

C25 APCO P25 Dispatch Display and Computer Data Interface Manual
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Not all described features are included with all systems. Contact Cimarron Technologies for instant access to particular features.

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Note:

Portions of this manual that are highlighted in yellow represent features that were not yet implemented at the time of the manual's writing (October, 2010). Contact technical support at 760-738-3283 for information regarding availability of C25 firmware field upgrade.

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CHAPTER 1

Features

What Is the C25

The C25 is a data decoder capable of decoding any of the following formats: APCO P25, MDC-1200[®], and/or FleetSync[™]. It is built to help fleet dispatchers/controllers to communicate with and manage their fleets. The C25 family consists of a C25 I (no alphanumeric display), a C25 II (Single window alphanumeric display) and a C25 III (multiple window alphanumeric display).

The C25 was developed to be:

- Friendly with current technology
- Real-Time
- Interactive and Flexible
- Powerful and Easy to Use
- Flash programmable to allow for future features and systems
- Industrial-strength

Capabilities

The C25 family provides these capabilities:

- User programmable to decode any of the following formats: APCO P25, MDC-1200[®], and FleetSync[™].
- Dual format decode is standard. One C25 can monitor for and decode two selected signaling formats.
- Triple format decode, allowing one C25 to decode three selected signaling formats. (Optional Feature. Contact Cimarron for pricing details)
- Capable of reacting to MDC-1200[®] Repeater Access, Setup and Knockdown signaling.
- Programmable to decode and display MDC-1200[®] statuses and messages.
- Large, highly visible main display.
- Multiple window displays are available, capable of simultaneously displaying up to six of the last received ID's.
- Alias programmable, relating ID's to alphanumeric aliases of up to eight characters long. (Requires the Alias Optional Feature. Contact Cimarron for pricing details)

- Extended aliasing (Assignment field) provides an additional 28 characters for each ID. (Requires the Alias Optional Feature. Contact Cimarron for pricing details)
- In MDC-1200[®] signaling, decodes and displays the entire allowable HEX ID set.
- Reacts to directed call alerts targeting the C25 programmed ID.
- P25 ID's and MDC-1200[®] ID's can be displayed in Hexadecimal or Decimal format.
- Serial communications ports can be daisy-chained from one C25 channel card to the next channel card, eliminating the need for serial port combiners and buffers.
- Decodes and displays both the FleetSync[™] fleet number and unit ID.
- Message types can be renamed to permit customized systems.
- Allows the review display of the last twenty received messages.
- Data Mute relay output provides N.O. and N.C. relay contacts to be used to mute associated receiver during MDC-1200[®] data reception.
- COS qualified muting. Keeps the associated radio audio muted until after a valid decode and remutes the audio when signal reception ends for MDC-1200[®] and FleetSync.
- P25 NAC and/or TGID Permission Mode flags valid users by changing output states. Can be used to enable repeaters and other communications equipment for those users with permission.
- Two programmable open-collector outputs can be related to the reception of types of messages. Outputs can be used to trigger external alarms, auto dialers, counters, etc.
- Internal sounder can be programmed to create different audible alerts depending on message type received.
- "Authorize" permits the C25 to be used to allow only authorized users access to repeater systems. (Requires the Alias Optional Feature. Contact Cimarron for pricing details)

- "Enunciate" feature allows unique tones to be sounded when specific ID's are received. (Requires the Alias Optional Feature. Contact Cimarron for pricing details)
- User programmable for a selection of many serial output formats.
- Unique user definable serial output strings.
- Programmable display type permits "Taxi Bid", "Scrolling", and "Message and Assignment" presentations.
- Unique user definable display personality for C25-II and III.
- Incorporates a real time clock so all received data can be time stamped.
- P25 decode qualification by NAC and/or TGID.
- External display clear input can be attached to a footswitch to clear the display by a dispatcher without reaching for the decoder.
- AGC conditioning reduces the need for adjustments on the receive side.
- Rack mountable

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Specifications

Data Formats

APCO P25, MDC-1200[®],
FleetSync[™]

Modulation Type

APCO P25	C4FM 9600 BPS
MDC-1200 [®]	FSK 1200 BPS at 1200/1800Hz
FleetSync [™]	MSK 1200 BPS at 1200/1800Hz

Display Memory

Review twenty previous messages by pressing "REVIEW" button on C25 II and C25 III

Display Type

C25 I	Ten LED's indicating: Mute, Decode, Transmit Busy, Key, Modulation, System Error, Transmit I/O, Receive I/O and Power
C25 II	Eight large (0.7") 5x7 pixel LED display matrixes capable of displaying up to eight digit number or alphanumeric alias. Can be user defined to meet unique customer requirements.
C25 III	Eight large (0.7") 5x7 pixel LED display matrixes capable of displaying up to eight digit number or alphanumeric alias. Twenty Eight 0.3" 5x7 pixel LED display matrixes capable of displaying programmed message and assignment fields or up to six of the previously received ID's or aliases. Can be user defined to meet unique customer requirements.

Data Input

Single ended	30mv to 12Vpp (singled ended input is required for P-25 decode)
Balanced	600 Ω : -30 to +10dBm; Hi Z: -36

to +4dBm

Interface

Serial	RS-232C, ASCII via RJ-11 connection, programmable Baud Rate: 1200, 2400, 4800, 9600, 19.2k Data Bits: 7 or 8 Parity: Odd, Even or None Handshake: None Power: +5VDC on pin 1 jumper controlled.
Data Mute	Form C Relay, 1A, N.C., N.O. and Armature.
Key Output	Open collector transistor, sinks up to 500mA
External Alarms	Two open collector transistors, sink up to 500mA each. Software programmable to respond to any number of selected message types.

Dimensions

C25 I	7.87" x 6.25" x 2.5"
C25 II	7.87" x 6.25" x 2.5"
C25 III	7.87" x 6.25" x 4.75"

Power Requirements

5 VDC \pm 5% at 2 A (12V option available at additional cost)

Sounder

Audible 3400 Hz 80db(A) @ 2'.
Programmable

Enhancements

Cimarron's C25 is modularized to allow you to enhance your capabilities without returning the unit for upgrade. After purchasing, these features can be activated over the telephone. (Contact Cimarron for pricing details)

Optional features include:

- Aliasing

The Alias feature is an extra option that allows the user to create a table that is used by the C25 to display an alphanumeric "Alias" instead of the actual received numeric ID. The created Alias Table is stored in the C25 and has a maximum of 7123 individual entries. The alias table also is used to define unique "Enunciate" beeps and a twenty eight character extended alias referred to as the assignment field.

- Triple format decode

The standard C25 is capable of decoding two signaling formats at the same time. The triple format decode feature can be added to permit decoding of three different signaling types on the same audio input line.

- Translator

This feature translates incoming FleetSync™ or APCO P25 ANI into MDC-1200® format enabling legacy dispatch systems to work in a mixed fleet environment.

CHAPTER 2

Installation

The C25 may need to be programmed with your requirements before it will work in your system. See Appendix A for the personality that is programmed in the equipment as it is shipped from the factory. Before installation, verify the type of receive audio to which you are interfacing (must be flat discriminator audio for P25 signaling) and adjust the C25 jumpers to match the level. The C25 permits you to match system requirements with minimal loading. Proper grounding is extremely important. Ensure that station ground is attached to the C25 ground connections at P1 pin 8 or P2 pin 10.

Jumper Information

Jumper	Default	Purpose
JP-1	Out	For factory use.
JP-2	Out	Applies 5VDC to the RJ-11 serial connector.
JP-3	In	Attaches RxMute Output to the normally open contacts of the mute relay.
JP-4	Out	Attaches RxMute Output to the normally closed contacts of the mute relay.
JP-5	8-7 In 6-5 Out 4-3 Out 2-1 Out	Provides 0dB of gain. Provides 12dB of gain. Provides 24dB of gain. Provides 36dB of gain.
JP-6	In	Applies a ground to RxMute Common.
JP-7	In	Internally references the data in common line to ground.
JP-8	Out	Adds 6 dB of attenuation to the data in signal. For use only in balanced systems.
JP-9	Out	Adds 12 dB of attenuation to the data in signal. For use only in balanced systems.
JP-10	Out	Adds 18 dB of attenuation to the data in signal. For use only in balanced systems.
JP-11	In	Adds 6 dB of attenuation to the data in signal. For use only in unbalanced systems.
JP-12	Out	Adds 12 dB of attenuation to the data in signal. For use only in unbalanced systems.
JP-13	Out	Adds 18db of attenuation to the data in signal. For use only in unbalanced systems.
JP-14	Out	Internally applies a 600-ohm termination to the data input lines. For use in balanced systems

		requiring termination.
JP-15	In	Grounds the microprocessor side of channel busy. If channel busy is programmed for active low and JP-15 is intact, the C25 will always believe that the associated radio channel is available (not-busy).
JP-16	In	Adds a pull-up resistor to the PTT input line.
JP-17	Out	For factory use.
JP-18	Out	For factory use.
JP-19	Out	Connects PTT in with KEY out.
JP-20	In	In conjunction with JP-21, selects NPN transistor for PTT input circuit. This provides a crossover point of $0.5\text{VDC} \pm 0.3\text{vdc}$ for the detection of PTT.
JP-21	In	In conjunction with JP-20, selects NPN transistor for PTT input circuit. This provides a crossover point of $0.5\text{VDC} \pm 0.3\text{vdc}$ for the detection of PTT.
JP-22	Out	In conjunction with JP-23, selects PNP transistor for PTT input circuit. This provides a crossover point of $2.8\text{VDC} \pm 0.3\text{vdc}$ for the detection of PTT.
JP-23	Out	In conjunction with JP-21, selects PNP transistor for PTT input circuit. This provides a crossover point of $2.8\text{VDC} \pm 0.3\text{vdc}$ for the detection of PTT.
JP-24	Out	Add for 600 Ohm balanced configuration only
JP-25	In	Internally references the Data Out common line to ground.
JP-26	Out	For future use
JP-27	Out	Add for 600 Ohm balanced configuration only
JP-28	Out	For factory use.
JP-29	Out	For factory use.

The C25 is shipped configured for a High Z ground referenced system.

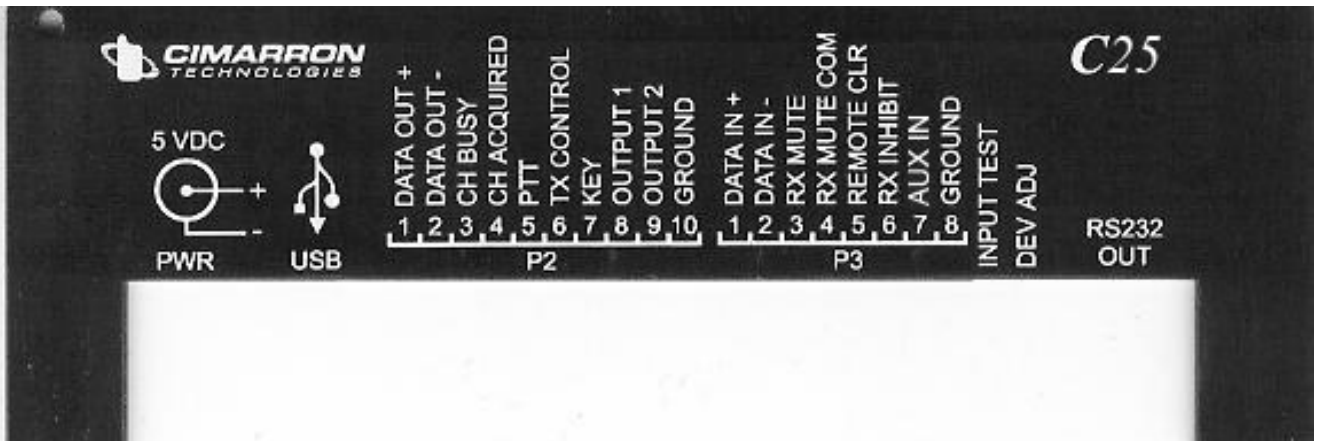
Jumpers JP-13, 12, 11, 10, 9 and 8 set up attenuation circuits. Only one of these jumpers should be installed. JP-13, 12 and 11 are for unbalanced systems and JP-10, 9 and 8 are for balanced systems.

The C25 runs on regulated 5 VDC. Use only the factory supplied power block.

