SECTION 16742

VARIABLE MESSAGE SIGN SYSTEM

COMMON DESIGN PACKAGES	SUBMITTAL PHASE	STATUS	ORIGIN/APPLICATION
DP-37 Lechmere Station	RFC	UNDER REVIEW	~~REV.00 05/03/2019~~ REV.01 06/06/2019
DP-38 Union Square Station	PRE-RFC	UNDER REVIEW	NO CHANGES/*
DP-39 E Somerville Station	INTERMEDIATE	UNDER REVIEW	NO CHANGES/*
DP-40 Gilman Station Plans	RFC	UNDER REVIEW	~~REV.00 05/03/2019~~ REV.01 06/06/2019
DP-41 Magoun Square Station	INTERMEDIATE	UNDER REVIEW	NO CHANGES/*
DP-42 Ball Square Station	INTERMEDIATE	UNDER REVIEW	NO CHANGES/*
DP-43 College Station Plans	PRE-RFC	UNDER REVIEW	NO CHANGES/*
DP-57 Communications	RFC	UNDER REVIEW	REV.01 06/06/2019

*ALL CHANGES APPLY
UDD-UNDER DESIGN DEVELOPMENT
RFI DB#75 MBTA#127 SUBMITTED & ACCEPTED WITH REV.00 05/03/2019
RFI DB#448 MBTA#493 SUBMITTED & ACCEPTED WITH REV.01 06/06/2019

SECTION 16742

VARIABLE MESSAGE SIGN SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

This Section specifies designing, furnishing, and installing equipment necessary to form a complete and operational Variable Message Sign (VMS) system at GLX MBTA passenger stations. VMS system shall display information via Light Emitting Diode (LED) scrolling signs located on station platform and other areas as specified herein.

A.

VMS shall be controlled from the Public Address (PA) Control System utilizing the MBTA WAN backbone from the existing AIM PA\VMS system installed by Rockwell Collins (Formerly ARINC) at 45 High St. under a separate contract. VMS shall display text corresponding to PA announcements, and shall be synchronized with the PA audio announcement.

B.

The DB Entity is responsible for turnkey design and installation at each passenger station. This shall include integration into the AIM PA/VMS System located at 45 High St.

C.

WAN Connectivity from 45 High St. to the local passenger station shall be provided by the DB Entity via the WAN system network to be installed for this Project.

D.

The DB Entity shall provide LAN connectivity at the local station to support the passenger station sign networks.

E.

The DB Entity shall provide all hardware and software interfaces required to connect signs to the AIM PA/VMS System located at 45 High St.

F.

1.2 SYSTEM FUNCTIONAL DESCRIPTION

A.

The VMS shall be amber color information display system that operates in conjunction with the AIM PA/VMS system installed at 45 High St. This system provides a visual display of the audible announcements and messages, as well as additional text using LED technology. The technology used shall provide variable message display capabilities for messages, including: public information, service, community, safety, security, events, news, sports, weather, and advertising messages. Messages may be composed of still or moving text or graphics that comply with the provisions of the Americans with Disabilities Act (ADA). The displayed text shall be variable in size and font, highly visible, and easy-to-read. The use of amber LED block technology allows superior message viewing in dim lighting, harsh and very bright interior lighting, including direct sunlight on the face of the display. The Visual Information System shall allow for a very wide viewing angle, thereby reaching a greater number of potential message viewers. The Visual Information System shall interface with and be controlled by the AIM PA/VMS System to provide visual text messages synchronized with audible voice announcements.

1. Communications: The Visual Information System Communication Network shall require a 24–port 10baseT switch. The AIM PA/VMS shall communicate with the station VMS units via the Ethernet switch. Signs shall be configured for one network connection (IP Ethernet connection)

per sign network and further utilize IP Ethernet interface to interconnect the signs within the network. More than one sign network may be required per zone.

2. The passenger station VMS shall connect to the PA/VMS System via the MBTA WAN network. This interface shall be used to convey announcement activity information to the VMS that will display the message. The AIM PA/VMS System shall allow the visual message display to be synchronized with the audible announcement for train arrival and all MBTA passenger station announcements. In addition, train arrival countdown information shall be displayed and integrated with the MBTA headend system.

3. Station VMS shall be configured for a minimum of 3 zones (inbound, outbound, and mezzanine). Additional zones to be added as specified within this document.

4. Zones for VMS shall consist of Sign Networks comprised of one IP Ethernet address per sign, and shall utilize IP communication between signs for inter-zone connectivity; more than one sign network may be used per zone. Sign Network configurations and zone assignments shall be dictated by the passenger station physical layout and project drawings.

    a. All cable shall be shielded CAT-6 or better.
    b. Fiber optic cable shall be utilized for Ethernet cable runs longer than 300 feet.
    c. All Ethernet connections shall conform to EIA/TIA-568 Standards.
    d. A Sign Network shall be defined as IP Ethernet sign interconnections with one IP address per sign in the network. Each zone may have more than one sign network.

