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SPECIFICATIONS*

TEMPERATURE RANGE	-30°C TO +60°C
BATTERY POLARITY	NEGATIVE GROUND
DC INPUT POWER	
A+	13.8 Vdc, ±20%
IGN-A+	13.8 Vdc, ±20%
DC OUTPUT POWER	
A+SW	13.6 Vdc, ±20%
TX-SW-IGN	13.6 Vdc, ±20%
MAXIMUM BATTERY A+ CURRENT DRAIN	
UNIT OFF	10 milliamperes
MAXIMUM INPUT A+ CURRENT DRAIN	
WITHOUT RADIO	350 milliamperes
WITH RADIO (Rated Audio)	3.0 amperes
IGN-A+	20 milliamperes
MAXIMUM OUTPUT CURRENT DRAIN	
A+SW	3.15 amperes
TX-SW-IGN	20 milliamperes
TTL LOGIC LEVELS	
HIGH (1)	4.0 ±1.0 Vdc
LOW (0)	0.5 ±0.5 Vdc
RISE TIME	200 nanoseconds
FALL TIME	200 nanoseconds
HIGH THRESHOLD LOGIC LEVELS	
HIGH (1)	13.8 ±1.0 volts
LOW (0)	1.0 ±0.5 volts
HORN RING INPUT	
POWER	13.8 volts ±20%
CURRENT	220 milliamperes
HORN RING OUTPUT	
POWER	13.6 Vdc ±20%
CURRENT	220 milliamperes
PA AUDIO RESPONSE	PER EIA-204
FAST SQUELCH	
RF DETECT THRESHOLD	-115 dBm
VOL/SQ HI INPUT	300 millivolts rms
TONE FREQUENCY	7000 Hz
FAST SQUELCH SETTING (NOMINAL)	25 millivolts rms

*These specifications are intended primarily for the use of the service technician. Refer to the appropriate Specification Sheet for the complete specifications.

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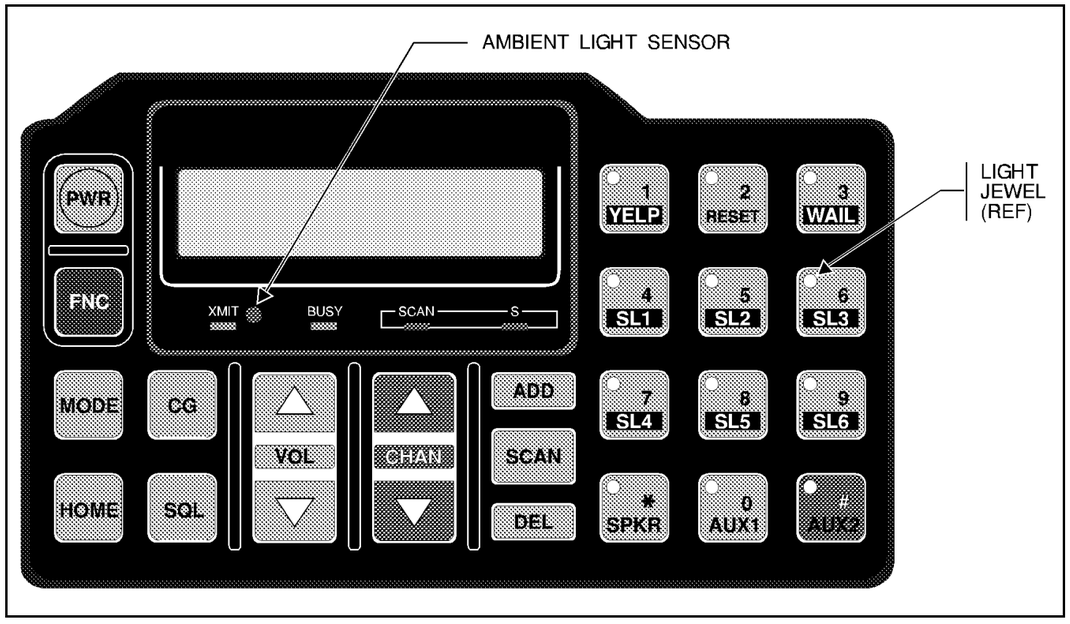


Figure 1 - S-825 Series System Control Unit Front Panel (w/Siren)

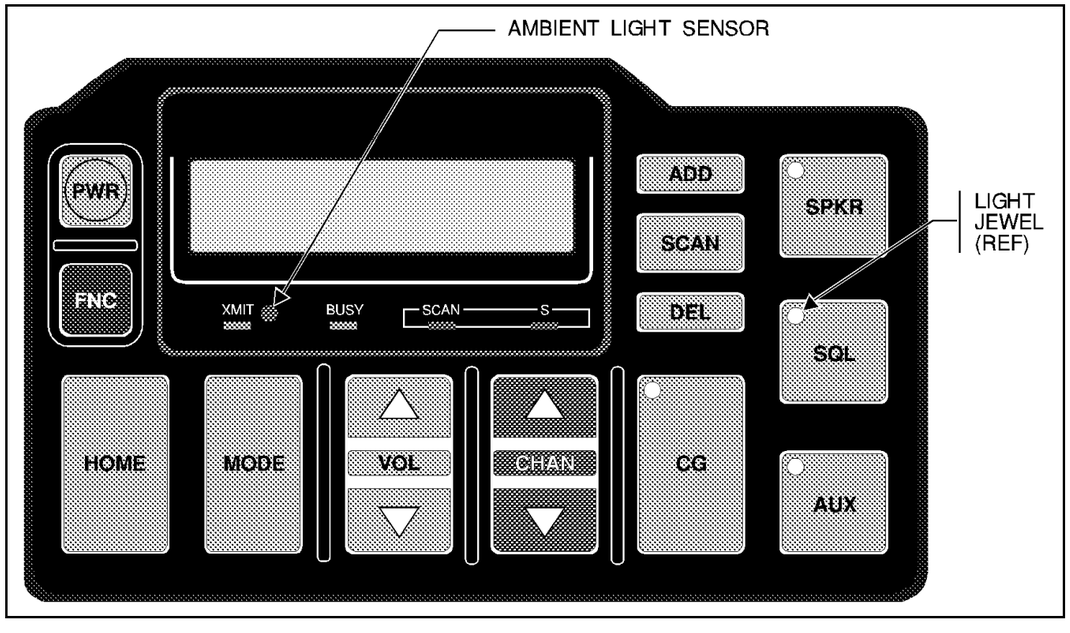


Figure 2 - S-825 Series Scan Control Unit Front Panel

DESCRIPTION

The S-825 Series Control Units are highly functional, ruggedly constructed weatherized control units for use in a variety of vehicular applications. The S-825 series control units are available in two modes, a Scan model and a System model. The System model includes all of the Scan features plus siren and light control buttons, a DTMF pad, and an added auxiliary button (see Figures 1 and 2).

Both control units are equipped with a field-programmable personality EEPROM for ease in customizing systems and making changes.

The control units are housed in a two-piece cast aluminum, weather resistant housing. Each control unit contains three printed circuit boards; a Keypad Display Board, a Microcomputer Board and an I/O (Input/Output) Board.

All external connections to the control unit are made to jacks on the back of the unit. A plastic cap mounts over the cable connections to maintain the weatherproof capability. The weatherproof microphone is secured to the microphone jack by a captive retaining screw in the weatherproof microphone plug. The control unit is also equipped with a weatherproof speaker.

All controls are front-mounted push-buttons that are backlighted for nighttime visibility. The indicators are Light Emitting Diodes (LEDs), and an eight-digit Liquid Crystal Display (LCD). An electroluminescent (EL) panel provides back lighting for the LCD.

A light sensor (photo detector) that automatically distinquishes between day and night light levels to control the LEDs and EL panel intensity in both bright or low light conditions. The light sensor may also be programmed to remain off if desired.

CONTROLS & INDICATORS

There are 25 push-button controls on the System control unit keypad, and 15 push-button controls on the Scan keypad. The keypad boards provide the operator interface to the control units. The control unit front panels are shown in Figures 1 and 2. The name and function of each of the push-buttons is shown in Table 1.

The System control unit is equipped with 12 push-buttons with red indicators that flash when the function is enabled; YELP, RESET, WAIL, SL1, SL2, SL3, SL4, SL5, SL6, SPKR, AUX1, and AUX2. The back light control and the button indicator brightness are adjusted by the same control.

SCAN AND SYSTEM	SYSTEM ONLY	
PWR	YELP	(1)
CHAN UP	RESET	(2)
CHAN DN	WAIL	(3)
VOL UP	SL1	(4)
VOL DN	SL2	(5)
MODE	SL3	(6)
HOME	SL4	(7)
CG	SL5	(8)
FNC	SL6	(9)
SCAN	SPKR	(*)
ADD	AUX1	(0)
DEL	AUX2	(#)
SQL	SPKR	
AUX (Scan Only)		

Table 1 - Push button Controls

The Scan control unit is equipped with four push-buttons with red indicators that flash when the function is enabled; SPKR; SQL, CG, and AUX.

The backlight control and the button indicator brightness are adjusted by the same control.

A PC programmable option is provided to disable beeps when keys are pressed on the keypad. A PC programmable options is also provided to disable the wrap around feature for the MODE, CHAN, and CG functions.

The location of each button is determined by the personality programming.

CONTROLS

The power button is a push-push button that turns the entire radio/siren/light system on and off.

MODE select allows selecting groups of frequencies. The maximum number of MODEs depends on the number of modes, the number of channels, and other programmable options. Each mode may consist of up to 32 transmit and receive frequencies. The MODE select works in conjunction with the CHAN UP/DN buttons.

The first press of the MODE key displays the current mode selection. To change modes press either CHAN UP/DN. If either key is held depressed, then the display will ramp through the selections at a 3 Hz rate. The selections will wrap around at the end of the list unless disabled by the PC programmer.

PC programming will allow an option to enter the mode number directly via the KEYPAD on the SYSTEM model. With first press of a MODE key, the current mode will be displayed along with two blinking cursors located in the seventh and eighth digits (and the display timer started). If a KEYPAD key is pressed, then the digit is displayed in the right most digit. The second KEYPAD key is pressed the first will scroll to the left and the new key is displayed on the right.

When the mode number has been entered, pressing the MODE key again will lock the selected MODE, download the radio information, and return the display to the CHAN selection.

Each MODE selection has an ASCII name (up to 8 characters). For example:

LYNCHBRG

mode = City of Lynchburg

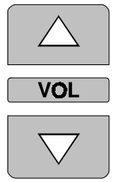
ROANOKE

mode = City of Roanoke

Once a MODE selection is made and either the display timer has expired or the MODE key is pressed again, the control head will download the radio information to the radio. This takes approximately 1.7 seconds.

NOTE

DURING THE DOWNLOADING PROCESS, THE CONTROL HEAD WILL NOT RESPOND TO ANY KEY ACTION NOR RECEIVE A CALL.



VOLume select allows selection of up to 16 levels of audio. Pressing a VOL button for the first time will increment or decrement the volume by one step and cause the display to show "_VOL_xx" where xx represents volume level one to sixteen. If a VOL button is held depressed for more than one second, the volume level will ramp at a 3 Hz rate and stop at max and min levels. The SQL and DIM functions work in conjunction with the VOL buttons.

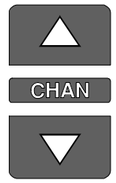
If audio is present in the speaker, depressing a volume button will cause an increment or decrement but will not sound a beep at each level change. The audio present in the speaker will provide volume feedback. Individual key presses or ramping is valid.

The display will automatically return to the channel display three seconds after the last VOL button action. However, if the operator wishes to return immediately, depressing either CHAN button will return the display to the selected channel (does not increment or decrement the channel selection).

SQueLch select allows selection of up to 16 levels of squelch threshold. Depressing the SQL button causes the display to show "_SQL_xx", where xx represents level one to sixteen. Using the VOL buttons, the level may be increased or decreased. If the mode selected has CTCSS or CDCSS, then adjusting the squelch will automatically disable channel guard until the SQL adjustments are complete.

NOTE

SCAN OPERATION IS STOPPED WHILE SQUELCH ADJUSTMENTS ARE BEING MADE TO PREVENT IMPROPER OPERATION. IF SQUELCH IS LEFT OPEN, SCAN MAY NOT OPERATE CORRECTLY.



Once the selection is made, depressing the SQL button again will establish the selection and allow volume selection with the VOL buttons again, enable Channel Guard if present, and restore the scan state. In the event the operator fails to press the SQL button a second time, the display will automatically return to the CHAN display, accept the SQL selection, and return the volume keys to the volume function after three seconds.

CHANnel select allows selection of up to 32 frequencies that are programmed into a MODE, RANGR is capable of 16 channels and DELTA is capable of 16 or 32 channels. Each channel consists of a transmit and receive frequency, transmit and receive Channel Guard codes, and carrier control timer. The CHAN select also works in conjunction with the MODE button and CG button.

Each press of the CHAN UP or CHAN DN will cause an increment or decrement of the channel selection. If a CHAN button is held pressed for more than a second, then the display will ramp through the selections at a 3 Hz rate. PC programming provides an option to turn off wrap around at each end of the channel list.

Each CHAN selection has an ASCII name (up to 8 characters) displayed. For example:

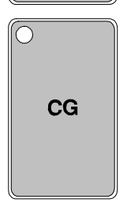
3_POLICE

channel = police channel number 3

FIRE_11_

channel = fire channel number 11

HOME select allows the selection of a home channel in the current MODE. The PC programming assigns which channel, if any, in each mode is the HOME channel.



Channel Guard (CG) select operates only if the control unit is programmed for download as channel guard is encoded/decoded by the radio.

The CG button allows the selection of channel guard codes (either tone or digital). Each CHAN can be programmed to have a DEFault transmit and receive channel guard code. The CG selection is used to override this default code and is remembered even when power is removed. CG set to "DEF" returns the channel guard code to the default code.

