

NAS

DTMF CONTROLLER



OPERATIONS AND MAINTENANCE

MANUAL

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Introduction

The NASS DTMF Controller is an integral part of North American Signal's family of products used for wireless Supervisory Control and Data Analysis (SCADA) applications. Using 2-way, wireless DTMF tone telemetry, this product provides an economical solution for controlling and monitoring your facilities without the costly build out of infrastructure to access the location.

Outfitted with a 6 watt UHF/VHF radio transceiver operating on your licensed frequency, the DTMF Controller provides security and range not available with products that operate in the unlicensed band. With range up to 15 miles from fixed base sites, the product can be controlled from the ground with a standard 2 way portable radio or configured with a fixed base control facility to operate multiple sites. Equipped with "voice annunciation features," you will receive over-the-air command confirmation on your 2-way radio or base equipment. Add a TELCO line interface unit to the base and be able to control and monitor your facilities by using the touch pad on your telephone.

With 4 Opto Isolated inputs and 2 independent relay controlled outputs, the DTMF Controller provides the capability to monitor and control numerous devices at your facility. Designed with flexibility and simplicity in mind, the unit can be configured in minutes with a portable radio or with the aid of PC. Equipped standard with our low profile chassis, the Controller fits anywhere you can find space and operates on either AC or DC power. The onboard DC-DC converter provides complete battery isolation for isolated ground battery plants.

Have a custom application? Not a problem for the staff at North American Signal. We will find a way to adapt the equipment to meet your requirements.



Applications

- Transportation
 - Key Up—Key Down Highway Grade Crossing Equipment
 - Remote Control- Indication Wayside Switches, Yard Switches
 - Defect Detection
 - Remote Message or Alarm Annunciation—Auto Dialer System for Maintenance
- Personnel
 - Mobile Base Station Control
- Utilities
- SCADA System Interface
 - Lift Station Monitor/Controller
 - Irrigation Control
 - Traffic Device Monitor
 - Remote Security Monitoring



System Components

The DTMF Controller is a single board stand-alone controller designed to monitor and control wayside facilities utilizing DTMF Tone Telemetry. Ease of installation and setup allow the user to be operational with minimal procedures. The unit can be a stand-alone remote radio control package or it can be configured as a talker only unit. If the location requires isolated ground, the unit comes equipped with a DC-DC converter. This can be removed at customers request if isolated ground is not an issue at the location.

DTMF Radio

The controller comes equipped (unless specified) with a 6 watt synthesized DTMF radio transceiver capable of working on up to 8 user-defined channels, operating in the VHF band from 136 –174 MHZ. Other operating frequencies in the UHF- VHF band are available upon customer request. The radio will be factory programmed with customer-supplied frequencies.

Inputs — Outputs

The DTMF controller is equipped with four digital Inputs operating at 5-32 volts DC and two independent relay outputs rated at 2 amps @30VDC or 1 amp @125V AC. Relay outputs are configured with a standard Front, Back Heel Contact configuration for output control. The unit can be configured to automatically release outputs using a timer setting or activation of one of the inputs on the unit.

Voice Chipset

The controller comes standard with a voice chip set. A customer defined voice table consisting of 2 messages can be included on this chip set if specified. Message tables can be changed at customer request.



Programming and Set Up

The DTMF controller is equipped with FLASH memory, which allows user set up of operation parameters. These parameters are described in the following Menu descriptions.

Interfacing to Serial Port

Interface to the DB9 serial port using a standard 9 pin serial cable and a PC equipped with a standard communication package, such as Hyper-terminal or ProComm Plus. Port settings are direct connect, 9600, n, 8, 1 Flow Control is None. Please note that the use of USB-Serial adapter can cause issues. We will provide a USB-Serial Cable upon request.

Insure the CAPS LOCK button is depressed ON for your computer for data entry of values.

Plug the cable into the port to initiate a terminal session with the controller unit. The following Main Menus will appear on your screen, depending on the configuration.

It is very straightforward to navigate through the Menu selection procedures on the DTMF Controller module. By entering the text or alpha characters located in parenthesis [()], the menu selection will appear or toggle the value. Step back to the main menus is easily accomplished by pressing the **ESC** key.

DTMF Controller Main Menu

Values programmed for each of the menu settings appear in the values field of each menu selection.

