Radio Console System Interface for the Virginia State Police Computer Aided Dispatch System

Interface Description

Revision 01

Revision History:

Revision:	Date:	Reason:
A	03/22/2004	Initial draft for comments
01	03/29/2004	First general release. Draft reviewer's comments incorporated

Trademarks:

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1.0 Introduction

1.1 Purpose

This document describes the telephone control interface for the Virginia State Police (VSP) Computer Aided Dispatch (CAD) system.

1.2 Scope

The component architecture, interface protocols, and control messages that allow the CAD system to automatically dial outgoing calls and route incoming Caller ID information to the proper CAD terminal position, are described in this document. The current interface implementation does not support any additional functionality.

Only the components directly related to supporting the two functions stated above are within the scope of this document. The Telephone Switch and Caller ID Display Unit depicted on the diagram in Figure: 2-1 are included for reference only. While details relative to these components are not within the scope of this document, it should be noted that they are COTS[1] equipment and do not comply with NENA[2] Recommended Generic Standards for E9-1-1 PSAP[3] Equipment.

Appendix A contains the Functional System Description (FSD) document for the CAD System, Caller ID Interface. An explanation of how the CAD system uses the telephone interface control messages to route Caller ID information can be found in this document.

1.3 Requirements

Because the existing CAD Telephone Interface was implemented to utilize capabilities offered by the Orbacom Systems Inc. TDM-150 console system, nomenclature references and operational consideration for proprietary components of this system are made throughout this document. For direct compatibility with this existing implementation, radio console systems of other manufacture must comply with the protocols, formats, and content requirements imposed by this interface.

2.0 Communications Interface

This section provides details about the hardware interface between the CAD and radio console systems. Information provided in subsequent sections references component shown on the diagram in Figure: 2-1. Additional non-referenced components are shown for completeness only.

[1] Commercial Off The Shelf
[2] National Emergency Number Association
[3] Public Safety Access Point

2.1 Hardwire Protocol

An asynchronous RS-232A serial data connection is required between the VSP CAD server and the radio console system. The Orbacom TDM-OP260, a Universal CAD Control Interface (UCC) option in the console system Central Processing Package (CPP), provides a male DB25 connector that is cabled to an equivalent connector on the CAD system DECserver™.

2.2 Serial Port Configuration

RS232 signaling for the port on the DECserver™ is configured as follows:

9600 baud
8 data bits
No parity
1 stop bit
No flow control
No modem control
Access remote
All other port characteristics disabled

The existing Orbacom implementation uses a null modem cable for the interconnection. Pin outs required for this cable are as follows:

pin 2 – pin 3
pin 3 – pin 2
pin 7 – pin 7

A number of factors may necessitate additional provisions for insuring compatibility of connector pin gender and DTE/DCE signaling relationships. Connection compatibility with the DECserver™ is the responsibility of the console system provider.