Depressing the CG button causes the display to show "_CG_xxx", where xxx represents the ASCII for one of the Channel Guard codes or "DEF" (where "DEF" turns off the CG selection and returns to the default Channel Guard). "OFF" turns off the default Channel Guard code and the CG selections.

Using the CHAN buttons, the Channel Guard codes may be ramped up and down. PC programming allows disabling the wrap around feature and the selections will stop at the top and bottom of the list. If the wrap around is active, the CG list will wrap around at the top but stop at the bottom)"OFF" position) of the list. Each selection will display its ASCII name (up to 3 characters) in the last three digits of the LCD. For example:

_CG__100

selected Channel Guard = 100 Hz

_CG__NOR

selected Channel Guard = NORepeater

Once the CG selection is made, depressing the CG button again will establish the selection by downloading the information to the radio, return to the CHAN display, and return the CHAN select buttons to the channel function. The seventh and eight digit of the channel display will be overwritten with an "_*" to indicate the CG has been changed from the default value.

If the CG is changed on a scan priority one or two channel, then the "*" will appear in the seventh position (eight position will display a 1 or 2 for scan priority indication). In the event the operator fails to press the CG button a second time, the CG selection is accepted, after three seconds, and the display is returned to the CHAN display.

If the CG has been changed on the displayed channel, the "*" will be displayed in the seventh position. If the displayed channel is a scan priority, then the "P" will appear in the seventh position. If the display channel has both the CG changed and a scan priority selected, the "P" will overwrite the "*" in the seventh position. In this case, the CG selection may be reviewed by pressing the CG button.

Each CHAN has a CG enable option. When the personality of the control head is being programmed, an option bit will disable/enable each Channel for Channel Guard changes. If enabled, the Channel Guard changes will be allowed for that channel. Otherwise Channel Guard changes will not be allowed. The message "BLOCKED" will be displayed whenever the CG button is pressed and the selected channel is disabled.

In order to return to the default Channel Guard code, the operator must use CG and select "DEF" with the CHAN buttons.

No matter which CG is selected, taking the MIC off hook will disable CG decode until it is returned to the hookswitch.

FNC (function) select allows selection of either backlighting adjustment of the keypad and the LEDs by using the VOL buttons, or DTMF generation (System only) using the right 12 buttons configured as a telephone keypad (DTMF digits are marked in the upper right hand corner of each button).

To adjust the back lighting of the keypad and the LEDs, press FNC followed by either VOL UP or VOL DN. There are five levels of brightness plus off. The first press of FNC causes the display to show "KEYPAD". Depressing the VOL UP or VOL DN button once will cause the display to show "_DIM_xxx", where xxx represents the light level one through five and "OFF", and enables the VOL buttons to ramp through these selections. Pressing the FNC button a second time will establish the selection and return the VOL buttons to volume selection. If the operator fails to press FNC the second time, the functions are accepted after three seconds and the display is returned to the CHAN display.

To generate DTMF, first press the FNC button (display will show "KEYPAD"). Use the DTMF keypad to dial the desired number. The first key will blank the display and place the number in the right most digit. A DTMF sidetone will be heard in the speaker at the same time the digit is transmitted. All subsequent digits will scroll to the left with the last eight showing in the display.

NOTE

THE DURATION OF THE DTMF DIGIT IS 100 MILLISECONDS AND THE TRANSMIT HANG TIME IS TWO (2) SECONDS.

When dialing is complete, press FNC to return the keypad buttons to the sire/light functions and the display to the CHAN display. The dialing function will automatically return the CHAN display after 20 seconds of no use or when the microphone is returned to the hookswitch.

The SCAN button is a push-push switch that enables or disables scan operation. When scan is disabled, the control head will transmit and receive on the selected CHAN only. SCAN must be off in order to program the scan list of channels and to select the priority one and priority two channels. A PC programmable option allows for a mode to have a preprogrammed scan list that can not be deleted by the radio operator. Another option allows off hook scan.

When SCAN is enabled, the SCAN LED is illuminated. The scan list will be scanned at approximately 20 ms per channel. When a non priority channel becomes active, the audio will open. If the active channel is different then the selected channel, the display will change to the channel being received and flash at a one hertz rate. This is done to indicate that this channel is not the selected channel for transmit.

In order to transmit on this flashing channel, the CHAN buttons must first be sued to select this channel. Alternately, the ADD button may be pressed while the display is flashing, and this will set the selected channel to the receiving channel. If the active channel is the selected channel, then the display will not flash and transmission will occur on this channel when the PTT is activated.

When receiving a non priority channel, the priority channels will be scanned. Personality programming will determine if tone Channel Guard is to be decoded with scan on the priority channels.

If Channel Guard is not to be decoded on the priority channels, then the priority channels will be scanned three times a second, and the priority two channel will be scanned once a second.

If tone Channel Guard is to be decoded with scan on the priority channels, then the audio hole in the nonpriority channel may be as large as 520 milliseconds.

When the priority one channel becomes active with the correct Channel Guard, then scanning stops and the display is changed to the priority one channel (flashing if not the selected channel) and audio is enabled. Scanning will resume when the priority one channel goes away.

Any PTT action will stop scan, enable transmit on the selected channel, and re-enable scan when the PTT ends. Any SQL adjustments will stop scan until the adjustments are completed.

Personality programming determines if SCAN continues when the MIC is off hook.

The ADD and DELete buttons are used to program the scan list when SCAN is off. Each mode can have a scan list of up to 32 frequencies. The "S" LED is used to indicate whether a channel is included in the scan list or not.

To ADD a channel to the scan list, turn SCAN off and then select the channel with the CHAN UP/DN buttons. Press the ADD button once. The "S" LED will illuminate to indicate the channel has been added to the scan list.

To program a frequency as the priority tow (P2) channel, first ad the channel to the scan list. Next press the ADD button a second time. The seventh and eighth position LCD digits will change to show "_2". An old P2 will be replaced by this new selection. If the ASCII name for the channel is greater than six digits, the last two digits will be over written.

To program a frequency as the priority one (P1) channel, first add the channel to the scan list. Then press the ADD button two more times. The first push will temporarily make the selection priority two. The second push will make the selection priority one and restore previously selected priority two. Any old P1 will be replaced by the new selection. The seventh and eighth position LCD digits will change to show "_1". If the ASCII name for the channel is greater than six digits, the last two digits will be over written. If the CG selection for this channel has been changed, the "*" will be displayed in the seventh position.

To DELete a channel from the scan list, first select the channel by using the CHAN buttons. Press the DEL button (remember that SCAN must be off). This will remove the channel from the scan list even if it is a priority channel.

If a scan channel becomes active due to interference or an unwanted conversation, the operator can use the DEL button to delete the channel form the scan list (even if SCAN is enabled). When the BUSY LED is illuminated, press the DEL button once, and the channel will be deleted from the scan list. A PC programming option will allow the selection to be temporarily deleted from the scan list in RAM (restored after a power down or mode change and not with scan on/off).

AUX1, AUX2, and AUX (Scan)

Each AUX button can be personality programmed to be one of the following functions. RPT, HOME, GSTAR, PA, T90/99 encode, VG, or SL1 - SL6. The functions are described below.

RPT FUNCTION

If a Vehicular Charger is not present, the RPT function can be programmed as a push-push switch that enables or disables the Vehicular Repeater. A control signal from the control unit must be routed to the repeater, and this signal will enable/disable the repeater operation. When enabled, the button LED will flash at a 2 Hz rate and a beep tone will sound through the radio speaker (not the SIREN/PA speaker) every 2 seconds.

If a Vehicular Charger is present, then the control head does not require a RPT enable button. The control unit will always monitor the RPT PTT such that when the repeater is enabled (removing the portable from the Vehicular Charger), the repeater will activate the PRT PTT line for transmissions.

SCAN may be interlocked with RPT operation if the AUX button is used to enable/disable repeater operation. If the option is selected, then any time the RPT is enabled, SCAN will automatically be disabled, and SCAN is "BLOCKED" from being turned on. This insures that the portable unit will hear a response from the selected channel and not be off scanning other channels.

Local PTT always has priority over a RPT PTT request.

HOME FUNCTION

HOME select allows the selection of a home channel in the current MODE.

GSTAR FUNCTION

The control head optionally provides a digital ID message when the AUX button is depressed. A side tone of the digital signal being transmitted is heard in the speaker so the operator knows when to speak. Personality programming determines the transmitter attack time.

GSTAR and T90/T99 are not compatible in the same MODE. If a mode has GSTAR, then the same GSTAR ID is present for all channels in that MODE.

PA FUNCTION

Public Address is a push-push function that enables and disables the public address. When enabled, the button LED will flash at a 2 Hz rate. This function is reset at power down.

To use the PA function an AUX button must be programmed for PA. When PA is selected, incoming calls will still be heard on the internal radio speaker until the MIC PTT is pressed. When the MIC PTT is pressed, the receive audio is disabled, and the mic audio is routed to the SIREN/PA amplifier and its external speaker.

The PA volume control (16 levels) is ramped by the VOLume buttons only when the MIC PTT is pressed. The PA volume level is remembered by the control head.

T90/T99 ENCODE FUNCTION

T90/T99 encode function is a push button that transmits a specified tone frequency. Each channel may have either a T90 (single tone) or a T99 (two tone) encode sequence. GSTAR and T90/T99 are not compatible in the same MODE.

VG FUNCTION

VG (Voice Guard) function is a push-push button that toggle between private and clear mode for a remote VGE unit. The DES version of Voice Guard or a local VGE version has the control on the Voice Guard front panel. In this case, the control unit has no knowledge of Voice Guard operation and does not require and AUX function.

When remote VG is handled by the control unit in the clear mode, the channel display is normal and a audio beep is heard at each PTT. When VG is enabled in the private mode, the seventh and eighth digit in the channel display is overwritten with "_P".

SIREN/LIGHT FUNCTIONS (System)

The siren and light functions for the S-825 System control units are fully PC programmable such that any siren and any combination of lights may be programmed for each button.

There are four PC programmable options for siren and light controls that enable the user to customize the functions. A CANCAL feature (PC programmable) allows the choice of each key either turning off previously selected functions or adding to them. A MOMENTARY feature (PC programmable) allows keys to be program-med a toggle or momentary.

The third PC programmable option allows selection of the ignition A+ to control the siren functions. If the option is enabled, then the siren functions will not operate unless the ignition A+ is present. Note that the lights will operate regardless of ignition A+.

The fourth PC programmable option allows selection of the horn ring polarity (either A+ or A- active).

The siren functions are interlocked with the external speaker and the public address functions. If the external speaker function is enabled, the siren functions will be disabled, and likewise if a siren function is enabled, the external speaker function is enabled, the external speaker function will be disabled.

The siren functions are also interlocked with public address operation. Enabling the PA function will not disable a siren until the microphone PTT is depressed. Once the microphone PTT is pressed, the siren function will pause while the microphone audio is routed to the PA speaker. The siren function will return when the microphone PTT is released.

An optional siren/light relay unit must be attached to J5 of the S-825 control unit via an optional serial cable. The siren/light option generates the siren tones and provides relays for up to 9 light functions. Each of the relay functions are fused and do not require any additional relay panels or fuse blocks. In addition, the S-825 has five parallel logic outputs than can drive relays directly with the addition of EMF protection diodes.

NOTE

THE SIREN FUNCTIONS ARE NOT REMEMBERED AT POWER DOWN.

The functions for the S-825 siren/light interface are as follows:

YELP: The YELP function is a push-push switch that enables or disables the YELP siren and any associated lights. When enabled, the YELP button led will flash twice a second.

The "horn ring" acts as a push-push switch and will toggle the siren output from the "YELP" to "CONSTANT WAIL". Pressing the "horn ring" a second time will return the siren output to "YELP". Pressing the YELP button will turn off the YELP siren.

RESET: The RESET function is a push function that resets (turns off) all siren and lights that are currently active.

WAIL: The WAIL button is a push-push switch that enables or disables the WAIL siren and any associated lights. When enabled, the siren is enabled in the "CONSTANT WAIL" mode and the WAIL button led will flash twice a second.

The "horn ring" acts as a push-push switch and will toggle the siren output from the "CONSTANT WAIL" to "YELP". Pressing the "horn ring" a second time will return the siren output to the "CONSTANT WAIL". Pressing the WAIL button will turn off the siren.

MAN: The MANual function is a push-push switch that enabled or disabled the manual siren. When enabled, the MAN button led will flash twice a second.

The "horn ring" shall control the siren output such that the siren is in the "WAIL" (peak and hold) mode as long as the "horn ring" is depressed. Releasing the "horn ring" or depressing the MAN button again will turn off the siren.

HiLo: The HiLo function is a push-push switch that enables or disables the HiLo siren and any associated lights. When enabled, the HiLo button led will flash twice a second.

The "horn ring" shall control the siren output such that the siren is in the "Air Horn" mode as long as the "horn ring" is depressed. Releasing the "horn ring" will return to the "Air Horn" siren. Depressing the HiLo button will turn off the siren.

Air Horn: The Air Horn function is a push-push switch that enables or disables the HiLo siren and any associated lights. When enabled, the HiLo button led will flash twice a second.

SL1 - SL8: The SL1 - SL6 buttons and the SL7 and SL8 functions are push-push buttons that enable and disable siren and/or lights or car functions. When enabled, the button led will flash twice a second. SL7 and SL8 are siren/light functions that may be PC programmed for the AUX1 and AUX2 keys.

SPKR (EXTERNAL SPEAKER): when the SPKR function is enabled, the button LED will flash twice a second and the LCD will display "SPEAKER". All radio received audio will be routed to either the external speaker (using the radio amplifier) or to the siren/light amplifier. External volume may be adjusted independent of the internal volume setting (internal volume restored when SPKR is disabled).

The SIREN functions are interlocked with SPKR operation. If the external speaker is enabled, the SIREN function will be disabled automatically when the radio receiver audio becomes active. When the receive audio goes away, the SIREN function will be restored.

