



TimeLink



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Application Note

Marine Time Code Distribution Using TMG512X, TMD1133 and TMD1134

STANAG / HaveQuick (HQ) Architecture for Naval Platforms

1. Introduction

Modern naval platforms rely on a **common, precise time reference** for navigation, communications, combat systems, and weapon control. Many of these systems use **STANAG and HaveQuick (HQ)** time codes as their primary timing reference.

This application note describes a **typical marine time-synchronization architecture** based on TimeLink equipment:

- **TMG512X** – Marine Time Code Generator (GNSS or external source disciplined)
- **TMD1133** – Redundant 1PPS / digital pulse Distributor
- **TMD1134** – Multi-signal Distributor for STANAG / HQ and other digital time codes

The goal is to provide a **robust, redundant and scalable** distribution of STANAG and HQ signals across the ship.

2. Functional Requirements on a Ship

A marine time system must:

- Provide a **GNSS-disciplined master time** (GPS / Galileo / GLONASS / BeiDou)
- Generate **STANAG 4430 / 4372 HQ** time codes and **1PPS** references
- Distribute these signals to multiple consumers (CMS, radar, EW, SATCOM, weapon control, INS, etc.)
- Offer **redundancy** and **fault-tolerant distribution**
- Support **remote monitoring** from the ship's IP network (SNMP, web)

TimeLink products address these requirements as follows.

3. Role of Each Equipment

3.1 TMG512X – Marine Time Code Generator

The **TMG512X** is the **master time source** on board.

Main functions

- GNSS-disciplined internal OCXO
- Generation of:
 - **STANAG 4430 XHQ**
 - **STANAG 4372 HQIIA**
 - **ICD-GPS-060 HQ / BCD**
 - **1PPS**
 - **IRIG-B00x** and **NMEA ZDA** (for auxiliary systems)
- Up to **8 configurable outputs** (RS422 / TTL / ICD-GPS-060 electrical levels)
- Integrated **NTP server** for IP equipment
- Remote management via **HTTP/HTTPS, SNMP v2c/v3, SSH, SYSLOG**

In a marine installation, the TMG512X is typically fed from a **military GPS receiver through NMEA/PPS or HQ/PPS** and installed in the **mission or combat system rack**.

3.2 TMD1133 – 1PPS Redundant Distributor

The **TMD1133** is used to **fan-out the 1PPS reference**, which many subsystems use for internal disciplining.

Key points

- 1 or 2 inputs (depending on model), with automatic / manual source selection
- Up to **10 isolated 1PPS outputs**
- Very fast fault detection and switching
- Remote status and configuration through Ethernet (HTTP / proprietary UDP)
- Front-panel LEDs for clear local diagnostics

On a ship, the TMD1133 is typically used to supply 1PPS to:

- Navigation and INS systems
- Time servers for IP networks
- Test / measurement equipment
- Additional TimeLink generators (for local disciplining if needed)

3.3 TMD1134 – STANAG / HQ Multi-Signal Distributor

The **TMD1134** distributes **STANAG and HQ time codes** toward mission-critical systems.

Typical configuration

- Inputs: STANAG 4430 / 4372 or ICD-GPS-060 HQ signals from the TMG512X
- Outputs: multiple isolated copies of the same code (RS422 / TTL)
- Low jitter, low delay skew between channels
- Remote supervision and mode control over Ethernet

Typical consumers:

- Combat Management System (CMS)
- Radar and surface/air tracking systems
- Electronic Warfare (EW) and ESM receivers
- Missile / weapon control and fire-control computers
- Telemetry and recorders

4. Example Marine Architecture

Below is a **typical block diagram** for a shipboard STANAG/HQ distribution system:

1. TMG512X (Master Generator)

- GNSS antenna → TMG512X
- TMG512X outputs:
 - **STANAG 4430 / HQIIA** on two outputs
 - **ICD-GPS-060 HQ** on one output
 - **1PPS** on one output
 - Optional IRIG-B / NMEA outputs for auxiliary loads