DTMF C14
(0) Loc ID 4711
(1) Tone Act. Output 1=12345611#
(2) Tone Deact. Output 1=12345610#
(3) Tone Act. Output 2=12345611#
(4) Tone Deact. Output 2=12345620#
(5) RLY 1 Timer P010
(6) RLY 2 Timer R030
(7) Reset RLY 1 with Input 1
(8) Reset RLY 2 with Input 2
(9) Msg 1 to Input 3
(A) Msg 2 to Input 4



Entering Location ID – Menu Item (0)

Enter a value of 0

Prompts Loc ID =

Enter up to nine-digit number (using 0 through 9 and decimal point). Leading zeros are not necessary.

DTMF C14

(0) Loc ID 4711

(1) Tone Act. Output 1=12345611#

(2) Tone Deact. Output 1=12345610#

(3) Tone Act. Output 2=12345611#

(4) Tone Deact. Output 2=12345620#

(5) RLY 1 Timer P010

(6) RLY 2 Timer R030

(7) Reset RLY 1 with Input 1

(8) Reset RLY 2 with Input 2

(9) Msg 1 to Input 3

(A) Msg 2 to Input 4

Loc ID = 4711

In this example, location ID 4711 is entered

Pressing enter after entry will refresh the screen with the new value. If a mistake is made depress 0 again and reenter the number.



Tone Activate for Output 2 - Menu Item (3)

The Tone Activate sequence is the DTMF keypad sequence you will enter to activate Relay 2 output.

Enter **3** Prompts Tone Activate Output 2
Tone Act. Output 2=123456789

Enter up to nine digits (0-9, #, or *).
Leading zeros are not necessary.

DTMF C14

- (0) Loc ID 4711
- (1) Tone Act. Output 1=123456789
- (2) Tone Deact. Output 1=123456781
- (3) Tone Act. Output 2=1234561
- (4) Tone Deact. Output 2=12345620#
- (5) RLY 1 Timer P010
- (6) RLY 2 Timer R030
- (7) Reset RLY 1 with Input 1
- (8) Reset RLY 2 with Input 2
- (9) Msg 1 to Input 3
- (A) Msg 2 to Input 4

Tone Act. Output 2=123456789

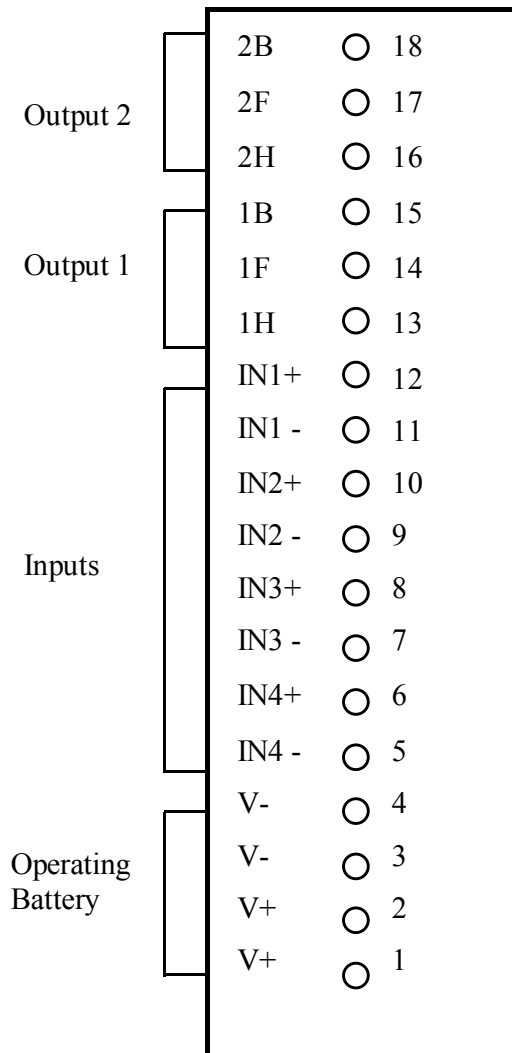
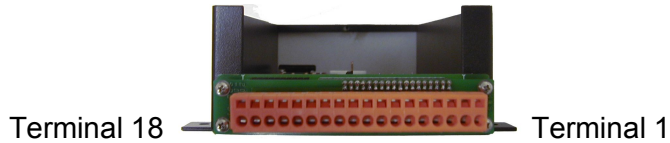
Depressing enter will refresh screen and new value will appear

