

CH104 Control System series



MBW Technologies, LLC

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Installation & User Manual

EM100xx Interface Module

for Livorsi ETS Throttle Head
and Yanmar Electronic Engines

P/N: MN10016-52

MBW Technologies, LLC (2 – Year) Limited Warranty

Electronic Modules and Displays

MBW Technologies, LLC (“MBW”) warrants its Electronic Module and Display products to be free from defects in materials and workmanship for a period of two (2) years from the date of shipment by MBW. Within this period, MBW will, at its sole option, repair or replace any Electronic Module or Display that fails in normal use and is returned to MBW (freight prepaid) within the warranty period. MBW is not responsible for charges connected with the removal of such product or reinstallation of replacement or repaired parts. This warranty does not cover failures due to abuse, misuse, accident, faulty installation or unauthorized alteration or repairs.

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Warranty Return Procedure:

To obtain warranty service, contact MBW Technical Support Department at (267) 932-8573 x341 or email Support@mbwtech.com to describe problem and determine appropriate action.

NMEA 2000® is a registered trademark of the National Marine Electronics Association.

Technical Specifications

EM100xx Module

Operating Voltage	6 to 16 VDC
Operating Temperature	-18C to +77C
Storage Temperature	-40C to +85C
Power Consumption - operating	250mA @ 12VDC (w/display)
Power Consumption – power down	<100uA
Vibration	ABYC P-24
Communication	NMEA 2000®
Humidity Test 100 Hours	+77C @ 90-95% Rel. Humidity
Transient Voltage Test	SAE J1113-12
Protection	IP67
Corrosion / Salt Spray	300 hrs per ASTM B117
EMI Emissions	ABYC P-24
EMI Immunity	ABYC P-24
Dimensions (base unit without harness)	117mm x 115mm x 35mm (4.63" x 4.50" x 1.38")

EM100xx Data Transmitted

Engine Throttle	Yanmar proprietary
Gear	Yanmar proprietary

to operate. If the inputs differ by more than 10% the lever will be considered failed. The select lamp will begin a fast flash indicating a critical failure and the drive train in question will be held at the engine idle state. If the throttle head wiring is defective or disconnected the system will indicate a critical failure and enter into the system error reaction state. If the network communications connection from the EM100 to the Yanmar Control Network is lost or broken the system will indicate a critical failure and enter into the system error reaction state.

System Calibration

To calibrate the EM100xx module with the mating throttle head, perform the following steps.

STOP: Your Throttle and Shift System has been calibrated from the factory. Proceed with the steps below only if the EM100x module or throttle controls have been replaced.

****** Proceed With Caution ******

1. With the control powered off, move the **PORT** gear lever to the full forward position; the throttle lever to idle. In the case of a multi-engine application move all throttles to the idle position.
2. Power the system, while pressing and holding the select switch. The control is now in the calibrate mode. Select lamp "Off"
3. Move all throttle levers to the wide open throttle position. Press the select switch to enter the position of the throttle lever(s). The green lamp on the select switch will flash momentarily when data is entered.
4. Move all throttle levers to the idle position. Press the select switch to enter the position of the throttle lever(s). The green lamp on the select switch will flash momentarily when data is entered.
5. Power the system off and back on.
6. The control is now calibrated.
7. Verify calibration by viewing the %Throttle display on the i5601E display. The display should read 100% for each throttle when the respective throttle lever is a WOT. The display should read 0% for each throttle when the respective throttle lever is at idle.

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Product Overview

The EM100xx Series Product is designed as a Plug 'N' Play Throttle and Gear Control for applications using Yanmar Electronic Engines. The EM100xx product is designed to integrate with a Livorsi ETS throttle head. The system provides electronic throttle and electronic gear operation for each drive train. Single, Dual, Triple and Quad engine versions are available. The Sport Control provides a separate lever for shifting and a separate lever for throttling commonly known as Single Function Controls.

