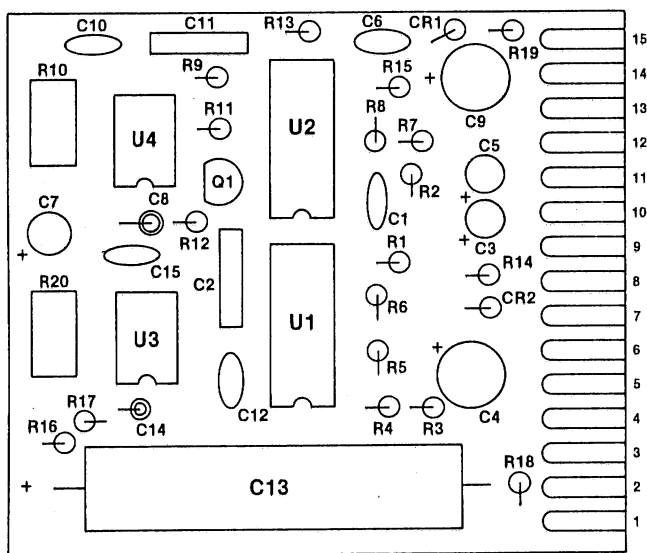


Figure 13. Parts location for Model GT-267 audio gate/timer.

through L. If more than six translated tones are needed, another translator module may be added to the 212A. Location of parts for the Model 262 is shown in Figure 7.

262 ENCODER SPECIFICATIONS

Frequency Range: 67 to 251 Hz (each tone), continuously adjustable
 Number of Tones: Up to 6
 Frequency Stability: $\pm 0.25\%$
 Dimensions: $3\frac{5}{16}$ in. (8.4 cm) $\times$ $2\frac{3}{4}$ in. (7.0 cm) $\times$ $\frac{5}{8}$ in. (1.5 cm)

MODEL 264 POWER SUPPLY

The regulated 15-V power supply consists of a transformer, regulator, and filter components. Two transient protective devices RV1 and RV2 limit transient voltage from the power line.

MODEL 266 RELAY MODULE (Figures 10 & 11)

This is a plug-in module with four DPDT relays and four transistor drivers. It is used for special applications where individual relay outputs from each 261C or 268 decoder are desired.

266 RELAY CARD SPECIFICATIONS

No. of Relays: 4 per card
 Input: Compatible with 261C or 268 output
 Contacts: DPDT, 2 A @ 26 Vdc, 1A @ 115 Vac

MODEL GT-267 AUDIO GATE/TIMER (Figures 12 & 13)

The GT-267 card is intended for use in Cetec Vega's Model 212A system, where it provides a number of support functions which may be required for specific applications. These include: an audio gate to enable/disable an audio path in response to the presence or absence of an appropriate CTCSS tone, an off delay timer which allows adjustment of the off delay timer of all 261C and 268 decoders in the system with a single control, and a time-out timer which limits transmission duration to a preset limit.

The logic input to the GT-267 (pins 1 and A) is connected to the PTT bus in the 212A which is driven by the installed 261C or 268 CTCSS decoders. This bus will go "high" whenever an appropriate CTCSS tone is detected by the decoder. U2A and U2B, in conjunction with R1, C1, and R2, filter and shape this input for use by the other GT-267 circuitry. U2B pin 4 drives U1, the audio gate. Audio will be passed by this gate only when the PTT bus is "high". Resistors R3, R4, R5, and R6 bias the gate for proper operation. C4 is a signal bypass to eliminate signal leakage and C3 and C5 provide ac coupling of the gate input/outputs at pins L,10 and M,11 on the card. When using the audio gate connect the output of the high-pass filter (TB2-16) to the audio gate input (TB1-7). The audio-gate output (TB1-8) is connected directly to the transmitter's modulation input (mic. high).

The off delay timer consists of an RC monostable trigger cir-

cuit (C6, CR1, R7, R8, and U2D); U4, the off delay timer; and Q1, the holdoff switch. The monostable is triggered by the falling (off) edge of the PTT bus, generating a short pulse which triggers U4, the off-delay timer. Q1 prevents the falling edge from reaching U3, the time-out timer, until U4 times out. If the PTT signal returns prior to completion of the U4 timing cycle, no reset reaches U3 and the card PTT output at B₂ remains high throughout. However, if U4 times out prior to the decoder PTT output going high again, U3 is reset and the PTT command is removed.

The off-delay time is established by C1 (and C7), R9 and R10. With J1 open, the off-delay can be adjusted by R10 to be from 5 to 500 ms. With J2 closed, the off delay can be adjusted to be from 50 ms to 4 seconds. In order for the off delay timer on the GT-267 to operate properly, the off-delay for all 261C and 268 cards in the system should be set to minimum.