DTMF C14

- (0) Loc ID 4711
- (1) Tone Act. Output 1=123456789
- (2) Tone Deact. Output 1=123456781
- (3) Tone Act. Output 2=123456789
- (4) Tone Deact. Output 2=1234562
- (5) RLY 1 Timer P010
- (6) RLY 2 Timer R030
- (7) Reset RLY 1 with Input 1
- (8) Reset RLY 2 with Input 2
- (9) Msg 1 to Input 3
- (A) Msg 2 to Input 4

Installation

DTMF Controller Terminal Board Configuration



Bottom or Right hand side of unit looking from back of chassis

The WAGO connector accepts wire size from 14AWG up to 22AWG. It is recommended to use stranded wire for circuit connection. Power input on DC units equipped with DC-DC converters will operate on 9 volts up to 36 volts DC.



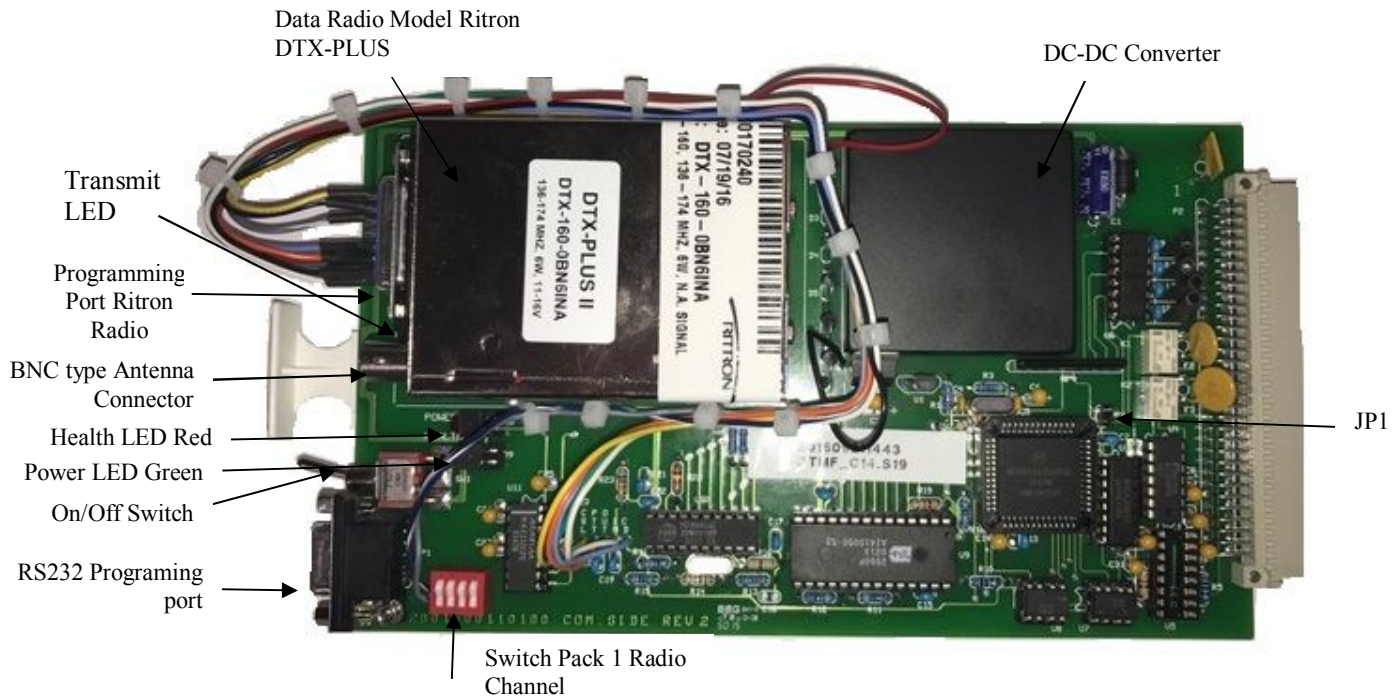
DTMF Controller Ordering Information

The DTMF Controller can be equipped with or without internal DTMF telemetry. Ordering references for each system configuration are listed in the table below.

