

## Technical Note TN-3390d-SR

### P25 Firmware v3.01.05

### P25 Programming Application v3.1.2.174

### Tx9000 Calibration Application v3.1.1.1

7 December 2023

This Technical Note applies to P25 cadence release R23.2.

Firmware **v3.01.05.0153** for TM9400 and TM9800 P25 mobiles, and the TP9400, TP9600 and TP9800 P25 portables, and is supported by:

- P25 Programming Application **v3.1.2.174** (or later)
- Tx9000 Calibration Application **v3.1.1.1** (or later)
- EnableFleet **v4.9.2** (or later)

#### Important Note

The TMX450 UnifiedVehicle does not support this software. It can operate with Firmware up to v2.22.06 and will be supported in a later version, yet to be confirmed.

#### Important Note:

TM9400 25W mobiles from serial number **21543771** (manufactured with firmware **v3.00.03**) can be upgraded to later builds and can also be downgraded to firmware **v2.22.06**. If these radios are loaded with any other firmware builds, they will stop working.

They can be made operational again by re-installing firmware v2.22.06 or v3.00.03 (or later) but this will involve removing and re-attaching DC power during the upgrade procedure as outlined in TN-1899e-AN page 2.

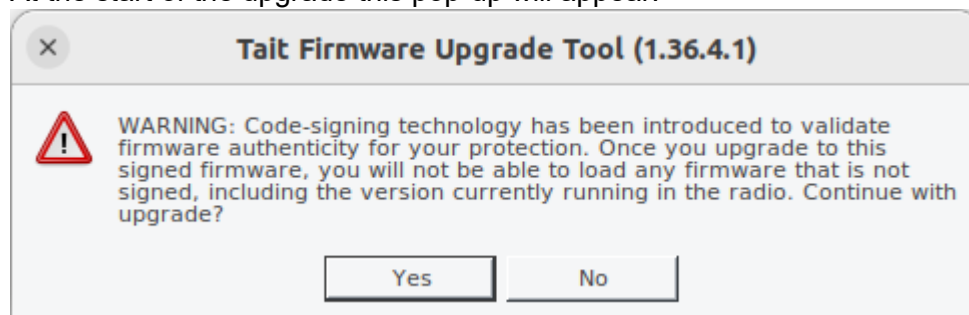
Once a TM9400 is firmware v3.01-signed it cannot be downgraded to these older builds anyway. This note includes any custom firmware builds through CSD that are based on the firmware builds outlined above.

#### Important Note

The release of the color control heads requires the TM9400 and TM9800 bodies using these to upgrade to P25 firmware v3.01 code-signed firmware.

**The firmware in the body must exactly match the firmware in the control head.**

At the start of the upgrade this pop-up will appear:



See further details in TN-3397b-AN

### Important Note

Tx9000 Calibration Application v3.1.1.1 (or later) is required to support radios running firmware v3.00 or later (calibration database 0101). Production builds were released with this firmware.

Any production-built radios or existing radios upgraded to firmware v3.x will require this too, therefore, it is imperative during the upgrade that the radio's calibration is read and written back using calibration application v3.1.1.1

