NENA Recommended Generic Standards for E9-1-1 PSAP Intelligent Workstations

NENA Technical Reference
NENA-04-004 Original, June 16, 2000
Generic Standards for E9-1-1 PSAP Intelligent Workstation (IWS) Equipment

Prepared by:
National Emergency Number Association (NENA) PSAP CPE Standards Committee

Published by:
NENA

Printed in USA

NENA

TECHNICAL REFERENCE

NOTICE

This Technical Reference is published by National Emergency Number Association (**NENA)** as a guide and recommendation for the designers and manufacturers of customer-premise systems that are used for the purpose of processing emergency calls at a Public Safety Answering Point (PSAP). It is not intended to provide complete design specifications or parameters nor to assure the quality of performance of such equipment.

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It is possible that certain advances in technology will precede these revisions. Therefore, this Technical Reference should not be the only source of information used to purchase the Customer Premise Equipment (CPE). **NENA** members are advised to contact their Telephone Company representative to ensure CPE compatibility with the Telco network.

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The **NENA** Executive Board has recommended this document for industry acceptance. For more information about this document, contact:

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1 INTRODUCTION

The goal of the NENA – IWS Study Group was to:

- Develop an industry definition of Intelligent Workstations and the new acronyms associated with both the Computer Telephony Integration (CTI) and computer industries.
- Integrate functionality and technology issues that exist in the NENA Technical Reference NENA-04-001 Recommended Standards For E9-1-1 PSAP Equipment and NENA-04-003 Recommended Generic Standards for E9-1-1 ISDN PSAP Equipment Utilizing Basic Rate Interface (BRI).
- Develop standard terminology defining the various levels of integration available with Intelligent Workstations, and CAD systems, radio systems and databases.

This NENA Technical Reference was created as a result of the work performed by the study group and the NENA CPE Technical Committee.

1.1 General

This NENA Technical Reference NENA-04-004 defines the Public Safety Answering Point (PSAP) Intelligent Workstation (IWS) equipment requirements intended for use by users, manufactures and providers of E9-1-1 Customer Premise Equipment (CPE).

A PSAP is an agency or group of agencies designated and authorized to receive and respond to emergency calls requiring one or more public services (Police, Fire, EMS or all three).

1.2 Purpose and Scope of Document

This Technical Reference is a guide for designers and manufacturers of PSAP equipment. It defines conditions and identifies engineering and technical requirements to be considered before the purchase of such equipment. It may also be of value to purchasers, maintainers and users of such equipment.

This document is not intended to provide complete design specifications for PSAP equipment. It will neither ensure the quality of the performance of the equipment nor should it serve as an exclusive procurement specification.

1.3 Organization of Document

This document is organized into the following major sections:

Section 1 - Introduction
Section 2 - Enhanced 9-1-1 System Description and Features Definition
Section 3 - PSAP Interfaces
Section 4 - PSAP Remote Maintenance
Section 5 - PSAP Feature Requirement Specifications
Section 6 - Power Requirements
Section 7 - Physical and Electrical Environmental Requirements
Section 8 - Installation, Maintenance and Administration

Section 9 - Registration Requirements
Section 10 - Quality and Reliability
Section 11 - Glossary

1.4 Document Terminology

The terms "shall be", "must be" and "required" are used throughout this document to indicate required parameters and to differentiate from those parameters that are recommendations. Recommendations are identified by the words "it is desirable" or "preferably".

1.5 Reason for Issue

This document is issued to serve as a NENA standard and guide for E9-1-1 PSAP and IWS equipment.

The purpose of this standard is to identify the minimum requirements as well as desirable recommendations for PSAP IWS equipment and interfaces provisioned today as well as to identify requirements for future PSAP equipment and interfaces.

1.6 Reason for Reissue

NENA reserves the right to modify this technical reference. Whenever it is reissued, the reason(s) will be provided in this paragraph.

1.7 Year 2000 Compliance

All systems that are associated with 9-1-1 shall be designed and engineered to ensure that no detrimental, or other noticeable impact of any kind, will occur as a result of the date change to the year 2000, or any date subsequent thereto. This shall include embedded application, computer based or any other type application.

To ensure true compliance the manufacturer shall provide verifiable test results to an industry acceptable test plan such as BellCore GR-2945 or equivalent.