Item	Unit	Catalog Ref No.
DTMF Controller with 5 Watt Internal Radio with Chassis DC-DC Converter Included	EA	NAS-DTMF-100
DTMF Controller Module Only	EA	NAS-0011-01-00
DTMF Antenna Kit w 17 foot cable	EA	NAS-DTMF-AK-17
Chassis	EA	NAS-0011-00-00
USB-Serial communication Cable	EA	NAS-USB-SER-CBL

DTMF Controller Module Hardware Diagram

The DTMF Controller module can be equipped with Internal DTMF Radio and DC-DC converter. The unit below is equipped with these devices.



On/Off Switch: Powers the Unit

Health LED (RED): A visual status of card. When on steady, indicates card is functioning properly. When off or flashing indicates, indicates card should be replaced.

Power On LEDs (Green): Steady flash. If dark, indicates low voltage (+5) or a steady reset condition. Card will not operate with this indicator off.

Programming Port Ritron Radio: Factory programming provided

Switch Pack 1: External channel selector for DTMF Radio Channels 1-8. 8 channels can be assigned to the module. Refer to application drawings for switch setting configuration. Factor Default Channel 8 Switches 1-4 Open position

JP1 - Installed during installation of Executive Loader Program. Remove for normal Operation.

RS232 Port: Used to interface serial cable to laptop for programming setup. Used to transfer Executive Program files

System Installation and Set Up

Initial Site Set Up

When design, module configuration, and interface wiring to external circuitry are complete, the DTMF controller module can undergo operational testing for the programmed application. The system should be tested to insure the function it was designed to perform is operational.

If units are equipped with telemetry products such as a RITRON DTMF radio, it is recommended that antenna configuration be installed external to the location. Operational testing of these components should be conducted along with module testing.

If unit is equipped with DTMF Controller module set up operational testing should be in accordance with design parameters installed in the Application Program File.

- ➔ Verify that all battery connections are the proper polarity in accordance with details shown on Terminal Board Configurations.
- ➔ Turn on power switch to the module.
- ➔ Insure Power LED located above the on/off switch is illuminated.
- ➔ Verify that module LED communication is operating in accordance with the details outlined in the Hardware Description section for the module.
- ➔ Verify Inputs and Outputs are operating based on configured application.

Activating Outputs

Be sure to assign Tone Activate and Tone Deactivate sequences for Output 1 and Output 2 (see pages 8 through 11) prior to activation.

When the tone is received by the DTMF controller for any of the activate or deactivate sequences programmed into the functions 3 short 1000 cycle tones will be heard on the radio. This provides feedback to the user that the radio is operational.

Output 1

To activate, enter tone sequence use for Menu Item (1)

To deactivate, enter tone sequence used for Menu Item (2)

Output 2

To activate, enter tone sequence use for Menu Item (3)

To deactivate, enter tone sequence used for Menu Item (4)

Message Annunciation

For test, activate the input assigned to the appropriate message. Transition on input must be low to high. Message will annunciate LOC ID as well as activate deactivate messages.

Maintenance and Troubleshooting

The DTMF Controller system is a robust hardware package designed to operate in the harshest environments. The module has onboard process control and visual LED indicators. Figuring out what to fix if it is broken is as straight forward as using the maintenance menus.

At North American Signal, we try very hard to keep things simple, which includes diagnosing a problem with the unit if it is not functioning correctly. As with any troubleshooting procedure, the first order of business is to assess what the reported problems are and eliminate potential causes.

Visual inspection of the LED indicators on the module is a quick, easy way to assess if the failure is hardware related.

Troubleshooting Checklist

- ✓ **Chassis Power lights not illuminated:** Check input voltage on battery voltage input terminals 1,2,3,4 to determine if between 9-36 volts DC. Possible DC-DC converter failure on motherboard.
- ✓ **Health LED not flashing at one and one half second rate on module:** Possible processor failure. Insure power is within specification.
- ✓ **Input or Output not functioning:** Check connections and voltage on appropriate Terminal on WAGO. If present and not functioning, faulty input is possible - replace module.
- ✓ **Unit not communicating Voice Messages:** Inspect antenna connections. Inspect RITRON Radio. Refer to manufacturers information on this unit for troubleshooting the radio.
- ✓ **DTMF Controller not operational:** Check status of LED Indicators. Check antenna connections.
- ✓ **Output Resetting:** Check configuration and insure timers and inputs to reset are set up properly.
- ✓ **No Radio Output:** Check rocker switch on module to insure proper channel setting.