The time-out timer can be adjusted over the range of 0.75 to 4 minutes in two ranges. The circuit triggers within 500 microseconds when a PTT command is received at the GT-267 input. Off delay is controlled by the off-delay timer. The timer, U3, is triggered by the PTT command via a slow down circuit (R13, C11, and U2F) which allows time for the off delay timer to trigger in the PTT "off" mode. U3 is triggered by the monostable pulse generator consisting of C12, CR2, R14, R15, and U2E. It is directly reset (after the off-delay interval) via U2F. Two timing ranges are provided: 2 to 4 minutes (J3 open) and 0.75 to 2.5 minutes (J3 closed). The time interval is established by C13, R20, R17, and R16. A jumper is provided (J2) to defeat the time-out timer in the event that the audio gate and off-delay functions are desired but the time-out timer is not. Closing J2 will defeat the timer; the output of U3 will then be controlled by the input pulse and the off-delay timer. Output short-circuit protection is provided by R18, which limits the output current to less than 100 mA.

GT-267 SPECIFICATIONS

AUDIO GATE

Frequency Response:	150 Hz to 10 kHz (min.)
Insertion Loss:	Less than 4 dB for 600-ohm load Less than 1 dB for 10-k ohm load
Off Isolation:	60 dB minimum
Maximum Input Level:	+ 13 dBm (+ 15 V supply)
Distortion:	Less than 1% at 0 dBm input

OFF-DELAY TIMER

Off Delay:	Low range: 5 to 500 ms High range: 0.05 to 4 s
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TIME-OUT TIMER

Turn-on Time:	Less than 500 μ s
Turn-off Time:	As set by off-delay timer
Time-Out Timer:	Low range: 0.75 to 2.5 min. High range: 2.2 to 4 min.
Output Level:	14 V (+ 15 V supply), current limited to 100 mA, short circuit

GENERAL

Power Requirements:	+ 10 Vdc to + 15 Vdc
Current Drain:	30 mA, max (normal PTT load)
Temperature Range:	- 30 °C to + 70 °C
Timing Stability:	$\pm$ 15%

INSTALLATION

The Model 212A mounts in a standard 19-inch rack and requires 3-1/2 inches of vertical space. A removable front panel permits access to all plug-in printed-circuit modules. All wir-

ing is at the rear of the chassis to two screw terminal strips, TB1 and TB2. Depth is 3-5/8 inches behind the front panel. For connections, see Figure 1.

Receiver output may be either separate voice and tone or combined. If combined, the two filter inputs are tied together by connecting TB2-11 to TB2-13. The combined input is then connected to the receiver output. If the tone comes from the discriminator and the voice from an audio amplifier, then the separate inputs of the 212A are used.

If + 10 to 18 Vdc is available, then it is connected to TB1-17 and -18; otherwise, with a Model 264 power supply, 120 Vac is connected to the three-pin ac connector J1. Transmitter interconnections are: voice output, TB2-15 and -16; CTCSS tone output, TB2-14; key line, TB1-1 and -3. Ground connections are TB1-12 for the receiver and TB2-15 for the transmitter.

Avoid 212A installation in areas of excessive heat or intense magnetic or radio fields. Normal practice of good shielding of control and audio leads and short ground connections will ensure easy installation and trouble-free operation.

The most common installation practice is as follows:

- (A) Voice audio input to the 260 is taken immediately after the radio's audio-squelch gate. This allows the radio's original noise squelch circuit to silence the 260's voice-filter input unless an RF carrier is present and prevents squelch noise being transmitted during the hold-over delay after a mobile transmission.
- (B) The voice audio output of the 260 is connected directly to the transmitter's modulation input (mic. high).

Caution: The 260's voice filter input should never be installed in the speaker line. The dynamic gain of the amplifiers after the squelch gate is usually very high and results in poorer repeated audio quality due to the loss of signal-to-noise ratio in high-gain circuits.

ADJUSTMENTS

Model 212A is adjusted at the factory for all customer requested conditions. Final adjustment of tone and voice levels on the interface board and adjustment of tone output level for proper transmitter deviation on the output of the decoder and translator boards should be the only adjustments needed.

For location of all controls, see the parts layout figures on the different modules. The sensitivity of the tone system is 10 mV. A convenient method for adjustment is to observe the signal at pin 8 on the 260 interface edge connector. With a receiver input including one of the CTCSS tones, increase R2 level setting until a stable square wave is found. Then to assure adequate limiting in the system, increase the level 3 to 6 dB more as measured at the arm of R2 (less than 1 mV at U1-1).