Radio Connections

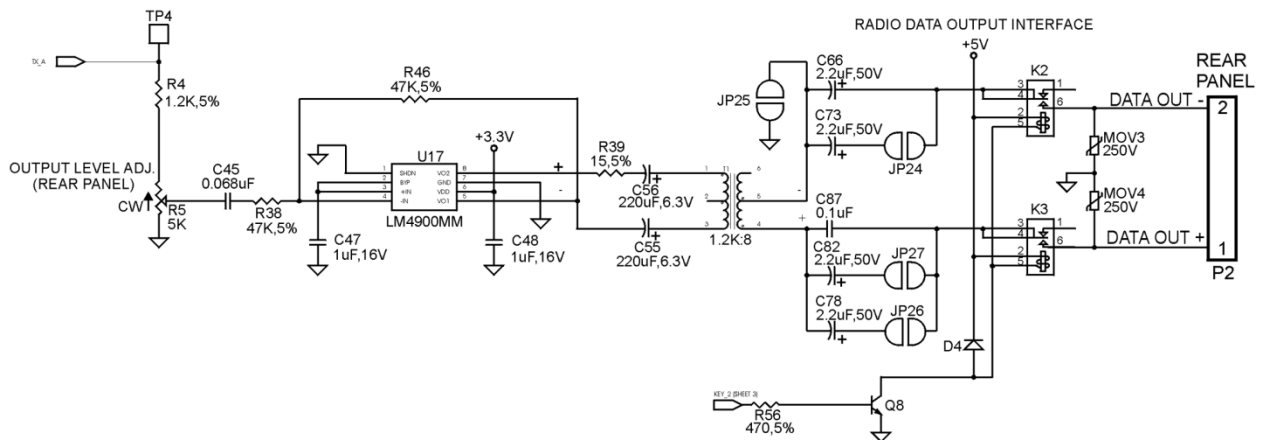
Conn	Signal	Use
P2-1	DATA OUT +	Signal output (high side) from the C Plus. Jumper selectable for high impedance single ended (to 14Vpp) or 600 ohm balanced (to +10dBm). Relay switched, connected only during data generation. Capacitively coupled.
P2-2	DATA OUT -	Signal output (low side) from the C Plus. In high impedance single ended, this line is referenced to ground. In balanced, it is signal return. Relay switched, connected only during data generation.
P2-3	CHBSY IN	High impedance input. Connect to a point that changes state when radio is receiving (busy). Used in COS qualified mute feature. To enable this line, jumper JP-15 must be removed.
P2-4	CHAQR IN	Not used in the C25.
P2-5	PTT IN	Not used in the C25.
P2-6	TXCTL OUT	Used when in the Translator mode to inhibit recovered receive audio so that it does not affect the generated MDC-1200 translation.
P2-7	KEY OUT	Open collector output active during attack delay and data generation in the Translator configuration.
P2-8	OUT 1	Programmable to be active with received message types. When the associated message type is received, this open collector output becomes active (low) for two seconds. Capable of sinking up to 500 mA.
P2-9	OUT 2	Programmable to be active with received message types. When the associated message type is received, this open collector output becomes active (low) for two seconds. Capable of sinking up to 500 mA.
P2-10	GROUND	Ground
P3-1	DATA IN +	Signal input (high side) to the C25. AGC conditioned. Jumper selectable for high impedance single ended (30mV to 12Vpp), high impedance balanced or 600 ohm balanced (-30dBm to +10dBm).
P3-2	DATA IN -	Signal input (low side) to the C25. In high impedance single ended, this line is referenced to ground. In balanced, it is signal return.

P3-3	RXMUTE OUT	Relay output, jumper selectable for N/O or N/C configuration. Used to momentarily interrupt radio speaker audio to prevent the data burst from being heard.
P3-4	RXMUTE OUT COM	Relay output used in conjunction with RXMUTE OUT. Jumper selectable for either "isolated armature" or ground.
P3-5	REM CLR	Isolated input used to clear the display. Performs the same function as the front panel push button "Clear". Ground to activate.
P3-6	RX INHIB	Prevents decoding from taking place if signal is active. Used in shared trunking systems to prevent decoding of all signals present on discriminator.
P3-7	AUX IN	Unused
P3-8	GROUND	Ground



Data Output

Data output is the signal out of the C25 when used in the Translator configuration. Data Out + is the high side and Data Out - is the low side. Data output is jumper selectable for single ended or balanced configurations. In non-balanced configurations, Data Out - is referenced to ground. However, note that it is not directly shorted to ground. In balanced systems, it is signal return. Always attach an independent station ground to the rear panel P3 pin 8 or P2 pin 10.



The output is capacitively coupled for DC blocking, is MOV protected and is completely isolated by relays when not actively encoding.

If connected to a balanced line, remove ground jumper JP-25. For 600 ohm operation, add jumpers JP-24 and JP-27.

Data output must be adjusted to match the requirements of the attached system. Rear panel potentiometer R5 is available to adjust amplitude.

The Self-Test command `$$KEYT` is used for setting outbound data level for Translator applications. This command activates the C25 Key output and sends MDC-1200 data for 10 seconds.

Channel Busy

Channel busy input is used to determine if the radio is in the process of receiving (and therefore, the frequency is occupied). Typically, channel busy would be attached to a squelch or CTCSS circuit that changes state when receiving. Channel Busy input sense can be programmed to be active when high or when low. Channel busy can be used to qualify data mute. In COS Qualified muting, the associated radio is muted by the C25 until a valid MDC-1200[®] or FleetSync[™] data decode. Once the data has passed, the radio is unmuted and remains unmuted until the Channel Busy line changes state. At that time, the radio is again muted. Note that JP-15, which is inserted at the factory, holds channel busy to a known state. This jumper must be removed for the channel busy input to function.

Channel Acquired

Not used in the C25.

PTT Input

Not used in the C25.

Transmit Control

This Line can be used when in the Translator mode to inhibit recovered receive audio so that it does not affect the generated MDC-1200[®] translation. Transmit control function can be mapped using the \$MAP feature so that it engages and disengages the relay typically assigned to the mute function. This, then can be used to break open the recovered audio path before the MDC-1200[®] injection point for the duration of the MDC data.

Key Output

Key output is an open collector output that becomes active during attack delay and data generation in the Translator configuration.

OUT1, OUT2

OUT 1 and OUT 2 are open collector outputs capable of sinking up to 500 mA to within 0.7v of signal ground. These outputs are programmable to be associated with received message types. When the associated message type is received, the output goes low for two seconds. This is useful for activating external alert systems or auto-dialers. They can also be used to remotely control devices via external relays.

If the C25 is placed in the "Authorize mode" or NAC/TGID Permission mode from the programming main menu, previously programmed functions of OUT1 and OUT2 are superseded and they perform as follows:

1. Open collector OUT1 becomes active goes to within 0.7v of signal ground (capable of sinking up to 500mA), while OUT2 remains inactive, providing a high impedance.
2. The C25 begins monitoring channel busy for activity.
3. If activity is detected on channel busy, the C25 listens for ANI.
4. If ANI data is detected, and the decoded ANI ID is present in the ALIAS table, OUT1 and OUT2 reverse states, bringing OUT1 to high impedance and OUT2 to

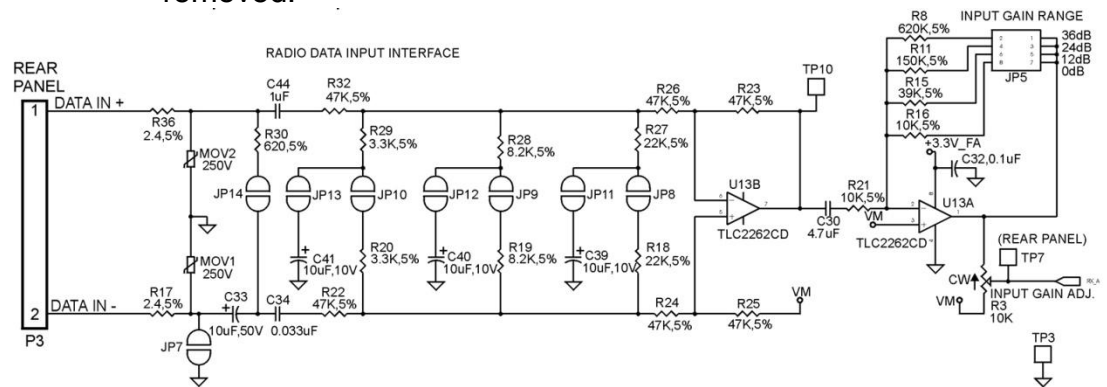
within 0.7V of signal ground.

5. This reversal remains in effect until channel busy becomes inactive, then OUT1 and OUT2 reverse to their original states.

6. If no ANI data is detected or the decoded ANI ID is not present in the ALIAS table, OUT1 and OUT2 remain in their original states.

Data Input

Data input is the signal input to the C25. Data In + is the high side and Data In - is the low side. Data input is jumper selectable for high impedance single ended, high impedance balanced and 600 ohm balanced. In non-balanced configurations, Data In - is referenced to ground. However, note that it is not directly shorted to ground. In balanced systems, it is signal return. Always attach an independent station ground to the rear panel P3 pin 8 or P2 pin 10. P25 decode is not supported in balanced line input systems. To decode P25 signaling, the C25 input must be attached directly to the discriminator output of the receiver and JP7 and JP11 must be installed with JP8, 9, 10, 12, 13 and 14 removed.



The input is capacitively coupled for DC blocking and is MOV protected. When interfacing to a radio, connection should be discriminator audio, before de-emphasis (flat audio). Data input + should be jumpered for high impedance and data input - should be jumpered to ground.

APCO P25 decoding requires discriminator audio input and does not support balanced phone line input. If not decoding P25 data and if connected to a balanced line, remove ground jumper JP-7 and install the 600 ohm

jumper (JP-14) to terminate (if this is the only device on the leg) or remove the jumper to offer high impedance (if another device is on the leg and is terminated).

Data input is AGC conditioned so generally, no adjustment is necessary. A test point is provided for O'scope analysis. If the signal is clipped and distorted, a potentiometer and a bank of gain jumpers can reduce gain. Alternately, if the signal is too weak, gain can be increased.

Attenuation jumpers are described below. Use only one jumper at a time.

Input Signal Attenuation	Unbalanced	Balanced
18 dB	JP-13	JP-10
12 dB	JP-12	JP-9
6 dB	JP-11	JP-8

JP5 provides an amplification stage to increase the data input signal. Amplification factors are described below.

Input Signal Amplification	Jumper position	Absolute Max signal at TP10
0 dB	7 to 8	1.6 VPP
12 dB	5 to 6	0.65 VPP
24 dB	3 to 4	0.2 VPP
36 dB	1 to 2	0.05 VPP

If you experience a decode rate of less than 100%, view the ANI signal waveform at TP-10. Adjust the attenuation jumpers so that the waveform is not clipped. Do not exceed the absolute maximum peak-to-peak signal level listed in the above table. Then view the waveform at TP-7 and adjust jumper JP-5 and VR3 for a 500mVPP ANI signal.

RX Mute Output

RXMute Out and RXMute Out Com provide a data mute output feature that can be used to remove MDC-1200[®] data audio from the local audio path. Two muting methods are available and can be chosen in the C25 personality programming.

Mute on RX Data Only

In this mode, the C25 mute relay can be used to momentarily interrupt speaker audio during receipt of

MDC-1200[®] data, preventing most of the data burst from being heard through the receiving radio's speaker. The speaker audio can be routed in series with the unit's mute relay, or the mute relay can shunt a low power audio pre-amplifier signal to ground. Jumpers are provided to select normally open or normally closed relay contacts and to jumper for either isolated armature or ground.

Unmute After Data (COS Qualified)

In COS Qualified muting, the associated radio is constantly muted by the C25 until a valid MDC-1200[®] or FleetSync[™] data decode. Once the data has passed, the radio is unmuted and remains unmuted until the Channel Busy line changes state. At that time, the radio is again muted. In this manner of muting, the entire MDC-1200[®] or FleetSync[™] data burst is omitted. However, users in analog mode without ANI data will not unmute the receiver and they will not be heard. To activate the Channel Busy line, remove jumper JP-15.

Remote Clear

Remote Clear is an isolated input that performs the same function as the front panel push button "Clear". This line can be connected to a normally open foot switch. When the dispatcher presses the foot switch, the main display will be cleared. If the switch is pressed again within 1 second of the first press, the C25 III secondary display will be cleared as well. If using an external display and the serial output format "Display" is selected, when the remote clear is activated, the C25 will send ten blank characters out the serial port, effectively clearing the external display.

RX Inhibit

RX Inhibit prevents the C25 from decoding and displaying received signals. If the RX Inhibit line is active, the C25 ignores received data. This is useful in shared systems to qualify which signals on the discriminator should be decoded.

Aux In

Auxiliary Input is not used.

Ground

It is extremely important that a separate ground line be run between the associated radio system and the C25.

Incorrect grounding will result in inconsistent encoding, decoding and key and mute functions. In all systems, be sure to attach station ground here.

Inverting P25 Data

Depending on the radio being used to supply discriminator audio to the C25, P25 audio data may need to be inverted in order to successfully decode.

To invert P25 data, while the C25 is in normal operate mode, press and hold the left front panel button for five seconds. The C25 will respond by displaying INV P25 or NORM P25 on the C25-II or C25-III display. The device will then restart and begin the power-up sequence. On the C25-I, the status LED's will sequence from right to left for inverted P25 data and will sequence from left to right for normal data.

This can also be accomplished in programming mode, under the Radio Interface menu, select "Invert P25 Data". Exit programming mode cycle power to the C25 and try decoding again.

RS-232 Port

On the back of the C25, there is an "RJ-11" six-conductor phone jack. This port can be programmed as a printer port and be connected directly to a serial printer to record channel activity. Output format and characteristics are user programmable. Baud rates available are 1200, 2400, 4800, 9600 and 19200 with 7 or 8 data bits and odd, even or no parity. Serial output format types are user definable with the \$FORMAT command or user selectable from the following types: Cimarron Standard, MODAT, BED-31/1207, Cimarron Translated Output, CML, Cimarron Traditional and Cimarron Multichannel. Examples of these outputs can be found in chapter 5, Technical Information.

Serial Input as a data source

Serial Input is handled similar to audio input. If, for example, the serial input has SRC and EM and the display is defined as S1,&SRC,MSG, then the device will display the source ID on the large display. It will also alternate ID with message from the message table (unless data is normal PTT).

Serial input will be converted as necessary and forwarded for the serial output. So if "Cimarron Standard" is defined for the serial output type and the serial port receives SRC, EM from serial input then the

device will formulate the correct Cimarron Standard serial output.

Daisy Chaining multiple C25's in a MCC

Multiple C25 devices can be "daisy-chained" by attaching serial output to the next C25 serial input and defining SO and SI the same for all devices except the last C25 in the chain. The last C25 would have Serial output defined so that it is compatible with the Dispatch Console or CAD software. Each C25 could receive audio data input from a different source. The C25 would adequately buffer data so that collisions would not occur on the serial daisy chain. If data is received via the serial input and that data has a channel tag, then the C25 will continue to relate that data to the channel tag when it forwards it to the serial output. This is so that in a daisy chain, the last unit which has a serial output definition containing a channel tag, the received data is still attributed to the correct channel.

Interfacing to a Computer or Printer

The C25 has an RS-232 serial port to facilitate data output to a printer, console or computer. For port specifics, please refer to chapter 5, Technical Information.