Components

1000066-xx	CH; Livorsi ETS, ETP, ESSA (customer specified)	1 per engine
1000016	Switch; N.O. , momentary, Grn LED, w/connector	1 per engine
CM10002	Harness; Devicenet, 2'	As needed
CM10003	Harness; Devicenet, 3'	As needed
CM10006	Harness; Devicenet, 6'	As needed
CM10009	Harness; Devicenet, 9'	As needed
CM10012	Harness; Devicenet, 12'	As needed
CM10016	Harness; Devicenet, 16'	As needed
CM10020	Harness; Devicenet, 20'	As needed
CM10030	Harness; Devicenet, 30'	As needed
CM10060	T; Devicenet	As needed
EM100SE	EM; CH, Sport Style, Yanmar Electronic, Single Engine	1 per engine
EM100DE	EM; CH, Sport Style, Yanmar Electronic, Dual Engine	1 per system
MN10016-5X	Manual, User/Installation, EM100xx series	1 per engine
MN10013-XX	Mounting Template, CH104 series	1 per engine



1000016 – Select Switch

Engine Synchronization

As shipped from the factory, the control system provides engine speed synchronization when installed in a multi-engine application. As defined by Yanmar, this feature called “Cruise” sync and provides throttle synchronization when the throttles are >20% throttle AND the throttle levers are matched within 5% of one another. Should the throttle levers be mis-matched by >5%, the engine speed for each engine will be defined by the lever position for that engine.

Start-in-Gear Protection

The Yanmar Control System provides a connection for start-in-Gear protection. This connection is made in the Yanmar Control System engine harness. (See system diagram for details.) The Yanmar Control System NSP must be connected to allow the Yanmar engine to start. The Neutral Start Protect input of the Yanmar Control Module (pin 5 to pin 11) must be connected to transmission NSP connector.

Station Transfer

When an application requires a second station the Sport Control provides the ability to transfer between stations. The select button is used for this purpose. The transfer occurs when the following conditions are met:

- Operator invokes the transfer sequence by pressing the “Select” button at the station they wish to control from. The select lamp will begin to blink at both stations.
- Match gear lever(s) between the two stations
- Match throttle lever(s) between the two stations within 5% of each other. When the levers are within tolerance, the select lamp of the controlling station will light continuously.
- Inactive station will turn off the select lamp.

The operator has five seconds for the transfer to complete. After five seconds the request will be terminated and control will remain at the original station. One other condition can cause the transfer to terminate. This is when the operator at the currently active station moves one of his levers. It is recommended that transfers occur when the operator and vessel are in safe condition.

Throttle Failure Detection

Each throttle lever has two potentiometer inputs. If either input goes outside its allowable throttle range the system select lamp will begin a slow flash indicating a non-critical failure and the system will continue

System Operation

For single station applications, the control will auto select when the following conditions are met;

- 1) System is powered
- 2) Gear lever is neutral
- 3) Throttle lever is less than 2% throttle.

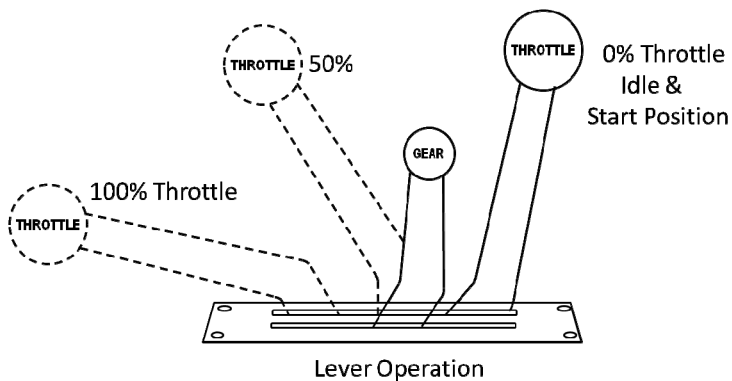
For dual station applications, station select will occur when the following conditions are met;

- 1) System is powered.
- 2) Gear Lever is neutral
- 3) Throttle lever is less than 2% throttle.
- 4) Select switch for desired station is pressed.

When these conditions are met the select lamp (green lamp) will activate indicating the station is selected. If the control is not selected the select lamp will flash. The Yanmar System will allow the engine to start if the throttle head is not selected but will not allow the engine to throttle up until the control is selected. If the select lamp is flashing simply move the throttle and gear levers to the idle/neutral positions. The select lamp will stop flashing and indicate a steady green indication. The control is now selected and operational.