5. Announcement Processing: Upon initiation of an announcement, the PA/VMS System shall provide the VMS with the required message codes and/or text, and the sign zones to which the announcement is to be displayed.

6. Message Creation: Messages, graphic images, animation and advertisement for display on the signs shall be created, edited, scheduled, changed, or deleted through the use of ARINC's AIM software running on the PA/VMS System or a remote computer workstation attached to the network. This AIM PA/VMS System software has the capability to:

    a. Create message resources;
    b. View messages created on the computer screen before sending them to the VMS.
    c. Create and maintain message databases;
    d. Create and maintain a hierarchy of various messages - i.e. live, real-time, Scheduled and train arrival.
    e. Schedule messages and target specific signs by location, time of day, day of week, frequency of display, and ancillary equipment;
    f. Set up program lists for various groupings of stations.

7. Display Graphics: The Visual Display System signs shall have the capability of displaying amber color in each LED pixel or dot. LED matrix shall be 32H x 240L. Features of the VMS signs shall include:

        a) Minimum 12MB memory for storage of messages;
        b) Stored messages, message schedules, display configuration, time and date shall be stored in non-volatile memory;
        c) Individually addressable VMS sign units;
        d) Optically isolated signal inputs in the following communication modes, as required:
        1.Ethernet – Via (1) direct 10base-T, 10baseFX or 100base-T, Ethernet Media

Adaptor connection.

2.Fiber to Ethernet – Via an internal media converter fiber to Ethernet connection.

e) NEMA 4 modular and weather-tight enclosure;
f) Light baffling to minimize glare and reflection for outdoor use;
g) Photo sensor built-in to vary display brightness with ambient light conditions;
h) Message delivery options including: scrolling up-down, right-left, left-right, down-up; instantaneous, burst, and ancillary equipment and can be selected by software interface;
i) Built-in diagnostics;
j) Real-time clock with battery backup;
k) Present messages that are continuous, uniform, and unbroken in appearance;
l) Multiple fonts and special effects generator.

1.3 SUBMITTALS

During design, the DB Entity shall provide for submittal a list of passenger stations, zone assignments and interface type.

A. DB Entity shall submit all communication devices required for turnkey installation for MBTA approval.

B. Sign enclosure paint scheme shall be submitted for approval.

C. Sign enclosure site specific detail and installation plans shall be submitted for approval prior to installation.

D. Upon completion of electronic sign system test, submit a certified test report to the MBTA. In the case where deficiencies require re-test, a sequential test report shall be submitted.

E. DB Entity shall submit as-built drawings and maintenance manuals one week prior to final scheduled functional testing.

F.

PART 2 - PRODUCTS

2.1 PASSENGER STATION ETHERNET SWITCH DEVICES

Other Ethernet devices not specifically specified elsewhere including fiber converters, hubs and ancillary equipment shall be temperature and vibration hardened adequate for the subway environment. Requirements shall include:

1. Operating Shock and Vibration: Meets Bellcore GR-63-CORE Sections 4.4.1 and 4.4.3

A. 2. Ambient Temperature: -40° to 160°F (-40° to 70°C)

3. Ambient Relative Humidity: 10% - 95% (non-condensing)

4. SNMP Manageable (Ethernet devices only).

2.2 VISUAL MESSAGE SIGN DISPLAYS

Variable Message Signs, general - The LED matrix shall be composed of an array of replaceable LED modules. The VMS unit shall use amber LEDs. Display Characteristics shall be as follows:

A.

1. General Description: Variable Message Sign, Amber, with black off-state LED Full Matrix Multi-Line Display, with full text/graphics capability, outdoor weatherproof Nema-4 enclosure
2. Sunlight Readability – Due to the inconsistent rating of LED brightness by manufacturers, no minimum candela rating is specified. The outdoor displays shall be readable in direct sunlight. The DB Entity shall provide Sun Shades where required or where signs are in direct sunlight.
3. LED Matrix size: 32 H x 256 L
4. Cabinet Size: D16.4” H x 83.6” W x 13.75”D (double faced) or 16.4" H x 83.6" W x 8.5"D (single faced)
5. LED Pixel Pitch: 8mm
6. LED Wavelength: Amber, 593 nm.
7. Minimum Viewing Angle: >=60 degrees’ horizontal x 60 degrees’ vertical, from center viewing axis
8. VMS Addressability – Each VMS shall be individually addressable via a true TCP/IP interface.
9. VMS Message Storage – minimum of 12Mb memory
10. Display Capability: Text, graphics, logos, basic animation, multiple fonts styles and sizes.
11. Fonts - An extensive font set shall be included with the VMS. All VMS fonts shall meet ADA requirements for signage. ADA Section 4.30.2 and 4.30.3 describe requirements for width-to-height ratio, stroke width-to-height ratio, and character height. Fonts shall include a robust character set containing all characters required to express messages in standard Spanish and English languages. The character sets include upper case, lower case, numerical digits, non-alphabetic, and non-numeric special characters.
12. VMS Self Diagnostics – Each VMS display shall be capable of self-diagnosis and communicating its operational, temperature and equipment status to the AIM PA/VMS System. The AIM PA/VMS System shall automatically request status from individual VMS displays. In addition to identifying errors, the status reports shall also serve as an independent and redundant means of verifying the message content of each VMS, allowing the effects of any spontaneous