USB Port (Factory use only)

Resource Mapping

C25 resources and functions can be mapped to satisfy special user needs. Output functions *OUT1*, *OUT2*, *TXCtl*, *KEY* and *MUTE* as well as input functions *CLEAR* and *CHBSY* (*CHANNEL BUSY*) are made more flexible with the following \$\$ commands:

Outputs

Output functions can be mapped to alternate output ports with the command

\$\$MAP <function> TO <output>

This would mean that if an individual wanted the mute relay to act like *OUT1*, they would use "\$\$MAP *OUT1* TO *MUTE*". If they desired to use *OUT2* as the mute function, they would enter "\$\$MAP *MUTE* TO *OUT2*". The original <function> remains intact unless also mapped.

Inputs

The input *CLEAR* (the button on the front of the C25)

can be mapped to activate the function CHBSY. The original function of the CLEAR button remains intact.

\$\$MAP CHBSY TO CLEAR

Resource Status

To find out what the status is of the C25 resources, enter the command

```
$$MAP?
```

The C25 will return a table describing the current settings

```
Output OUT1 is function OUT1
Output OUT2 is function OUT2
Output KEY is function KEY
Output TXCtl is function TXCtl
Output MUTE is function MUTE
Function CHBSY is input CHBSY
```

Translator Decode Installations

The Translator option is an additional cost feature that converts a standard C25 into a device that converts APCO P25 and FleetSync™ signaling into MDC-1200® compatible signals. (Contact Cimarron for pricing details)

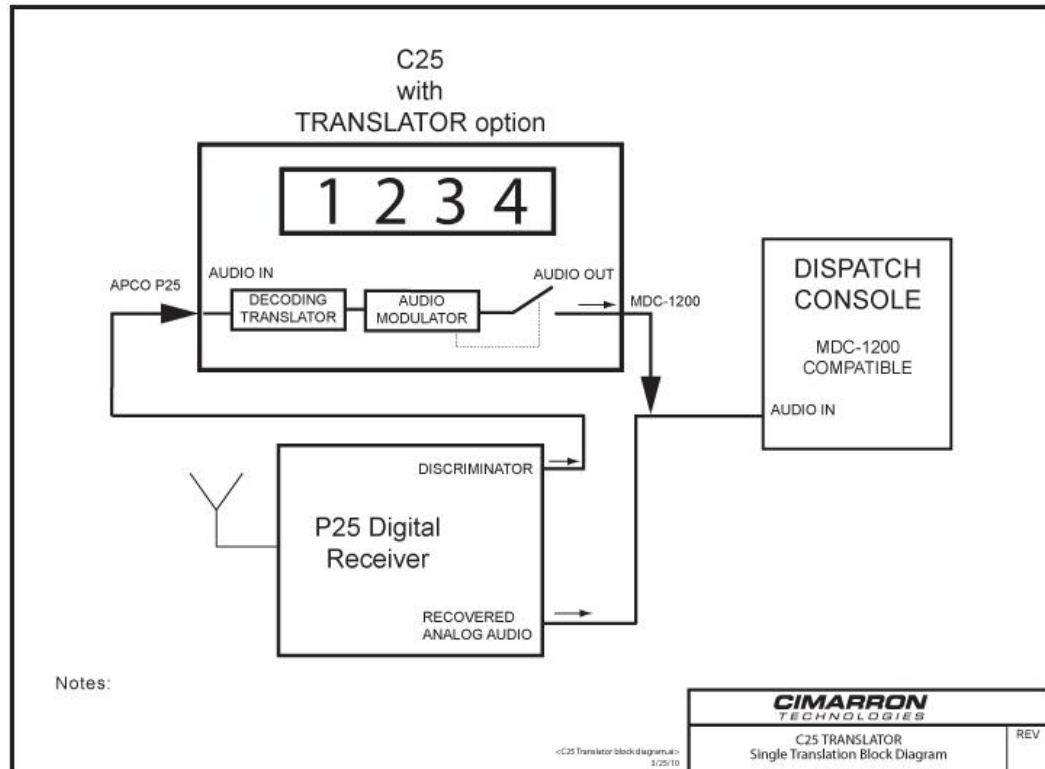
Say that you have a mixed fleet consisting of MDC-1200®, APCO P25 and FleetSync™. The base dispatch console is made by Motorola and generates and decodes MDC-1200®. The translator is used to translate non-MDC-1200® signaling into MDC-1200® equivalent signals.

The translator input is attached to the receiver discriminator and the Translator output can be attached to a point at the console where recovered analog audio from the P25 receiver enters.

Once the Translator Feature is turned on, the C25 becomes a 'Translator' only and no longer has the features of the C25 as follows:

- It will translate incoming P25 and FleetSync™ ANI data into audio MDC-1200® ANI data.
- It will ignore inbound MDC-1200® data and will only display P25 and FleetSync™ IDs.
- The Alias Feature will not be used if it is installed.
- The serial data out (RS-232) becomes invalid.

- FleetSync™ Fleet ID is lost as only unit ID is supported in the MDC-1200® format.
- Only P25 ID's up to FFFF are translated. Five and six character P25 ID's are ignored.
- The mute function is only available with COS qualified mute and the receipt of FleetSync™ data.



Operation goes like this:

A unit (ID 1111) in the field with APCO P25 signaling keys up and his PTT ANI is transmitted. At the translator, the APCO P25 ANI is decoded and converted to MDC-1200®. This signal is recombined with the recovered analog audio signal and forwarded to the dispatch console.

FleetSync™ is unique in that field ID's consist of a fleet ID and a unit ID. As MDC-1200® only supports a four digit unit ID, the decoding translator strips the Fleet ID from the received data string and only the unit ID is

translated and forwarded.

P25 ANI ID's can be up to six HEX characters in length. The translator will only successfully translate P25 ID's with a length of up to four characters.

CHAPTER 3 Programming

Programming

When Using Hyperterm, characters you type will not be visible on the computer display.

The C25 can be programmed via the RJ-11 RS-232 serial connection. The RJ-11 serial connection can be used with any computer running terminal emulation software like "Hyperterm" (Included in Windows 95, 98, XP and NT), "Terminal" (Windows 3.1) or any version of "ProComm" (third party software). Upon power-up, the C25 begins listening at 9600, N, 8, 1 for a user sign-on message. The C25 remains in this listening mode for 10 seconds. If, during the listen mode, a user enters the phrase "\$\$C25", the device remains at 9600, N, 8, 1 and enters program mode. If no sign-on message is received at the end of 10 seconds, the C25 configures the serial port in the manner stored in memory. If there is no preference programmed, the C25 remains at 9600, N, 8, 1. The C25 will respond to the sign-on message even after the initial 10 seconds if the sign-on is sent in the baud rate/protocol specified in memory.

If the C25 is permitted to enter program mode, the main menu is outputted and the device awaits input from the user. When in program mode, the C25 suspends normal operation until program mode is exited.

```
HELLO
MAKE YOUR SELECTION FROM THE FOLLOWING OPTIONS

1. PROGRAM THE C25 PERSONALITY
2. SET THE DATE AND TIME
3. ACCESS THE ALIAS TABLE
4. ACCESS THE MESSAGE TABLE
5. ACCESS THE NAC TABLE
6. ACCESS THE TGID TABLE
7. ENABLE AUTHORIZE MODE
8. ENABLE NAC PERMISSION MODE
9. ENABLE TGID PERMISSION MODE
A. PROGRAM NEW FLASH
B. NORMAL OPERATION

ENTER YOUR SELECTION: _____
```

Building the Alias Table

The Alias feature is an extra option that allows the user to create a table that is used by the C25 to display an alphanumeric "Alias" instead of the actual received numeric ID. The created Alias Table is stored in the C25 and has a maximum of 7123 individual entries. The alias table also is used to define unique "Enunciate" beeps and a twenty eight character extended alias referred to as the assignment field.

The C25 will only accept Alias tables after the feature has been purchased and activated.

Alias tables are created using the text editor "Notepad". A full feature word processor can also be used but the file must be saved in the text only (raw text) format. The constructed alias table must be sorted in order of the eight digit ID field (When sorting, characterize all numbers as HEX and all FleetSync™ ID's appear after all other format numbers) and saved in ANSI format. The alias table is constructed as follows:

NNNNNNNN,AAAAAAA,FFFFFFFFFFFFFFFFFFFFFFFF, B

Where:

- N Up to eight digit ID. For FleetSync™, the entry will be a 3 digit fleet assignment a dash and a 4 digit unit ID. (e.g. 123-3289). The fleet assignment must be between 100 - 349. The ID must be between 1000 – 4999. In P25, the entry will be up to a 6 character ID and in MDC, the entry will be up to a 4 character ID. MDC-1200® and P25 ID's can include all HEX characters (e.g. A12E).
- A Eight character Alias. Can contain any character in the full ASCII set (except a "," which is used as the field delimiter and "\$" which is the end of table marker).
- F Twenty-eight character assignment field. Note that only the right-most 19 characters are handled for C25 III display in "Message and Assignment" mode.
- B For ID sensitive alerts, this entry can contain a number between 2 and 5. This number reflects the quantity of single beeps the C25 will sound when PTT ANI is received from the associated

ID. (e.g. if the number is 3, the C25 will sound three short beeps). To have no audible beep for a particular ID, enter a zero (0). If a one (1) is entered, the beep configuration is as described in the message table. This is called the "Enunciate" feature.

The alias table can have a maximum of 7123 entries. The table must be in order by the eight digits of the unit ID. Tables with few entries can be entered in ID order, but if you have a very large table that needs to be sorted, consider loading the table into Microsoft Excel, sort it using Excel, save the file as a "CSV" file and then renaming the file .TXT.

After sorting the alias table, open it again in Notepad and append, as the only character in the last line, a dollar sign (\$). This is the end of file designator and must be present. The completed table should look like this:

```
00000001, SALES, FIELD SYSTEM 3, 1
00000002, ASSESSOR, , 1
00000004, MARK, INSTALLATION TEAM, 1
00000008, TRUCK 8, PUMPER WITH XTRA, 1
00000016, CAPTAIN, BUILDING 13 FLOOR 5, 4
00000032, LADDER 6, NORTH CITY STATION, 0
$
```

Remember to add a line at the end of the file that contains only a \$. This is the end of file marker and must be added after sorting.

Once a table has been constructed and saved, it can be loaded into the C25 by following the below procedure:

From the main menu, enter selection 3. ACCESS THE ALIAS TABLE. The following menu appears:

ALIAS EDIT MODE

1. SEND A SORTED TABLE TO THE C25
2. RECEIVE THE TABLE FROM THE C25
3. ERASE THE C25 ALIAS TABLE MEMORY

PRESS BACK SLASH "\ " TO GO BACK
OR PLEASE ENTER YOUR SELECTION: _

Select option 1, SEND A SORTED TABLE TO THE C25. The C25 reminds you to "Make sure you have a sorted Alias table file to download". Press "y" to

continue or “\” to abort. Wait about 5 seconds and the C25 prompts “*Please send sorted Alias table now*”.

On the Hyperterm Menu bar, select *Transfer* and then *Send Text File*. A window opens to allow you to locate and designate the file to send. Using standard windows convention, find and select the previously created file and then press *Open*. The file will begin to be loaded into the C25.

When completed, the C25 will report “*Alias Table built. Press \ to continue.*” Continue pressing “\” until you arrive back at the main menu. There, selection “B” returns the C25 to normal operation.

To make changes to an existing alias table, select option 2, RECEIVE THE TABLE FROM THE C25. The C25 will prompt you to open the file that will capture the output to the terminal emulator. At this point, on the Hyperterm menu bar, select *Transfer* and then *Capture Text*. A window opens to allow you to enter the path and name of the file you will capture text to. Be sure to note where you are saving the file. Press *Start*. You will be brought back to Hyperterm. Press “y” to begin the download. When completed, again go to *Transfer – Capture Text* and then select *Stop*. You will be brought back to Hyperterm. Press “\” to return to the programming menu. Press “\” again to get to the main menu.

Then open the saved file using a text editor like Notepad. Make the desired changes, save the file and then send the changed table back to the C25. If the file is no longer in order, be sure to sort it first.

If the alias feature is enabled but no longer desired, select option 3, ERASE THE C25 ALIAS TABLE MEMORY. This will delete the table. ID’s will then be displayed exactly as received.

Programming the C25 Personality

The C25 is a multi-feature device capable of encoding and decoding various non-compatible formats as selected by the user. Outputs are varied and are can be selected by the user as well. Because of this flexibility, the C25 must be programmed with a personality that meets user requirements. To program the C25 personality, from the main menu, select option 1, PROGRAM THE C25 PERSONALITY. A map of the programming tree is shown below:

1. SELECT FORMAT TYPE
 1. APCO P25
 2. MDC-1200
 3. FLEETSYNC

2. SELECT SERIAL OUTPUT TYPE
 1. CIMARRON STANDARD
 2. MODAT
 3. EXTENDED BED-31/1207 FORMAT
 4. BED-31/1207
 5. CIMARRON TRANSLATED OUTPUT FORMAT
 6. CML
 7. CIMARRON MULTICHANNEL ANI
 8. CIMARRON STANDARD CLASSIC
 9. DISPLAY
 - A. FORMATTED

3. SELECT DISPLAY TYPE
 1. TAXI BID
 2. SCROLLING
 3. MESSAGE AND ASSIGNMENT
 4. FORMATTED

4. SELECT MUTE TYPE
 1. MUTE ON RX DATA ONLY
 2. UNMUTE AFTER DATA (COS QUALIFIED)

5. DEFINE SERIAL PORT PARAMETERS
 1. BAUD RATE
 2. DATA BITS
 3. STOP BITS
 4. PARITY
 5. END STRING WITH <CR> <LF>
 6. PRINT ONLY CRITICAL MESSAGES

6. DEFINE RADIO INTERFACE
 1. CH BUSY ACT HIGH/LOW
 2. RX INHIBIT ACT HIGH/LOW
 3. ATTACK DELAY
 4. INVERT P25 DATA
 5. DISCONNECT DELAY

7. ASSIGN CHANNEL NUMBER
8. ASSIGN BASE ID NUMBER
9. ENABLE/DISABLE SOUNDER

PRESS BACK SLASH "\ " TO GO BACK
OR PLEASE ENTER YOUR SELECTION: _

Designating Multiple Signaling Formats

The standard C25 is capable of decoding two signaling formats from the attached audio channel. Triple format decode is also available at an additional cost, allowing one C25 to decode three selected signaling formats.