The EM100xx Interface Module communicates to the Yanmar Drive Train Control Module via the CANBus network. The Yanmar Control System will lock-out engine start under the following conditions;

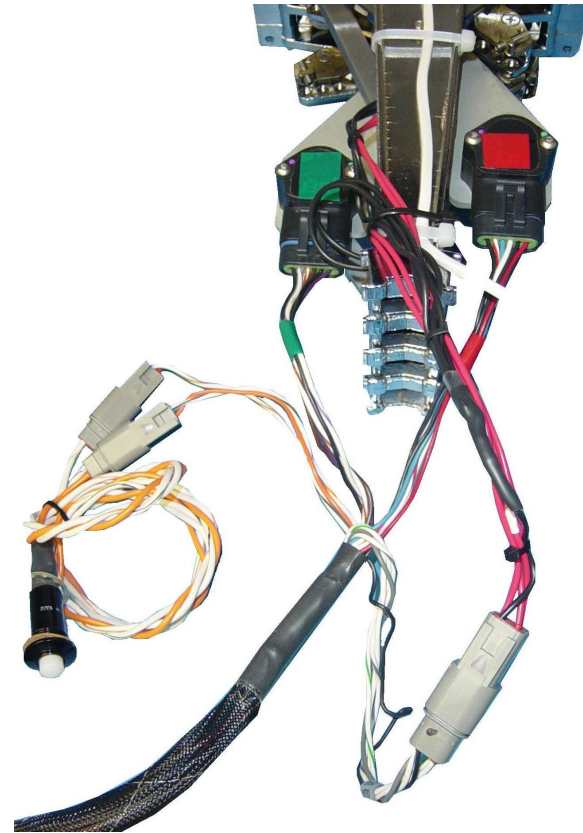
- 1) The station is selected.
- 2) The gear lever is requesting a gear position other than neutral.
- 3) The throttle lever is requesting a throttle > 5%.



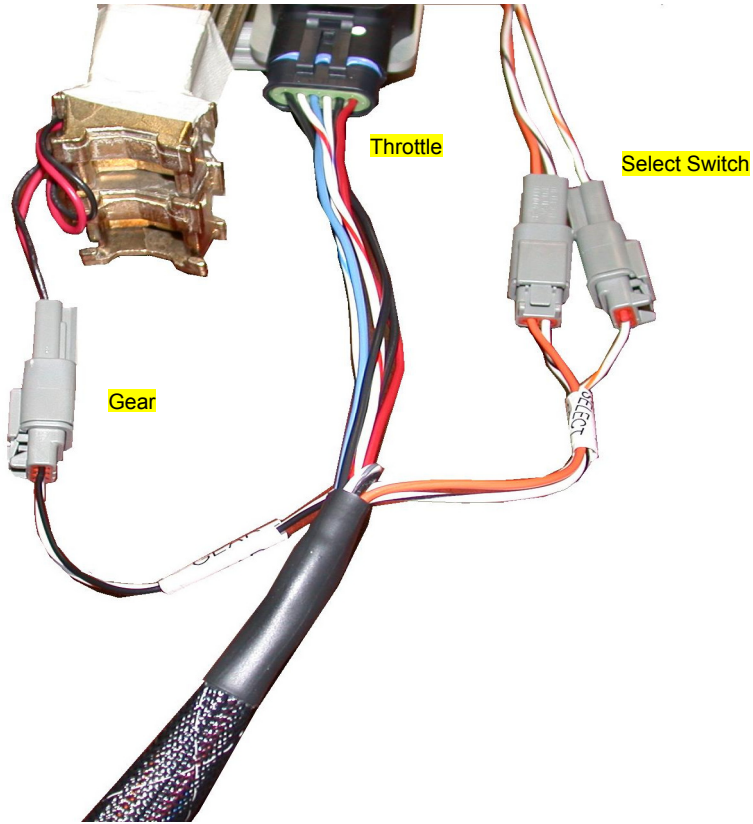
Dual Engine Throttle Head - Customer Specified