## New Features in P25 Firmware v3.01.01

- **JIRA-TRM-45462: Implement packet data encryption**  
Encryption keys defined in P25 Digital > Encryption can now also be used to encrypt over-the-air packet data. This option is configured by encryption key selection dropdown in P25 Common > Encryption 'User Data Encryption' once P25 Conventional > Data 'Packet Data Services' is enabled.
- **JIRA-TRM-51249: P25 Trunking location to use 'user data encryption key'**  
If 'User Data Encryption' is configured (as defined above for conventional) then a P25 Trunking profile will use the same 'Encryption Key Name' to encrypt over-the-air location data.
- **JIRA-TRM-50767: Voice Annunciation volume is now configurable**  
Requests from some users were for the fixed volume of the voice annunciation audio to be lower. The new dropdown box in UI preferences > Voice Annunciation > General 'Volume Level' now provides variability from 1(min) to 6(max). The default is '6' which is the same level fixed in older firmware. It must be left at '6' if the radio configuration is written back to older firmware.  
**Note:** This does not impact the 'Shutdown Annunciation Volume Level' which has its own level setting.
- **JIRA-TRM-50706: Allow automatic received audio destination on Bluetooth**  
Allows the received audio destination when using a Bluetooth device to be configurable. For example, the received audio can always be played on the radio speaker or on the Bluetooth speaker. Bluetooth > General 'Speaker Selection' provides Automatic, Bluetooth or Radio. Bluetooth or Radio force the audio to always be these outputs and Automatic decides by which PTT (radio or Bluetooth device) was last pressed.
- **JIRA-XPA-926: Bluetooth Connectable option**  
In Bluetooth > General > Common is a new checkbox 'Connectable'. When this is enabled, Bluetooth in the portable is put into a mode that allows other Bluetooth devices to request a connection *to* the radio. Disabled is the previous behavior where Bluetooth connection can only be requested *from* the radio. If 'Connectable' is enabled, then the 'Power-On Action' dropdown will allow 'Start in connectable mode'.

- **JIRA-TRM-50709: Allow automatic mic selection on portable PTT**  
Allows the portable PTT > Mic PTT / External PTT(1) 'Audio Source' to select 'Automatic' allowing the radio to switch between the radio and the Bluetooth device, so a user can use the same PTT when there is (or isn't) a Bluetooth device connected rather than having to configure two separate PTT's.
- **JIRA-TRM-49956: Implement low intensity backlighting option on TM9400/TM9800**  
In conjunction with a new checkbox on UI Preferences > Display 'Low Light Backlight Level Adjustment' the backlight levels for Low and Medium can be reduced to lower levels for operation in extremely low-light environments. This change will affect the backlight levels for the keys (including keypad mic), display, and indicators. Unchecked, the Low and Medium backlight levels remain at previous intensity values. High remains unchanged. This feature is best utilized with 'Continuous' backlighting.
- **Remedy WO 94242: Allow Vote/Scan groups in Keypad Store/Recall feature**  
This feature previously supported single channel store and recall using the keypad number buttons when Conventional > Conv Key Settings > Action and Key Settings 'Use Numeric Keypad for Channel Store/Recall' was checked. Users can now also store and recall 'Vote' or 'Scan' groups too. Note only 'Standard' scan type is accommodated, 'Background' and 'In-Zone' are not supported for this. TRM-49882
- **Mobile Color Control Heads**  
This release will support the pending releases of the color control heads for the TM9400 and TM9800 mobiles. Existing mobile bodies must be upgraded to firmware v3.01-signed.

## Problems Fixed in P25 Firmware v3.01.01

- **JIRA-TRM-50688: Change of RF PA in the 25W mobiles**  
A supply chain issue for the RF PA final device (PD55015) used in the 25W B1, H5 and H7 mobiles required production to change to use the (PD55035) already used in the high-power mobiles. As this requires RF driver and final gate bias target changes, a new hardware version number (HVN 0004) was created for the calibration application to configure the correct bias target values.
- **Remedy INC 62079: In-vehicle Repeater stops beaconing**  
A dual body mobile configured as an in-vehicle repeater (VMR) supporting phase-2 was found to stop beaconing to LAN clients after several overs. This occurred on a network with no hangtime and a solution was implemented to accommodate for this. TRM-50875
- **Remedy INC 62298: First voice packets missing through In-vehicle Repeater**  
A dual body mobile configured as an in-vehicle repeater (VMR) supporting phase-2 would sometimes fail to pass the first few voice packets of an over from a network (WAN) to the secondary body (LAN) transmitter. In some instances, this would recover after a couple of super-frames. This was traced to voice frames not stopping at the end of a previous over resulting in an incorrect start voice frame ID for the following overs. TRM-50874