To designate which formats the properly enabled C25 will decode, enter programming mode, select C25 "personality programming" and then choose "select format type". Enter one format type, then the additional format type(s). The C25 will remember the last two selections, or if triple format decode has been purchased

and activated, the last three selections.

To verify your selections, return to "select format type" and the C25 will describe the format types for which it is currently configured.

Setting the Date and Time

From the Main Menu in program mode, select option 2 SET THE DATE AND TIME. The C25 will return the currently set date and time and prompt you to enter the new date and time. After entering the desired information, press <Enter> to send the information to the C25 or <ESC> to cancel. Time must be entered in 24hour format. Date and time will be retained without external power for a maximum of 12 hours.

Editing the Message Table

The C25 is programmed with message definitions that relate to the most common MDC and FleetSync bit patterns. However, if your application requires unique messages, beeps or output activations, a user defined message table can be created and loaded into the C25. Upon receipt of data, the C25 checks first in the user defined message table if present. If the definition exists there, the C25 uses that definition. If not present, then the C25 uses the internal message table definitions.

Message tables are created using the text editor "Notepad". A full feature word processor can also be used but the file must be saved in the text only (raw text) format and in ANSI format. The message table is constructed as follows:

xNNNN , S , MMMMMMMM , B , O

xNNNNNNNN , S , MMMMMMMM , B , O (for MDC double packet)

Where:

- x** Character that defines whether the payload definition relates to (F)leetSync or (M)DC-1200
- N** Four digit (or eight digit if referring to double burst MDC-1200) HEX message payload (MDC bits 16-31 of each packet - F/S FMT and MSG)
- S** Single character abbreviated message.
- M** Eight character message. Can contain any

character in the full ASCII set (except a ",", which is used as the field delimiter and "\$" which is the end of table marker).

B Audible alert selection. Messages with B = 2 through 6 are classified as critical messages.

0 silent

1 single beep of 250ms.

2 short beeps, 250ms on and 100ms off repeated for 5 seconds.

3 long beeps, 500ms on and 500ms off repeated for 5 seconds.

4 short beep, long beep, 250ms on, 250ms off, 500ms on, 500ms off repeated for 5 seconds.

5 continuous tone for 5 seconds

6 continuous solid tone until the clear button is pressed

O Assigns an open collector output to function when the message is received.

0 none

1 Out1 becomes active for 2 seconds

2 Out 2 becomes active for 2 seconds

Remember to add a line at the end of the file that contains only a \$. This is the end of file marker and must be added after sorting.

EXAMPLE

M0146,1,AT BASE,0,0

M0246,2,LOADING,0,0

M0346,3,ENROUTE,0,0

M0446,4,ON SITE,1,1

M0546,5,TO BASE,1,1

M0147,A,REQ BRK,2,2

M0247,B,LUNCH,2,2

M0347,C NEED TOW,5,2

M0447,D,OFF,2,2

\$

The table must be in order by signal type and payload. The completed table ends with a line containing only "\$".

Once a table has been constructed and saved, it can be loaded into the C25 by following the below procedure:

From the main menu, enter selection 4. ACCESS THE MESSAGE TABLE. The following menu appears:

```
MESSAGE EDIT MODE

1. SEND A TABLE TO THE C25
2. RECEIVE THE TABLE FROM THE C25
3. DELETE THE MESSAGE TABLE

PRESS BACK SLASH "\" TO GO BACK
OR PLEASE ENTER YOUR SELECTION: _
```

Select option 1, SEND A TABLE TO THE C25 and when prompted, send (in ASCII format) the previously constructed file (message.txt) to the C25. If a table already exists in the C25, it will be overwritten. Note that procedures to send files are different depending on the terminal emulation software you are using. But the file must be sent in ASCII format.

To make changes to an existing table, select option 2, RECEIVE THE TABLE FROM THE C25. Save the file to your computer. Then open the saved file using a text editor like Notepad. Make the desired changes, save the file and then send the changed table back to the C25.

Access the NAC or TGID Tables

The C25 will allow qualification by NAC and/or TGID. These tables are capable of having up to 12 entries. If NAC and/or TGID tables exist, the C25 will not react to received data unless received NAC/TGID exists in the table. If both tables exist, the C25 will not react to received data unless both qualifiers are true. In a communications system, the default TGID value is \$0001 and a TGID of \$FFFF includes everyone. However, if you desire to have the C25 react regardless of TGID, simply delete (or do not create) a TGID table. If NAC/TGID Permission mode is turned on for a table,

then the table is not used for qualification.

Enable "AUTHORIZE" Mode

Authorize mode is a method to filter out unauthorized users of repeater systems or use the C25 to activate alarms. In this mode, the C25 monitors channel busy for activity and looks for ANI. If the ANI ID is not present or is present but is not in the authorized users list (alias list) then the C25 will toggle Out1 and/or Out 2 to lock out the repeater transmitter stage (or activate remote alarms). The lock out will remain in effect until the channel busy line shows lost activity.

If Authorize mode is enabled in programming, the user is asked if the mode is to react to all message types or react only to critical messages. This additional filter can be used to activate remote alarms if the message received was from an authorized user and the message was critical. Critical messages are defined as those with a beep value greater than 1.

NAC Permission Mode

The existing C Plus "Authorize" mode still functions in the same manner. However, there is another method available in P25 mode. Enabling the P25 NAC permission mode will compare received NAC with the contents of the NAC table and react by changing condition of OUT1 and OUT2 if a match is present. The state change remains in effect until the data stream ceases and NAC becomes null.

The default NAC value is \$293.

\$F7E and \$F7F will cause outs to react on any incoming NAC

If NAC permission mode is turned on, the NAC table is not used for decode qualification.

TGID Permission Mode

The existing C Plus "Authorize" mode still functions in the same manner. However, there is another method available in P25 mode. Enabling the P25 TGID permission mode will compare received TGID with the contents of the TGID table and react by changing condition of OUT1 and OUT2 if a match is present. The state change remains in effect until the data stream ceases and TGID becomes null.

The default TGID value is \$0001.

A TGID of \$FFFF includes everyone.

If TGID permission mode is turned on, the TGID table is not used for decode qualification.

Programming New Flash

From the main menu, enter selection A. PROGRAM NEW FLASH and when prompted, send (in ASCII text format) the new flash. Download time is approximately 8 minutes at 9600 baud.

Using the \$\$FORMAT Command

The C25 serial port and the displays can be defined by the customer using the \$\$FORMAT command.

Variables for the command are defined below. Alias can be requested for any ID by adding -a to the variable.

Assignment can be requested for any ID by adding -A to the variable. This feature also allows the \$\$FORMAT command to specify different number bases for different target devices or fields. MDC-1200[®] and P25 ID's must be specified to be represented in Hex (#) or Decimal (&) format. If requesting alias or assignment and there is no entry in the alias table for the received ID, then the field will be blank unless it is also prefaced with a # or & to specify the number base the ID is to be represented in.

For example:

SRC-a will only return information if the SRC ID is present in the alias table. Otherwise, the area will be blank.

#SRC-a will return the alias unless the ID is not present in the alias table then it will return the source ID in HEX.

&SRC-a will return the alias unless the ID is not present in the alias table then it will return the source ID in Decimal.

HINT:

Use a text editor like "Notepad" to create the \$\$FORMAT strings in advance. Save the string to the computer, then use the "Send Text File" function (In the "Transfer" menu) of HyperTerm to load the entire string into the C25.

FleetSync ID's are always represented in decimal format.

P25 Variables

- Source (SRC) [#SRC = HEX, &SRC = DEC]
- Destination (DEST) [#DEST = HEX, &DEST = DEC]
- Talk Group (TGID) [#TGID = HEX, &TGID = DEC]
- Mfgr ID (MFID)

- Emergency flag (EM)
- Low speed data (LSD)
- Network Access Code (NAC) [#NAC = HEX, &NAC = DEC]
- Data (DATA)
- Status Symbol (SS)
- Trunking Sig Block (TSBK)

F/S and MDC Variables

- Source (SRC) [#SRC = HEX, &SRC = DEC]
- Destination (DEST) [#DEST = HEX, &DEST = DEC]
- Payload (DATA) (in MDC, bits 16-31 each packet) (in F/S, fields FMT and MSG)

If you specify #SRC or #DEST using \$\$FORMAT command and the received message is FleetSync, then the ID presented will be fleet ID plus Unit ID fff-uuuu. FleetSync™ ID's are always presented in decimal format. Alias tables look up the complete FleetSync ID of fff-uuuu.

C25 Variables

- Date (DATE)
- Time (TIME)
- Alias (-a)
- Message (MSG)
- Message Abbreviation (M)
- Assignment (-A)
- Channel (CHAN)
- Signaling type (F, M, or P) (SIG)

Target devices

- Serial Input (SI)
- Serial Output (SO)
- 8 Character main display (D1)
- 28 Character secondary display (D2)

Spaces are not permitted in the \$\$FORMAT command unless they are within the quotes as part of labels or delimiters

The C25 provides separately definable serial input and output functions. Serial Input can also be handled just as audio data input so that information received via the serial input port is displayed on the device and forwarded to the serial output port. In the programming menus, serial output can be selectable between the pre-existing C Plus style output strings or defined using the

FORMAT command. The output length of any variable is truncated by removing leading zeros or spaces.

Example: `$$FORMAT,SO,&SRC",",SRC-a",",SRC-A",",DATE",",TIME$`

Would provide to the serial output the source ID, the alias of the source ID and the assignment of the source ID as well as date and time. Characters that are in quotes will be presented exactly as entered. In this example, commas are defined as the delimiter. If the information in quotes is before the variable, it will be presented before the value of the variable. If it is after the variable, it will be presented after the value of the variable.

1234,Chief,Station 6 South,03/22/2010,11:56:12

Quoted information can also be labels like:

`$$FORMAT,SO,"ID: "&SRC,"Alias: "SRC-a,"Assignment: "SRC-A,"Date: "DATE,"Time: "TIME$`

Would provide

ID: 1234 Alias: Chief Assignment: Station 6 South Date: 03/22/2010 Time: 11:56:12

Printer commands can be outputted to the serial port by using imbedded control characters where ^J is a line-feed and ^M is a carriage return. These commands must be placed within the quoted regions of the \$\$FORMAT command. A \$\$FORMAT command of:

`$$FORMAT,SO,"^M^JID = "#SRC,"^M^JALIAS = "SRC-a,"^M^JNAC = "#NAC,"^M^JTIME = "TIME,"^M^JDATE = "DATE$`

Would create a printout like this:

```
ID = 143A
ALIAS = Chief
NAC = 293
TIME = 11:23:25
DATE = 06/12/10
```

```
ID = 2525  
ALIAS = Ladder13  
NAC = 293  
TIME = 11:25:14  
DATE = 06/12/10
```

```
ID = 143A  
ALIAS = Chief  
NAC = 293  
TIME = 11:26:01  
DATE = 06/12/10
```

Similarly, information appearing on the main and secondary display can be defined by the FORMAT command.

Example: `$$FORMAT,D1,&SRC"-",SIG$ and
$$FORMAT,D2,DATE"-",TIME"-",NAC="#NAC$`

Would provide to the C25 – III displays the following:

1234 - M

03/23/2010 - 11:23:45 - NAC=293

The large main display shows the source ID (1234) and the signaling format received (MDC-1200[®]). The secondary display shows the date, the time and the Network Access Code. The 28 character locations of the display are filled from right to left with unused character displays remaining blank.

Variables requested for the main display (D1) will alternate between displaying each requested variable in the `$$FORMAT` command. Each value will be presented for 2 seconds and will repeat until replaced by values of another transmission or the clear button is pressed. Up to four variables can be designated for D1 alternating display.

If you wish to retrieve a previously entered `$$FORMAT` command string, use the following command:

```
$$FORMAT,xx?
```

Where `xx` is the target device definition you desire (SO,

SI, D1, D2).

Radio Interface Parameters

Channel Busy Input.

Selects the desired input logic of the Channel Busy Input. This input provides the equipment with the status of the interfaced radio.

RX Inhibit.

Prevents decoding from taking place if the signal is true. Used in shared trunking systems to allow decoding only of targeted signals present on the discriminator. As the discriminator "hears" all signals on the selected repeater, this line can be attached to a squelch gate which is active only when the received signal is for the appropriate user group.

Attack Delay

Used in Translator applications to hold off the generation of the MDC translation data burst. Available time selections are 0ms to 9999ms.

Invert Data.

Inverts APCO P25 data.

Disconnect Delay

Qualifies signal loss. Channel busy and/or P25 signal loss must remain active for this time before it is considered lost.

CHAPTER 4

Operation

Decoding Capabilities

The C25 family consists of the C25 I computer interface, C25 II display unit and the C25 III display unit. All three are capable of decoding the following formats:

Format	Function
APCO P25	Source ID, Destination ID, Talk Group, Mfgr ID, emergency flag, low speed data, Network Access Code, targeted call alert, Data, TSBK
MDC-1200 [®]	Source ID, Dest ID, Status, Message, RAC, Emergency, Raw payload, targeted call alert
FleetSync [™]	Source ID, Dest ID, ENI, Raw payload, Status, targeted call alert

Front Panel Displays and Controls

C25 I

The C25 I is a computer interface device. The front panel consists of LED Indicators describing the functioning of the unit. The LED's and their function are as follows:

Indicator	Function
MUTE	Lights when the C25 detects data which may or may not decode. Stays lighted during the entire reception period. Follows the action of the Mute relay.
DEC	Lights when the C25 has successfully synchronized with incoming data and is decoding valid data.
TXBSY	Indicates that the attached transmitter is busy.
KEY	Indicates that the C25 is keying the attached transmitter
MOD	Indicates that the C25 is modulating data for transmission.
AUX 1	Unused
ERROR	Flashes when there is an equipment failure.
TX IO	Lights when the C25 is providing data to the serial I/O port.
RX IO	Lights when the C25 is detecting data from the serial I/O port.
POWER	Indicates that the unit is powered on.