PUBLIC ADDRESS: Public Address (PA) is PC programmable to any of the SL or AUX keys. When PA is enabled, the button LED will flash twice a second and the LCD will display "PUB_ADR". Radio receiver audio will still be heard in the internal car speaker until the MIC PTT is activated.

Pressing the MIC PTT will disable any selected SIREN and enable the public address. The PA audio will be routed to either the external speaker (using the radio amplifier) or to the siren/light amplifier. The PA volume may be adjusted only while the MIC PTT is depressed. When the MIC PTT is released, the previous internal volume setting will be restored and any SIREN function that was active will return.

INDICATORS

Both control units use four identical static LED indicators. A description of the static LED follows.

XMIT: The XMIT red LED will light anytime the mobile is in the transmit mode (includes RPT TX also).

BUSY: The BUSY green LED will light anytime the channel is receiving a signal strong enough to open the squelch circuit based on the SQL setting. Audio may or may not be heard as channel guard may keep the speaker muted. Removing the MIC from the hookswich will disable the Channel Guard decode so that the channel may be monitored before transmitting.

SCAN: The SCAN yellow LED will light anytime the Scan function is enabled.

S: The **S** green LED will light anytime the displayed channel is included in the scan list.

OPERATION

TO RECEIVE A MESSAGE:

1. Press the PWR (power) switch to turn the control unit and radio ON.
2. Select the proper MODE and channel by pressing the **MODE** and **CHAN** up s or down t buttons.
3. Set the desired volume level by pressing the **VOL** up s or **VOL** down t switches. A tone "beep" will be heard, indicating the relative volume level.
4. Enable the squelch circuit by pressing the **SQL** switch. Next, press the **VOL** down button until noise is heard from the speaker. Then press the **VOL** up button until the noise just disappears. The radio is now ready to send and receive messages.

TO SEND A MESSAGE:

1. Turn the radio ON and select the proper channel.
2. Pick up the microphone and listen briefly to make sure that no one else is using the channel.
3. Press the push-to-talk switch on the microphone and identify the mobile unit. The red **XMIT** (transmit) light will turn on each time the PTT switch is pressed.
4. Release the PTT switch and wait for an answer. Then complete the message.

NOTE

Always speak in a normal tone of voice, speaking across the face of the microphone and not directly into it. Do not speak any louder than normal as shouting will actually reduce the radio range.

KEYBOARD SELF-TEST

The self-test procedures contained in this section allow the operator to make a quick check of some of the keyboard functions. The Self-Test includes a test of all of the segments of the display panel, and the four static LEDs. The tests should be helpful in quickly isolating keyboard problems, and when troubleshooting the control unit.

The test can be terminated at any point by pressing the **FNC** and **ADD** buttons at the same time. There will be a slight delay as the control unit allows the microprocessor watchdog time out to reset the unit. An @ symbol usually appears in the display during the reset.

The test mode will automatically be terminated if no keys are pressed for 30 seconds. Progression from one state to the next is done by depressing any button on the keypad.

Test Requirements

1. Make sure the control unit is turned on (by pressing the PWR button if necessary).
2. Make sure the control unit is in a normal mode of operation (not in the MONITOR test mode).

NOTE

The test can be terminated at any point by simultaneously pressing the FNC and ADD pushbutton on the keypad.

Test Procedure

Switch the control unit to the test mode by simultaneously pressing the FNC and ADD push7button on the keypad. The control unit will exercise a series of keypad board tests in typically 30 to 60 seconds. Active user participation is necessary for these tests.

The test procedure and the order of keypad test functions follows:

1. Displays the latest software revision number on the eight character LCD display as follows:

GROUP XX

   where XX is the software kit Group number.

   This display lasts until a key is pushed.

2. Displays Copyright notice on the eight character LCD display as follows:

(C)_1992

   This display lasts until a key is pushed.

3. The control unit will display "stars" in all LCD digit positions as follows:

****

   This display lasts until a key is pushed.

4. The control unit will display "zeros" in all LCD digit positions as follows:

00000000

   This display lasts until a key is pushed.

5. The control unit will blink the XMIT LED with the LCD display showing the following.

XMIT LED

   This test lasts until a key is pushed.

6. The control unit will blink the BUSY LED with the LCD display showing the following.

BUSY LED

   This test lasts until a key is pushed.

7. The control unit will blink the SCAN LED with the LCD display showing the following.

SCAN LED

   This test lasts until a key is pushed.

8. The control unit will blink the S LED with the LCD display showing the following.

S LED

   This test lasts until a key is pushed.

9. The control unit will blink the EL panel with the LCD display showing the following.

EL PANEL

   This test lasts until a key is pushed.

10. The control unit will display either of the following.

PHOTO L	or	PHOTO D

    The display shown indicates whether the photo-detector of the front panel detects wither a high ambient light level (L for light) or a low ambient light level (D for dark).

    This test lasts until a key is pushed.

11. The control unit will display the following.

PUSH KEY

    This display will last until a key is pushed. Each subsequent key pushed is displayed on the LCD display until a different key is pushed.

NOTES

1. The user initiated test may be terminated at any point by pushing the FNC and ADD keys simultaneously.
2. If no user activity is detected for a period of 30 seconds, the control unit will revert back to the normal mode of operation.

CIRCUIT DESCRIPTION

DISPLAY PANEL

The display panel consists of a display board and keyboard for either vehicular or motorcycle applications. The panel includes the keyboard push-button controls, LCD display, LED indicators, the photo detector, and electroluminescent (EL) panel for backlighting the LCD display.

Keyboard

The keyboard provides the operator interface to the control unit and radio. The Deluxe keyboard is equipped with 25 push-button controls. The Select control unit is equipped with 15 push-button controls. The Keypad board is connected to the processor board by means of a 20-pin, in-line connector. Functions for both the System and Scan keyboards are shown in Table 2.

Display Board

The LED displays indicate the operational status of the radio system. A total of 14 LED's are used in the System version of the control unit, while 4 LED's are used on the Scan version of the control unit. Both control units use four static LEDs. The four static LEDs are XMIT, SCAN, BUSY, and S.

The System control unit used 12 flashing LED indicators that flash when the function is enabled. The flashing LEDs are YELP, RESET, WAIL, SL1-SL6, SPKR, AUX1 and AUX2.

The Scan control unit is equipped with four flashing LED indicators that flash when the function is enabled. The flashing LEDs are SPKR, SQL, CG and AUX.

LCD Display

The LCD display is an eight character, alphanumeric display utilizing 18-segment digits. All of the characters available for the display are shown in Table 3.

Photo Detector

The photo detector is used to give a light/dark level indication to the control unit. The information derived from the photo detector is used to dim the LEDs in low light conditions, and to automatically turn the electroluminescent (EL) panel on and off.

EL Panel

The EL panel provides the backlighting on the front panel assembly. The backlighting illuminates the LCD display and the keyboard buttons.

SWITCH NAME	FULL FEAT FUNCTION	SCAN FUNCTION
PWR	Y	Y
FNC	Y	Y
MODE	Y	Y
HOME	Y	Y
CG	Y	Y
SQL	Y	Y
VOL s	Y	Y
VOL t	Y	Y
CHAN s	Y	Y
CHAN t	Y	Y
ADD	Y	Y
SCAN	Y	Y
DEL	Y	Y
YELP	Y	N
SL1	Y	N
SL4	Y	N
SPKR	Y	N
RESET	Y	N
SL2	Y	N
SL5	Y	N
AUX1	Y	N
WAIL	Y	N
SL3	Y	N
SL6	Y	N
AUX2	Y	N
AUX	N	Y
SPKR	N	Y

Table 2 - Push-button Identification

PROCESSOR BOARD

The processor board contains the control unit microcomputer that provides the intelligent interface to the different keyboards, and to the I/O board. An EPROM contains the program memory (software) for the microcomputer, and an EEPROM contains the control unit and radio system programmable personality and frequency information.

The EPROM contains the control unit operational code for the fully functional radios system, the MONITOR test software, and the self-test software. The standard EPROM size is 64 k by 8-bit memory.

The EEPROM contains information on transmit and receive channel frequency, modes, volume and squelch control,

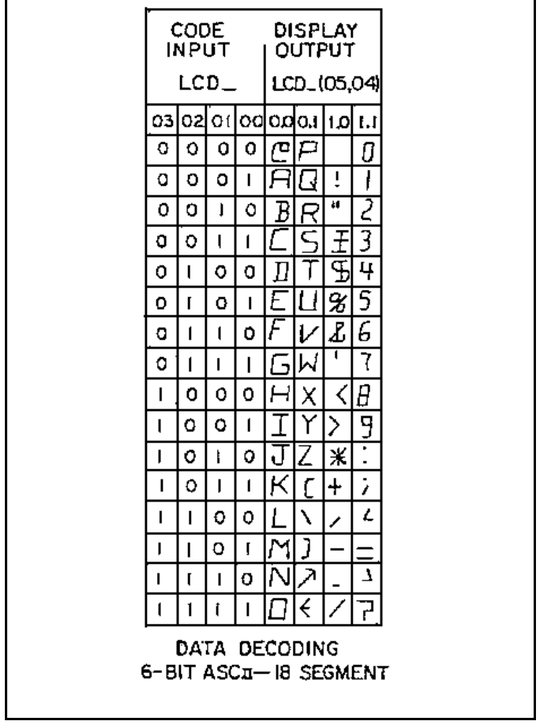


Table 3 - LCD 18-Segment Digit Characters

brightness level, power switch setting, Channel Guard encode/decode, GSTAR encode, and keypad switch definition. The standard EEPROM size is 8 k by 8-bit memory.

The optional GSTAR code provided allows up to 8192 ID's to be programmed into the control unit with GSTAR provides a PTT ID message when the microphone PTT switch is activated, and an EMERGENCY ID message when an external switch is activated (i.e., footswitch). The external switch acts as a silent alarm with no indication on the control unit that an alarm has been activated.

Power up/down control of the control unit and the rest of the radio system is performed by a flip-flop. This flip-flop switches the A+ power to the rest of the radio system through a relay.

AC power for the electroluminescent panel is generated by the EL driver device. This power is duty-cycle modulated to provide the intensity control of the EL backlighting.

The fast squelch detector is comprised of an analog filter/limiter circuit. The fast squelch detector provides a quick indication of carrier activity on the receive radio channel.

Ambient light level from the phototransistor on the Keypad/Display Panel is limited by a voltage comparator. This is used to automatically turn on the EL backlighting and reduce the LED brightness.

An optional limited channel guard signal from the radio is re-limited by a comparator. The Microcomputer Board performs the channel guard (tone or digital) decoding in the radio system.

A watchdog timer is included on the processor board to insure proper software execution. The watchdog timer is used to monitor the operation of the microcomputer software and to generate a reset pulse in the event that the microcomputer does not properly execute the program memory software contained in the EPROM.

I/O BOARD

In addition to providing the interface to the control unit processor board, the I/O board also interfaces to the following radio system components:

- RANGR mobile radio
- Vehicular repeater
- Siren/Light/PA unit
- Voice Guard unit
- Dual Control unit
- Handset/Hookswitch
- Internal-External speaker

The I/O board memory-mapped registers are written to by the processor board. A total of five registers control radio system operation in addition to the direct control from the display panel keyboard.

The first register controls the steering of microphone audio, Channel Guard tone or code, and GSTAR signalling to the radio transmitter. Control is also provided to steer the received radio audio and volume setting tone to the radio speaker (either internal or external). This register also steers the received radio audio and microphone audio to the external Siren/PA unit. Also included is the control of the EEPOT's for volume and squelch level setting. Other radio controls are also generated, such as radio PTT, receiver alert tone/receiver PA key, and receiver mute.

The second register controls the routing of the horn ring current drive to the horn return relay for sounding of the horn on the vehicle. This register also provides the hookswich or monitor output function which routes the received radio audio to the speaker prior to radio transmission. The siren PA PTT control is also provided, and remote control of the Voice Guard unit. Optional siren controls such as TAPII and WAIL are also included.

Register three is used to generate the siren/light relay controls. These controls are Siren-Light 1 (SL1) through Siren-Light 6 (SL6). This register also generates the internal/external speaker relay control, and activates the dual control pulsed control line.

The fourth register controls the generation of a 32-step tone/DTMF signal for transmitting and for the audible beeps and sidetones for the radio speakers. Control of the vehicular repeater is accomplished by an enable line to the repeater unit.

The final register is used to generate 4 of the 5 frequency select lines to the mobile radio as well as the radio reset and the radio store lines.

A digitally controlled potentiometer (EEPOT) on the I/O board is used to adjust the level of audio (received radio audio or microphone audio) to the speaker or external PA unit. A second EEPOT is used to adjust the squelch level to the mobile radio for variable squelch operation.

An audio amplifier is used to drive the audio to the external PA unit or the headset (in a motorcycle unit).

The I/O board also contains the 5-volt regulator that is used to supply logic and audio power to the remainder of the control unit. The I/O board provides heat sinking for the 5 volt regulator. The regulator also generates a power up reset to the hardware registers on the I/O board and to the microcomputer on the processor board.

The I/O board also contains a relay that is used to switch the battery power to the switched power line. The control for the power relay comes from the processor board.

Jumpers on the I/O board configure the control unit for the various options used. Table 4 contains the jumper configuration for the various options.

JUMPER	POSITION OF PLUG	FUNCTION OR OPTION
J21	1 & 2 2 & 3	DEFAULT CHANNEL DOWN REMOTE
J22	1 & 2 2 & 3	DEFAULT HANDSET/ HOOKSWITCH

Table 4 - I/O Board Jumper Configuration

POWER DISTRIBUTION

Power requirements for the S-825 series control units include A+ and IGN A+.

Control unit A+ is the continuous battery power and normally goes to the power relay. A+ power is input to the relay control flip-flop on the processor board which is used to energize the coil of the relay through a Darlington driver on the I/O board.