- **JIRA-TRM-51323: P25 portables running GPS device when not configured**  
 Production line testing found that portables built or upgraded to v3.0x firmware will have the GPS device running even if it was not enabled in user configurations. The impact is radios will have shift life shortened by about 1-hour on P25 portables using v3.00.00 to v3.00.06 (inclusive). If GPS is configured there is no change to its functionality and shift life remains as expected.
- **JIRA-TRM-51186: Intermittent system errors when sending P25 2-tone paging calls**  
 A system error may have occurred only if 'Audible Side Tones' were enabled on the P25 Paging > Encode tab and the tones in use were between 500 and 1000Hz. This issue wasn't present in firmware v2.22 and was traced to the vocoder where 2-tone is generated and resolved.
- **JIRA-TRM-51150: Radio unlocks the pin entry lock after receiving a call**  
 If Startup/Shutdown > General 'Security Lock on Power Up' is enabled and the radio is receiving a call on the channel whilst locked it would remove the pin-entry pop-up window, allowing user access to the menu when that call ended. As it was still locked it remained unable to transmit or receive. Resolved this unexpected loss of the pin entry window.
- **JIRA-TRM-51272: Pin entry can be bypassed by emergency mode**  
 If a radio commences an Emergency callout using Programmable I/O > Digital input (AUX\_GPI2) when the radio is powered-off, the radio will start-up in emergency mode at power-on (as expected) but when the emergency ends the user was no longer required to enter the Startup/Shutdown > General 'Security Lock on Power Up' pin for the radio to enter the idle screen.
- **Remedy WO 99444: Bluetooth devices visible but cannot be connected**  
 Resolved the following two scenarios:  
 Issue (a): With a Bluetooth device turned off and all existing devices removed from the 'Manage devices' list and the radio was power-cycled a previous device reappeared but cannot be connected to, until the device is 'found and paired' again.  
 Issue (b): If a radio has no devices paired or in the 'Manage devices' list, after a power-cycle of the radio the Bluetooth radio menu would have 4x displayed connection options when only 'Find Device' and 'Options' would be valid. TRM-49414
- **Remedy INC 62083: KMF Registration fails if WiFi uses DHCP**  
 Fixed an issue that could cause outgoing UDP packets (such as KMF registrations) to be lost or misrouted when the TP9600 or TP9800 WiFi was attempting to connect.
- **Remedy WO 100348: Hookswitch bouncing resets Loneworker**  
 TM9400 mobile users found vehicle vibrations would erroneously reset Loneworker timer functions if the microphone 'bounced' in the hangup clip. To stop this issue a new checkbox 'Ignore Hookswitch Activity' has been added to the Lone Worker page. The TM9800 mobile also supports this. TRM-49819

## Problems Fixed in P25 Firmware v3.01.02

- **Remedy WO 89420: CCDI transmit power functions report unsupported command**  
Functions in CCDI manual MTB-0003-xx defined how to switch between RF power output levels (Off, Very Low, Low, Medium, High) but the terminal always returned an error response. The CCDI commands now correctly permit the selection of transmit power levels – up to the configured value in the programming application for that channel.  
TRM-45991
- **JIRA-TRM-51377: System error at shutdown**  
The GPS timer initiated by CCR mode messages was still writing to the serial port under CCDI protocol after shutdown. The CCDI was handling the reset protocol, shutting down itself but was not informing CCR and this caused an unaligned memory in remaining serial writes.
- **JIRA-TRM-50646: Serial flash inhibiting Voice Annunciation**  
Resolved an error found in internal testing where the TM9400 mobile hardware version HW0006 had an issue loading voice annunciation files due to driver changes for flash devices. This issue was not present on current hardware version HW0007, and it did not affect HW0006 using firmware v2.22. TM9800 is not affected.
- **JIRA-TRM-51418: OTAR does not work if the radio has the UKEK but not TEK**  
Reworked protection to resolve OTAR packet handling from sending packets in the clear if the operational mode is encrypted.  
Resolved an issue where the radio is encrypted however no encrypted trunking channel resource is available.