Specifications: DTMF Controller

Physical:

Chassis:	11" L X 7"W X 2" D
Environment:	-40 to +71 Degrees C
Slots	Single Card slot 18 pin Connector

Inputs:

4 Isolated Digital Inputs	5-32V DC 3000 volt isolation
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Outputs

2 Independent Relay 125VAC	Contact Rating 2 Amps @30VDC 1 Amp @
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Power:

DC-DC Converter	Operating Voltage 9-36V DC, Isolated Ground
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Serial Ports:

DB9 Serial Female on DTMF Card
DB 15 Serial Radio Transceiver

Terminals:

WAGO 18 way plug in connector
Wire Size 14 AWG—22AWG



DTMF Radio Model VHF RITRON

Frequency Range 136-174 MHz Frequency Control
Synthesized Frequency Resolution 5, 6.25, 7.5 (132-150), 2.5 kHz (150-174)
Operating Voltage (VDC) 6.0 - 15.0
Operating Temperature -30 degrees C to +60 degrees C
RF Connector Type BNC User Interface
DA-15 (15-pin D)
Case Dimensions (L x W x H) 3.0" x 2.5" x 1.0" (75mm x 62.5mm x 25mm)
excluding connectors and mounting tabs FCC Emission Designator
16K0F3E, 11K0F3E FCC
Type Acceptance NP42422430-001 IC Type Acceptance 2984195377A

Receiver

RF Input Impedance
50 ohms Frequency Stability
2.5 ppm Receiver Attack Time
<7 ms Carrier Detect on Cold Start
<30 ms Selectivity
-60 dB @ 12.5 kHz; -70 dB @ 25 kHz Intermodulation
-70 dB Spurious and Image Rejection
-70 dB FM Hum and Noise
-40 dB @ 12.5 kHz, -45 dB @ 25 kHz Sensitivity -12 dB SINAD
< -116 dBm Conducted Spurious
< -57 dBm Current Drain
<90 mA Audio Distortion
<3% Audio Response
6 dB de-emphasis or flat Output Impedance
1k ohm Audio Coupling
AC or DC (2.5 V) Audio Output (adjustable)
50 mV rms to 212 mV rms into 2k ohms Data (Aux) Output (adjustable)
50 mV rms to 400 mV rms into 600 ohms flat

Transmitter

Bandwidth
18 MHz: 132-150; 24 MHz: 150-174 RF Output Power
1 - 6 watts RF Output Impedance
50 ohms Duty Cycle (-30°C to +60°C)
2 W = 7.5 V: 50%, 5 sec max. transmit @ 25°C
4 W = 11.25V: 20%, 5 sec max. transmit @ 25°C Transmitter Attack Time
<7 msec Frequency Stability
2.5 ppm Spurious and Harmonic FM
-20 dBm FM Hum and Noise
-40 dB @ 12.5 kHz, -45 dB @ 25 kHz Current Drain
2W = 7.5 V <1100 mA, +7.5 VDC
4W = 11.25 V <1500 mA, +11.25 VDC Modulation Distortion
<3% Audio Input
6 dB pre-emphasis or flat Input Impedance
11k ohms-data, 2k ohms-audio Audio Input Level (adjustable)
40 mV rms for 1.5 kHz deviation Data (Aux) Input Level (adjustable)
10 mV rms to 100 mV rms for 1.5 kHz deviation Audio Input DC Level
5.5 VDC through 2.2k ohms Data (Aux) Input
AC coupled



Terms and Conditions of Sale

General

Our sale to you will be solely upon the terms and conditions set forth herein. They supersede and reject any conflicting terms and conditions of yours. Exceptions to any of our terms and conditions must be contained in a written or typed statement received from you. We shall not be deemed to have waived any of our terms and conditions or to have assented to any modification or alteration of such terms and conditions unless such waiver or assent is in writing and signed by an authorized officer.

Prices

Unless otherwise noted on the face thereof, prices are net F.O.B our factory and firm for thirty (30) days. The amount of any applicable present or future tax upon the production, sale, shipment or use of goods ordered or sold will be added to billing unless you provide us with an appropriate exemption certificate.

Warranty

North American Signal Systems (NASS) warrants its products and systems against defects in material and workmanship for a period of One (1) Year from date of shipment. Seller's entire warranty obligation is limited to repairing or replacing any equipment which is returned within the warranty period and which the seller finds to be so defective.