The A+SW power is the switched A+ power which enables the control unit to be turned on and off. The A+SW power is generated from the A+ power through the power relay.

IGN A+ is the switched power from the vehicle battery that is taken from the vehicle ignition switch.

TX-SW-IGN receives power from A+-SW-IGN whenever the control unit is turned on. TX-SW-IGN is applied to the radio controller to prevent transmissions if power is not applied to this line.

The control unit samples the IGN A+ to determine if the radio is transmitting, or if the siren/PA functions are to be activated.

Control unit grounds are GND (logic ground and limited Channel Guard ground), VOL/SQ-LO (radio received audio ground), and MIC-LO (microphone audio ground).

PROGRAMMING

The control unit contains an EEPROM for personality programming and storage of remembered parameters. The following equipment is required to program the S-825 series control units:

- Personal Computer (PC) - IBM compatible
- Serial Programming Kit TQ3310
- Control Unit cable TQ3338 (19C337114P1)

Serial Programming Kit TQ3310 consists of an Interface Module, a power supply and a cable that interfaces with the PC Cable (TQ3338) connects the Interface Module to the Control Unit.

Power for the Control Unit is supplied by the standard ignition cable. Refer to the Programming Manual for complete programming instructions.

CONNECTOR INTERFACES

All S-825 series external interfaces are made through cable connectors J1, J2, J3, J4, and J5 located at the back of the control unit.

The cables interface directly to the control unit I/O board where control, signal, and power lines are filtered, buffered, and protected. The cables are routed through, and strain relieved at the molded plastic back cap.

Connector J1 is the control unit power connector. Connectors J2 and J3 provide the mobile radio interface. Also, vehicular repeater connections are made to connector J3.

Connector J4 provides the microphone interface. Connector J4 provides the siren/light interface and PC programming interface.

Tables 5 through 9 list all connectors, pins, signal names, inputs or outputs to or from the control unit, analog or digital input/output, and standard input/output voltage levels that are used in the S-825 series control unit.

Note that a power input of 13.8 volts is to be applied to the unit in the following tables unless otherwise specified. Also note that a FLOAT reading may need to be pulled up to 13.8 volts in order to measure this level reliably.

The connectors at the back of the control unit are as follows:

J1 Power and Ignition Connector

J2 Radio Control Connector #1

J3 Radio Control Connector #2

J4 Microphone Connector

J5 Auxiliary Connector

CONNECTOR JI PIN	SIGNAL NAME	INPUT (I)/ OUTPUT (O)	ANALOG (A)/ DIGITAL (D)	LEVEL VOLTS
1	A-	I	A	0
2	SPKR 2	O	A	6.25 rms
3	A-	I	A	0
4	SPKR 2	O	A	6.25 rms
5	MIC HI	O	A	.020-.070 rms
6	MIC LO	O	A	0
7	PTT SW	O	D	0, 13.8
8	GSTAR	I	D	0, FLOAT
9	PTT GND	O	A	0
10	CG DIS IN	I	D	0, FLOAT
11	A+	I	A	13.8
12	A+ SW	O	A	0, 13.8
13	HKSW SPKR IN	I	A	6.25 rms
14	CTRL A-	O	D	0, FLOAT
15	HKSW SPKR OUT	O	A	6.25 rms
16	IGN A+	I	A	0, 13.8
17	INT SPKR 1	O	A	6.25 rms
18	EARPC SPKR 1	O	A	6.25 rms
19	EXT SPKR 1	0	A	6.25 rms

Table 5 - J1 Connector I/O Definition

CONNECTOR JI PIN	SIGNAL NAME	INPUT (I)/ OUTPUT (O)	ANALOG (A)/ DIGITAL (D)	LEVEL VOLTS
1	SQ ARM	O	A	0.300 (rms)
2	VOL/SQ LO	I	A	0
3	ALERT TONE	O	A	0.300 (rms)
4	VOL HI	I	A	0.300 (rms)
5	VOL ARM	O	A	0.300 (rms)
6	SQ DIS	I	D	0, FLOAT
7	CTRL A-	I	D	0, FLOAT
8	FB 1	O	D	TTL
9	FB 2	O	D	TTL
10	CAS	I	D	0, 9.00
11	A+SW	O	A	13.8
12	CG DIS OUT	O	D	0, FLOAT
13	TX SW A+	O	A	13.8
14	RAD PTT	O	D	0, FLOAT
15	MIC LO	I	A	0
16	MIC HI	I	A	0.025 (rms)
17	SPKR 1	I	A	6.25 (rms)
18	SPKR 2	I	A	6.25 (rms)
19	GND	O	A	0

Table 6 - J2 Connector I/O Definition

CONNECTOR JI PIN	SIGNAL NAME	INPUT (I)/ OUTPUT (O)	ANALOG (A)/ DIGITAL (D)	LEVEL VOLTS
1	PA KEY	O	D	0, FLOAT
2	GUARD SEL	O	D	0, FLOAT
3		I		
4	LIM CG HI	I		TTL
5		O		
6	SQ HI	O	A	0.300 rms
7		O		
8		O		
9	RAD RESET	O	D	0, FLOAT
10	DUAL CTRL	O	D	0, FLOAT
11		O		
12	RX MUTE	O	D	0, FLOAT
13	UN SW A+	O	A	13.8
14	ADV CHANGE	O	D	TTL
15	CLEAR SEL	O	D	0, FLOAT
16	STORE	O	D	TTL
17	FB 3	O	D	TTL
18	FB 4	O	D	TTL
19	FB 5	O	D	TTL

Table 7 - J3 Connector I/O Definition

CONNECTOR JI PIN	SIGNAL NAME	INPUT (I)/ OUTPUT (O)	ANALOG (A)/ DIGITAL (D)	LEVEL VOLTS
1	ALT PTT IN	I	D	0, FLOAT
2	PTT IN	I	D	0, FLOAT
3	A+SW	O	A	13.8
4	MIC HI	I	A	.020-.070 rms
5	SPKR 1	O	A	6.25 rms
6	CG DIS IN	I	D	0, FLOAT
7	SPKR 2	O	A	6.25 rms
7 (REMOTE)	CH DN (OPTION)	I	D	0, FLOAT
8	GND	I	A	0
9	MIC LO	I	A	0

Table 8 - J4 Connector I/O Definition

CONNECTOR JI PIN	SIGNAL NAME	INPUT (I)/ OUTPUT (O)	ANALOG (A)/ DIGITAL (D)	LEVEL VOLTS
1	ADV CHANGE	O	D	TTL
2	FB5	O	D	TTL
3	CPTT	I	D	0, FLOAT
4	SPTT	I	D	0, FLOAT
5	A-/REC	I	A	0
6	MIC PRE HI	I	A	.010 rms
7	MIC LO	I	A	0
8	HS AUDIO HI	O	A	6.25 rms
9	VOL/SQLO	I	A	0
10	SIREN 1	O	D	0, FLOAT
11	SIREN 2	O	D	0, FLOAT
12	SIREN 3	O	D	0, FLOAT
13	SIREN 4	O	D	0, FLOAT
14	SIREN 5	O	D	0, FLOAT
15	ON/OFF	O	D	0, FLOAT
16	EE WR EN	I	D	0, FLOAT
17	SEND	O	D	0, FLOAT
18	SPARE	O	D	0, FLOAT
19	SIR PA PTT	O	D	0, FLOAT
20	A-	I	A	0
21	PA AUDIO HI	I	A	3.25 rms
22	PA AUDIO LO	I	A	0
23 (TAB)				
24	RPTR ENBL	O	D	0, 13.8
25	HORN RING	I	D	0, 13.8
26	HORN RET	O	D	0, 13.6

Table 9 - J5 Connector I/O Definition

SYSTEM TEST PROCEDURES

The System Test Procedures provide the following tests to be performed on the S-825 Series Control Units:

- Power and continuity checks
- Keyboard functional test
- Processor board functional test
- I/O board functional test
- Digital signal loopback test
- Audio signal loopback test
- Power control test

All of the tests, except for the power continuity tests, are performed through the MONITOR intelligent test software. The MONITOR test software is embedded as part of the operational code of the microcomputer on the processor board. A complete list of the test equipment required is shown below.

TEST EQUIPMENT

The test equipment necessary for the test procedures include standard test equipment along with the test cables as required. The standard test equipment is listed as follows:

- S-800 Series Automatic Tester TQ-0614
- Power Supply, variable 0 to 16 volts, 500 mA
- Volt-Ohm Meter, 0-50 volts, 0-500 mA, 0-1 Megohm
- Oscilloscope, 50 MHz bandwidth
- Dumb Terminal (RS-232C compatible)
- Controlled Light Source
- Audio Signal Generator
- Distortion Analyzer

The S-800 Automatic Tester is required to provide the interface between the dumb terminal used to run the MONITOR software, and the control unit. The S-825 Automatic Tester consists of a bank of relays which enable the Control Unit to perform a series of digital and analog loopback tests to verify electrical operation of the unit.

During the test procedures, the power cable is the only standard cable that needs to be connected to the control unit at all times. The test cables are used as directed to exercise the digital and audio loopback tests necessary for the complete hardware component testing of the control unit.

Connections to the S-800 Automatic Tester include five cables which plug directly into jacks J1 through J5 on the Control Unit (or the I/O Board). In addition, one cable is required for the dumb terminal interface and one cable for the 13.8 nominal power supply input. The basic test setup procedure used to test the S-825 Series control unit is shown in Figure 3.

Refer to the Automatic Tester Maintenance Manual (LBI-38166) for complete instructions.

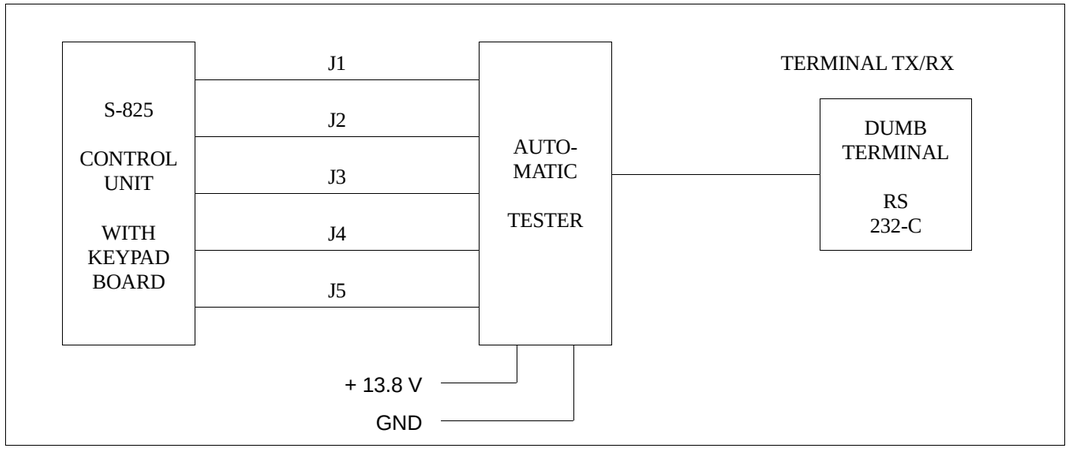


Figure 3 - Dumb Terminal Interface

POWER CONTINUITY TEST

Preliminary tests to be performed on the control unit are power and ground continuity testing. All supply inputs and outputs are checked to insure that no shorts exist between power and ground inputs prior to test.

In addition to the power supply lines, certain other signals are capable of carrying a substantial current. These signals are also to be checked for continuity.

The first test to be performed on the control unit is the continuity test. The continuity test verifies that certain points on the control unit are tied together (that is, no open patterns), or are disconnected (that is, no shorts). This test is performed on the control unit with NO power applied.

1) Verify that all connector points of A- are continuous.
2) Verify that all connector points of VOL/SQ LO are continuous.
3) Verify that all connector points of MIC LO are continuous.
4) Verify that any pairs of A-, VOL/SQ LO and MIC LO are not continuous.
5) Verify that all connector points of SPKR 1 are continuous.
6) Verify that all connector points of SPKR 2 are continuous.
7) Verify that all connector points of A+ and TX SW IGN are continuous.
8) Verify that all connector points of CRTL A- are continuous.
9) Verify that all connector points of INT SPKR 1 are continuous.
10) Verify that all connector points of RAD PTT are continuous.
11) Verify that all connector points of EARPC SPKR 1 are continuous.
12) Verify that any pairs of INT SPKR 1 and EARPC SPKR 1 are not continuous.
13) Verify that all connector points of CG DIS IN are continuous.
14) Verify that all connector points of A+ are continuous.
15) Verify that all connector points of A+ SW are continuous.
16) Verify that any connector pairs of A+ and A+ SW are not continuous.
17) Verify that all connector points of ADV CHANGE are continuous.
18) Verify that all connector points of FB5 are continuous.
19) Verify that all connector points of CPTT are continuous.
20) Verify that all connector points of SPTT are continuous.
21) Verify that all connector points of EE WR EN are continuous.

The power continuity test is described in Table 11. All ground lines (GND, LIM CG LO, MIC LO, and VOL/SQ LO) are to be tied together for the control unit test procedures.