## Problems Fixed in P25 Firmware v3.01.03

- **JIRA-TRM-51875: Support for keypad color control head**  
Implemented code changes to accommodate the release of the 21-key color control head (TCH6). Mobile radio bodies expecting to utilize this head need to be running firmware v3.01.03 or later.
- **JIRA-TRM-49487: Modify RS-485 termination configuration**  
Updated the displayed wording for the RS-485 termination when the radio has dual heads connected on the color control heads (TCH). The control heads now utilize the Blue (F2) and Orange (F1) for the shortest and longest cable runs (respectively). Previously these heads were using the scroll up/down keys for this operation.  
**Note:** If the TM9400 or TM9800 has Link Layer Authentication enabled pressing the Blue (F2) key at power-on will *also* switch the radio into Keyloading mode expecting an authentication key. This aspect will time-out after several minutes and can be ignored.

- **JIRA-TRM-51699: Dual Body displays 'Prog Mode ENTITY ID'**  
Fixed an issue where a dual body system could show 'Prog Mode ENTITY ID' during a boot-up. This was traced to reading identical OTAP values in each body – even though OTAP was disabled. The radio will now use the individually configured Global > OTAP > Global 'Entity ID' if OTAP is enabled. If it is not enabled the greyed-out Entity ID's are ignored.
- **JIRA-TRM-51436: Loud speaker 'pop' with repeated button presses**  
An annoying 'pop' could sometimes be heard from the mobile speaker if the user is scrolling through talkgroups/channels with the scroll keys – particularly if they were rapid keypresses. This audible pop was prevalent when a keypress beep occurred close to an indicator beep.
- **JIRA-TRM-51498: System errors on mobile**  
Fixed occasional system errors found in internal test suites. These system errors could create a loop, not resetting the radio as intended until the next power-cycle.

## Problems Fixed in P25 Firmware v3.01.04

- **JIRA-TRM-51970: TP9600 and TP9800 producing TDMA noise on transmit**  
Internal testing of DMR transmissions on the TP9500 and TP9700 UHF radios found TDMA noise present if the radios transmitted DMR Tier-2 or Tier-3 between 378 and 410MHz. This was traced to a transistor not switching the speaker circuit fully off when transmitting. This also impacted the TP9600 and TP9800 on P25 Phase-2 networks. This did not occur if the transmitting portables were using a RSM or on the TP9400 and TM9400/TM9800 which use a different architecture.

## Problems Fixed in P25 Firmware v3.01.05

- **JIRA-TRM-51876: BER failures in factory builds**  
Resolved an issue where factory run-up of only certain radio models were failing Bit Error Rate tests. TRM-52008
- **JIRA-RFET-6940: HK-band mobile not transmitting at top of the band**  
Resolved an issue found in production, but only on the HK-band high power mobile, where transmit would not ramp up correctly at the top of the band. This was an issue with the VCO loop voltage and was only present between firmware v3.01.01 and v3.01.04 inclusive.  
If existing HK mobiles are being upgraded, please ensure they use firmware v3.01.05 or later. TRM-51987

## Known Problems or Limitations

- The TMX450 UnifiedVehicle does not support v3.x software. It can operate with Firmware up to v2.22.06 and will be supported in a later version, yet to be confirmed.
- Remedy WO 101411: Some rare call contentions can cause system error 1:a31a50. TRM-50293