The integrity of NASS products and systems cannot be finally checked until all devices and circuits are connected to form a complete system or an effective portion thereof. Once accepted, NASS's warranty will be limited to parts that have been fully paid for.

Return of equipment to Seller is at Buyer's risk, and expense. Equipment returned to seller must be clearly identified and instructions must be furnished for reshipment to Buyer of the repaired or replaced device. Equipment will be returned to the NASS plant of original manufacture.

Adjustments will not be allowed for products or components which have been subject to abuse, alteration, improper handling or installation, or which have not been operated in accordance with the seller's instructions.

Cancellation of Orders

A cancellation charge will be established on a percentage of completion basis.

Restocking

The seller on equipment returned to NASS for credit/or exchange will charge a restocking fee of 15%.



Credit and Payment

Unless otherwise noted, terms are net 30 days. We may decline to deliver except for cash, or stop goods in transit, whenever for any reason doubt as to your financial responsibility develops. Pro rata payments shall become due with partial shipments. Where you are responsible for delay in shipment of any goods, the date of completion of goods may be treated as the shipment date for purposes of payment. On late payments, the contract price shall be increased by 1 ½ percent per month on the unpaid balance but not to exceed the maximum permitted by law.

Out of Warranty

NASS will repair or replace equipment that is termed out of warranty under the following terms:

- The customer shall return equipment to NASS at customer's expense.
- When the equipment is repaired and returned, customer shall be invoiced for the equipment based on total cost of labor and materials used for repair, test and inspection.

If it is determined by NASS that the repair cost will exceed 50% of the cost of new, NASS will notify the customer prior to the repair being made for direction.

Shipping

Unless you specify otherwise, goods will be boxed or crated, as we deem proper for protection against normal handling.

Routing and manner of shipment will be at our discretion and may be insured at your expense. Delivery of goods to the initial carrier will constitute delivery to you and all goods will be shipped at your risk. A claim for loss or damage in transit must be entered with the carrier and prosecuted by you.

Proprietary Data

Neither you nor any other person shall have any right to or have control over any engineering or production prints, drawings, or technical data which we in our sole discretion may consider proprietary to ourselves.

Software Terms

The following terms apply to products or systems that contain software.

- Subject to the terms and conditions hereof NASS grants you a nonexclusive nontransferable license to use the software at the designated site listed hereof. This license extends wholly to your internal use of the software. The software shall be used only on the platform assigned.
- If the platform is a single personal computer the software may be used by a single user on a single PC system
- If the platform is a local area network the software may be used only on a single local area network at the designated site and in accordance with the number of users designated in the order for the system or as licenses permit.



- If the platform is an embedded device or system, the software may only be used for that single embedded device or system.
- Except with regard to embedded software you may copy the software on the platform identified and make a backup copy of the software for archival purposes.
- Except for the license to use the software as expressly set forth in this agreement all rights, titles and interest in the software shall be retained by NASS. You do not own any copies of the software or any portion thereof. Ownership of the software is retained by NASS. You will not or allow any third party to create a derivative of the work or modify any of the software without the approval of NASS. You will not allow any third party to reverse assemble, decompile, or otherwise reverse engineer all or any portion of the any product or system produced by NASS.

Sales and Service:

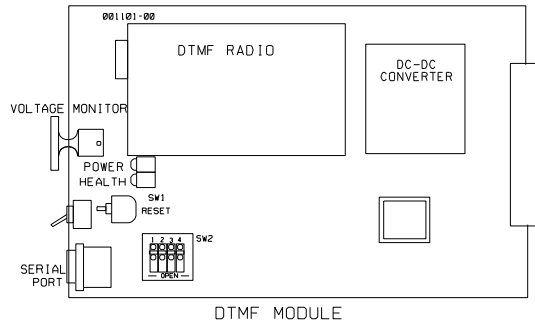
The team at North American Signal Systems is available to help you. Please contact our Customer Service Department for inquiries or service repairs. Thanks for being our customer!