SIGNAL	I/O BOARD PIN NUMBERS
A+	J1-1
A+SW	J2-11
GND	J1-1 J1-8 J2-19 J3-5 J4-8 J5-7
A+-IGN	J1-2
TX-SW-IGN	J2-13
HORN-RING	J1-3
HOR-RET	J1-4
SPKR1	J1-11 J2-17 J4-5
SPKR2	J1-10 J2-18 J4-7
CONNJ5-1	J5-1
CONNJ5-2	J5-2
CONNJ5-3	J5-3
CONNJ5-4	J5-4
CONNJ5-5	J5-5
CONNJ5-6	J5-6

Table 10 - Power and High Current Signal Lines

A)	NO POWER APPLIED TO I/O BOARD
B)	VERIFY THAT NONE OF THE LISTED POINTS ARE SHORTED TO ONE ANOTHER A+, A+SW, GND, A+-IGN, TX-SW-IGN, HORN-RING, HORN-RET, SPKR1, SPKR2, CONNNJ5-1 CONNJ5-2, CONNJ5-3, CONNJ5-4, CONNJ5-5, CONNJ5-6
C)	VERIFY THAT ALL CONNECTIONS OF A+ ARE SHORTED
D)	VERIFY THAT ALL CONNECTIONS OF GND ARE SHORTED
E)	VERIFY THAT ALL CONNECTIONS OF SPKR1 ARE SHORTED
F)	VERIFY THAT ALL CONNECTIONS OF SPKR2 ARE SHORTED

Table 11 - Power Continuity Test

TERMINAL SETUP AND CONFIGURATION

The dumb terminal is to be interfaced to the S-825 Automatic Tester in order to exercise the MONITOR test software. The dumb terminal is interfaced to the control unit through connectors P1 through P5.

AUTOMATIC TESTER

The S-800 Automatic Tester permits the testing of any one board of the three Control Unit boards with any two remaining boards that are known to be functional.

The Automatic Tester consists of a bank of relays which enable the control unit to perform a series of digital and analog loopback test to verify electrical operation of the unit.

Complete information for using the Automatic Tester is contained in Automatic Tester Maintenance Manual, LBI-38166.

S-800 AUTOMATIC TESTER SETUP AND CONFIGURATION

The S-800 Automatic tester is used in order to test any one board of the Control Unit with the two known functional remaining boards of the Control Unit. It is also used to test the overall control unit.

The Automatic Tester consists of a bank of relays which enable the Control Unit to perform a series of digital and analog loopback tests to verify electrical operation of the unit.

Connected to the S-800 Automatic Tester are five cables which plug directly into the Control Unit (on the I/O Board), one cable for the dumb terminal interface, and one cable for the 13.8 nominal power supply input.

There are four commands that are executed via MONITOR to perform the automatic testing of the individual boards of the S-825 Series Control Unit.

TEST S (or D)	Performs keypad and I/O related tests
TSTK S (or D)	Performs keypad related tests
TSTI	Performs I/O related tests
TSTP S (or D)	Performs Processor related tests

The Keypad Board test requires the TSTK command.
The I/O Board test requires the TSTI command.
The Processor Board requires the TSTP command.
The Control Unit requires the TEST command.

The keypad board test performs the following:

- Cycling of the LED

NOTE

The character S or D designates whether the unit (or boards) are configured for the Scan or System control unit, respectively.

- Cycling of a character on the LCD (* or 0)
- Photo detector test via * (for light) or 0 (for dark) on the LCD
- EL panel blinking at a rate of one complete LED cycle
- Sampling of the buttons

The control unit performs a series of loopback tests and displays failures. The failure test numbers are used via the lookup sheets that are part of the S-800 Automatic Tester to determine the nature of the failure.

The processor board and the control unit performs both the keypad tests and the I/O tests.

The S-800 Automatic Tester displays the test failures to the MONITOR terminal. The S-800 automatic tester uses the signal lines GUARD SEL, WAIL, and DUAL CTR to activate certain relay paths which perform the analog and digital loopback of the signals to the control unit.

Both the System and Scan control units mate to the S-800 Automatic Tester via the cable labeled J1 through J5 on the tester. The Automatic Tester receives input power from the 13.8 volt nominal supply source. The dumb terminal mates with the tester an RS-232C null modem cable.

Upon a power up, the Control Unit detects that the Automatic Tester is plugged in the unit. The criterion used to determine this is via the CPTT, SPTT, and CG DIS IN lines being grounded at a reset or power up of the control unit.

The control unit performs an autobaud function where it will lock onto the proper baud rate of the terminal as determined by decoding the carriage return character from the dumb terminal. The permissible buad rates are 19.2 k, 9600, 4800, 3600, 2400, and 1200.

For the control unit test procedures, the ground lines (GND, MIC LO, and VOL/SQ LO) are to be tied together via the automatic tester.

The dumb terminal is to be interfaced to the control unit (via the automatic tester) in order to exercise the test software, MONITOR, embedded as part of the operational code of the microcomputer on the processor board.

The dumb terminal is to be configured for the serial transmission as shown in Table 12.

The serial transmit and receive data lines from the control unit used to communicate with the dumb terminal are ADV CHANGE and FB5. ADV CHANGE receives the TXD lines from the RS 232C terminal. FB5 transmits to the RXD line of the RS 232C terminal.

TRANSMIT RATE	VARIABLE 1200 - 19.2 k
RECEIVE RATE	VARIABLE 1200 - 19.2 k
DATA BITS	7
PARITY	ODD
DUPLEX	FULL
CHARACTERS	ASCII, 0-9 AND A-Z, UPPERCASE
HANDSHAKING	NONE
TRANSMIT LINE	PIN 2 ON DB-25 CONNECTOR
RECEIVE LINE	PIN3 ON DB-25 CONNECTOR
SIGNAL GROUND LINE	PIN7 ON DB-25 CONNECTOR

Table 12 - Dumb Terminal Characteristics

TEST SOFTWARE ENABLE

Upon power up, the control unit displays a flashing "MONITOR" banner on the LCD display. At this point the control unit is awaiting a carriage return character from the dumb terminal. The control unit starts to look for the character at a baud rate of 19.2 k. If the carriage return is sent at a different baud rate or if another character is received, the control unit will switch to looking for the carriage return at 9600 baud. This process continues until the carriage return is received at the expected baud rate. The allowable baud rates are 19.2 k, 9600, 4800, 3600, 2400, and 1200.

Upon reception of the carriage return at the expected baud rate, the control unit transmits to the dumb terminal the standard control unit banner message.

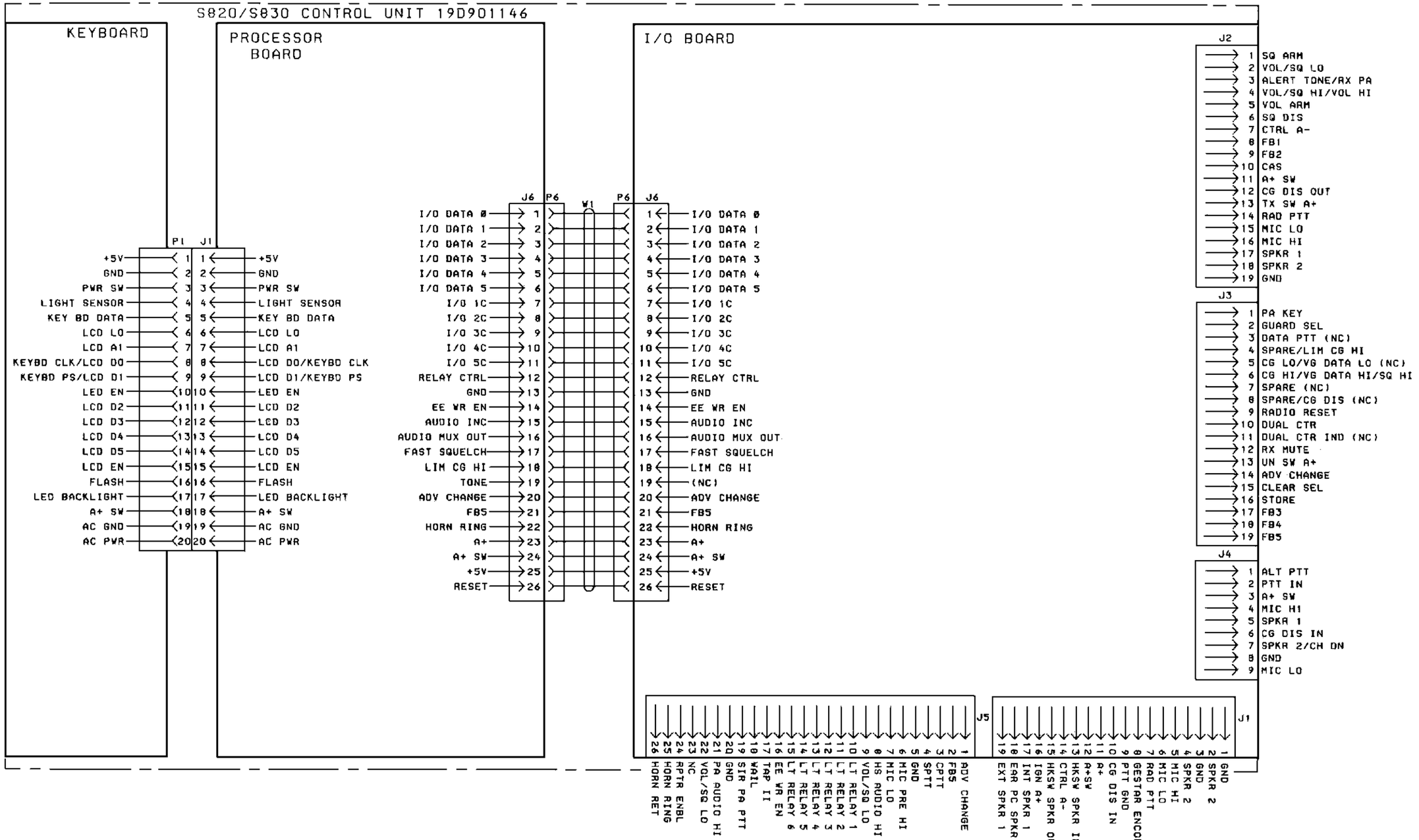
All commands from the dumb terminal are entered after the MONITOR prompt, *. The commands are processed and cause the control unit to perform a series of operations after the reception of a carriage return character (line feed character is not required).

The MONITOR code will process the command given and will not accept another command input until the previous command has completed execution as signified by the display of the MONITOR prompt, *. It is possible to abruptly terminate the execution by executing a <CTRL-Z> or an ESC character transmission from the dumb terminal. The control unit responds by transmitting the MONITOR prompt back to the dumb terminal.

SERVICE NOTE: All transmissions from the control unit to the dumb terminal are preceded by a carriage return and line feed.

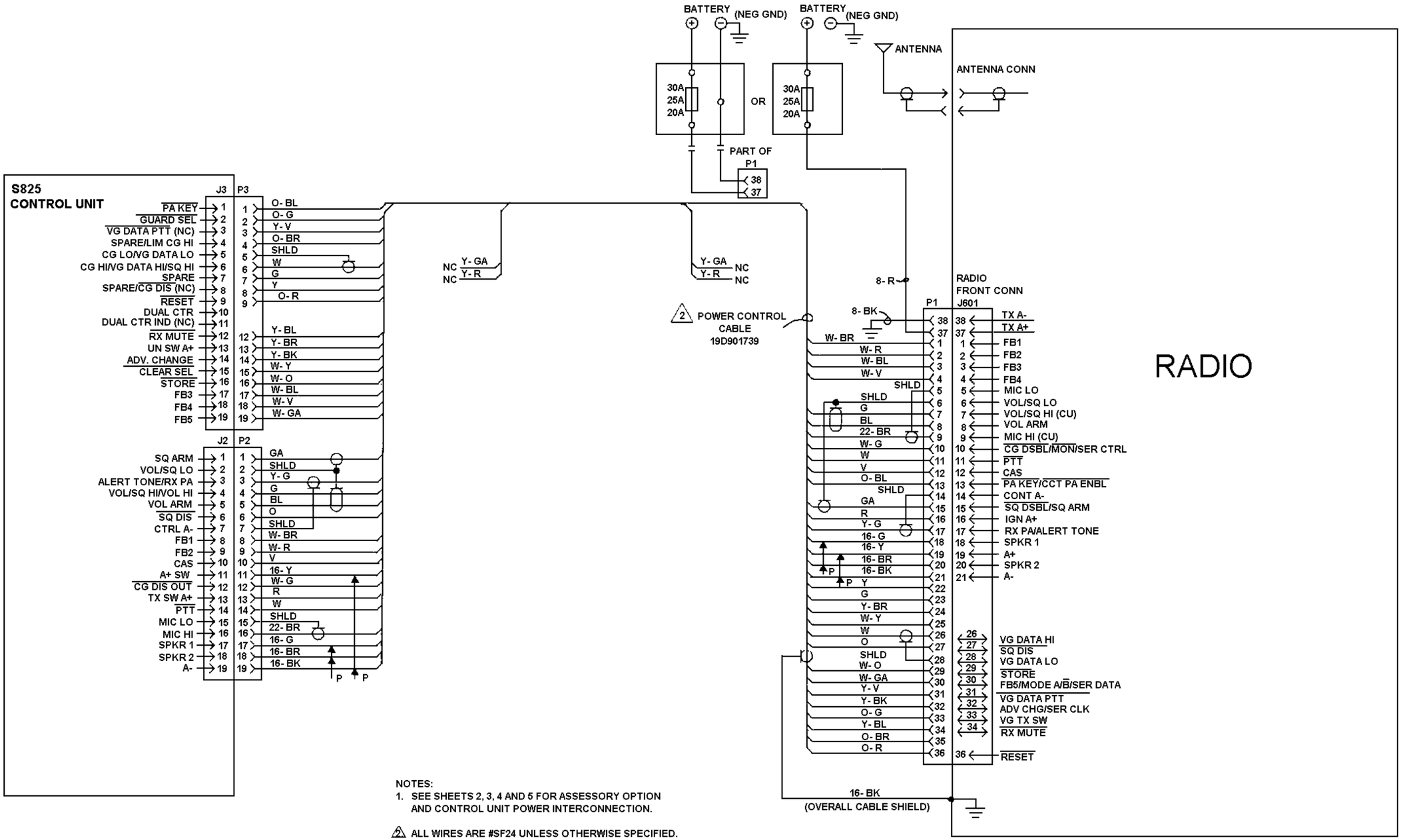
CAUTION

CMOS Integrated Circuit devices used in this equipment can be destroyed by static discharges. Before handling one of these devices, the serviceperson should discharge himself by touching the case of a bench test instrument that has a 3-prong power cord connected to an outlet with a known good earth ground. When soldering or desoldering a CMOS device, the soldering iron should also have a 3-prong power cord connected to an outlet with a known good earth ground. A battery operated soldering iron may be used in place of the regular soldering iron.