2 ENHANCED 9-1-1 - SYSTEM DESCRIPTION AND FEATURES DEFINITIONS

2.1 E9-1-1 System and Feature Overview

The E9-1-1 system and feature overview for PSAP’s using Intelligent Workstation equipment is as described in the NENA-04-001 and NENA-04-003 documents.

3 PSAP INTERFACES

The PSAP equipment will provide several interfaces in accordance with the following interface specifications.

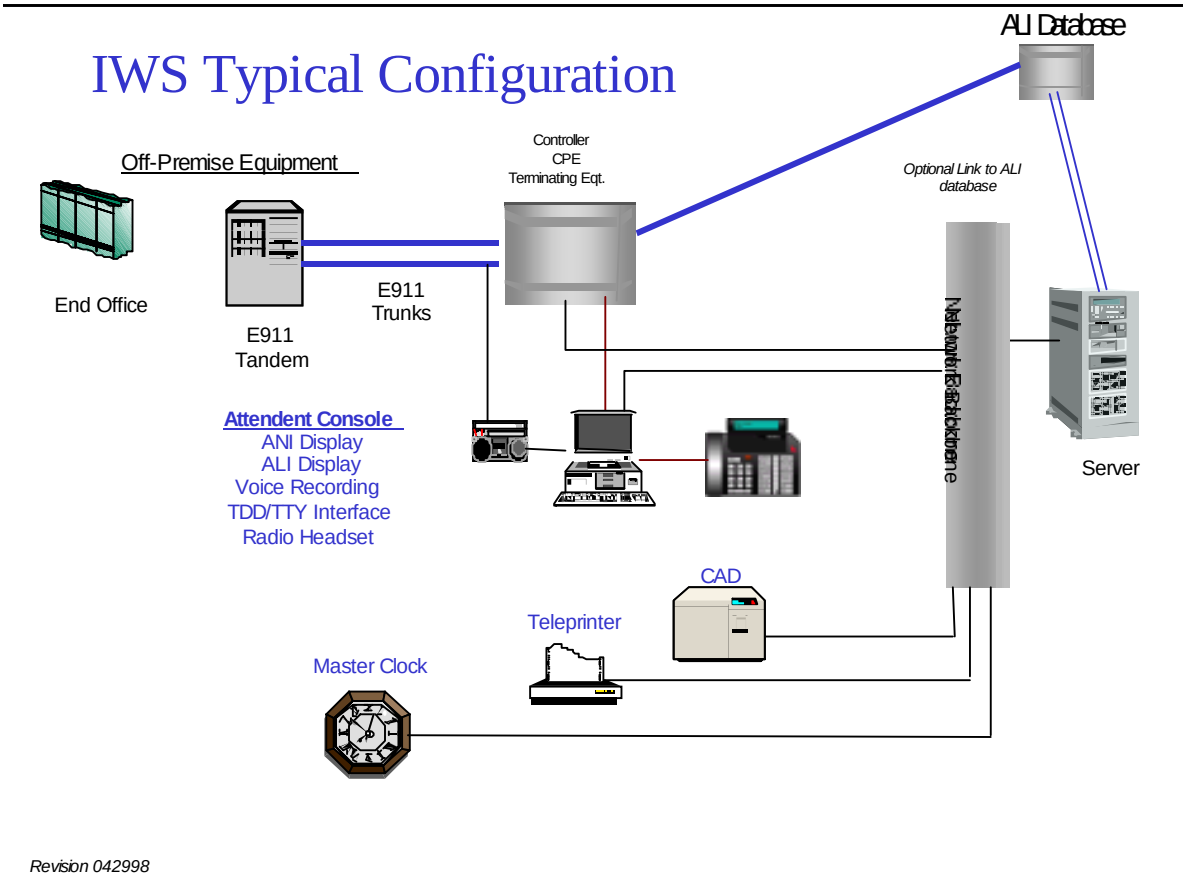

FIGURE 1
CUSTOMER PREMISES SYSTEM INTERFACE

All existing interfaces unless noted below are as described in the NENA-04-001, NENA-04-002, NENA-04-003 and NENA-03-002 documents.