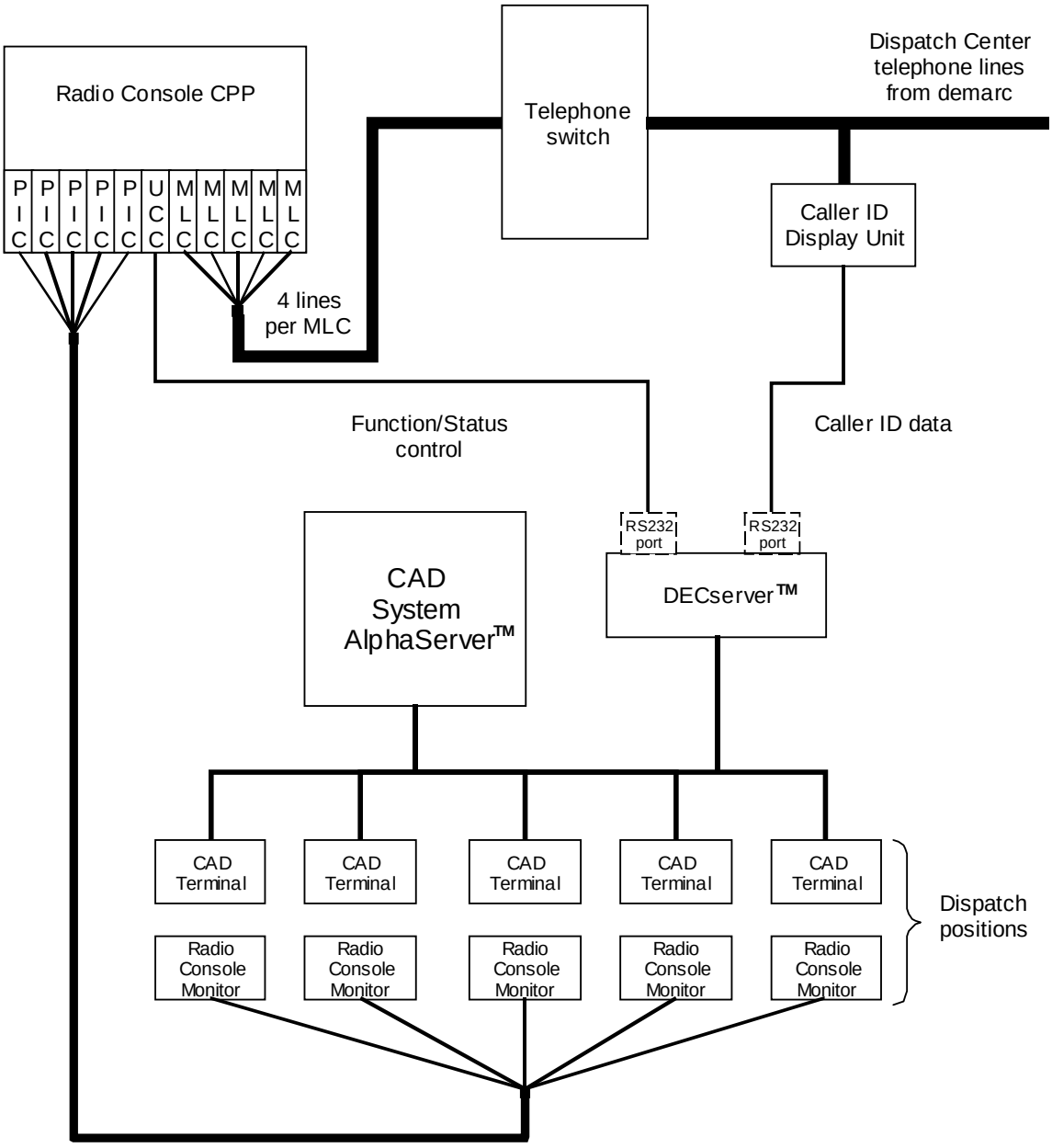

Figure 2-1 Component Diagram

3.0 Radio Console Control Messages

External CAD control of selected radio console functions is provided by a simple ASCII protocol. All messages transmitted between the radio console and CAD systems are ASCII encoded character strings in a standard format.

3.1 Standard Message Format

$[STX]$ MMM mmm PPP CCC nnn D_1--D_n XX $[ETX]$

Where:

$[STX]$	=	Start-of-Text transmission control character. (ASCII x02)
MMM	=	3-digit decimal ASCII Command Number.
mmm	=	3-digit decimal ASCII Sub-command Number.
PPP	=	3-digit decimal ASCII Position Number. Position is the console Position Interface Card address.
CCC	=	3-digit decimal ASCII Channel Number.
nnn	=	3-digit decimal ASCII Byte Count of the number of digits between this field and the Checksum field.
D_1--D_n	=	n-digit ASCII message with the length indicated in the preceding nnn field.
XX	=	2-digit hexadecimal ASCII Checksum calculated as the 8-bit binary sum of all fields between $[STX]$ and XX, translated to 1s compliment of the sum and converted to hexadecimal ASCII bytes.
$[ETX]$	=	End-of-Text transmission control character. (ASCII x03)

4.0 Control Commands

The commands defined in the following sections are used to initiate an Autodial sequence, and to determine the CAD terminal pickup position for incoming calls. Only four of the available TDM-OP260 command types are required to perform these two functions.

4.1 Function Command Sent From CAD

MLC Autodial

This command enables the CAD system to automatically dial a number on the specified Multiple Line Controller (MLC) phone line. An MLC Off-Hook Status message is returned to the CAD system in response to this command. The message format is:

[$^{S}r_{X}$] 032 009 PPP CCC nnn D_1--D_n XX [$^{E}r_{X}$]

Where:

PPP	=	address of the console system Position Interface Card (PIC).
CCC	=	address of the multiple line controller card.
nnn	=	number of data bytes to follow.
D_1	=	line number (1-4) on the line controller card
D_2--D_n	=	telephone number to dial

4.2 Status Messages Sent to CAD

MLC Off-Hook Status

This status message is sent to the CAD system when any of the telephone lines for a MLC card are taken off-hook, either manually by a CAD terminal position or in response to an Autodial sequence. The message format is:

[$^{S}T_{X}$] 169 001 PPP CCC 004 D_1--D_4 XX [$^{E}T_{X}$]

Where:

PPP	=	address of the console system Position Interface Card.
CCC	=	address of the Multiple Line Controller card.
nnn	=	number of data bytes to follow.
D1	=	line number (1-4) on the line controller card
D2--D4	=	number of console positions off-hook on this line

MLC On-Hook Status

This status message is sent to the CAD system when any of the telephone lines for a MLC card are put on-hook. The message format is:

[$^{S}T_{X}$] 170 001 000 CCC 001 D_1 XX [$^{E}T_{X}$]

Where:

CCC	=	address of the multiple line controller card.
D1	=	line number (1-4) on the line controller card

Return From MLC Line Inquiry

When the CAD system sends an Autodial command, this command will report the status of the specified line. The message format is:

[$^{S}T_{X}$] 400 010 000 CCC 002 D_1-D_2 XX [$^{E}T_{X}$]

Where:

CCC	=	address of the multiple line controller card.
D1	=	line number (1-4) on the line controller card
D2	=	"A" if line is available or "I" if line is in use.