CONTROL UNIT

(19D438693, Sh. 1, Rev. 0)

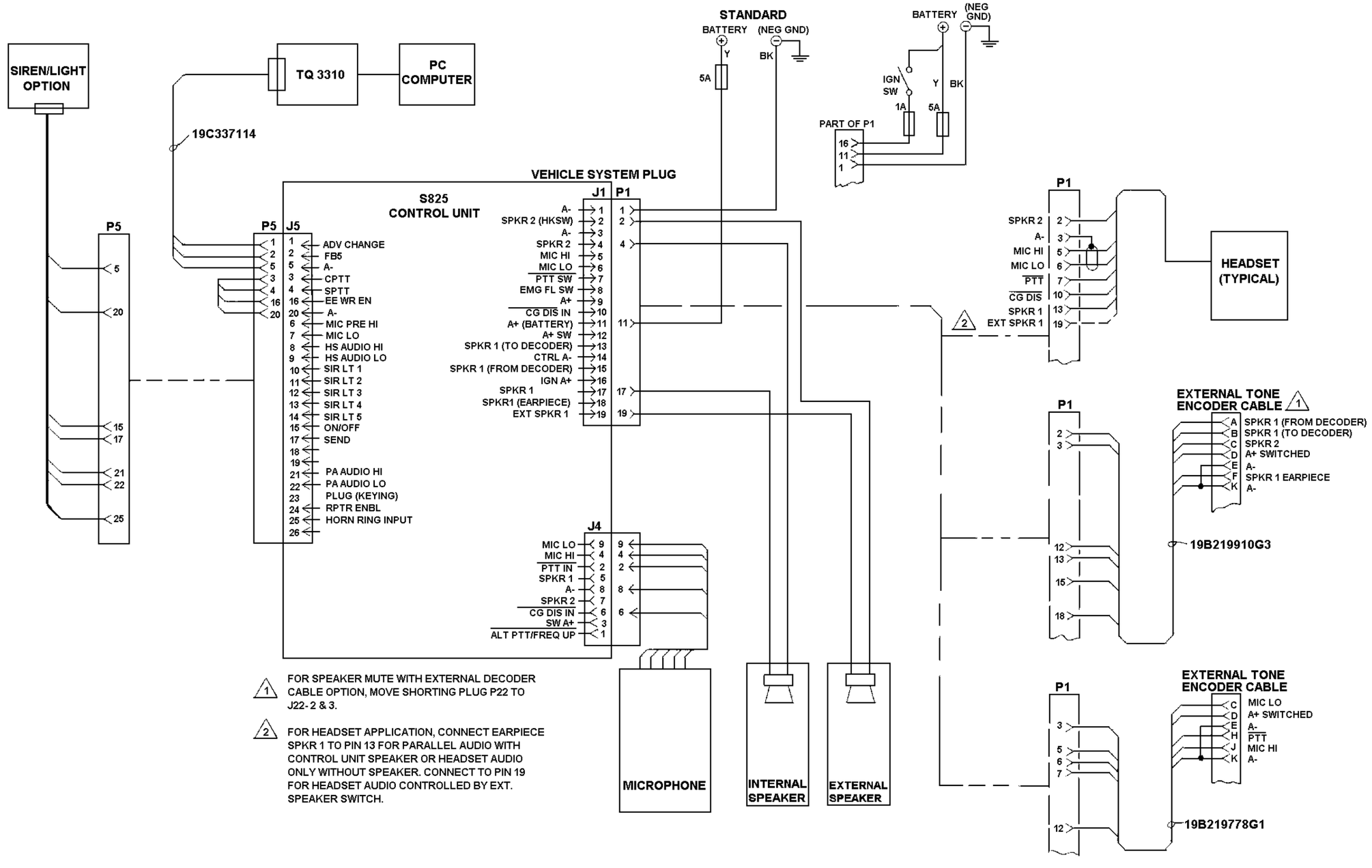


NOTES:
1. SEE SHEETS 2, 3, 4 AND 5 FOR ASSESSORY OPTION AND CONTROL UNIT POWER INTERCONNECTION.

2 ALL WIRES ARE #SF24 UNLESS OTHERWISE SPECIFIED.

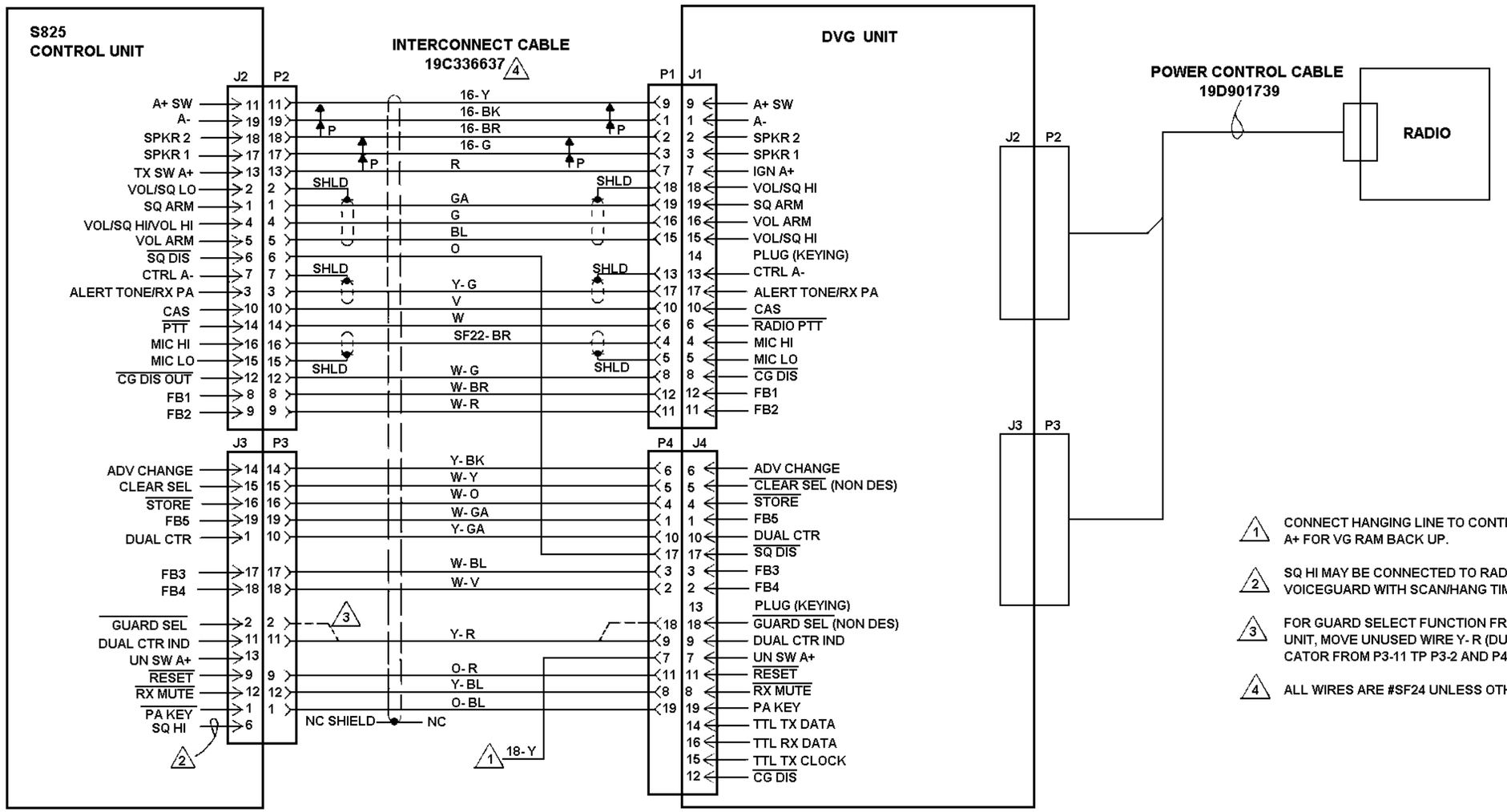
CONTROL UNIT TO MOBILE RADIO

(19D438650, Sh. 1, Rev. 0)



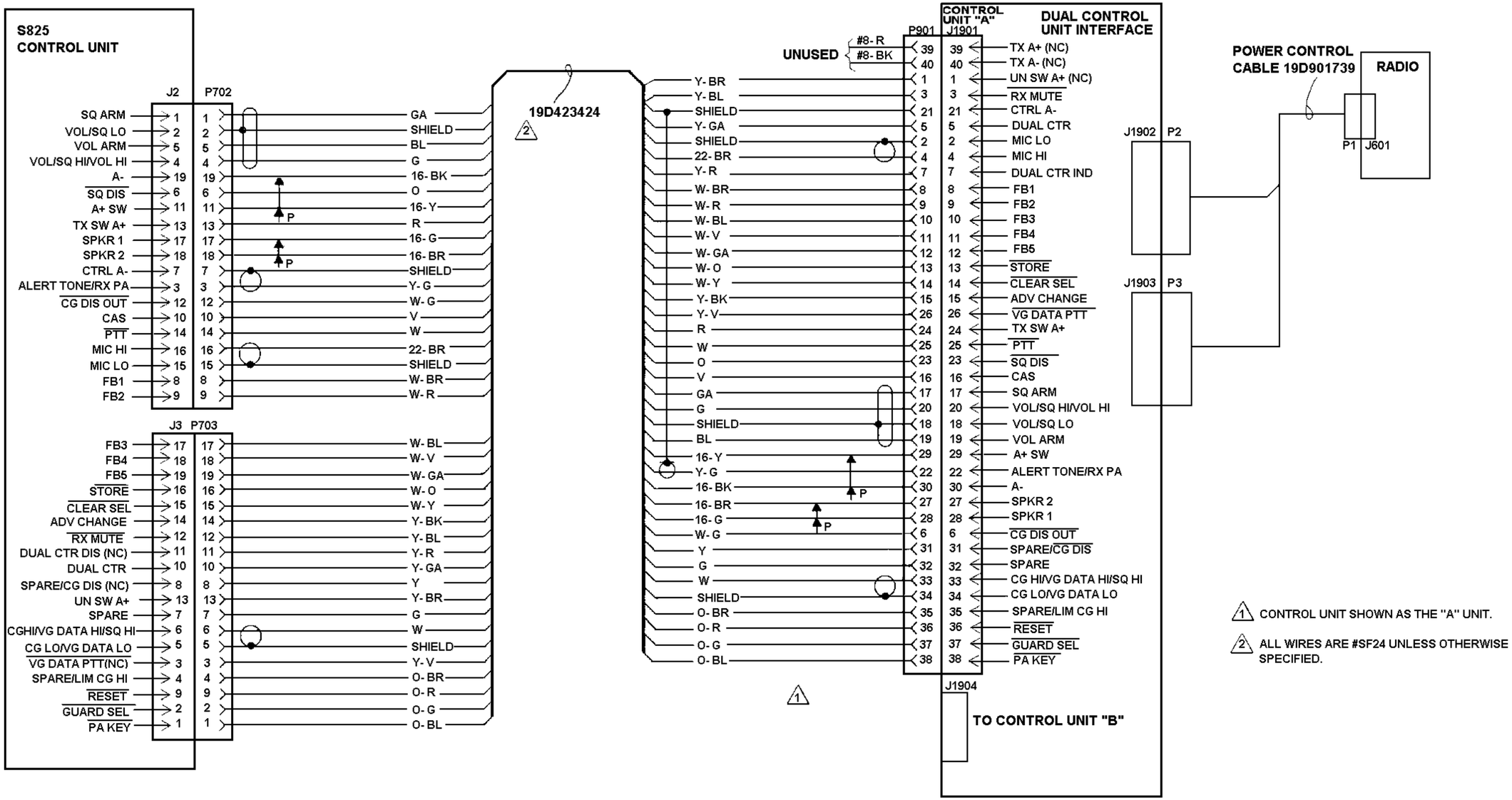
CONTROL UNIT WITH ACCESSORIES

(19D438650, Sh. 2, Rev. 2)