2. TMD1133 (1PPS Distributor)

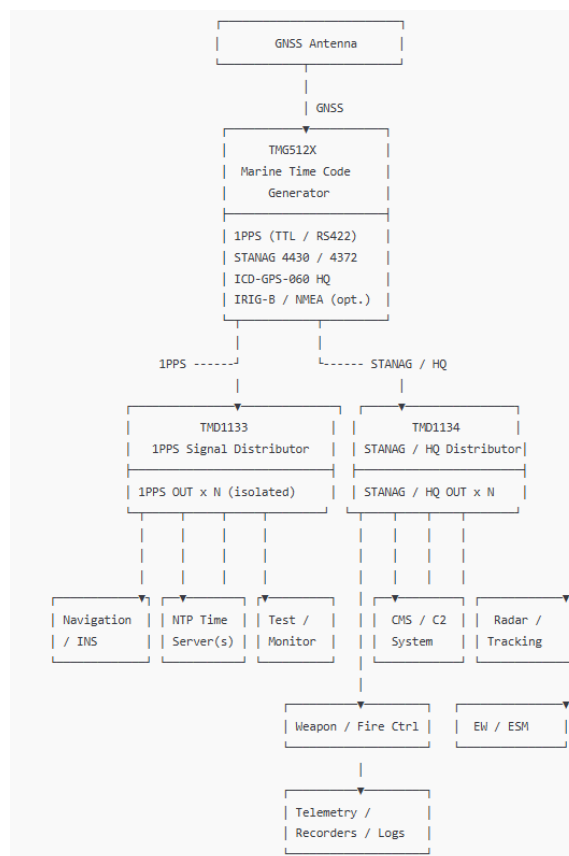
- Input: 1PPS from TMG512X
- Outputs: 1PPS to navigation systems, IP time servers, local monitoring units, etc.

3. TMD1134 (STANAG / HQ Distributor)

- Inputs: STANAG 4430 / HQ from TMG512X
- Outputs:
 - STANAG/HQ to CMS
 - STANAG/HQ to radar/sonar
 - STANAG/HQ to weapon control / fire control system
 - STANAG/HQ to telemetry / recorders

This structure ensures that all critical systems receive **coherent STANAG/HQ time codes and a common 1PPS reference**.

5. Signal Mapping Example



Source	Signal Type	Distributor	Typical Consumers
TMG512X	1PPS (TTL/RS422)	TMD1133	Navigation, NTP servers, local generators, test EQ.
TMG512X	STANAG 4430 XHQ	TMD1134	CMS, radar, tracking sensors
TMG512X	STANAG 4372 HQIIA	TMD1134	Weapon control, firing computers
TMG512X	ICD-GPS-060 HQ	TMD1134	SATCOM, radios requiring HQ synchronization
TMG512X	IRIG-B00x / NMEA	(direct or via other distributors)	Logging/recording, maintenance tools

6. Marine Integration Recommendations

- **EMI / EMC:**
 - Prefer **RS422 outputs** for long runs through noisy compartments.
 - Use shielded twisted pairs and proper grounding.
- **Redundancy Options:**
 - For high-critical missions, deploy **two TMG512X** in A/B configuration, feeding separate TMD1133/TMD1134 groups or using redundant distributor options.
 - Configure automatic failover and monitor alarms via SNMP.
- **Monitoring:**
 - Integrate TMG512X, TMD1133 and TMD1134 into the ship's **network management system**, using SNMP and SYSLOG for alarms (loss of GNSS, loss of signal, PSU fault, etc.).

7. Conclusion

By combining:

- **TMG512X** as the GNSS-disciplined **STANAG/HQ master time generator**,
- **TMD1133** for **robust 1PPS distribution**, and
- **TMD1134** for **multi-channel STANAG / HQ fan-out**,

a ship obtains a **coherent, robust and scalable marine time distribution system** compliant with STANAG and HQ requirements.

This architecture is suitable for **surface combatants, patrol vessels, support ships and coastal stations** that need reliable, standards-based time synchronization for mission and weapon systems.