3.1 Computer Aided Dispatch (CAD) Interface

In addition to the traditional CAD interface Intelligent Workstations can provide a greater degree of interfacing or integration.

The physical, electrical and protocols can remain as described in the NENA-04-001 and NENA-04-003 documents. In addition, it can also be through new protocols such as described in the TCP/IP section (Section 3.13 Page 14) of this document, or internal messages through the operating system or applications.

3.1.1 Integration

Intelligent Workstations resolve many of the new issues facing PSAP's today, however they can also create some of their own. Specifically the problems that stem from many separate computer and network systems, those being CAD, Radio, Mapping and IWS, to name a few. Some of the issues that can be easily overcome with Intelligent Workstations are as follows.

- **Space Constraints**
  - Multiple Keyboards, Monitors & Computers
- **Work Constraints**
  - Disperse information
  - Duplication of information
- **Technology Constraints**
  - Multiple Operating Systems
  - Multiple System Vendors

There are a number of integration levels feasible with the use of IWS and these other systems. Depending upon the various systems in place different levels are achievable. The various levels are described below.

3.1.1.1 Basic Integration

Basic Integration comes in two possible configurations both using a device called an arbitrator.

The first configuration allows for the same keyboard to access multiple computers, also known as CPU's. When running on compatible PC's, this allows the same keyboard for the IWS & other systems.

The second configuration allows for the same keyboard and monitor to access multiple CPU's. When running on compatible PC's, this allows the same keyboard and monitor for the IWS & other systems.

***Caution**:* *Similar commands between applications could cause undesired results. Please consult vendors to ensure compatibility between applications to minimize problems.*

While this level of integration reduces the number of devices used by the call taker, it still uses a manual method of switching which causes momentary delays during the transition from one application to another.

***Caution**:* *To avoid problems caused by these delays, care should be taken to allow switching of applications to complete.*

3.1.1.2 Enhanced Integration

Enhanced Integration provides a higher level of usability over the basic type described above.

Along with this however, comes a higher level of responsibility for both the vendors of the IWS & other systems, and the companies providing the service to the PSAP's.

With most systems running in a "Host" environment it is possible to replace the terminals that are used today with an emulation package on the PC used for the IWS. This solution allows the use of the same keyboard and monitor for both the IWS & other systems, but without the need for a manual switch box to change from one application to another.

This "Host Connectivity" and "Terminal Emulation" can be achieved via a number of different connections, eg., Serial Connection, Telnet, or SNA Server. Examples of terminals that could be supported are:

- RISC - 3151
- DEC VT100, 220, 320
- UNIX Telnet
- IBM 3270, 5250

With this type of Integration, the IWS PC can support multiple monitors, allowing each terminal session to reside on an individual or shared monitor. This still allows one keyboard and pointing device to control the various applications running without the need for manual switching between applications.

***Caution**:* *Similar commands between applications could cause undesired results. Please consult vendors to ensure compatibility between applications to minimize problems. Additional call taker training will be required to use multiple applications in a windowed environment.*

3.1.1.3 Intelligent Integration

Intelligent integration can allow for a complete integration between various applications residing on the IWS. This type of integration can resolve the work constraints that face the PSAP today. This includes such things as diversification and duplication of information, and potentially providing a seamless interface between multiple public safety applications.

This can be achieved in a number of different ways, which are dependent upon the various applications and the technologies used. These could include sharing of common databases, or configuration tools through technologies such as API's (Application Program Interfaces) or various database protocols.

Due to the vast extent of possibilities that exist, it is recommended that PSAP’s have the 911-system vendor/integrator recommend and approve the Intelligent Workstation computer hardware requirements. This should be based upon the various applications required to run on the Intelligent Workstation.

These recommendations must be reviewed and re-approved when any changes are made to the baseline system configuration delivered as well as changes made to external applications that interface with the IWS.

The PSAP must recognize that the number one priority of the Intelligent Workstation is the processing of the 911 call. No third party applications must interfere or interrupt this operation.

3.2 Recorders and Printers Interface

3.2.1 Recorders

3.2.1.1 Instant Call Check Recorders / Instant Recall Recorders (IRR)

With Intelligent Workstations, the call check recorder function may be integrated within the telephony application program or other complimentary application program(s) running on the workstation or a server. However, if the IWS or server application programs do not provide call check recorder functionality, it/they shall provide traditional physical and electrical interfaces for an external call check device, as described in the NENA-04-001 and NENA-04-003 documents.