There are two momentary push buttons on the front panel of the C25 I. The right button is labeled "Reset"

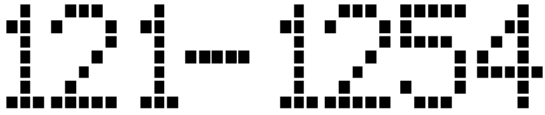

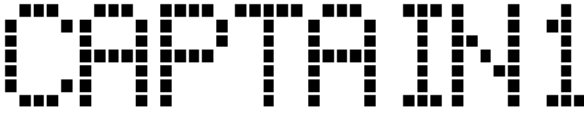
and causes the CPU Supervisor to reset all processors. The left button is not labeled and if pressed for 5 seconds will cause APCO P25 data to become inverted.

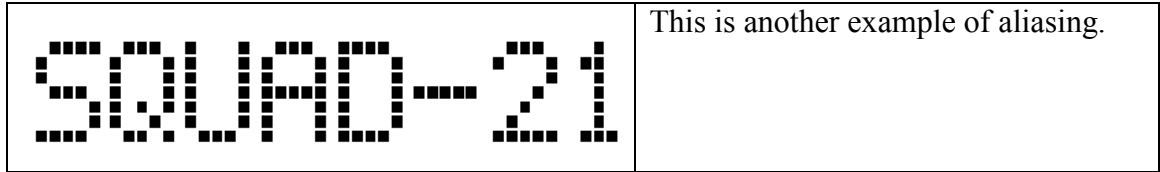
C25 II

The C25 II is a single window dispatch display unit. The display consists of eight large 5x7-pixel LED display matrixes. This display will show either the ID or the associated alias if one is programmed. ID's that do not have an alias associated are displayed as follows:

Signaling type	Display	Definition
APCO P25	1234, A246B, 654321,	A PTT ID has been received from radio ID (displayed number) which can also contain Hex characters.
MDC-1200 [®]	A876, 1234, AD90	A PTT ID has been received from radio ID (displayed number) which can also contain Hex characters.
FleetSync [™]	123-2289	A PTT ID has been received from radio whose fleet number is 123 and ID is 2289.

ID's can have alphanumeric aliases of up to eight characters in length. Upon receipt of an ANI message, the alias is displayed instead of the numeric ID.
(Requires purchasing the Alias feature)

	This is an example of a received FleetSync [™] ID. The three characters to the left of the dash (-) is the fleet ID and the four characters to the right is the unit ID. Fleet and Unit ID pairs can be aliased.
	This is an example of a received MDC or P25 ID and contains HEX characters. All valid MDC ID's (0001 through DEEE) can be displayed and aliased. P25 ID's can contain up to six characters.
	This is an example of an alias. The unit ID has been assigned the alias "CAPTAIN1". Any time the ID is received by the C25, the display will show the alias instead of the ID



When non-PTT type messages are received, the ID or alias is displayed for 2 seconds and then the message type. The display alternates in 2-second intervals between ID/alias and message type.

The C25 II has two push buttons on the front panel. The right button is labeled CLEAR and clears the display. If a critical message was last received, pressing the button once clears the alert and pressing the button the second time clears the display. Critical messages are defined as any message that has been programmed to sound one of five different tone alerts. Clearing the alert stops the tone from sounding and also stops the display from alternately flashing ID and message type.

The left button is labeled REVIEW and when pressed, steps the display through the last 20 received messages. Messages are displayed just as they were received except the left most display shows the order in which the messages were received. The most recent message will be labeled "a". Subsequent messages will be labeled "b", "c" and so forth. To facilitate speedy review, non-PTT messages alternate in 1-second intervals between ID/alias and message type instead of 2-second intervals.

To clear the review buffer, press and hold the review button while pressing the clear button. The review memory will be erased. The review buffer resides in SRAM and as such is volatile. If power is lost or removed, the review buffer will be erased.

C25 III

The C25 III is a multiple window dispatch display unit. The main display and its features are the same as the C25 II. In addition to the main display, there is a secondary, smaller display capable of displaying 28 characters just above the two push buttons. This display area is user programmable to present two selectable features as well as completely definable via the \$\$FORMAT command.

Scrolling ID's

The secondary display area can be programmed for scrolling ID's. In this configuration, when a second ID is received, the first received ID or alias will scroll to the secondary position. Leading and trailing blanks will be suppressed. Thereafter, received ID's will scroll in a similar manner until they scroll off of the secondary display. Redundant (identical subsequent) ID's of the same message type will not be displayed. Non-PTT messages will display the ID/Alias a dash (-) and the message type (abbreviated).

E	D	,	R	O	N	-	E	,	1	2	,	S	U	P	R	V	S	O	R	,	B	1	6	-	E		
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--	--

Message and Assignment

The secondary display area can be programmed to display the received message type (8-character max.) and the ID related assignment field (19-character max.) if present in memory.

M	A	N		D	O	W	N	-	B	U	I	L	D	I	N	G		1	3		F	L	O	O	R		5
---	---	---	--	---	---	---	---	---	---	---	---	---	---	---	---	---	--	---	---	--	---	---	---	---	---	--	---

Taxi Bid Display

Both the C25 II and the C25 III can be programmed to display in the Taxi Bid mode. In this mode, the first received data burst is displayed in the main display area. Subsequent ID's are shown in the secondary display area (for a C25 III) or are not displayed at all (C25 II). When either the remote clear or the front panel clear button is pressed, the main display clears and is ready to display the next received ID.

Alarms and Alerts, Critical Message Designation**Alarms**

In the message table, message types can be flagged to cause an open collector output when received. This output can be used to activate an external alarm system. There are two outputs available at the rear of the C25. These are labeled OUT1 and OUT2. The associated transistor circuitry is capable of sinking up to 500 mA. The transistor conducts for a period of 2 seconds when activated by the appropriate received message. Multiple message types can be designated to activate the same output. Only one output can be programmed per message type.

Alerts

In the message table, message types can be flagged to cause an audible alert when received. There are six different sounds that can be assigned to multiple message types. Only one sound can be programmed per message type. The sounds available are as follows:

Value	Alert	Duration
0	Silent	None
1	Single short beep	250 ms duration
2	Short beeps	250 ms on, 100 ms off – repeat for 5 secs
3	Long beeps	500 ms on, 500 ms off – repeat for 5 secs
4	Short beep, Long beep, repeat	250 ms on, 250 ms off, 500 ms on, 500 ms off – repeat for 5 secs
5	Continuous tone	on for 5 seconds
6	Constant on	On until clear button is pressed

Critical Message Designation

Critical messages are defined as any message that has been programmed to sound one of the alert tones (except single short beep). When a critical message is received, pressing the CLEAR button once stops the tone from sounding. Pressing twice clears the alert and also stops the display from alternately flashing ID and message type. Once a critical message is received, the display will not clear to a new message unless the precedence of the later message is equal to or higher than the current message. Precedence is determined by the number value of the alert sound. For example, say PTT ANI is assigned tone 1 (single short beep), emergency is assigned tone 2 (short beeps) and man down is assigned tone 3 (long beeps). An emergency is received and not cleared by the operator. Receipt of a PTT ANI will not be displayed (but will be placed in the review buffer). Receipt of a man down message will take priority over the emergency message and the emergency will be cleared and man down will be displayed.

ID Sensitive Alerts

Specific ID's can be programmed to cause an audible notice whenever PTT ANI is received from that ID. In the Alias table, place as the last entry for the affected ID, a number between 2 and 5. This number represents the

quantity of single (100ms) beeps the C25 will sound when the PTT ANI is received. To have no audible beep for a particular ID, enter a zero (0). If a one (1) is entered, the beep configuration is as described in the message table.

Targeting the C25 with Field Generated Alerts

The C25 will react to received P25 Individual Calls, FleetSync Select Calls and MDC Short call alerts and Long call alerts targeting the ID programmed in the C25 (\$\$UID?). If the C25 receives a call with matching ID, the display will alternate between "CALL" and the ID of the calling station and the sounder will sound continuously and OUT1 will activate until the clear button is pressed or the C25 detects that the attached radio has been keyed (this requires connecting radio PTT to the PTT connection on the back of the C25). If the C25 receives an MDC short call alert with matching ID, the display will only show "CALL".

Authorize Mode

The C25 can be programmed to filter out unauthorized users of repeater systems. In this mode, the C25 monitors channel busy for activity and looks for ANI. If the ANI ID is not present or is present but is not in the authorized users list (alias list) then the C25 will toggle Out1 and/or Out 2 to lock out the repeater transmitter stage. The lock out will remain in effect until the channel busy line shows lost activity. Once placed in this mode, previously programmed functions of OUT1 and OUT2 are superseded and open collector OUT1 becomes active and goes to within 0.7v of signal ground (capable of sinking up to 500mA), while OUT2 remains inactive, providing a high impedance. The C25 begins monitoring channel busy for activity and, if activity is detected, the C25 checks for ANI. If ANI data is detected, and the decoded ANI is present in the ALIAS table, OUT1 and OUT2 reverse states, bringing OUT1 to high impedance and OUT2 to within 0.7V of signal ground. This reversal remains in effect until channel busy becomes inactive, then OUT1 and OUT2 reverse to their original states. If no ANI data is detected or the decoded ANI is not present in the ALIAS table, OUT1 and OUT2 remain in their original states.

NAC Permission Mode

The existing C Plus "Authorize" mode still functions in the same manner. However, there is another method

available in P25 mode. Enabling the P25 NAC permission mode will compare received NAC with the contents of the NAC table and react by changing condition of OUT1 and OUT2 if a match is present. The state change remains in effect until the data stream ceases due to signal loss for a time greater than the time programmed in "Disconnect Delay".

The default NAC value is \$293.

\$F7E and \$F7F will cause outs to react on any incoming NAC.

If NAC permission mode is turned on, the NAC table is not used for decode qualification.

TGID Permission Mode

The existing C Plus "Authorize" mode still functions in the same manner. However, there is another method available in P25 mode. Enabling the P25 TGID permission mode will compare received TGID with the contents of the TGID table and react by changing condition of OUT1 and OUT2 if a match is present. The state change remains in effect until the data stream ceases due to signal loss for a time greater than the time programmed in "Disconnect Delay".

The default TGID value is \$0001.

A TGID of \$FFFF includes everyone.

If TGID permission mode is turned on, the TGID table is not used for decode qualification.

Decode Qualification by NAC and/or TGID

The C25 will allow qualification by NAC and/or TGID. These tables can have up to 12 entries. If NAC and/or TGID tables exist, the C25 will not react to received data unless the received NAC/TGID exists in the table. If both tables exist, the C25 will not react to received data unless both qualifiers are true. In a communications system, the default TGID value is \$0001 and a TGID of \$FFFF includes everyone. However, if you desire to have the C25 react regardless of TGID, simply delete (or do not create) a TGID table.

Translator

The translator feature changes the basic function of the C25. The translator is intended to convert ANI in APCO P25 or FleetSync™ into MDC-1200® so that the signal can be decodable at a dispatch console capable of only

MDC-1200[®] signaling.

Say that you have a mixed fleet consisting of MDC-1200[®], APCO P25 and FleetSync[™]. The base dispatch console is made by Motorola and decodes MDC-1200[®]. The translator input is attached to the discriminator of the digital receiver. The output of the Translator (at Data Out + and Data Out -) is attached to the recovered analog audio output of the digital receiver at the audio input to the console.

A unit in the field with APCO P25 signaling keys up and his PTT ANI is transmitted. At the translator, the APCO P25 ANI is decoded and converted to MDC-1200[®] and the resulting ANI burst is injected into the dispatch console input audio path.

P25 ANI ID's can be up to six HEX characters in length. The translator will only successfully translate P25 ID's with a length of up to four characters.

FleetSync[™] contains Fleet ID's which cannot be supported by the structure of MDC-1200[®]. This requires the translator to strip the Fleet ID from the received data string and forward only the unit ID.

To support FleetSync[™] group ID translation, up to ten ID translations can be entered into the C Plus. ID translations are defined by entering the following string:

```
$$Fxxxx=Myyyy
```

Where xxxx is the four digit FleetSync[™] target group ID and yyyy is a four digit MDC-1200[®] group ID. If A FleetSync group call is received targeting group xxxx, the translator will substitute MDC ID yyyy for that translation. For example, \$\$F4911=ME123 will permit FleetSync group ID 4911 to be translated into MDC group ID 123. MDC-1200[®] ID's that begin with "E" represent MDC groups.

An existing table can be read from the C Plus by entering the string:

```
$$FVIEWGROUPS
```

The table can be deleted by entering the following string:

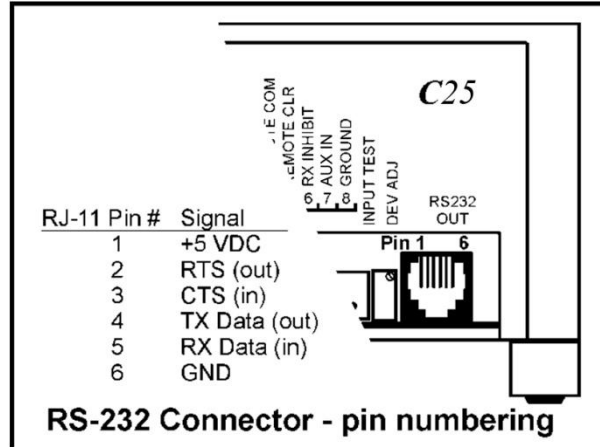
```
$$FERASEGROUP
```

CHAPTER 5

Technical Information

RJ-11 Serial Communications Port

The RJ-11 (6 pin modular) connector is RS-232 protocol compatible with pin assignments as described in the figure below:



Interconnect cables must be six conductor, with pin-to-pin configuration (pin 1 of one side goes to pin 1 of the opposite side, 2 to 2, 3 to 3 etc.)