communication errors to be corrected. The proper execution of commands sent from the AIM PA/VMS System can be verified. Through the status reporting, the Administrator shall be able to query the entire system, and automatically take corrective action if necessary.

13. VMS Environmental Design - The proposed VMS equipment shall be designed and manufactured to withstand a harsh transit environment including the effects of weather conditions on outdoor deployed equipment. All Variable Message Signs shall be certified to the NEMA 4 standard. Operating temperatures shall be from 40º C to +50º C (-40º F to 120º F). VMS outdoor units shall be waterproof and sealed against particulate matter invasion such as steel and other metallic particulate matter typically found in a transit environment. The hardware shall be modular and designed for ease of service.

14. The presence of ambient radio signals and magnetic or electromagnetic interference including those from power lines, transformers and motors, shall not impair performance of the display system. The display system shall not radiate electromagnetic signals that adversely affect any other electronic device

15. Internal display component hardware (nuts, bolts, screws, standoffs, rivets, fasteners, and ancillary equipment) shall be fabricated from stainless steel, aluminum, nylon, or other durable corrosion-resistant materials suitable for the signage application

B. Specific Variable Message Sign Characteristics

GENERAL INFORMATION

ITEM	DESCRIPTION
General Description:	Variable Message Sign, Amber Monochrome LED Dot Matrix Multi-Line Display, with full text/graphics capability, outdoor weatherproof enclosure
LED Description:	LEDs are installed in replaceable modules. LED technology is Amber AlInGaP.
LED Life:	100,000 hours MTBF.
LED Pixel Pitch:	8mm
LED Brightness:	4000 cd/m^2 minimum. 99 levels automatic or manual control
LED Wavelength:	Amber
Minimum Viewing Angle:	>=60 degrees from the center viewing axis in both horizontal and vertical viewing directions
Display Area Size:	32 pixels high X 256 pixels wide 10.10 inches high x 77.20 inches wide 2 lines at 28 characters each line
Ambient Light Adjust	Automatic dimming of LED's in darkened ambient light to prevent eyestrain.
Display Capability:	Alphanumeric Text, Data Field Support, Bit Map and Font Based Graphics.
Clock:	Built in time and day and date. Clock and date can be updated by remote command message from Operations Control Center. In the event of a power loss to the VMS, time and date are capable of automatic update once communication is restored.

Message Storage:	Minimum of 12Mb memory
Fonts:	Normal fonts have ADA compliant aspect ratios. Bold and Wide versions also available. Multiple fonts and graphics may be displayed simultaneously based on applications software.
Background:	Matte black
Display Attribute Selections:	Scrolling (left to right, right to left, top to bottom, bottom to top), variable scrolling speed, circulate (continuous scroll in either direction), automatic centering, justify left or right, instantaneous pop-up (no scrolling of any kind), blinking (character, word, message), no blink.
Sign Network:	Individual sign network, within a zone at a station, shall consist of one Ethernet IP address per sign and a daisy chain configuration to additional signs utilizing IP Ethernet.

SPECIFICATIONS

ITEM	SPECIFICATIONS
Design Approach:	Weathertight design to withstand the harsh transit environment. NEMA 4 rated.
Humidity Range:	0% to 100% RH, non-condensing
Operating Temperature:	-40º C to +50º C (-40º F to 120º F)
Storage Temperature:	-40 to 85 degrees C
Conformal Coating:	Circuit boards conformal coated to MIL-I-46058C
Case size:	16.4" H x 83.6" W x 8.5"D for two line, 16 LED each line Single Face (SF) display. 16.4" H x 83.6" W x 13.75"D Double Face (DF) display.
Mounting:	Side mount brackets for overhead mounting
Case Material:	Aluminum
Weight:	Approximately 163 pounds (SF), 231 pounds (DF)
Display Face Plate:	Polycarbonate, clear, 0.236", field replaceable
Corrosion Resistance:	All metallic housing components and fasteners shall be corrosion resistant
Service Access:	The display electronic components shall be mounted to a metal plate (backplate) for easy removal. Backplate is accessed from the front of the enclosure. All external screws are of vandal-resistant, non-corrosive design, key lock entry. Keyed alike existing signs deployed at the MBTA.
Power Requirements:	120VAC, 2.3 Amps, 266 Watts (SF) 120VAC, 4.3 Amps, 512 Watts (DF)
Diagnostics Communications Interface:	Internal port for diagnostics interface. No external port due to weatherseal integrity and vandalism/security issues.
CPU	Power PC Architecture 200MHz CPU Clock (280 MIPS)
Ethernet Support	The display shall support a socket based communications model using TCP/IP, DHCP, Telnet, and SNMP.
Diagnostics	Diagnostic services through the software API interface.
Firmware Upgrades:	The Display Firmware shall be remotely upgradeable.
Electrical Safety Certification	Certified to UL-48 and to FCC Part 15 Class A