3.2.1.2 Logging Recorders

With Intelligent Workstations, the logging recorder function may be integrated within the telephony application program or other complimentary application program(s) running on the workstation or a server. However, if the IWS or server application programs do not provide logging recorder functionality, it/they shall provide traditional physical and electrical interfaces for a logging recorder device, as described in the NENA-04-001 and NENA-04-003 documents.

3.2.2 Printers

Printers are used in conjunction with 9-1-1 CPE to provide documents such as Call Detail Records (CDR), on-demand ALI prints, MIS reports, etc. With IWS, configuration of printers can be made in a variety of ways including, local (each workstation) or networked/shared (print server). Regardless of the purpose or configuration, the physical and electrical interfaces for IWS printers remain the same as described in the NENA-04-001 and NENA-04-003 documents.

3.3 ANI Display Interface

In addition to the traditional interfaces for ANI displays, Intelligent Workstations can provide a greater degree of interfacing or integration.

The physical and electrical interfaces and protocols can remain as described in the NENA-04-001 and NENA-04-003 documents. In addition, new protocols such as described in the TCP/IP section (Section 3.13 Page 14) of this document, or internal messages through the operating system or applications can be used.

3.4 ALI Display Interface

In addition to the traditional interfaces for ALI displays, Intelligent Workstations can provide a greater degree of interfacing or integration.

The physical and electrical interfaces and protocols can remain as described in the NENA-04-001 and NENA-04-003 documents. In addition, new protocols such as described in the TCP/IP section (Section 3.13 Page 14) of this document, or internal messages through the operating system or applications can be used.

3.5 PSAP Time Synchronization Interface

It is important that all applications on the Intelligent Workstation have the same time stamp for a particular event. Furthermore, it is a requirement to have all workstations synchronize with a master clock device in compliance with the NENA-04-002 document

3.6 Remote Data Transfer Interface

It is desirable that E9-1-1 Customer Premises Equipment have the option to be equipped with modems and/or facsimile machines. Those modems/facsimile machines are used to transmit information to a remote location. The user interface allows the PSAP attendant to manually execute a data transfer. The PSAP equipment shall provide attendant with positive and/or negative feedback on the data transfer.

The remote connection can be achieved through any means available to the PSAP, including, but not limited to the Public Switched Telephone Network (PSTN), through a dedicated link, or via a local area network (LAN) or wide area network (WAN) connection.

The NENA-04-001 and NENA-04-003 documents describe both the modem and facsimile protocols. In addition, new protocols such as described in the TCP/IP section (Section 3.13 Page 14) of this document, or internal messages through the operating system or applications can be used.

3.6.1 LAN/WAN Connectivity

Based on existing technologies a multitude of data transfer solutions exist. These technologies include, but are not limited to TCP/IP as described in the TCP/IP section (Section 3.13 Page 14) of this document. The specific protocols and interfaces will be dependent upon the network technology deployed.

3.7 1A2 Key Telephone System Interface

It is desirable that Intelligent Workstations have the capability to interface to 1A2 key telephones system as described in the NENA-04-001 document. It is also desirable that Intelligent Workstations have the ability to interface to other telephone systems, both mentioned in the same document and newer solutions that are being developed and documented such as ISDN and the NENA-04-003 document.

3.8 Telephone Analog Audio Interface

The NENA-04-001 document describes all interfaces required for the telephone analog audio interface. The telephone system provider shall provide this interface if the telephone system does not support an integrated TDD/TTY and recall recorder functionality that complies with the recommendations made in this document.

It is desirable that the telephone systems support this interface in order to accommodate future requirements for ancillary devices not yet covered in this document.

3.9 Telephone Audio Interface (For Digital Telephone Sets)

The NENA-04-001 document describes all interfaces required for the telephone audio interface. The telephone system provider shall provide this interface if the telephone system does not support an integrated TDD/TTY and recall recorder functionality that complies with the recommendations made in this document.

It is desirable that the telephone systems support this interface in order to accommodate future requirements for ancillary devices not yet covered in this document.