Upon initial power-up, the C25 begins listening at 9600, N, 8, 1 for a user sign-on message. The C25 remains in this listening mode for 10 seconds. If, during the listen mode, a user enters the phrase "\$\$C25", the device remains at 9600, N, 8, 1 and enters program mode. If no sign-on message is received at the end of 10 seconds, the C25 configures the serial port in the manner stored in memory. If there is no preference programmed, the C25 remains at 9600, N, 8, 1. The C25 will respond to the sign-on message even after the initial 10 seconds if the sign-on is sent in the baud rate/protocol specified in memory.

If the C25 is permitted to enter program mode, the main menu is outputted and the device awaits input from the user.

Fabricating a Programming Cable

For connection directly into a computer serial port, the following adapter must be used:

RJ-11 Pin #	DB-9F Pin #
1 (Wht)	Not Connected
2 (Blk)	8
3 (Red)	7
4 (Grn)	2
5 (Yel)	3
6 (Blu)	5

Fabricating a Printer Cable

For connection directly into a serial printer, the following adapter must be used:

RJ-11 Pin #	DB-9M Pin #
1 (Wht)	Not Connected
2 (Blk)	8
3 (Red)	7
4 (Grn)	2
5 (Yel)	3
6 (Blu)	5

Fabricating a Daisy-chain cable

To daisy chain multiple C25's together connect the RJ-11 RS-232 ports in the following manner:

C25 RJ-11 pin connector				
C25#1	C25#2	C25#3	C25#X	Last C25
1 N/C	1 N/C	1N/C	1N/C	1 N/C
2 N/C	2 N/C	2 N/C	2 N/C	2 N/C
3 N/C	3 N/C	3 N/C	3 N/C	3 N/C
4	4	4	4	4
5 N/C	5	5	5	5
6	6	6	6	6

*

Note: N/C = no connection

The `$$FORMAT` command must be used to set up the serial input and serial output strings so that they match for connected C25's. The serial output of the last C25 must be selected to match the requirement of the console/computer attached. See page 35 for further details.

DB9-p5

DB9-p2

Console or
Computer
serial input

USB Port Description

The USB port is for factory use only.

Serial Output Formats

The output format can be selected from one of the following pre-defined formats or the \$\$FORMAT command can be used to build a user-defined unique output.

Cimarron Standard

Cimarron standard format is similar to the Cimarron C-Mark II and III printer output format. For the C25 II and III (in scroll mode), this format is defined as follows:

```
<lf>iiiiiiii-MMMMMM-hh:mm:ss-mo/da/yr-CH-cc<cr>
 1   2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43
```

<lf>	Line Feed
i	ID or ALIAS (8 chars)
-	Space (one space)
M	Message (8 chars)
-	Space (one space)
hh	Hours (2 num)
:	Printed : (one colon)
mm	Minutes (2 num)
:	Printed : (one colon)
ss	Seconds (2 num)
-	Space (one space)
mo	Month (2 num)
/	Printed / (one slash)
da	Day (2 num)
/	Printed / (one slash)
yr	Year (2 num)
-	Space (one space)
CH	Printed CH (two characters)
-	Space (one space)
cc	Channel (2 num)
<cr>	Carriage Return

Examples

```
00000300 EMRGNCY 11:06:30 03/20/01 CH 01
SUPRVSOR ANI ID 11:07:28 03/20/01 CH 01
123-4567 ANI ID 11:08:01 03/20/01 CH 01
```

For the C25 III in message and assignment mode, the output is similar to the Cimarron C-Mark IV format. Although the Assignment field in an alias table is capable of holding 28 characters, this display mode only presents the right-most 19. The format is defined as follows:

```
<lf>hh:mm:ss-mo/da/yr-CH-cc-iiiiiii-MMMMMM-AAAAAAAAAAAAAAAAA<cr>
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
```

<lf>	Line Feed
hh	Hours (2 num)
:	Printed : (one colon)
mm	Minutes (2 num)
:	Printed : (one colon)
ss	Seconds (2 num)
-	Space (one space)
mo	Month (2 num)
/	Printed / (one slash)
da	Day (2 num)
/	Printed / (one slash)
yr	Year (2 num)
-	Space (one space)
CH	Printed CH (two characters)
-	Space (one space)
cc	Channel (2 num)
-	Space (one space)
i	ID or ALIAS (8 chars)
-	Space (one space)
M	Message (8 chars)
-	Space (one space)

A Assignment (19 chars max.)
 <cr> Carriage Return

Examples

```
11:06:30 03/20/01 CH 01 00000300 EMRGNCY Bldg 23 Floor 6
11:07:28 03/20/01 CH 01 SUPRVSOR ANI ID SECTOR 5 BEAT 2
11:08:01 03/20/01 CH 01 123-4567 ANI ID Assignment Blue
```

MODAT

The "Modat" format is as follows

```
$mmm^^iii^dd/mm/yy^hh:mm:ss<cr>
 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
```

\$ Beginning of string delimiter
 mmm Message (PTT) other types not reported
 ^ ASCII blank character
 iii Three digit numeric ID (MSD's if present are truncated)
 dd/mm/yy Date (day/month/year)
 hh:mm:ss Time (hour:min:sec)
 <cr> ASCII carriage return

Examples

```
$440 123 13/06/01 15:25:55
$PTT 123 13/06/01 15:26:25
```

BED-31/1207 Output Format

The format consists of twelve ASCII characters providing Unit Identification, Tag Bit Configuration, Message Coding and Radio Channel Identification. HEX ID's are not be supported. Tag bit and status bit coding is accomplished to be consistent with the output expected from equivalent legacy GE Star ID's (T1=8192, T2=4096, S1=2048). The channel identifier field displays channel 1 through channel Z. Orbacom dispatch consoles require this format. The format is as follows:

```
<lf>iiiiitsSmMc<cr>
 1 2 3 4 5 6 7 8 9 10 11 12
```

<lf> Line Feed

i	ID 4 digit number max 2047. Must add values of T1, T2 and S1 to attain true ID. Fleet ID's in FleetSync™ are not represented.
t	Tag bit configuration (0 thru 3 where 0=00, 1=01, 2=10, 3=11)
s	Status bit MSD (0 or 1)
S	Status bits LSD's (0 through 7)
m	Message bit MSD (0 or 1)
M	Message bits LSD's (0 through 7)
c	Radio Channel Identifier (0 through Z)
<cr>	Carriage Return

Examples:

```
0025100011
2047000011
2047000071
```

Extended BED-31/1207 Output Format

The Extended BED-31/1207 format has enhancements to more fully take advantage of the ID range offered by MDC-1200® and P25 signaling. The format consists of twelve ASCII characters providing Unit Identification with a range of 0001 through FFFF, Tag Bits (fixed at 00), Message Coding and Radio Channel Identification. The ID field will display the ID through the entire valid range in Hex. The channel identifier field has been modified to display channel 1 through channel Z. The format is as follows:

```
<lf>iiiiitsSmMc<cr>
 1  2 3 4 5 6 7 8 9 10 11 12
```

<lf>	Line Feed
i	ID 4 digit number for APCO P25, and MDC-1200®. Fleet ID's in FleetSync™ are not represented.
t	Tag bit configuration, tag bits are left at 00.
s	Status bit MSD (0 or 1)
S	Status bits LSD's (0 through 7)

m Message bit MSD (0 or 1)
 M Message bits LSD's (0 through 7)
 c Radio Channel Identifier (0 through Z)
 <cr> Carriage Return

Examples:

```

95B1000011
A652000011
2047000071

```

Cimarron Translated Output Format

The Cimarron translated output format is defined as follows. If MDC-1200[®] or P25 format is selected, HEX characters are not supported.

```

<lf>iiiiitMc<cr>
  1  2 3 4 5 6 7 8  9

```

<lf> Line Feed
 i ID (4 digit number max 9999)
 t Tag bits are left at 00 and Fleet ID is not reported.
 M Message character A=PTT ANI, E=Emerg, M=Mandown. In FleetSync™, any received status other than E or M is represented by "S".
 c Radio Channel Identifier (0 through 9)
 <cr> Carriage Return

Examples:

```

00010E1
00160A1
12570S1

```

CML Output Format

The CML output format is used in CML consoles and also Modular Communications (MODUCOM) consoles. The format is as follows:

Note: For console compatibility, the ASCII output data rate should be programmed for 1200,N,7,2.

```
<lf>iiiiimthhmm<cr>
  1  2 3 4 5 6 7 8 9 10 11 12
```

<lf> Line Feed

i ID (4 digit number 0000 through DEEE) or (4 char alias with leading truncated). In FleetSync™, the fleet ID is not represented.

m Message bit (1 for PTT or 7 for Emergency)

t Always reported as 0 from the C25

hh Hours

mm Minutes

<cr> Carriage Return

Examples:

```
8645101201
BILL101201
0023701205
```

Cimarron MultiChannel ANI Format

The C25 receives data messages from remote radio units equipped with encoders and converts the received messages to a serial ASCII data sentence and passes them to the host computer. This "inbound" ASCII data sentence is formatted as follows:

```
$CR,iiii,mm,cc<cr><lf>
$CR,fff-iiii,ss,cc <cr><lf> (FleetSync™ Only)
```

Receive Data Sentence, sent by the C25 to the host computer where:

\$CR Receive-data sentence header

fff Fleet ID (FleetSync™ only. Valid range = 100-349)

iiii Unit ID (0000 .. FFFF) (F/S Valid range = 1000-4999)

mm Unit message (00 .. 7F) in ASCII-HEX, as described below:

- 00 - Status One
- 10 - Status Two
- 20 - Status Three

- 30 - Status Four
- 40 - Status Five
- 50 - Status Six
- 60 - Status Seven
- 70 - Status Eight
- 01 - Unit PTT ID Message
- 02 - Unit Interrogate
- 07 - Unit Emergency Message
- 08 - Unit Selective Call Cancel
- 09 - Unit Stuck Mic Message
- 0A - Unit Radio Open-Mic-Monitor
- 1B - MDC generic STAT-ALERT Ack
- 3B - MDC Repeater Access
- 4B - MDC Repeater Setup
- 5B - MDC Repeater Knockdown
- 0F - Unit Man Down Message
- 4A - Unit Radio Disable
- 5A - Unit Radio Enable
- 7F - Remote Base Station ID
- ss** Two digit Status for FleetSync™ Only
 - 00 No Ack when ACK expected
 - 01 - Unit PTT ID Message
 - 10-99 Status messages where the following are defined by Kenwood:
 - 88 - Emergency mode Off
 - 89 - Horn Alert
 - 90 - Radio TX Stun
 - 91 - Radio TX and RX Stun
 - 92 - Turn Stun Off
 - 93 - ACK TX Stun
 - 94 - ACK TX/RX Stun
 - 97 - Stat ACK
 - 98 - Unit Man Down Message

99 - Unit Emergency Message

cc Received channel number (00 .. **FF**)
<cr> ASCII carriage return character
<lf> ASCII line feed character

Cimarron Standard Classic

Cimarron standard classic format is the Cimarron C-Mark II and III printer output format. For the C25 II and III (in scroll mode), this format is defined as follows:

```
<lf>iiii-MMMMM-hh:mm:ss-mo/da/yr-CH-c<cr>
 1  2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
```

<lf> Line Feed
i ID or ALIAS (4 chars)
- Space (one space)
M Message (6 chars)
- Space (one space)
hh Hours (2 num)
: Printed : (one colon)
mm Minutes (2 num)
: Printed : (one colon)
ss Seconds (2 num)
- Space (one space)
mo Month (2 num)
/ Printed / (one slash)
da Day (2 num)
/ Printed / (one slash)
yr Year (2 num)
- Space (one space)
CH Printed CH (two characters)
- Space (one space)
c Channel (1 num)
<cr> Carriage Return

Examples

```
0300 EMERGY 11:06:30 03/20/01 CH 1
SUPR ANI ID 11:07:28 03/20/01 CH 1
4567 ANI ID 11:08:01 03/20/01 CH 1
```

Display

The Display serial output is intended to drive an external display. The output is defined as follows:

```
iiiiiii.s<CR><LF>
 1 2 3 4 5 6 7 8 9 10 11 12
```

Where "i" = maximum eight character unit ID or ALIAS followed by a decimal and "s" = single character abbreviated message designator from the C25 message table. The string ends with <CR><LF>

i	ID or ALIAS (8 chars)
.	Printed dot (.)
s	Single character message type (from message table)
<cr>	ASCII carriage return character
<lf>	ASCII line feed character

Leading zero's are truncated. The single character abbreviated message designator will always be present. If the message type is undefined in the message table, the designator will be "!" (exclamation).

In display mode, if the front panel or external clear button is pressed, ten blank characters are sent out the serial port, effectively clearing the external display.

APCO P25

Source ID (SRC)

The Source ID is the Unit ID of the sending unit. This provides PTT ANI information. ID's are from \$000000 through \$EEEEEE with F being reserved as a wildcard.

Destination ID (DEST)

The Destination ID has the ID of the intended target for individual calls.

Talk Group (TGID)

The Talk group ID identifies the talk-group for the message. The purpose of a talk group is to allow logical groupings of radio users into distinct organizations.

TGID's are from \$0000 to \$FFFF.

\$0001 is the default TGID is used in systems where talk groups are not implemented.

\$0000 no-one or a talk group with no users. Used when implementing an individual call.

\$FFFF reserved as a talk group which includes everyone.

Mfgr ID (MFID)

The Manufacturer ID is set to \$00 or \$01 unless manufacturer non-standard features are being used, in which case, the 8 bit field contains the HEX ID of the manufacturer.

