



Precision Navigation Module

By focusing on the unique needs of each customer, Central Railway Manufacturing has worked with leaders in the freight transportation industry to address timing, navigation and positioning requirements to turn their precision railroading goals into a reality.

Precision Navigation Module

Central Railway Manufacturing's equipment portfolio includes the PNM, the Precision Navigation Module. The PNM is a fully featured AAR-S9102 and S9103 precision positioning and locomotive time solution, capable of connecting dual-GNSS and time-based inertial functions to Ethernet on-board networks. The CRM PNM also incorporates user-accessible high-powered edge processing to its positioning and time management engines in a compact, standalone form factor.

Insight into PNM technology...

The PNM employs a versatile redundant processing architecture that bridges two fully featured multi-constellation GNSS receivers to a precision Inertial Management Unit (IMU), an embedded real time clock (RTC), and redundant gyroscope-equipped accelerometers to a dedicated positioning microcontroller and a quad-core customer accessible edge processor. This architecture is designed to support cutting edge industry standard navigation requirements via Ethernet but also legacy navigation applications through serial port applications.

- 2 x GNSS RF receiver inputs
- 2 x NMEA legacy serial ports
- 3 x 10/100/1000 Ethernet

The PNM GNSS receivers also support a wide array of RTK positioning and correction standards such as NTRIP, RTCM, PPP, SBAS and Differential modes.



Your data at your fingertips...

The PNM is part of the CRM Enabling Technologies suite of products whose focus is to allow customers to leverage their own networks and data mining infrastructure to connect to and utilize on-board telemetry. The CRM PNM not only conforms to industry-driven precision navigation standards, but also allows customers to gain direct access to raw data streams such as IMU and accelerometer data simultaneously as the PNM performs dead-reckoning functions with these streams.

In addition to hosting up to two of the most state-of-the-art GNSS receivers in the industry, the CRM PNM is a powerful standalone locomotive edge processing platform that boasts a state-of-the-art quad-core applications processor capable of hosting Linux customer data mining, analytics, routing, and locomotive configuration management applications with up to 32GBytes of user storage. The PNM supports a wide range of scripting engines such as Python® to enable all manner of customer-driven processing and rules functions without the need for additional cards.

PNM Detailed Characteristics	
Processor:	i.MX8 QuadLite Application Processor 4 x ARM Cortex® 64-bit A53 at 1.5GHz
Memory:	3GB LPDDR4 32GB User and Application FLASH 2GB Secured OS/Boot FLASH
Connectivity:	3 x 10/100/1000Mbps Ethernet -VLAN, QOS, Port Iso/Fwd 2 x Multifunction Serial -RS-232/422/485 -Synchronous/Asynchronous -Programmable Termination -HDLC/SDLC with CRC
Wireless:	1 x 802.11 a/b/g 1 x Cellular Modem -CDMA/GSM 3G/4G/LTE 2 x GNSS with RTK, L-band Corr. -GPS L1/L2/L5 -GLONASS G1/G2/G3 -BeiDou B1/B2 -Galileo E1/E5a+b
Power:	74V nominal, 40V to 110V operating 6W Typical, 9W peak
Environment:	-40°C to +70°C Operating 0% to 95% RH Non-condensing AAR-S9401 Shock and Vibration