3.10 Radio/Telephone Headset Interface

The NENA-04-001 document describes all interfaces required for the radio/telephone headset interface. The telephone system provider shall provide this interface if the telephone system does not support integrated functionality that complies with the recommendations made in this document.

3.11 PSAP Alarms

In addition to the PSAP alarm recommendations described in the NENA-04-001 document, special attention should be given to the potential failure points that now exist with Intelligent Workstations.

The following table shows the potential failure points for both the telephone (voice) and data elements of the system.

Potential Failure Points

Telephony (Voice)	*Data*
Power (AC/DC)	Power (AC/DC)
ANI controller and/or PBX/ACD	ALI Controller
Telephone set/interface device	Workstation computer
	Computer network (LAN/WAN)
	Server

3.11.1 IWS Specifications

The minimum requirements for alarm interfaces shall be through a network management tool or internal messaging, such as but not limited to SNMP, HP OpenView, Compaq Insight Manager, etc.

Due to the nature of the various operating systems (OS) utilized with Intelligent Workstations, certain conditions such as OS failure may not be able to produce alarm messages. In such cases external monitoring devices are desirable. These remote alarms can be interfaced through

traditional methods as described in the NENA-04-001 document or with LAN/WAN or TCP/IP connectivity as described in this document in section 3.13 Page 14.

3.12 TDD/TTY Interface

The NENA-04-001 document describes all interfaces required for the TDD/TTY interface. The telephone system provider shall provide this interface if the telephone system does not support integrated TDD/TTY functionality that complies with the recommendations made in this document.

It is desirable that the telephone systems support this interface in order to accommodate future requirements for ancillary devices not yet covered in this document.

3.13 Transport Control Protocol/Internet Protocol (TCP/IP)

The use of TCP/IP for data message exchange both on Local Area Networks (LAN) as well as Wide Area Networks (WAN) is recommended due to its reliability, flexibility and industry wide acceptance.

TCP/IP is a message oriented data communications protocol that allows for the standard message exchange of various standard communications functions. It also has a built in routing protocol that can be used by an intermediary network to route messages to any other TCP/IP entity on the network. This allows messaging to occur between various equipment types located at any point on an interconnected network.

For complete description of the TCP/IP protocols, please refer to the Information Sciences Institute RFC: 793 and RFC: 791 documents.

3.14 Physical Interfaces

The most common interface in use is the RS-232 interface. This section will only attempt to summarize the most common applications of the interface used in the 9-1-1 environment. For a complete description of RS-232, please refer to the NENA-04-001 document.

The RS-232 standard defines the functions of four types of interface leads.

- **Data leads -** Used to transmit and receive data
- **Ground leads -** Used for electrical protection or as an electrical return path
- **Control Leads -** Used to indicate or sense a status condition
- **Clocking leads -** Used for synchronizing one device to the timing of another.

There are 24 specific functions listed in the standard. They are defined as follows:

Lead	*Label*	*DTE*		*DCE*	*Function Name*	*CCITT*	*EIA*
1	FG				Frame Ground	101	AA
2	TD	Output	⇨	Input	Transmit Data	103	BA

Lead	*Label*	*DTE*		*DCE*	*Function Name*	*CCITT*	*EIA*
3	RD	Input	⇦	Output	Receive Data	104	BB
4	RTS	Output	⇨	Input	Request To Send	105	CA
5	CTS	Input	⇦	Output	Clear To Send	106	CB
6	DSR	Input	⇦	Output	Data Set Ready	107	CC
7	SG				Signal Ground	102	AB
8	CD	Input	⇦	Output	Carrier Detect	109	CF
9		Input	⇦	Output	Positive DC Test Voltage		
10		Input	⇦	Output	Negative DC Test Voltage		
11					Unassigned		
12	(S) CD	Input	⇦	Output	Secondary Carrier Detect	122	SCF
13	(S) CTS	Input	⇦	Output	Secondary Clear To Send	121	SCB
14	(S) TD	Output	⇨	Input	Secondary Transmit Data	118	SBA
15	TXC	Input	⇦	Output	Transmit Clock	114	DB
16	(S) RD	Input	⇦	Output	Secondary Receive Data	119	SBB
17	RXC	Input	⇦	Output	Receive Clock	115	DD
18		Output	⇨	Input	Receiver Dibit Clock		
19	(S) RTS	Output	⇨	Input	Secondary Request To Send	120	SCA
20	DTR	Output	⇨	Input	Data Terminal Ready	108.2	CD
21	SQ	Input	⇦	Output	Signal Quality	110	CG
22	RI	Input	⇦	Output	Ring Indicator	125	CE
23		Output	⇨	Input	Data Rate Select	111/112	CH/CI
24	EXT	Output	⇨	Input	External Transmit Clock	113	DA
25	BO	Output	⇨	Input	Busy		