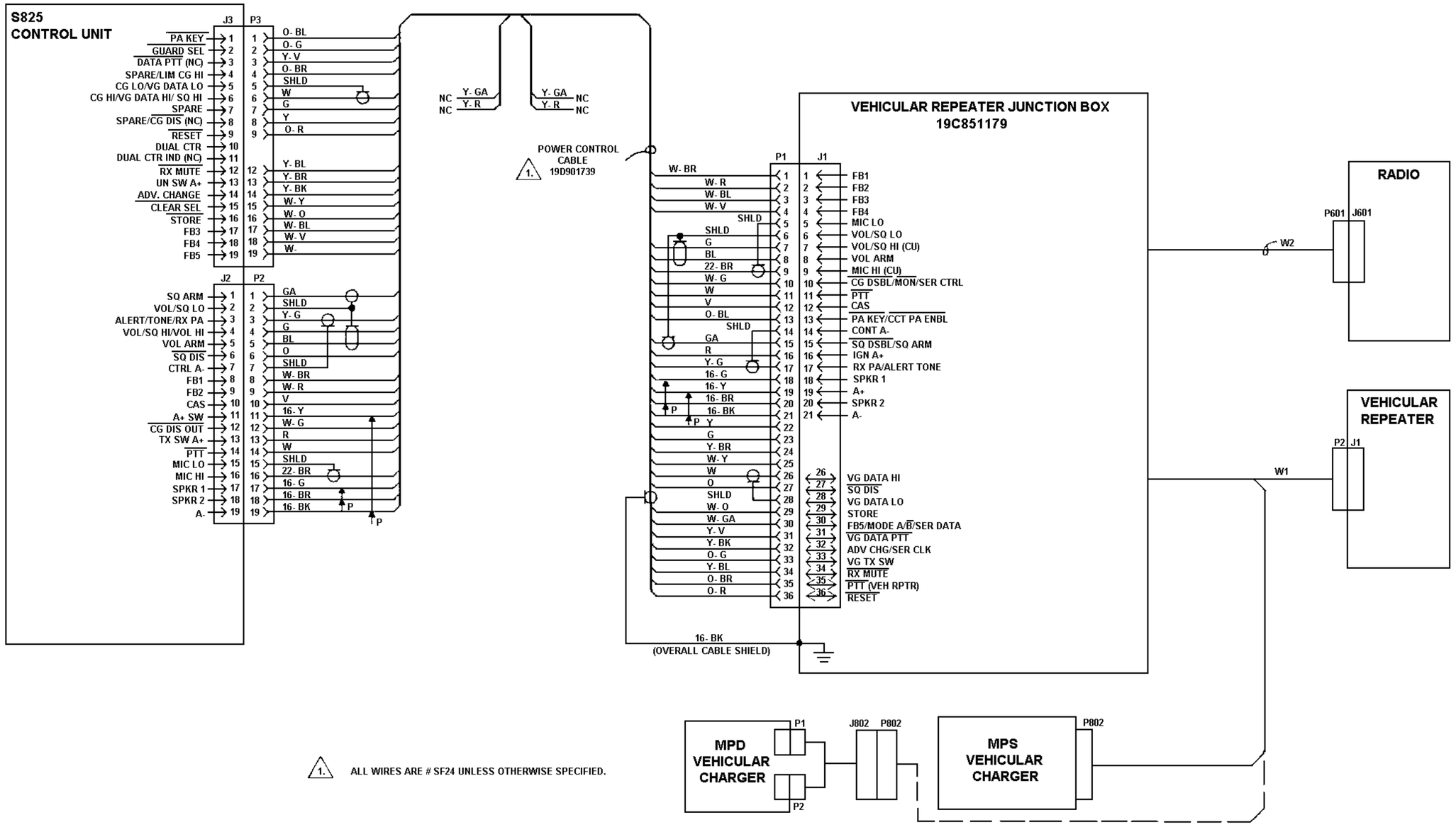
CONTROL UNIT WITH VOICE GUARD

(19D438650, Sh. 3, Rev. 0)



CONTROL UNIT WITH DUAL CONTROL

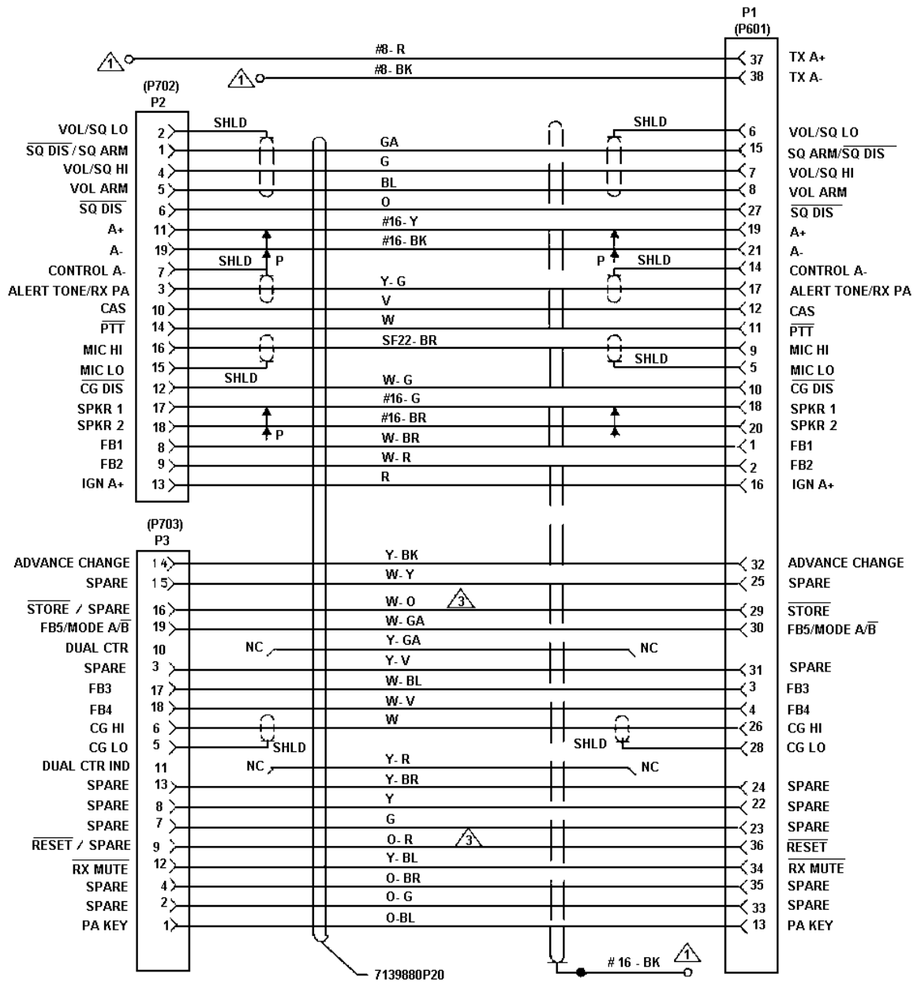
(19D438650, Sh. 4, Rev. 0)

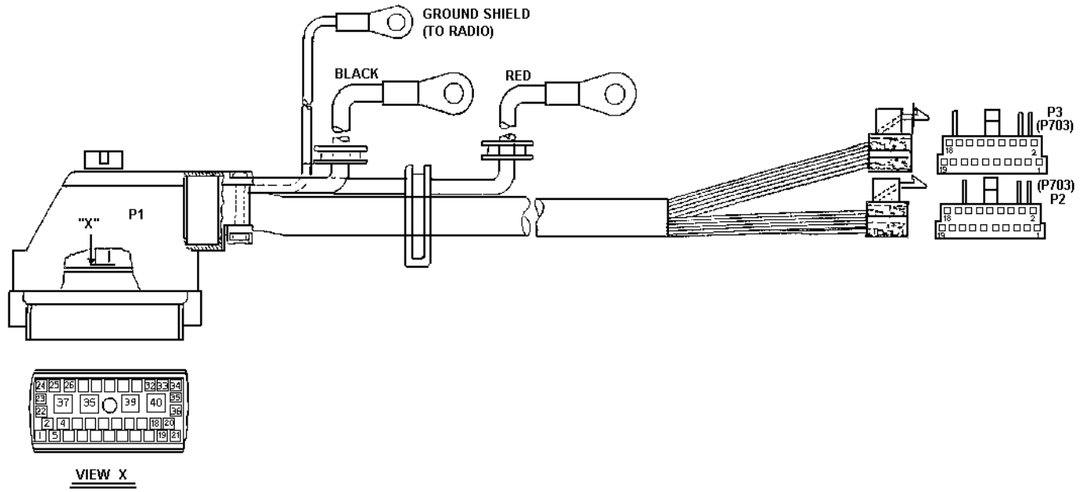


CONTROL UNIT WITH VEHICULAR REPEATER

(19D438650, Sh. 5, Rev. 0)

SCHEMATIC DIAGRAM

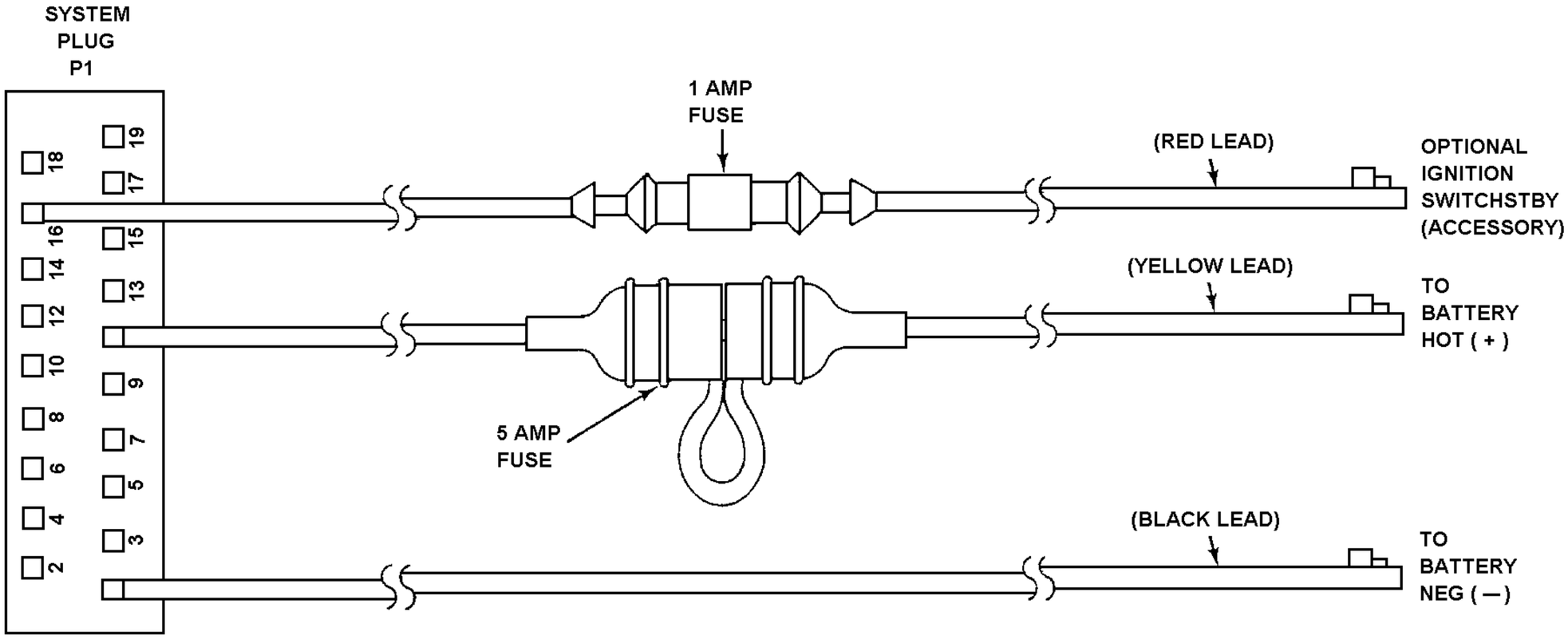




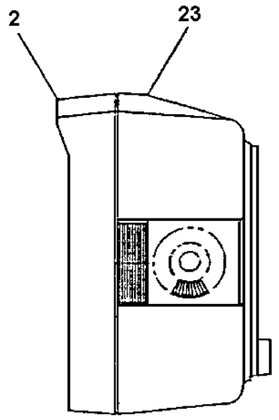
1. ELECTRICALLY UNCONNECTED UNTIL INSTALLED BUT TERMINATED PER ASM 19D901739.
2. ALL WIRES ARE #SF24 AWG UNLESS OTHERWISE SPECIFIED.
3. FOR GROUPS 3, 4 & 6 W-O AND O-R WIRES ARE NOT CONNECTED AT EITHER END.

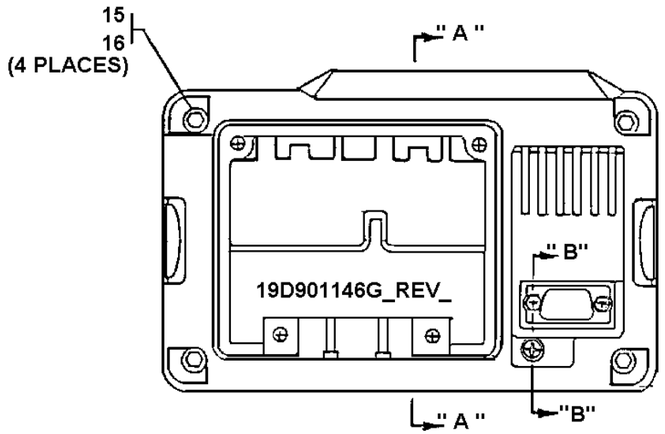
S-825 SERIES
POWER/CONTROL CABLE

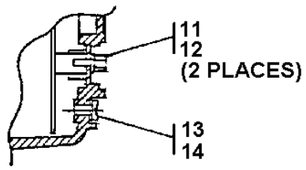
(19D901742, Sh. 1, Rev. 0)



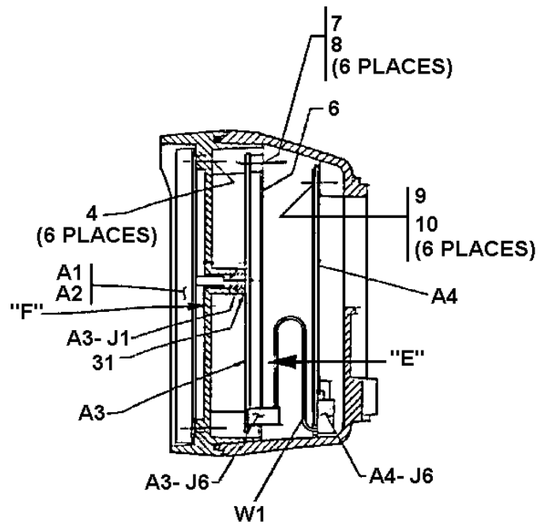
S-825 SERIES
IGNITION SWITCH CABLES
(19B219537, Rev. 2)



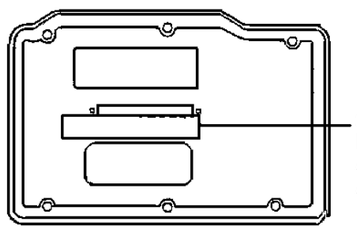




SECTION B - B

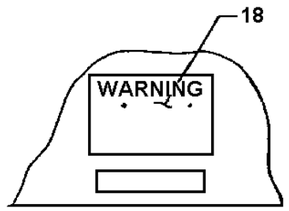


SECTION A - A



FRONT COVER
VIEW AT "F"