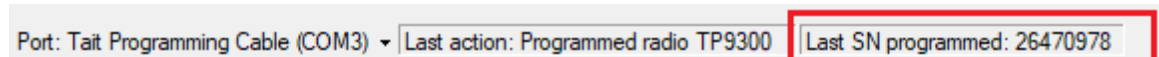
- Remedy INC 57230: P25 radios in fixed sites and powered on for months stop sending OTAP registrations. TRM-48517
- Remedy INC 58865: When using CCR to select talkgroups it will only select those already configured in the radio. The API manual needs to be corrected. TPUB-1571
- JIRA-TRM-46127. Secure Inhibit is not actioned until the end-user presses the radio PTT.
- Remedy WO 59225: Performing a read of a TM9456 dual body's installed encryption keys only identifies those on the lowest MAC addressed body. Switching interfaces to single body verifies the correct keys are present in both.
- JIRA-TRM-50020. The increased message line feature in TRM-40558 (see problems fixed section) with very long labels for actions assigned to a function key will result in truncated final word(s) on the display.
- JIRA-TRM-50534. The TP9800 and TM9800 can circumvent RF band restrictions if it does not have a Dualband and/or Multiband SFE key(s) enabled. This is only valid if a site has a control channel on one RF band and traffic channels on another and the radio is able to make calls on that site.
- JIRA-TRM-49088: The Aina BLE button device is forgotten by the radio when attempting to reconnect or after a disconnect, it needs to be paired again.
- JIRA-TRM-48988: A 'Please Wait' message does not always appear when a radio is shutting down for an OTAP upgrade.
- JIRA-TRM-48764: If loneworker activation/deactivation is based on a geofence 'Entry to' or 'Exit from' a region and the GPS hasn't yet received a fix before that fence is crossed, no action occurs even when a fix is finally acquired.
- JIRA-TRM-48724: If the loneworker menu is open on the radio when it crosses a geofence it displays the previous state and does not update when you cross the geofence. The menu needs to be closed then reopened to see the updated state.
- The Savox BTR-155 Bluetooth RSM was found to suffer from some transmitted TDMA noise (P25 Phase-2 trunked) at the very top of 800MHz band. It is still usable for analog and P25 Phase-1 use.
- JIRA-TRM-40184: Radios on group calls without the correct encryption key will not unmute, however, they will randomly flash the encryption icon.
- JIRA-TRM-39304: Emergency incorrectly indicates 'Emergency Tx Cycle Failed' on first PTT on a radio even though it goes on to perform correctly.
- JIRA-TRM-38628: Noise blanker is not enabled for P25 trunking.
- JIRA-TRM-38202: Dynamic regroup command is not actioned when in duress mode.
- JIRA-TRM-34064: TM9400 resets when subjected to high volumes of PPP traffic over the microphone serial port. Use the AUX port instead.
- JIRA-TRM-31853: In a P25 conventional emergency call, the radio unmutes to an encrypted emergency call even without the correct (or any) keys and plays garbled audio.
- JIRA-TRM-30448: The volume of the 'Radio stunned' indicator doesn't change.

## P25 Programming Application v3.1.0.172

### New Features and Enhancements:

- **JIRA-XPA-896: Add the radio's serial number to the App status bar**

Added a box that will display the serial number of the last radio read or programmed radio. There's often a need to confirm the serial number of the just done radio – without interrogating the radio again to verify this. This item can also be right-clicked to save to an external list if desired.

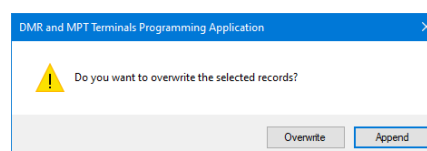


- **JIRA-XPA-133: Reword the channel paste pop-up box**

Previously when using Microsoft excel to copy and paste channel configurations the user was presented with a pop-up box with the text:

*"Do you want to overwrite the selected records?  
Click 'Yes' to overwrite or 'No' to append."*

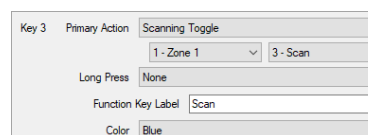
This has since been simplified to 'Overwrite' or 'Append' on the button text.