There is no specific connector defined within the standard. The most common connector used in RS-232 interfaces is the DB-25 connector. It is often incorrectly referred to as an RS-232 connector. The connector is a 25 lead connector that lends itself extremely well to this standard. Not all 24 defined leads are required to be used for every application and therefore a 25-pin connector is not always required. For many asynchronous connections, only eight leads are required. This allows for the use of other types of connectors such as the DE-9, 8 Pin Modular or AUI connectors. Regardless of the physical connector, each lead must be clearly identified in supporting documentation and must operate according to the RS-232 standard.

3.15 Intelligent Workstation Integration

In addition to the CAD interface/integration described in this document many other applications could be integrated within the Intelligent Workstations.

It is recommended that PSAP's have the 911-system vendor/integrator recommend and approve the Intelligent Workstation computer hardware requirements. This should be based upon the various applications required to run on the Intelligent Workstation.

These recommendations must be reviewed and re-approved when any changes are made to the baseline system configuration delivered.

The PSAP must recognize that the number one priority of the Intelligent Workstation is the processing of the 911 call. No third party applications must interfere or interrupt this operation.

4 PSAP FEATURE REQUIREMENT SPECIFICATIONS

In addition to the PSAP features described in the NENA-04-001 and NENA-04-003 documents the Intelligent Workstation should offer a selection of additional features that can be configured on a per log-in basis within the system. The following provides a list of additional features that could be made available.

All screen resources shall be accessible by either a keyboard command, a pointing device or touchscreen.

4.1 Telephone Functions

The Intelligent Workstation shall allow call takers to have on-screen access to all telephone features. These shall include the following as a minimum:

- Hold
- Re-dial
- Release
- Cancel Transfer / Function
- Transfer / conference
- Answer / Off hook
- Dial
- Line Status Indication
- Hook Flash or Equivalent
- Direct trunk/line access

4.1.1 Queuing (Optional)

Queuing is an automated process by which calls are presented in a predefined sequence to a call taker. This functionality may be implemented as a complement to the basic telephony IWS functionality.

It is desirable to include call queue(s) that can be configured with different line types and characteristics.

Call queue functionality should provide:

- Number of calls in queue
- The time oldest call has been in queue
- The trunk number or line number of the incoming call
- Line status, e.g., ringing, off-hook

4.2 Pre-recorded Greetings (Optional)

The Intelligent Workstation may provide advanced record, playback and digitized voice functions for the purpose of pre-recorded greetings. The system could have the ability to record personalized greeting announcements, i.e., "9-1-1 What is your emergency?" that can be played upon initial call taker connection.

4.3 Automatic Number / Location Identification

ANI/ALI information access is an essential requirement of any E9-1-1 system. As such the IWS shall display the ANI and ALI as received from the E9-1-1 network, or in a reformatted structure. This information could be captured to support various features such as supplemental ALI information, premises information, call history, etc.

4.3.1 Field Triggered Features

With information being added to the ANI/ALI for new requirements, it is desirable that the Intelligent Workstations provide certain functions dependent upon data contained in defined fields within the ALI being received. For example, a call could be automatically flagged as coming from a wireless carrier, ALEC, PBX, etc.

4.4 Feature Buttons

The Intelligent Workstation shall provide buttons to allow for "point & click" access to frequently used features and commands.

4.5 Call Detailing

It is desirable for certain applications that the Intelligent Workstation allow the call-taker to select a designated call type, such as fire, auto accident, B & E, after the initial response from the caller. The system shall present the call-taker key questions relative to the emergency at hand. The call types shall be configurable by the PSAP.