\$09	Aselsan Inc
\$10	Relm / BK Radio
\$18	EADS Public Safety Inc
\$20	Cycomm
\$28	Efratom Time and Frequency Products, Inc
\$30	Com-Net Ericsson
\$38	Datron
\$40	Icom
\$48	Garmin
\$50	GTE
\$55	IFR Systems
\$5A	INIT Innovations in Transportation, Inc
\$60	GEC-Marconi
\$68	Kenwood Communications
\$70	Glenayre Electronics
\$74	Japan Radio Co.
\$78	Kokusai
\$7C	Maxon
\$80	Midland
\$86	Daniels Electronics Ltd.
\$90	Motorola
\$A0	Thales

\$A4 M/A-COM

\$B0 Raytheon

\$C0 SEA

\$C8 Securicor

\$D0 ADI

\$D8 Tait Electronics

\$E0 Teletec

\$F0 Transcript International

\$F8 Vertex Standard

\$FC Zetron, Inc

Emergency flag (EM)

This flag is set when the transmission occurs because the emergency button has been pressed.

Low speed data (LSD)

Low Speed Data is intended for custom user applications.

Network Access Code (NAC)

Network access codes are used to control network and repeater access. NAC codes are used the same way as CTCSS and DCS codes are in analog radios. NAC's are from \$000 to \$FFF.

\$293 is the default NAC value.

\$F7E will unquench on any incoming NAC.

\$F7F is used in repeaters to allow all incoming signals to be repeated.

Data (DATA)

Data messages from PDU with DUID = 1100

Status Symbol (SS)

Status symbol is a two bit variable that describes the status of repeater channels. If status symbol is one of the variables requested in the \$\$FORMAT command for a display, and the value of SS changes during the same reception, the display will be refreshed to reflect the new value. If status Symbol does not remain constant during a transmission, this could indicate that there are transmit

bit errors. Status symbol is represented by a single character as follows:

0	Field radio, Talk Around, unknown
1	Repeater originated, channel is busy
2	Field radio, repeater system, unknown
3	Repeater originated, channel is idle

Trunking Sig Block (TSBK)

Trunking signaling block (single block or multi-block) control channel information with DUID = 0111. Provides decoded Octets from OSP, ISP or LCO messages.

FleetSync™ ID and Message Description

The C25 is capable of decoding and displaying FleetSync™ Basic and FleetSync™ Version 2.0 data transmissions at 1200 baud of the following types: PTT ANI, Emergency(ST99) and (ver 2.0 only) Man Down(ST98) and all status messages 10 through 99.

The C25 is currently not compatible with Kenwood FleetSync™ II Air Protocol nor 2400 baud.

The C25 is capable of decoding and displaying the entire set of FleetSync™ Fleet and Unit ID's. The allowable fleet assignment range is from 100 to 349. The allowable unit ID range is from 1000 to 4999.

Using the \$\$FORMAT command, FleetSync variables are as follows:

Source (SRC) [#SRC or &SRC will be decimal]
 Destination (DEST) [#DEST or &DEST will be decimal]
 Payload (DATA) (Fields FMT and MSG)

MDC-1200® ID and Message Description

The C25 is capable of decoding unit ID's in the full hexadecimal range from \$0001 through \$DEEE.

Using the \$\$FORMAT command, MDC-1200® variables are as follows:

Source (SRC) [#SRC = HEX, &SRC = DEC]
 Destination (DEST) [#DEST = HEX, &DEST = DEC]
 Payload (DATA) (Bits 16-31 of each packet)

MDC Repeater control messages

The C25 is capable of reacting to MDC Repeater control messages.

NOTE:

FleetSync ID's are always presented in decimal format, regardless of the \$\$FORMAT command entered. The # or & is ignored for FleetSync but is still considered for receipt of P25 or MDC-1200 data.

HINT:

Use a text editor like "Notepad" to create the \$\$FORMAT strings in advance. Save the string to the computer, then use the "Send Text File" function (In the "Transfer" menu) of HyperTerm to load the entire string into the C25.

If "Access" is received and the ID matches the C25 ID, out1 will become active and remain active until loss of carrier (ch bsy).

If "Setup" is received and the ID matches the C25 ID, out1 will become active and remain active until receipt of a "Kdown" that matches the C25 ID.

If these messages are received where the ID field does not match the ID of the C25, they are decoded, displayed and outputted to the serial port – but no acknowledgment is generated and the out1 activation does not occur.

Dynamically definable MDC message definitions

To increase flexibility, the C25 has features where MDC-1200 message definitions can be re-defined to meet unique system requirements. This is accomplished by creating and installing a message table.

CHAPTER 6

Troubleshooting

Performing Self Tests

To facilitate troubleshooting of the C25, the following self test directives exist and can be inputted via the serial communications port:

The C25 runs on regulated 5 VDC. Use only the factory supplied power block.

Directive	Definition
\$\$LOOP	Generates a PTT ANI message and then an emergency message in MDC-1200 [®] format. Repeats for 16 seconds, one message per second.
\$\$KEYT	Keys the C25 and sends MDC-1200 data for 10 seconds.
\$\$OUTS	Causes the outputs to individually wiggle for 3 seconds each. Affects Key, RXMute, TXCtl, Out1 and Out 2.
\$\$DISPLAY	Illuminates all pixels in the display (C25 II and III)

The Local Loop-Back test (\$\$LOOP) generates a PTT ANI message and then an Emergency ANI message in the MDC-1200[®] format. This signal generation will continue for 16 seconds, with one message being generated per second. If the test is successful, the display will display the decoded messages. If an alias has been programmed for the test ID, then the alias will be displayed. The test ID is 8888.

To prepare for the local loop-back test, disconnect the C25 from the attached communications system and connect Data Out A to Data In A and connect Data out B to Data In B.

Note that once the emergency message is received, subsequent PTT ID messages will not be displayed unless the clear button is pressed. This is because critical messages must be cleared manually from the display. Serial output, however, will display all messages received.

The Data Modulation Test (\$\$KEYT) is used to adjust

MDC-1200[®] data output when in the Translator configuration to match the requirement of the equipment attached.

The Output Line Test (\$\$OUTS) "wiggles" output lines to allow verification of operation. (Key, RXMute, TXCtl, Out 1, Out 2). This test should only be performed when the C25 is not connected to an associated radio. Each of the above mentioned lines will be brought active for 500ms and then inactive for 500ms and then active for another 500ms. This "cycle" will continue for three seconds for each line. Only one line is "wiggled" at a time.

Installation Hints

The C25 is AGC controlled and generally requires no adjustments to the receive signal. However, if you are having a decode rate of under 100%, try performing the following steps. Refer to the main board schematic. Notice that there are attenuation networks controlled by JP13, JP12 and JP11 (for unbalanced systems) and JP10, JP9 and JP8 (for balanced systems). Also notice that after the attenuation networks, there is an amplifier (U9B) whose gain is controlled by jumper placement on JP5. Use an oscilloscope to view the ANI signal waveform at TP10. Adjust the appropriate jumpers in the attenuation circuitry so that your waveform is not clipped and maximum values are not exceeded. See the table on page 18. Now view the waveform at TP7 and adjust jumper JP5 and VR3 for a 500mV p/p ANI signal. This procedure is also covered on page 18.

Inverting P25 Data

Depending on the radio being used to supply discriminator audio to the C25, P25 audio data may need to be inverted in order to successfully decode.

To invert P25 data, while the C25 is in normal operate mode, press and hold the left front panel button for five seconds. The C25 will respond by displaying INV P25 or NORM P25 on the C25-II or C25-III display. The device will then restart and begin the power-up sequence. On the C25-I, the status LED's will sequence from right to left for inverted P25 data and will sequence from left to right for normal data.

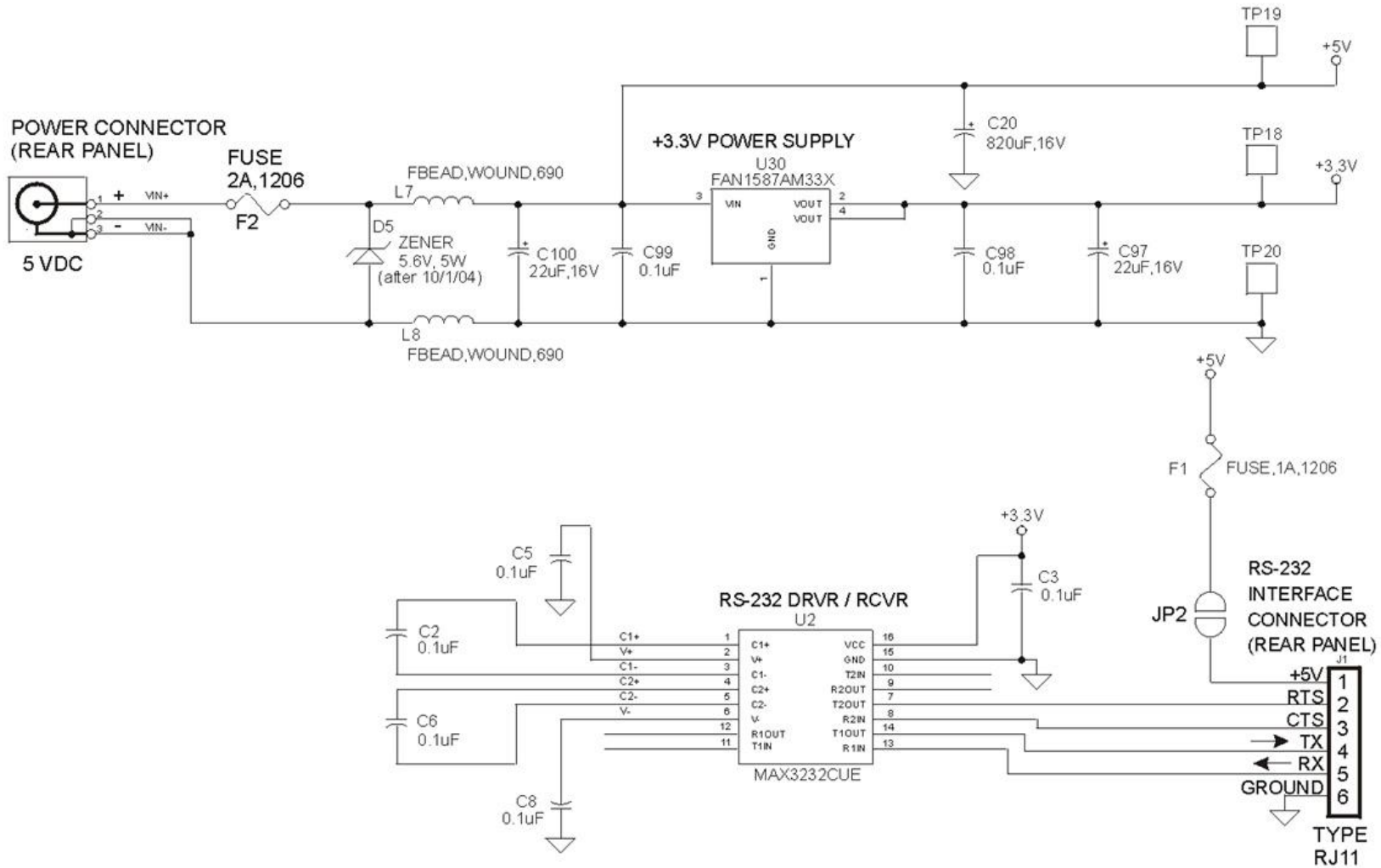
This can also be accomplished in programming mode, under the Radio Interface menu, select "Invert P25 Data". Exit programming mode cycle power to the C25

and try decoding again.

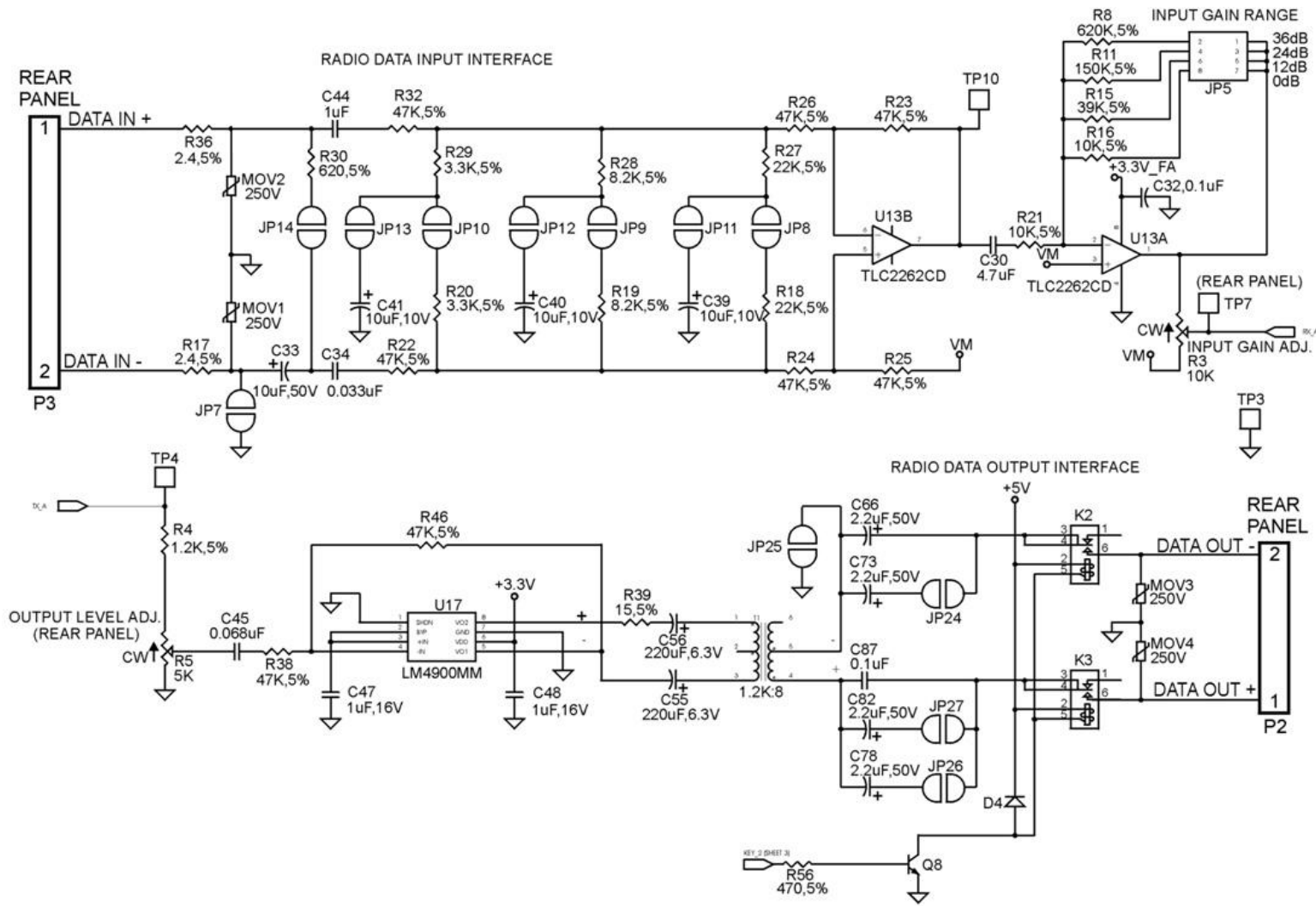
Audio Data Input

In order to decode P25 data, the audio input to the C25 must be from unfiltered receiver discriminator. Wireline connections will not support P25 data.