Tone output level from the Model 212A is 4 volts peak-to-peak with a drive capability of 2 mA. This level is adjusted by R14 on the end of the 261C decoder, R20 on the end of the 268 decoder, and R12 of the 262 translator. Voice level is set by R19 on the 260 interface board. Frequency is set by the potentiometers on the translator and decoder boards. A precision frequency counter preferably of the period-measuring type must be used for frequency measurement. Adjust clockwise to increase frequency.

Adjust the off-delay on all 261C cards to minimum by adjusting R24 to minimum, and on all 268 cards to minimum by adjusting R17 and R35 to minimum.

Set the desired system off-delay by adjusting R10 on the GT-267. Close J1 if an off delay longer than 500 ms is desired. Frequently, off-delay is merely adjusted to the minimum value which provides reliable system operation.

Set the time-out timer with R20. Close J3 if the desired interval is less than 2.5 minutes. To set the interval, depress and hold the test switch on one of the 261C or 268 cards. The LED indicator on the 260 card should illuminate steadily. Using a watch, time the interval between pushing the test switch and the time when the LED goes out on the 260 card. If no time-out timer is required, close J2 to disable the timer.

TROUBLE SHOOTING

Several self-test features are built into the Model 212A system. A push button switch at the upper left of the chassis can be pressed to check the keying circuits of the interface module. A jumper across R17 on the 260 module will allow Model 212A tests without keying the transmitter. Alternatively, the keying circuit to the transmitter can be disabled by removing the lead to TB-1.

Remember to check the light-emitting diodes on the interface and decoder boards for a quick assessment of system performance. One decoder LED and the interface LED should glow whenever a CTCSS tone is present.

Do not overlook the unlikely faults. Check to see that all modules are fully seated in their sockets. Perhaps it may be useful to remove and reinsert the boards. Check that 15 V and 5 V are present at S and J respectively, on each edge connector.

When the push button S1 is pressed, the interface LED should turn on and, if installed, the translator should generate a frequency corresponding to the jack into which P1 is plugged. Thus, every time the push button is pressed the transmitter should key on and the selected tone should be fed into the tone portion of the modulator circuit. The decoders will generate a tone. Be sure to restore the plug, P1, to its storage jack after any tests. If, in normal operation, tone is generated and the keying circuit operates on all but one of the CTCSS tones for which the system is set up, then there is a strong indication that the fault is in the decoder that should be responding to the absent tone. Since all decoders are identical except for the tone frequency setting, any spare decoder may be substituted for a faulty unit by replacing and retuning to the desired frequency.

In the trouble-shooting instructions to follow, when

reference is made to an integrated circuit or transistor, remember to check all associated components for failure.

If the fault is no signal output from the Model 212A, the trouble-shooting suggestions are as follows: Feed tone into TB2-11 with an audio frequency generator. This signal should be present at TP5 on the interface board. Use of extender board part number 001-1070 will facilitate trouble shooting. The next check point is pin 8 of the circuit-board edge-connector J1 where a 5 V peak-to-peak clipped sine wave should be present. If there is inadequate or no signal, then check U1A, U1B, and Q1. If the above check shows no signal present, check at TP2 on the decoder board. A 1 V rms sine wave should be present. If no signal, try sweeping the input frequency to see if the decoder has changed frequency. If the previous test is passed, check to see whether A and B on the decoder edge-connector go positive when the proper tone is present. If yes, check U3; if not, check U2-1, 7.

Note that there is no measurable voltage at L on the connector because it is the summing junction of the op amp on the interface board. Look for signal at the output of the summing amplifier on the interface board at TP4 of pin 11 on J1. If no output is found, feed an audio generator into TP3 to check the summing amp independently of any other inputs.

Lack of speech signal at TB2-16 indicates that the high-pass filter is inoperative. Check U2A and U2B.

In the translator module, the presence of all tones except one would strongly suggest failure of one frequency-adjusting potentiometer, or gate transistor. If none of the frequencies are generated, check U1A, U1B, and U2A and Q1. At TP1 a square wave of 5 V peak-to-peak should be found. At E1 the signal is a sine wave and it should be 1 V rms. The push-button switch should key the output switch, Q8. If signal is found at E1 but not at the output of the summing amp in the interface board, then Q8 may be defective. Remember to check the 5-V regulator.

If a Model 263 time-out module is used (no longer a current product) and the keying is not normal, the fault may be in the timer because all keying action goes through the time-out module. Apply + 15 V to pin A of the edge connector. The collector of Q1 should go to ground. Pin 2 of U1 should have a 10-ms negative-going pulse when 15 V is applied to A. If B does not follow A until the end of the time-out period, then either R5 or U1 is faulty.

If desired, the Model 212A may be returned to the Cetec Vega Service Department for all maintenance.

WARRANTY

Cetec Vega signaling products are guaranteed to be free from defects in material and workmanship for a period of three years from the date of shipment. Warranty is for factory repair or replacement only.



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