4.6 Language Selection

It is desirable that the Intelligent Workstation allow the call-taker the ability to change the language of the various communication elements of the user interface. Examples of this are TDD/TTY messages, medical priority messages, etc.

Note: Certain international character sets may not be supported by the IWS.

4.7 Message Board

It is desirable that the Intelligent Workstation allow supervisors and other users as deemed necessary to have access to an on-line message board. This allows the broadcast of a visual message to each workstation or a select group of workstations in the PSAP without interrupting the call-taker activity. The system shall also have the ability of allowing the call-taker to acknowledge the message sent by the supervisor.

4.8 Call Transfer Functions

It is desirable that the Intelligent Workstation be able to expand the variety and volume of information that can be transferred over the existing standard technology. The system could be programmable to recommend primary transfer destination based on the type of call. The call-taker could have the ability to send different types of information, such as ANI/ALI, additional location data, or even a script of the incident's questions and answers. The system could have the ability to allow this data to be transferred simultaneously to multiple locations (Police, Fire, etc.). The system could also allow for data to be transferred in a variety of communication modes to access faxes, other Intelligent Workstations, and printers.

4.9 TDD/TTY Functionality

The Intelligent Workstation shall provide an integrated TDD/TTY detector for all lines. The device should detect both Baudot and ASCII protocols. The system shall allow the call-taker to communicate freely by using the keyboard or by using pre-programmed TTD/TTY messages.

4.10 Management Information System (MIS)

It is desirable that the Intelligent Workstation incorporates some type of Management Information System (MIS). In addition to the recommendations provided in the NENA-04-001 document the following are also desirable.

4.10.1 Supervisory Functions and Call Incident Lists

It is desirable that the Intelligent Workstation provides the supervisors and PSAP managers a package of data handling tools. These tools could allow the viewing of the center's activity, as it happens, the ability to see detailed information on active or historical incident. Supervisors and managers should have the capability of filtering and viewing data in any number of ways, including viewing all active calls, all abandoned calls, view incidents by type or by ANI/ALI information. Multiple filters could be able to be combined to view information in even greater detail, for example, the supervisor could see all incident of a specific type that took place in a particular area, during a specific time period. All of these allow for better analysis, reporting and resource management.

5 POWER REQUIREMENTS

The NENA-04-001 document provides all recommendations for the power requirements of PSAP equipment, including Intelligent Workstations.

6 PHYSICAL AND ELECTRICAL ENVIRONMENT REQUIREMENTS

The NENA-04-001 document provides all recommendations for the physical and electrical environment requirements of PSAP equipment, including Intelligent Workstations.

7 INSTALLATION, MAINTENANCE AND ADMINISTRATION

In addition to the recommendations in the NENA-04-001 document for the installation, maintenance and administration requirements of PSAP equipment, the following recommendations pertain to IWS applications.

7.1 Interfaced-System commands Maintenance Event Log (Optional)

It is desirable that the Intelligent Workstation be able to provide a user action log capturing all the activity pertaining to a specific call. Every action stored should be date/time stamped and marked with the call-taker's identification.

It is desirable that a user-action event log be available at the IWS. This would allow for a “trace” of the commands that the IWS is subjected to by the user. This information would be used to monitor system response to user commands; this monitoring may be required to diagnose problems during the installation and maintenance of the IWS.

The user-action event log should be implemented to allow concurrent monitoring of any and all workstations, simultaneously. The information generated should be buffered (to RAM or media) for a minimum period of 24 hours. The enabling of this function should be transparent to the user, and not impact the usability of the IWS. The retrieval and storage of the log should be provided for the review and analysis of system response. The data (in ASCII text format) may be output in real time via any NENA approved interface as described in the NENA 04-001 document.

Each event in the log should be date and time-stamped. The identification of the position and/or user should be included in the log.

The user-action event log should be available for the IWS application. If the IWS application is running concurrently with other applications on the same “client” computer, the log should, as a minimum, keep track of all user commands directed to the IWS application.

***Note**: It is desirable that each individual application running on the same computer provide the same monitoring capability.*

7.1.1 Event Log

It is desirable that IWS applications which can accept commands from interfaces (either from without or within the same computer) keep track of those commands in the event log. This is intended as an aid in the installation and maintenance of such interfaces.