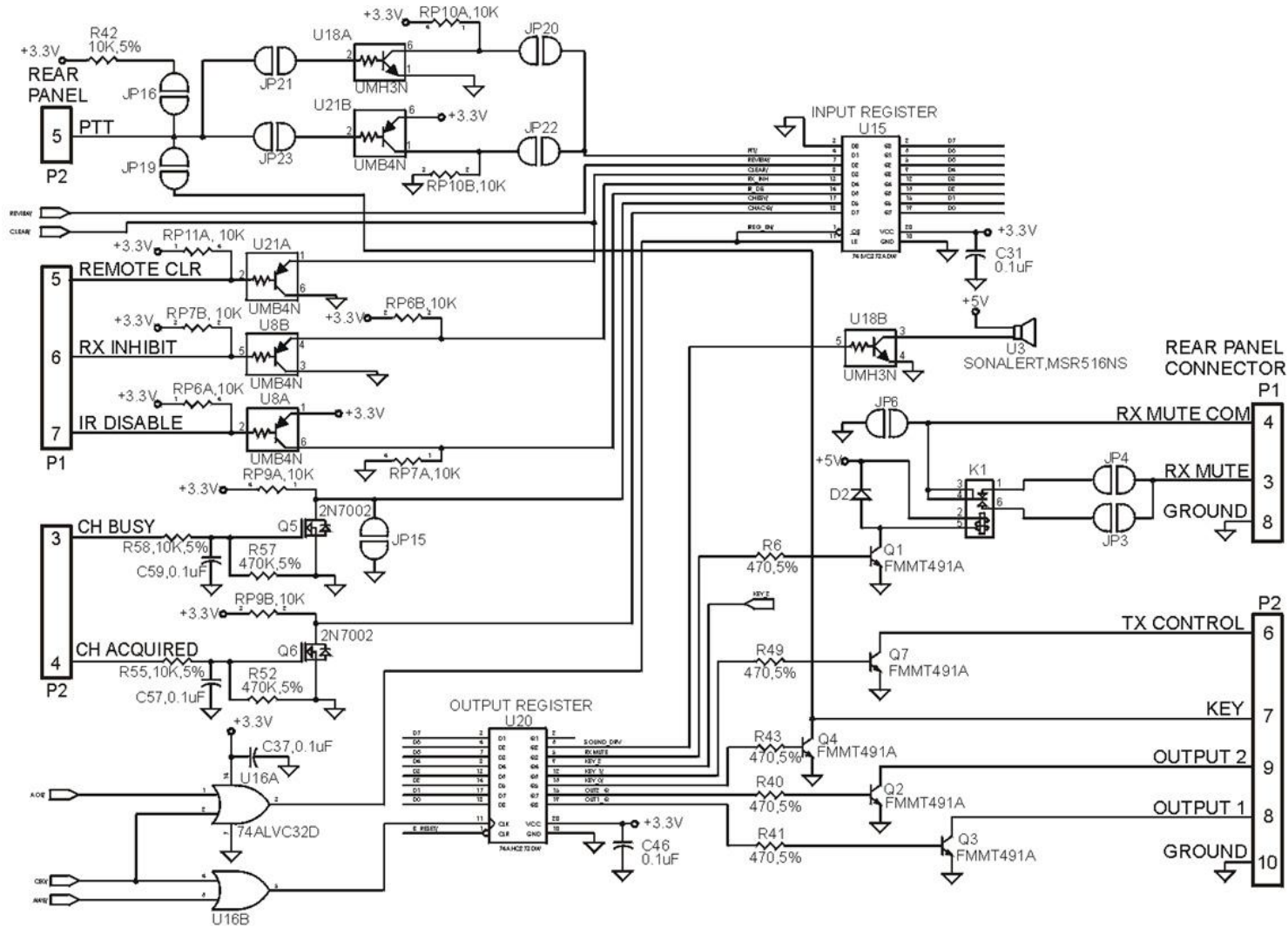
Power Supply Schematic



Line Input/Output Schematic



Radio Interface Schematic



CHAPTER 7

Product Support

If you have any questions or comments about Cimarron products, please make use of our technical support hotline at (760) 738-3283.

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WARRANTY

Cimarron Technologies Corporation warrants this product to be free from defects in material and workmanship for a period of three years from date of shipment. If a malfunction occurs due to defective material or workmanship, the product will be repaired or replaced (Cimarron's discretion) without charge if returned to the factory

This warranty does not apply to any failure or damage caused by accident, neglect, unreasonable use, improper installation, or to alterations or modifications to the unit. Nor does the warranty extend to damage incurred by force majeure (natural causes) such as lightning, fire, floods, or other such catastrophes, nor to damage caused by environmental extremes, power surges and/or transients

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A P P E N D I X A – Default Hardware and Personality Conditions

The following conditions are present in equipment as shipped from the factory.

Default hardware conditions for the C25

1. CHBSY_IN (input) disabled by insertion of Jumper JP15.
2. KEY (output) asserted – low on P2, static – high Z on P2
3. OUT1 & OUT2 (outputs) asserted – low on P2, static – high Z
4. RX MUTE asserted – relay energized, static – relay relaxed
5. REM_CLR (input) true when low at P3, static – pulled high
6. RX_INHIB (input) true when low at P3, static – pulled high

Default personality conditions for the C25 I

1. Signaling type APCO P25 and MDC-1200[®]
2. Serial output type Bed-31/1207
3. Display type N/A in C25 I
4. Serial port parameters 9600 – N – 8 – 1
5. CHBSY_IN act Low
6. RX_INHIB act Low
7. Attack Delay – 300ms
8. Channel number – 01
9. Base ID number – 0001
10. Sounder Disabled

Default personality conditions for the C25 II and III

1. Signaling type – APCO P25 and MDC-1200[®]
2. Serial output type – Cimarron Standard
3. Display type – scrolling
4. Serial port parameters 9600 – N – 8 – 1

5. CHBSY_IN act Low
6. RX_INHIB act Low
7. Attack Delay – 300ms
8. Channel number – 01
9. Base ID number –0001
10. Sounder Enabled

A P P E N D I X B – Dispatch Display Directives

Directive	Definition
\$\$C25	Places the C25 into programming mode
\$\$SWVER	Returns the version and date of the flashware
\$\$SOUNDEROFF	Disables the sounder
\$\$SOUNDERON	Enables the sounder
\$\$KEYT	Keys the C25 and sends data for 10 seconds in MDC-1200 [®] signaling format
\$\$UID	Returns the base ID assigned
\$\$CHAN	Returns the channel number assigned
\$\$OUTS	Causes the outputs to individually wiggle for 3 seconds each. Affects Key, RXMute, TXCtl, Out1 and Out 2.
\$\$DISPLAY	Illuminates all pixels of the display (II and III) for five seconds for test purposes.
\$\$LOOP	Generates a PTT ANI message and then an emergency message in MDC-1200 [®] signaling format. Repeats for 16 seconds, one message per second.
\$\$TRIDEC	If the Triple decode feature has been enabled, this command returns the three types of signaling that are enabled for decode.
\$\$MAP <function> TO <output>	Maps resources to different outputs. Available functions and outputs are OUT1, OUT2, TXCtl, KEY and MUTE.
\$\$MAP CHBSY TO CLEAR	Allows channel busy to be affected by the clear button.
\$\$MAP?	Reports the condition of C25 resources.
\$\$FORMAT <label><variable><label>, <label><variable><label> ~ \$	Command used to define unique display characteristics and serial outputs and inputs.

APPENDIX C - Sample Display Format Commands

<p>ID= 2582</p> <p>ALIAS= CHIEF EMRGNCY</p>	<p>\$\$FORMAT,D1,"ID= "&SRC\$</p> <p>\$\$FORMAT,D2,"ALIAS= "SRC-a," "MSG\$</p>
<p>CHIEF</p> <p>ID= 2582 EMRGNCY</p>	<p>\$\$FORMAT,D1,#SRC-a\$</p> <p>\$\$FORMAT,D2,"ID= "#SRC," "MSG\$</p>
<p>293-2A5C</p> <p>DID= 2582 TGID= 2255</p>	<p>\$\$FORMAT,D1,#NAC,"- "#SRC\$</p> <p>\$\$FORMAT,D2,"DID= "&DEST," TGID= "#TGID\$</p>
<p>2 1578</p> <p>NAC: 293-TGID: 1234-DID: 2AB3</p>	<p>\$\$FORMAT,D1,SS," "&SRC\$</p> <p>\$\$FORMAT,D2,"NAC: "#NAC,"-TGID:"#TGID,"-DID: "#DEST\$</p>
<p>3456</p> <p>STATION 26 RESCUE SUPERVISOR</p>	<p>\$\$FORMAT,D1,&SRC\$</p> <p>\$\$FORMAT,D2,SRC-A\$</p>
<p>LOT A-25</p> <p>DATE:05/08/10 TIME:12:23:55</p>	<p>\$\$FORMAT,D1,SRC-A\$</p> <p>\$\$FORMAT,D2,"Date:"DATE," TIME:"TIME\$</p>
<p>2578 - E</p> <p>CHANNEL 56 TIME: 12:23:56</p>	<p>\$\$FORMAT,D1, &SRC," - "M\$</p> <p>\$\$FORMAT,D2,"CHANNEL "CHAN," TIME: "TIME\$</p>
<p>NAC: 293</p> <p>TGID: 1000- STATUS: 2-C:12</p>	<p>\$\$FORMAT,D1,"NAC: "#NAC\$</p> <p>\$\$FORMAT,D2,"TGID: "#TGID," - STATUS: "SS," -C:"CHAN\$</p>

APPENDIX D - Serial Control Characters

The following table describes serial control entries that can be imbedded within quotes in the \$\$FORMAT commands and their typical meaning to receiving devices.

Char	Entry	Meaning
NUL	^@	NULL character
SOH	^A	Start of heading
STX	^B	Start of text
ETX	^C	End of text
EOT	^D	End of transmission
ENQ	^E	Enquiry
ACK	^F	Acknowledge
BEL	^G	BELL
BS	^H	Backspace
HT	^I	Horizontal tab
LF	^J	Line feed
VT	^K	Vertical tab
FF	^L	Form feed
CR	^M	Carriage return
SO	^N	Shift out
SI	^O	Shift in
DLE	^P	Data link escape
DC1	^Q	Device Control 1, XON
DC2	^R	Device Control 2
DC3	^S	Device Control 3, XOFF
DC4	^T	Device Control 4
NAK	^U	Negative acknowledge
SYN	^V	Synchronous idle
ETB	^W	End transmission block
CAN	^X	Cancel line
EM	^Y	End of medium
SUB	^Z	Substitute
ESC	^[Escape
FS	^\ ^_	File separator
GS	^]	Group separator
RS	^^	Record separator
US	^_	Unit separator

A P P E N D I X E – Comparing the C Plus and the C25

The Cimarron C25 data interface decodes P25 and MDC-1200[®] (FleetSync[™] can be substituted in programming) data. The C25 has hardware and firmware differences to enable it to decode P25 data from radio discriminator audio. The C25 also has many additional features and enhancements. Like the C Plus, the C25 is available in three versions, the I, the II and the III. The C25 continues support of the optional features of Triple Format Decode, Alias and Translator.

The C25 is different from the Cimarron C Plus in the following ways:

- The C Plus optional feature, Dual Format Decode, is standard in the C25.
- Programming mode is entered by typing \$\$C25 instead of \$\$CPLUS.
- A new command (\$\$FORMAT) permits unique formatting of display data as well as defining serial output and serial input to match unique user requirements.
- Serial control commands can be imbedded into the serial port output string.
- With the additional alias feature, the Assignment field has been increased to 28 characters from 19.
- Multiple C25 serial outputs can be daisy chained so that external serial buffers are not required to create one combined serial data stream.
- Channelization capability has been extended to 256.
- Serial input can now be used as an input for display just like audio input.
- The C25 audio input must be from flat unfiltered discriminator audio in order to decode APCO P25 signaling.
- GE Star and DTMF signaling formats are not supported.
- Emergency Acknowledgments and encode capability are not supported (translator function is available and does generate MDC compatible signaling.)
- Decoded P25 and MDC ID's can be represented in HEX or Decimal format.
- Enhanced message tables enable the C25 to be programmed to react to and display any message for any MDC or FleetSync payload.

The C25 provides access to the following P25 variables: Source ID, Destination ID, Talk group ID, Manufacturer ID, Emergency flag, Low speed data, Network Access Code, Data, Status Symbol, Trunking Sig Block. These variables can be displayed or printed out, making the C25 valuable service test equipment.

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