- **JIRA-XPA-715: Implement F3 and F4 labels and colors for Color Control Head**

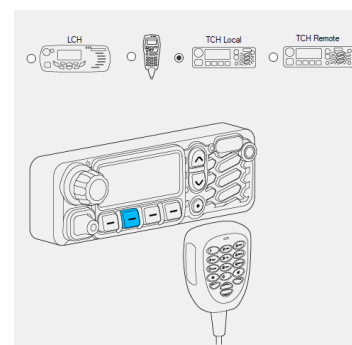
The mobile color control heads can have a label and a color for function keys F3 and F4 on the Function Ctrl Settings page. The 'Color' option box for F3 and F4 appears once an action is selected. An example for F3 shown right.

A mobile datafile with these label and color settings configured can still be written to a LCH or HHCH.



- **JIRA-XPA-712: Add TCH images to Key Settings page**

Updated the TM9400 and TM9800 Function Ctrl Settings page to include the display of the (TCH) color control heads and location of the relevant function keys for all head variants.



### Problems Fixed:

- **JIRA-XPA-1042: Changing Hardware Flow Control crashes the app**

Resolved an error when a TM9400 uses Tait Radio API > DTE/DCE Operation > Transparent Mode Enabled then attempted to configure Hardware Flow Control for CTS and RTS in Tait Radio API > Port Setup > Hardware Flow Control dropdowns which caused the application to crash.



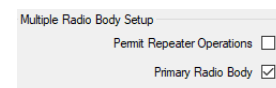
- **JIRA-XPA-106: Validation won't allow removal of one of the function key actions**  
If a mobile has a function key with both a short and long action configured and a programmable I/O has been assigned to simulate that function key, you could not then remove either of the actions. Corrected the validation such that only one action must be set.
- **JIRA-XPA-102: A radio can have 'Call Alert Rx Enable' but 'Individual Call Tx' disabled**  
With this configuration a radio receiving a call alert displays 'Selected op not allowed' message to the user. A validation warning has been added if this is configured  
*"Warning: You have configured the radio for call alert but the user does not have the capability to call back the initiator of the call alert."*

#### Online Help Changes:

- **Remedy WO 101929: Update Online Help for Emergency Activation Delay**  
Added details to the Function Ctrl Settings > Action and Key Settings > Emergency Activation Delay online help suggestion to also set the Audio Services > Indicators 'Loneworker Awaiting' audible indicator to 'Enabled' and 'Continuous'. XPA-733
- **JIRA-XPA-857: Update Help text for 'Low-light backlight level'**  
Updated the online help for this item to use the title 'Low-light Backlight Level' and add context that this feature is best utilized with the mobile display backlight set as continuous.

## P25 Programming Application v3.1.2.174

- **JIRA-XPA-1096: Primary Radio Body checkbox not visible**  
The 'Primary Radio Body' checkbox on the Specifications page was incorrectly left hidden for TM9400 and TM9800 mobiles. This is used to define which body in a dual-body configuration is responsible for the UI display etc. It should only be checked on one radio but if it is checked on more than one radio (or neither) then one radio is chosen at random.



## Known Issues Or Limitations

- Online Help: A number of Help pages were corrected in recent releases, but a number still do not appear or are blank when opened.
- Remedy WO 106403: Attempting to open the Function Ctrl Settings page causes the application to crash. This only occurs with the TM9100 mobile.
- JIRA-TRM-49399: The full range of P25 message values are not available in the current programming application, which is currently limited to 1-500 where radio will support 0-FFFF.
- JIRA-APP-15443, XPA-56: If there is no Tait programming cable connected to the PC when choosing the 'Voice Annunciation' folder in Tools > Options > General > Browse the application will display an unexpected error and exit.

- There is currently no help text for the UI Preferences > Voice Annunciation > Radio Shutdown Annunciation field for portables in this application release.
- There is currently no help text for the Function Ctrl Settings > Action and Key Settings > Emergency Activation Delay field in this application release.