7.2 Remote Maintenance

In addition to the PSAP remote maintenance features described in the NENA-04-001 document the Intelligent Workstations should allow LAN/WAN or TCP/IP connectivity as described in this document. This should be to both receive alarm messages and remotely diagnose the system.

8 REGISTRATION REQUIREMENTS

The NENA-04-001 document provides all recommendations for the registration requirements of PSAP equipment, including Intelligent Workstations.

9 QUALITY AND RELIABILITY

In addition to the quality and reliability recommendations provided in the NENA-04-001 document, special attention should be given to the failure points as described in the 3.11 PSAP Alarms section of this document on page 13.

9.1 Reliability Objectives

No single point of failure in any hardware or software component of the E9-1-1 PSAP system shall cause more than 50 percent failure of the E9-1-1 PSAP system.

The NENA-04-001 and NENA-04-003 documents define the various E9-1-1 PSAP components that exist today. In addition the following components exist for Intelligent Workstations:

a) CPUs
b) Servers
c) Operating systems
d) Software applications
e) System Physical Architecture and Distribution
   Wiring
   Hubs
   Routers
f) Fusing
g) Any electronic element or device within the E9-1-1 system

The minimum acceptable service for an E9-1-1 PSAP system in the event of a single component failure would be as follows:

a) At least 50 percent of the E9-1-1 trunks and 50 percent of the attendant positions shall be operational and have the minimum following functionality:
   - Audible and visual indication of incoming 9-1-1 call
   - Voice communications with the 9-1-1 caller

b) It is desirable for the vendor to provide at least 50 percent of the 9-1-1 trunks and 50 percent of the attendant positions be operational and have the following additional functionality:
   - ANI information
   - ALI information

Protection switching to redundant components may be required to meet the above outage standards. If protection switching of any E9-1-1 PSAP component is utilized, it must be performed on an automatic basis. There shall be no disruption in the minimum functionality of the calls in progress during switch over.

Note: *Consult with vendor(s) for specific operational impact.*

9.2 Reliability considerations

Due to the critical nature of E9-1-1 it is recommended that Intelligent Workstations be designed using an operating system such as Windows NT™ 4.0 or equivalent. In addition, applications shall be designed in the native environment of the operating system, such as 32-bit for Windows NT™ 4.0.

It is least desirable to have the core telephony or voice processing element of the system rely on any operating system that offers less than 99.99% availability.

It is desirable that the Intelligent Workstations have the capability of backing up critical data to an external storage device or to the server. This data shall allow the complete recovery of a workstation in the event of a failure.

10 REFERENCES

The following documents are referenced in this document.

Information Sciences Institute	RFC: 793 Transport Control Protocol Standard
Information Sciences Institute	RFC: 791 Internet Protocol
NENA-04-001	NENA Recommended Standards For E9-1-1 PSAP Equipment
NENA-04-002	NENA Recommended PSAP Master Clock Standard
NENA-04-003	NENA Recommended Generic Standards for E9-1-1 ISDN PSAP Equipment Utilizing Basic Rate Interface (BRI)
NENA-03-002	NENA Recommendation for the implementation of Enhanced MF

	Signaling, E9-1-1 Tandem to PSAP

11 GLOSSARY

Please refer to the NENA Master Glossary of 9-1-1 Terms

Note: To be updated to include at a minimum the following new terms.

11.1 Glossary

Term	*Definition*
IP - Internet Protocol	The mechanism for routing datagrams globally on a connectionless network.
IWS - Intelligent Workstation	Computer based 911 answering position equipment that includes computer telephony integration.
Queue	Queuing is an automated process by which calls are presented in a predefined sequence to a call taker.
TCP - Transport Control Protocol	The end to end reliability protocol that recognizes and corrects lower layer errors caused by connectionless networks.

12 APPENDICES

Refer to the NENA-04-001 document for the following appendices.

12.1 Appendix A - Automatic Location Identification And The Data Management System

12.2 Appendix B - Uninterruptible Power Supply

12.3 Appendix C - TVSS Selection Criteria

12.4 Appendix D - TDD/TTY Pre-Programmed Messages

12.5 Appendix E - EIA DB-25 AND DE-9 LEAD DESIGNATION