ITEM 32 TO
OVERLAP SLOT
.000 - .025



VIEW "E" (PARTIAL)

CONTROL UNIT
19D901146G3, G4, G9

LBI-38298A
S-825 CONTROL UNIT
ASSOCIATED ASSEMBLIES

SYMBOL	PART NO.	DESCRIPTION
		POWER/CONTROL CABLE 19D901739G1
		- - - - - - - - - - - - PLUGS - - - - - - - - - - - -
P1		Connector, Includes:
	19D900037P1	Shell.
	19D900015P1	Housing.
	19C850508P1	Cover.
	19A701376P1	Contact, electrical rated 4 Amps; sim to AMP 350657-1. (PQ-1 thru 17, 22 thru 36).
	19A701376P3	Contact, electrical rated 35 Amps; sim to AMP 350655-1. (P1-37, 38).
	19A701376P2	Contact, electrical rated 4 Amps; sim to AMP 350656-1. (P1-18 thru 21).
	19B800513P1	Gasket. (Used with P1 cable clamp).
	19A701488P4	Retaining ring. (Retains thumbscrew).
	19A700032P5	Lockwasher, internal tooth: No. 3MM. (Secures P1 cable clamp).
	19A700034P4	Nut, Hex: No. M3 x 0.5MM. (Secures P1 cable clamp).
	19A700031P425	Machine screw: No. M3-0.5 x 25. (Secures P1 cable clamp).
	19A705055P1	Thumbscrew. (Secures P1 to radio).
	19A701077P1	Clip.
	19A701312P6	Flatwasher: 1.7 - 1.85 ID. (Used with thumbscrew).
P2		Connector. Includes:
	19B226516G1	Shell.
	19A116781P3	Contact, electrical: wire range 16 - 20 AWG; sim to MOLEX 08-50-0105. (P2-11, 17 thru 19).
	19A116781P4	Contact, electrical: wire range 22 - 26 AWG; sim to MOLEX 08-50-0107. (P2-1 thru 10, 12 thru 16).
P3		Connector. Includes:
	19B226516G2	Shell.
	19A116781P4	Contact, electrical: wire range 22 - 26 AWG; sim to MOLEX 08-50-0107. (P3-1 thru 9, 12 thru 19).
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	7139880P20	Cable, special purpose, 14 conductors with overall shield.
	19A701460P2	Cable, red; sim to GE S1-57528.
	19A701460P10	Cable, black.
	7142878G1	Clip loop.
	19J706152P8	Retaining strap; sim to Dennison Bar-lok 08470.
	19J706152P9	Retaining strap; sim to Dennison Bar-lok 08471.
	19A701507P606	Screw, thread forming: M3.5-1.27 x 9.60. (Secures J1 cover to housing).
	19A701507P608	Screw, thread forming: M3.5-1.27 x 12.7. (Secures J1 connector to housing).
	19B800629P1	Solderless terminal. (Located on black ground wire).
	19B800629P6	Solderless terminal: wire range 14-16 AWG; sim to AMP 42751-2.
	19B800629P3	Solderless terminal. (Located on red + wire).
	19A115799P1	Solderless terminal: sim to AMP 11460.
	19A701631P610	Machine bolt: M6-1 x 10.
		MICROPHONE 19B801499P5
		MICROPHONE MOUNTING KIT 7141412G2
	N193P1408B6	Tap screw: No. 8-18 x 1/2.
	4031457G1	Bracket.
	4031458G1	Spring.
	19A116773P105	Tap screw, Phillips POZIDRIV: No. 7-19 x 5/16.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

SYMBOL	PART NO.	DESCRIPTION
		CONTROL UNIT MOUNTING BRACKET 19B801514G1
	19B801513P1	Bracket.
	19B232947P2	Nut, adjustment.
		CONTROL UNIT HARDWARE KIT 19A705137G3
	N710P1612B17	Tap screw, hex head: No. 10-16 x 7/8. (Used with mounting bracket - Quantity 4).
	N710P162412B17	Tap screw, hex head: No. 10-16 x 1-1/2. (Used with mounting bracket - Quantity 4).
	N171P16010	Cap screw, stainless steel: No. 10-32 x 5/8. (Mounts rear cover).
	19A149551P21012	Machine screw, hex head. (Mounts control unit - Quantity 2).
	N406P41	Lockwasher.
	N400P41	Flatwasher.
	4035449P8	Rubber bumper.
	19A134268P5	Conduit, non-metallic.
		REAR COVER ASSEMBLY 19B801262G1
	19D438177P1	Cable cover.
	19A701381P6	Rubber seal, round.
		20-WATT SPEAKER (4 OHMS) 19A149590P1
		Includes: 5" x 5" Waterproof speaker assembly, mounting bracket and installation hardware kit.
		SPEAKER CABLE 19A149590P6
		IGNITION CABLE FUSED CONNECTOR ASSEMBLY 19B219537G5
		- - - - - - - - - - - - - - - PLUGS - - - - - - - - - - - - - - -
P1	19B226516G9	Shell.
		- - - - - - - - - - MISCELLANEOUS - - - - - - - - - -
	19A114268P4	Conduit, non metallic.
	19A129505G2	Cable.
	19A129480G4	Fused lead.
	19B209519P1	Polarity tab.

CONTROL UNIT
19D901146G3 SCAN
19D901146G4 SYSTEM
19D901146G9 SYSTEM (W/O SIREN)
ISSUE 3

SYMBOL	PART NO.	DESCRIPTION
A1	19D902913G3	Keypad/Display Panel, System. (Used in G4).
	19D902913G10	Keypad/Display Panel, System. (Used in G9).
	19D438902P1	Display Panel, System. (Earlier model).
	19D438652P1	Display Panel, System. (Earlier model. Refer to Maintenance Manual LBI-38245).
A2	19D902913G4	Keypad/Display Panel, Scan. (Used in G3).
	19D438901P1	Display Panel, System. (Earlier model)
	19D438651P1	Display Panel, System. (Earlier model. Refer to Maintenance Manual LBI-38245).
A3	19D902865G1	Processor Board. (For Parts List, refer to applicable maintenance manual).
A4	19D902231G1	Input/Output Board. (For Parts List, refer to applicable maintenance manual).
		- - - - - - - - - - - - - - - CABLES - - - - - - - - - - - - - - -
W1	19B801253P3	Cable Assembly.
		- - - - - - - - - - - - - MISCELLANEOUS - - - - - - - - - - - - - (Refer to Mechanical Layout Diagram).
2	19B801256G1	Front Cover.
4	N170P13006B6	Screw, Cap: 6-32 x 3/8. (Qty. 6, Secures A1 & A2).
6	19C851565G1	Shield. (Mounts to frame).
7	344A3916P408	Screw, Torx: 4-40 x .50 (Qty. 6, Secures shield).
8	N404P11B6	Lockwasher, Internal: No. 4. (Qty. 6, Secures shield).
9	344A3916P506	Screw, Torx: 6-32 x 3/8. (Qty. 6, Secures A4).
10	N404P13B6	Lockwasher, Internal: No. 6. (Qty. 6, Secures A4).
11	19B209727P46	Female Screw Lock: 4-40 x 5/16; sim to AMP 205818-2. (Secures J4 on I/O Board).
12	N404AP11B6	Lockwasher, Internal: No. 4.
13	N97P15003	Screw: 8-32 x 3/16. (Secures cover).
14	19J706880P5	Washer, Nylon. (Secures cover).
15	N171P16010	Screw: 10-32 x 5/8. (Qty. 4, Secures cover).
16	19A701365P6	Washer: No. 10. (Qty. 4, Secures cover).
23	19C851661G2	Rear Housing.
31	19C337624P1	Guide, connector.
32	344A3743P1	Insulator.

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES

PRODUCTION CHANGES

Changes in the equipment to improve performance or to simplify circuits are identified by a "Revision Letter", which is stamped after the model number of the unit. The revision stamped on the unit includes all previous revisions. Refer to the Parts List for the descriptions of parts affected by these revisions.

REV. A - SCAN CONTROL UNIT 19D90114G3
REV A - SYSTEM CONTROL UNIT 19D901146G4
To add additional LED indicators to the display panel functions, the Scan Display Panel 19D438651P1 was replaced with Display Panel 19D438901P1. The System Display Panel 19D438652P1 was replaced with Display Panel 19D438902P1. The added LED indicators on both panels flash when the function is activated (selected).

Scan Display Panel 19D438901P1 contains the following added LED indicators and drivers: DS3/Q2, SQL indicator: DS5/Q4, CG indicator: DS4/Q3, AUX indicator: DS14/Q13, SPKR indicator.

System Display Panel 19D438902P1 contains the following added LED indicators and drivers: DS16/Q23, YELP indicator: DS17/Q24, RESET indicator.

REV. B - SCAN CONTROL UNIT 19D90114G3
REV B - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision A to Processor Board 19D902057G3. Refer to maintenance manual.

REV. C - SCAN CONTROL UNIT 19D90114G3
REV C - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision B to Processor Board 19D902057G3. Refer to maintenance manual.

REV. D - SCAN CONTROL UNIT 19D90114G3
REV D - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision A to Input/Output Board 19D902231G1. Refer to maintenance manual.

This revision also changed EPROM U3 software on Processor Board 19D902057G3 to 19A705710G7.

US was 19A705710G6 - EPROM KIT.

REV. E SCAN CONTROL UNIT 19D90114G3
REV E SYSTEM CONTROL UNIT 19D901146G4
This revision replaces A3 Processor Board 19D902057G3 with A3 Microcomputer Board 19D902571G1.

This revision also changed EPROM U3 software on Microcomputer Board 19D902571G1 to 19A705710G8.

US was 19A705710G7 - EPROM KIT.

REV. F - SCAN CONTROL UNIT 19D90114G3
REV F - SYSTEM CONTROL UNIT 19D901146G4
This revision changed EPROM U3 software on Microcomputer Board 19D902571G1 to 19A705710G9.

US was 19A705710G8 - EPROM KIT.

REV. G - SCAN CONTROL UNIT 19D90114G3
REV G - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision B to Input/Output Board 19D902231G1. Refer to maintenance manual.

This revision also changed EPROM U3 software on Microcomputer Board 19D902571G1 to 19A705710G10.

US was 19A705710G9 - EPROM KIT.

REV H - SYSTEM CONTROL UNIT 19D901146G4
(This revision consists of special application changes on the Input/Output Board 19D902231G1 that did not effect regular production boards.)

REV. H - SCAN CONTROL UNIT 19D90114G3
REV J - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision B to the Keypad/Display Panels 19D902913G3, G4 and G10. Refer to maintenance manual.

REV. J - SCAN CONTROL UNIT 19D90114G3
REV K - SYSTEM CONTROL UNIT 19D901146G4
To enable/disable GSTAR encode on a per channel basis and to save Siren/Light status, the U3 EPROM software of Microcomputer Board 19D902571G1 was changed to 19A705710G12

U3 was 19A705710G10 - EPROM KIT.

REV L - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision C to the System Keypad/Display Panel 19D902913G3. Refer to maintenance manual.

(Continued)

Maintenance Manual

S-825
CONTROL UNIT
19D901146G3, (SCAN)
19D901146G4, (SYSTEM)
19D901146G9, (SYSTEM w/o SIREN)

TABLE OF CONTENTS

KEYPAD/DISPLAY PANEL LBI-38725
MICROCOMPUTER LBI-38726
I/O BOARD LBI-38247

PRODUCTION CHANGES

REV. K - SCAN CONTROL UNIT 19D90114G3
REV M - SYSTEM CONTROL UNIT 19D901146G4
REV A - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revisions C & D to the Keypad/Display Panels 19D902913G3, G4 and G10. Refer to maintenance manual.
This revision also consists of Revision A to Microcomputer Board 19D902571G1.

REV. L - SCAN CONTROL UNIT 19D90114G3
REV N - SYSTEM CONTROL UNIT 19D901146G4
REV B - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision C to Input/Output Board 19D902231G1. Refer to maintenance manual.

REV. M - SCAN CONTROL UNIT 19D90114G3
This revision consists of Revision D to Keypad/Display Panel 19D902913G4. Refer to maintenance manual.

REV P - SYSTEM CONTROL UNIT 19D901146G4
REV C - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision E to Keypad/Display Panel 19D902913G4. Refer to maintenance manual.

REV. N - SCAN CONTROL UNIT 19D90114G3
REV R - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of Revision D to the Input/Output Board 19D902231G1. Refer to maintenance manual.

This revision also changed EPROM U3 software on Microcomputer Board 19D902571G1 to 19A705710G14 to add new features, including Fixed Squelch, Aux. HI/LO Volume and Auto HI Volume w/siren.

U3 was 19A705710G13 - EPROM KIT.

REV. P - SCAN CONTROL UNIT 19D90114G3
REV S - SYSTEM CONTROL UNIT 19D901146G4
REV D - SYSTEM CONTROL UNIT 19D901146G4
This revision replaces A3 Microcomputer Board 19D902571G1 with A3 Microcomputer Board 19D902865G1.

REV. R - SCAN CONTROL UNIT 19D90114G3
REV T - SYSTEM CONTROL UNIT 19D901146G4
REV E - SYSTEM CONTROL UNIT 19D901146G4
This revision consists of revision B to the Microcomputer Board 19D902865G1. Refer to maintenance manual.

This revision also changed EPROM U3 software on Microcomputer Board 19D902865G1 to 19A705710G15 to correct T99 tone interdigit time.

U3 was 19A705710G14 - EPROM KIT.

REV. S - SCAN CONTROL UNIT 19D90114G3
This revision consists of Revision E to Keypad/Display Panel 19D902913G3. Refer to maintenance manual.

ComNet Ericsson
CRITICAL RADIO SYSTEMS

Com-Net Ericsson Critical Radio Systems, Inc.
P.O. Box 2000
Lynchburg, Virginia 24501
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