Appendix A

Caller ID Interface
For the Virginia State Police
Computer Aided Dispatch System

CALLER ID INTERFACE

FOR

VIRGINIA STATE POLICE

1500 PRC Drive
McLean, VA 22101

TABLE OF CONTENTS

1.0 INTRODUCTION

This document contains information on the Caller ID feature being installed at the seven (7) Virginia State Police Division CAD systems. Caller ID information will be given to the CAD system via an RS-232 interface. While the CAD system receives the caller id information, the Orbacom console system will also send information on which console picked up the inbound phone call. As the CAD user answers a call on the 911 or 800 line, Orbacom will provide answering position information that will be matched up with the Caller ID information received on the RS-232 interface. Caller ID information received on the RS-232 interface will be written to a file to be used to match up with an inbound Orbacom message. The inbound Orbacom message will read the record from the caller id file based on the port number and write information into an ANI/ALI file. This file contains a record for each terminal. CAD users can then bring up an incident mask and transfer information from the file into the incident mask. Function keys will be defined to allow for the transfer of Caller ID information from the ANI/ALI file. All inbound Caller ID information will be written to a logging file that can be saved off of the CAD system and used for historical information.

The following sections provide a detailed explanation of the functionality of the Orbacom messages, inbound Caller ID information, CAD system functionality, Caller ID message logging and Technical issues.

2.0 ORBACOM MESSAGES

This section describes the messages that are received from the Orbacom console system and how the CAD system will interpret these messages with respect to caller id.

Listed below is an example of an inbound Orbacom console message for caller id:

<STX>169 001 005 020 004 2 001 05 <ETX>

The following describes each field of the message:

<STX>	Beginning of message
169	Off Hook Status
001	Unknown code
005	PIC position number (ex 005 is CAD position #5)
020	MLC Card number
004	Unknown code
2	Line number on the MLC card
001	Unknown code
05	Hex Checksum of the message
<ETX>	End of message

The “169” Off Hook Status message received by the CAD system indicates that the phone console is off hook. Since this could be either a user answering a call or making a request to make a call, receiving a “169” message is not enough to determine if this is related to caller id. Each division has the same MLC card numbers listed below:

018	Reserved for outbound calling (ignored for caller id)
019	
020	
022	
023	

The “020” MLC card number is used to determine if the inbound Orbacom message is related to caller id. Along with the PIC field, the system will be able to determine which CAD position answered the phone. Each MLC has caller id line numbers assigned and are listed below:

MLC Number	Orbacom Line #	Caller ID line #	
018	1	01	
018	2	02	
018	3	03	
018	4	04	
019	1	05	
019	2	06	
019	3	07	
019	4	08	
020	1	09	
020	2	10	
020	3	11	
020	4	12	
022	1	13	
022	2	14	
022	3	15	
022	4	16	(Microwave line)

Using the above Orbacom message, CAD position #5 answered the phone using MLC card #020 line #2 which corresponds to a caller id message beginning with “10”. The CAD system will look to find a caller id message with line # 10 and correspond that to CAD position 5.

3.0 INBOUND CALLER ID INFORMATION

This section describes the format of the inbound caller id information. Caller id information contains fixed length fields with a total message length of 72 characters. The first two characters of each message contain the line number. This is used to help determine which CAD position picked up the phone.

Inbound caller id information will be written to a relative index file (CALLID.SFL) on the CAD system. The file is indexed from 01 – 16, which corresponds to the line number. As each message is received, it is written into the file based off the line number. In this way, the file only contains the latest information received on the particular line number.

Listed below is an example of an inbound caller id message:

08 10/ 2 12:30 PM 804-555-1212 SMITH THOMAS<CR><LF>

The following describes each field of the message:

08	Line number
10/ 2	Date in MM/DD format
12:30	Time in HH:MM (12 hour)
PM	AM or PM indicator
804-555-1212	Phone field
SMITH THOMAS	Name field
<CR><LF>	End of message

If there is a problem with getting the caller id information or problems with the phone number, other data may be found in the message. The following may be found in the inbound caller id message:

INVALID DATA	Found in the time field. No phone number/name is provided
OUT OF AREA	Found in the phone field. No phone number/name is provided
PRIVATE	Found in the phone field. No phone number/name is provided

Inbound caller id information is received by the CAD system between the first and second ring. Once the call is answered, the Orbacom system will send in a message to the CAD system indicating which position picked up the phone. Using the above caller id message, the following Orbacom message will be received:

<STX>169 001 005 019 004 4 001 46 <ETX>

The Orbacom message indicates CAD position #5 (005) picked up the phone on MLC card 019, line # 4 which equates to a caller id message beginning as “08”. As the Orbacom message is received, the system will look for the latest message for caller id line “08” and send a message to CAD position 5 indicating what caller id information was received by the CAD system. Additionally, information will be written into an ANI/ALI file on the CAD system that will be used by the dispatchers to transfer information into the CAD incident entry form.