A.

B. The Visual Message Signs shall be Daktronics Galaxy AF-6700 or approved equal.

2.3 SIGN ENCLOSURE

Shall be constructed of 0.090" (minimum) thick aluminum and all joints welded together.

To maintain NEMA 4 certification, no external ventilation is allowed.

2.4 SIGN CONTROL

The controller shall be able to run independently from the Head end AIM PA/VMS System.

Communication protocol shall support other products from the VMS vendor such as other outdoor or indoor displays of varying sizes and/or colors.

The controller shall be able to be operated via Ethernet communication.

A.

B. Each controller shall be connected to a light sensor allowing each LED display to automatically adjust a minimum of 99 levels of brightness according to display direction and lighting conditions.

C. The controller shall allow connection to a temperature sensor that provides accurate site temperatures.

D.

2.5 CABLES

E. All sign manufacture recommendations for power and communications cable shall be followed.

A. Cables shall adhere to EIA/TIA 568 standards.

B. AC cable and power to VMS shall be as specified and provided for this Project.

C.

D. Control cable shall be CAT 6 STP made of jacketed, individually shielded twisted pairs as recommended by manufacturer for IP Ethernet data rate and distance, except where fiber connection is specified. All Sign manufacturer recommendations shall be followed.

E. Where required, a single mode 6-strand fiber optic control cable shall be used in placed of the CAT 6 cable. When fiber is required the DB Entity shall provide a fiber converter in the enclosure and in the communications room.

PART 3 - EXECUTION

3.1 INSTALLATION

Electronic Signs

Electronic signs shall be installed on platforms and mezzanine areas to achieve character heights per ADA guidelines, Table 703.5.5 Visual Character Height for signs. Sign enclosures shall be mounted in accordance with accepted site specific detail plans.

A.

Table 703.5.5 Visual Character Height

Height to Finish Floor or Ground from Baseline of Character	Horizontal Viewing Distance	Minimum Character Height
40 inches (1015 mm) to less than or equal to 70 inches (1780 mm)	less than 72 inches (1830 mm)	5/8 inch (16 mm)
	72 inches (1830 mm) and greater	5/8 inch (16 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 72 inches (1830 mm)
Greater than 70 inches (1780 mm) to less than or equal to 120 inches (3050 mm)	less than 180 inches (4570 mm)	2 inches (51 mm)
	180 inches (4570 mm) and greater	2 inches (51 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 180 inches (4570 mm)
greater than 120 inches (3050 mm)	less than 21 feet (6400 mm)	3 inches (75 mm)
	21 feet (6400 mm) and greater	3 inches (75 mm), plus 1/8 inch (3.2 mm) per foot (305 mm) of viewing distance above 21 feet (6400 mm)

Conduit

Conduit on station platforms to the Communication Rooms and other areas shall be provided. Conduit, conduit fittings and connections shall be furnished and installed by DB Entity. Conduit entrances to electronic sign enclosures shall be made weather tight by use of a Meyers type hub.

B.

Cable

Cables shall be installed within rigid steel conduit. Conductors shall be identified by color and listing its function. Cable routing distances between signs and the Communications Room shall be kept at a minimum to ensure accurate communications. The MBTA shall approve cable routing distances. Power cable(s) shall be routed in a separate conduit from data communications cable.

C.

3.2 TESTING

Notify the MBTA at least five days in advance of electronic sign system test so that MBTA or his representative may be present at this test if he so elects.

A.

Note any system deficiencies observed under testing in certified test report. All deficiencies shall be corrected and system shall be re-tested.

B.

C. Factory tests each electronic sign, prior to integration with mounting assembly. Perform full functional testing.

D. Functionally test complete system, with MBTA present, as required. If any deficiencies are observed, correct same as described herein.

E.

Functional tests shall include full integration with the existing MBTA AIM PA/VMS System located at 45 High St.

END OF SECTION