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Appendix

Unit Diagram DTMF Controller Configuration



TOP VIEW

NAS CONTROLLER SOFTWARE CONFIGURATION MANAGEMENT TABLE			
APPLICATION	FILE NAME	DATE	DESCRIPTION
DTMF EXEC	DTMF_C14.S19	12-14-04	DTMF MODULE EXECUTIVE

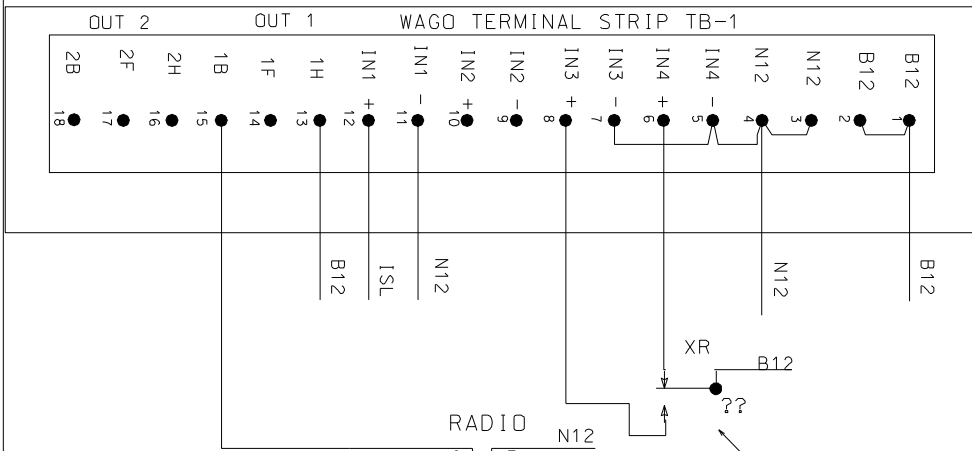
CHANNEL SELECTOR SWITCH

1	2	3	4	CHANNEL
0	0	0	0	CHANNEL 8
0	0	CL	0	CHANNEL 7
0	CL	0	0	CHANNEL 6
0	CL	CL	0	CHANNEL 5
CL	0	0	0	CHANNEL 4
CL	0	CL	0	CHANNEL 3
CL	CL	0	0	CHANNEL 2
CL	CL	CL	0	CHANNEL 1

SW2				
POSITION	1	2	3	4
CLOSED				
OPEN	○	○	○	○

SWITCHES SET FACTORY DEFAULT CHANNEL 8
 ○ SWITCH DOWN OPEN POSITION
 CL SWITCH DOWN CLOSED POSITION

REAR VIEW



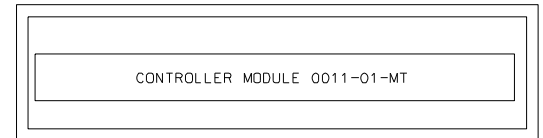
ACTIVATE OUTPUT 1 1231#
 DEACTIVATE OUTPUT 1 1231*
 ACTIVATE OUTPUT 2 4561#
 DEACTIVATE OUTPUT 2 4561*

OUTPUTS 1 AND 2 ARE ALSO RESETTABLE WITH TIMER SETTING 0-999 SECONDS
 MESSAGES ARE PROGRAMMED INTO THE SYSTEM.
 MESSAGE ACTIVATION CAN BE ACCOMPLISHED WITH LOW TO HIGH TRANSITION ON ANY OF THE 4 INPUTS

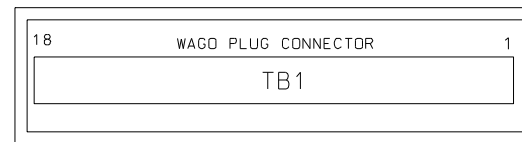
MESSAGE 1- CROSSING ACTIVATED INPUT 3 LOW TO HIGH
 MESSAGE 2- CROSSING DEACTIVATED INPUT 4 LOW TO HIGH

ADD THIS CIRCUIT FOR SPOKEN MESSAGES

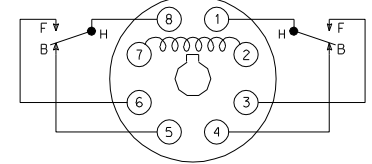
NAS DTMF CONTROLLER FRONT VIEW



NAS DTMF CONTROLLER REAR VIEW



DAYTON 12VDC 1A484



DETAIL 1A484

REVISIONS	DR:	NAS/MBY	DTMF CONTROLLER	FILE
	DES:	NAS/MBY		DTMF.DGN
	CHK:	NAS/MBY		DRAWING NO.
	APPR:			DTMF.DGN
	DATE:	04-24-08		SH. 1 OF 1

The operation of any circuits and equipment shown herein must be checked by point to point breakdown and complete operational testing of the system (or sections of the system) into which they are connected.

SCALE: NONE