NOTE

Since caller id information is received by the CAD system between the first and second ring, it is very possible that the CAD system may get an inbound Orbacom message without an associated caller id message. This will happen if the dispatcher picks up the line on the first ring. Since there is no connection between the caller id message and the Orbacom message (other than what was mentioned above), there is no way of knowing that the inbound Orbacom message will result in a received caller id message. Dispatchers must be keenly aware of this situation and compare the caller id information displayed on their CAD position with the caller id information displayed on the Orbacom console.

4.0 CAD SYSTEM FUNCTIONALITY

This section describes the functionality to transfer caller id information into the CAD incident mask. Function keys and drop down menu boxes are enabled to allow dispatchers to transfer the caller id information into the incident mask. The CAD system requires that the incident mask be displayed on the screen prior to using the function keys or the drop down menus.

The following function keys are defined for the CAD system and caller id:

Function Key	**CAD Command**	**Drop Down Menu**	**Data Transferred**
Shift/F2	ALI1	Incident Incident Entry	Source (9), Phone, Time
Shift/F3	ALI2	Incident Incident Entry	Source (9), Phone, Time, Name

As the dispatcher answers the phone and the caller id information is received by the CAD system, the Orbacom message will be received by the CAD system. The Orbacom message indicates which CAD position picked up the phone and what caller id line contains the data. The CAD system will look into the caller id file based on the line number and extract the information. It will be written to the terminal ANI/ALI file (ALIW.RFL). The dispatcher will receive an audible beep on their terminal and there will be a short message displayed in the error window. The information will have the phone number (if available) and the name (if available).

At this point, the dispatcher should verify that the information displayed at the bottom of the CAD screen is the same caller id information as displayed on their Orbacom console. If the information is correct (answered the phone after the second ring), the dispatcher call bring up a clean incident mask (Shift F1) and then use the ALI1/ALI2 buttons to pre-fill the incident mask with the caller id information.

If the error window gets cleared, the last caller id information can be viewed by clicking on the **911** button on the lower right hand corner of the screen. This will redisplay the last caller id information sent to the terminal. The caller id information in the ANI/ALI file will remain until the next phone call answered by the dispatcher results in another caller id message sent to the terminal.

The caller id file (CALLID.SFL) is updated each time a caller id message is received by the CAD system. Its information is based on the line number of the message. The ANI/ALI file is updated each time the dispatcher answers a caller id phone line and receives the message at the bottom of their CAD screen. The ANI/ALI file's information is based on the CAD terminal number.

5.0 CALLER ID MESSAGE LOGGING

This section describes the message-logging feature that is supplied with the caller id interface. All inbound messages received on the caller id RS-232 line (CLID in the CAD system) are written to a logging file (IDLG on the CAD system). This file is similar to the TLOG logging line currently in use. Multiple versions of this file are allowed on the disk drive and can be archived for future retrieval.

A new version of the file is created every time the IDLG line is started on the CAD system. The file remains open for logging until the IDLG line is exited. Scheduled commands have been updated to have the line exited once a day to create a log of the caller id calls for the day. Listed below are the scheduled commands that are used to begin a new logging file each day for the caller id information:

```
SCHED DAY/0000,MSTR/CLS/IDLG/EXIT
SCHED DAY/0015,MSTR/CLS/IDLG/UP
```

The logging file is named IDLG.DAT and is located in the [DATCAD] directory. This file has no relationship to the CALLID.SFL file used in this interface. The purpose of this file is to archive all caller id messages received in the CAD system.

6.0 TECHNICAL ISSUES

There are technical issues that arise with this interface that must be addressed in this section. Since we are receiving two data streams and two different times, it is possible that one or more of the data streams may not be received at the CAD system. If this is the case, the information displayed to the dispatcher, if at all, may not be an accurate representation of the caller id information.

Listed below are some technical problems that could arise with this interface:

Issue	**Interface Impact**
Dispatcher answers call on 1st ring	Orbacom message received without a caller id message. Dispatcher gets a message on their CAD terminal based on old caller id information
Orbacom line down	No indicator on CAD terminal of caller id information
Caller ID line down	Caller id information displayed is not most current

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