## Programming Application Database Compatibility

Cadence	P25 Programming Application	TM9100 and TP9100 Database	TM9400, TP9400, and TP9600 Database	TM9800 and TP9800 Database
R22.2	v2.22.0.289	0522	0397	x
R22.2-Patch	v2.22.1.283	0522	0397	x
R23.1	v3.0.4.1	0522	0432	0432
R23.2	v3.1.0.172	0522	0443	0443
R23.2-Patch	v3.1.2.174	0522	0443	0443

## Calibration Application v3.1.1.1

- When production updates the radio builds to firmware v3.x, their calibration database will update to 0101 so this calibration application (or later) is required to support them. Any existing radios that are upgraded from v2.x (Cal DB 0012) **must** have their calibration data read and written back as part of the firmware upgrade process to update to Cal DB 0101.
- **Remedy WO 104333: Cal App crashes with TM9100/TP9100 radios**  
Tx9000 Calibration Application v3.0.2.1 would crash when attempting to calibrate Tx Power Control on the TP9100 or TM9100 radios. This did not occur with Tx9400/9600/9800's. XPA-1015
- **Remedy INC 58640: DCS deviation correction**  
Reading an existing calibration from a radio will now correctly display the DCS on the Dev/Squelch > Deviation Settings page. This should be 15% of FSD but an error (present for some time) showed what the radio had programmed was actually much higher, and the calibration application will now display this actual value.  
The default value in radios built from June 2023 has also been updated to the correct level, but any existing radios can now use this application version to decrease the DCS value if desired. Note that modern DCS decoders were able to deal with this higher level without issue.
- **JIRA-TC-192: Add support for TM9800**  
Added support for the TM9800 mobile (TMC platform) to the calibration application.

## Windows O/S Compatibility

The PC and Calibration Applications require [Microsoft \[.NET\] framework v4.6.1](#) (or later).

The Applications are tested as compatible with the following Operating Systems:

- Windows 11 (64 bit)
- Windows 10 (32 and 64 bit)

Windows XP, Vista, 7, 8.0 and 8.1 are not supported.

## First Serial Numbers v3.01.01

TM9400 Mobile Firmware v3.01.01*	S/N <b>21586582</b>
TM9800 Mobile Firmware v3.01.01	S/N <b>21571823</b>
TP9400 Portable Firmware v3.01.01*	S/N <b>26842138</b>
TP9600 Portable Firmware v3.01.01	S/N <b>26829158</b>
TP9800 Portable Firmware v3.01.01	S/N <b>26829181</b>

\* The TM9400 and TP9400 installed firmware is unsigned for this cadence R23.2.  
These models will move to signed from the R23.3 cadence onwards.

## Publication Information

<b>Related Documentation</b>	TN-1899e-AN – Upgrading Terminal Firmware TN-3333 – Upgrading the first release firmware in TP9500 and TP9600 TN-3346d-SR – P25 R23.1 Cadence v3.00.05 TN-3397b-AN – Introducing Code-signing and OTAP2			
<b>Compliance Issues</b>	None.			
<b>Compatibility Issues</b>	None.			
<b>Regional Support Instruction</b>	Inform all service staff and dealers of the released information.			
<b>Confidentiality</b>	Confidential – This message or document contains proprietary information intended only for the person(s) or organization(s) to whom it is addressed. All recipients are legally obliged to not disclose Tait technological or business information to any persons or organizations without the written permission of Tait.			
<b>Distribution Level</b>	Associate.			
<b>Document History</b>	<b>Issue</b>	<b>Date</b>	<b>Description</b>	<b>Author</b>
	-	4 September 2023	First release of R23.2. Firmware v3.01.01 Prog App v3.1.0.172 Cal App v3.1.1.1	J James G Brenchley

Document History	Issue	Date	Description	Author
	b	21 September 2023	Updated to advise EnableFleet needs to be v4.8.0 or later. Release of Prog App v3.1.2.174 with Primary body checkbox.	G Brenchley
	c	21 November 2023	Updated with Cal App fix for XPA-1015 in v3.1.1.1. Added changes for firmware v3.01.03. Added first serial numbers for firmware v3.01.01.	G Brenchley
	d	7 December 2023	Added changes for firmware v3.01.04 and v3.01.05.	G Brenchley