EM100xx – Electronic Module

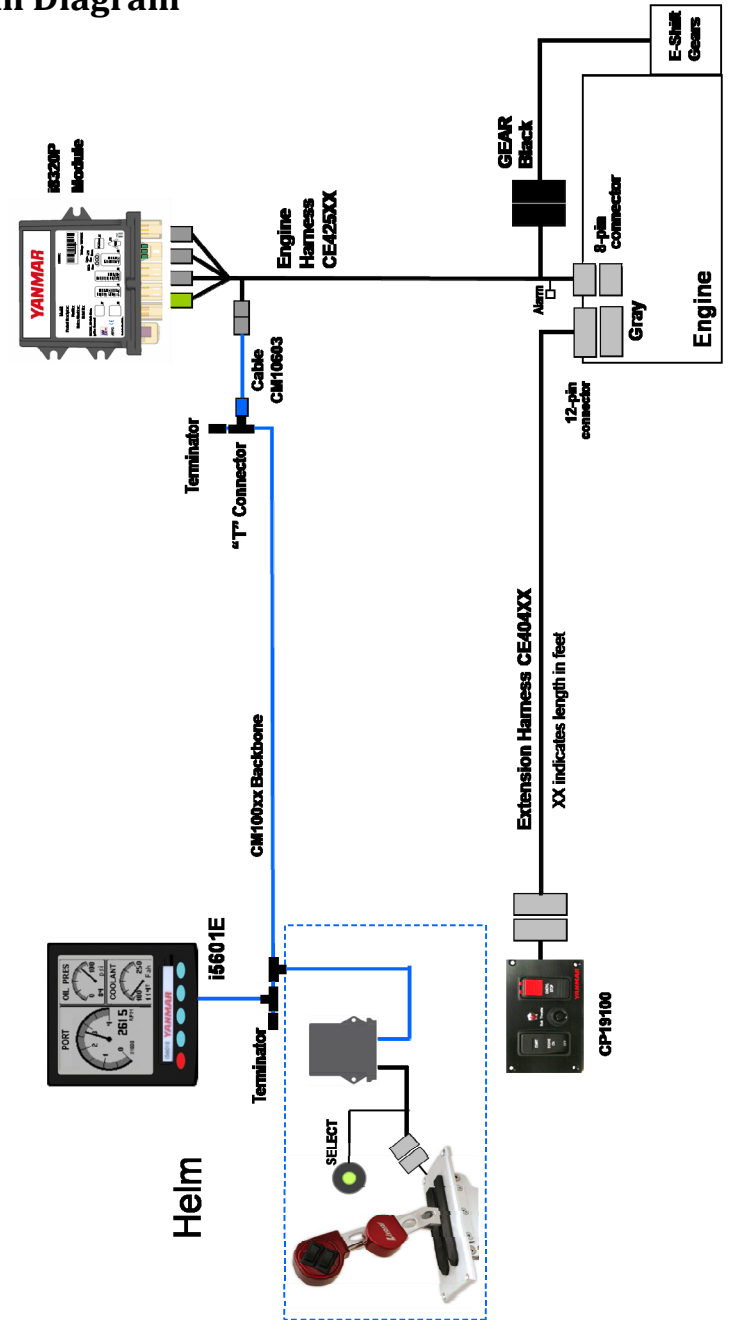


EM100DE Series Interconnect



EM100SE Series Interconnect

System Diagram



Installing the System

CAUTION

The safety messages that follow have **CAUTION** level hazards.

ALWAYS ensure the power supply is OFF and battery cables are disconnected before you make any electrical connections.

Making the Connections

Each connector end has a label identifying the connection location. Match the labels with connecting device. In most cases the connector fits in one and only one mating connector. The supply power **MUST** be OFF when interconnecting the system. The EM100xx module must be calibrated to the mating throttle head. The EM100xx interface module is supplied from the factory calibrated to the supplied throttle head. Should the EM100xx module be mated with a new throttle head, recalibration is required. See System Calibration section for details.

- Recommended order:
 1. Verify the battery / battery switch connections to each engine per the engine installation diagram. (Refer to engine manufacturer installation manual.) Verify engines are bonded to battery return (-) and that battery banks are tied to battery return. Verify engine blocks are connected battery bank ground.
 2. Locate placement area for throttle head. Use supplied template (MN10013) for proper mounting.
 3. Locate placement area for EM100xx module. Use supplied template (MN10013) for proper mounting.
 4. Locate placement area for throttle select switch. Mount using 5/8" dia. Hole.
 5. Locate Yanmar NMEA 2000® network. Find appropriate location to install a network 'T'. Connect EM100xx module to network using certified network harnessing and 'T'.
 6. Connect throttle select switch PN: 1000016-00 to EM100xx module. (2- 2pin DTM connectors)
 7. Connect EM100xx module to throttle head via: 1 - Packard 6 pin connector and 1 Deutsch 3 pin connector for Single Engine applications. 2 – Packard 6 pin connectors and 1 Deutsch 6 pin connector for Dual Engine applications.

After all controls and system components have been mounted and connected, the system must be setup to agree with the engines, transmissions and operator preferences. Reference Yanmar Electronic Control Operational Manual for details.