Emtron YXZ1000R ECU

PRODUCT DATASHEET

Rev 1.0

YXZ1000R



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1.0 General

Emtron's YXZ1000R Plugin ECU is built upon the outstanding foundation of the SL Series and features the same processing power and logging capacity. This lightweight package is housed in a Billet Aluminium Enclosure, designed to be plugged into the OEM harness to allow for a true "Plug and Play" install. As few inputs & outputs remain unused for User definition, CAN Bus 2 is made available providing additional I/O expandability. Other features include up to 32MB permanent memory for on-board logging, 4-channel oscilloscope function, DBW control, Knock control using digital filter technology, High Speed Ethernet communications and 3-axis G-force sensing.

Power Supply

- Operating voltage: 6.0 to 22.0 Volts DC (ECU shutdowns at 24.0V)
- Operating current: 290mA at 14.0V (excluding sensor and load currents)
- Reverse battery protection via external fuse
- "Smart" battery transient protection

Operating Temperature

- Max operating range: -30 to 110°C (-22 to 230°F)
- Recommended operating range: -30 to 85°C (-22 to 185°F)

Physical

- Aluminium 6061 grade CNC billet enclosure
- Enclosure size 120 mm x 130 mm x 27 mm
- Weight: 470g
- Connector system: 68-way Super Seal waterproof connectors with gold plated contacts
  - Pin diameter: 1 mm
  - Current rating: maximum 15A per pin (wire gauge dependant)
  - Connector A: 34 pin Key 2 Super Seal
  - Connector B: 34 pin Key 1 Super Seal

Internal

- Dual 100MHz processors
- 500Mb DDR RAM (0.5Gb)
- 32MB ECU logging memory
  - Over 1200 channels available
  - 1Hz to 500Hz logging rate
- Oscilloscope 4-channel function with 32MB storage
  - Sampling at 100k samples/second
  - Includes Crank Index and Sync sensor inputs
  - Includes Digital Inputs 1-4
- On-Board barometric pressure sensor
  - Range 40 - 115.0 kPa
- 3-Axis accelerometer
  - 16-Bit resolution
  - ±2g/±4g/±8g dynamically selectable full-scale
  - Output data rate 500Hz

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2.0 Outputs

8x Port Injector Outputs—high ohm

- 70V clamping
- Outputs can be used for ground switching, 6A Continuous, 10A Limit
- All outputs are short circuit and over current protected
- No Flywheel diodes (external diode(s) required for VVT control)

4x Ignition Outputs

- 3 x Ignition outputs for direct to coil wiring – IGBT
- 1 x Adjustable TTL Ignition drive current (35mA or 70mA)
- Outputs can be used for ground switching, 1A Continuous, 3A Limit
- All outputs are short circuit and over current protected
- No Flywheel diodes (external diode(s) required for VVT control)

10x Auxiliary Outputs

- Drive by Wire (DBW), dual boost control, gearshift solenoids, stepper motor and many more.
- All outputs have PWM control, maximum frequency = 15 kHz
- Flywheel diodes integrated into all outputs
  - Auxiliary 1-8 Flywheel to the “ECU Supply” pin B1 connector B
  - Auxiliary 9-10 Flywheel to the “ECU 9-12 Supply” pin A34 connector A
- All outputs are short circuit and over current protected

  Low Side Drivers
  - Auxiliary 1-4: Low Side 4A continuous, 6A peak modulated, 8A limit
  - Auxiliary 5-8: Low Side 2.5A continuous, 4A peak modulated, 5A limit

  High Side Drivers
  - Auxiliary 1-8: High Side 4A continuous, 9A limit

  Half Bridge Drivers
  - Auxiliary 9-10: Half Bridge 5A continuous and 8A limit. Can be used as Low Side, High Side or together in H-bridge configuration for DC motor control (DBW)

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3.0 Inputs

12x Analog Voltage/Temperature Inputs

- Fully configurable including custom calibrations
- Switchable 1k ohm pull-up resistors on ANV 7-12
- Accepts a 0.0 - 5.000V analog input. Resolution is 1.22mV (12-Bit)
- Input Impedance 100k Ohms to ground

14x Digital/Speed Inputs/Switched Inputs

- Frequency range from 0.0Hz up the 30.0kHz on channels 1-8
- Magnetic and Hall effect sensor compatible on DI 1-4 with programable trigger edge(s)
- Hall effect sensor only on DI 5-8 with programable trigger edge(s)
- Independent programable frequency-based arming threshold control, range 0.0 - 12.0V on DI 1-4
- Fixed frequency-based arming thresholds on DI 5-8. Rising = 1.2V, Falling = 1.0V.
- Wheel speed, output shaft speed and other frequency-based signals
- ON/OFF switched inputs: AC request, Launch enable, cruise switch, table control switching etc with arming threshold control, range 0.0 -20.0V
- Accepts a 0.0 - 20.0V analog input. Resolution is 4.88mV (10-Bit)
- Switchable 4k7 ohm pull-up resistors on all 12 channels to 10V
- Maximum input signal amplitude +/- 80V

1x Knock Input

- 1 Independent knock input channel
- Using Bosch, Digital Knock Integrated Circuit Technology with programmable digital filter coefficients
- Centre frequency configurable from 500Hz - 25kHz
- Bandwidth window from 100Hz - 5kHz
- Digital filter window; Hamming or Blackman
- Gain control (x1, x2, x4, x8)
- Cylinder selectable knock input
- Knock control available on ALL Ignition modes (Direct, Wasted, Distributor etc)

1x Crank Index Engine Decoding Inputs

- OEM Magnetic sensor compatible
- “True” zero crossing detection on magnetic signals for precise engine position decoding.
- Programmable independent arming threshold control from 0.1V to 12.0V
- OEM pattern supported
- Maximum input signal amplitude +/- 80V
- Input Impedance 39k ohms to ground

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4.0 Voltage and Ground Supplies

2x ECU Supply Input

- 15.0A Max (pin limited)
- 6V - 22.0V Range
- Supplies ECU power
- Supplies power to Auxiliary 1-10 High Side Drivers
- 1 x Dedicated battery power supply
- 1 x Ignition Power Supply

1x 5.0V Sensor Supply

- 5V Vref1 output current 250mA

4x ECU Main Grounds

- 15.0A per pin, total 60A

1x Sensor 0V Reference

- Analog Sensor 0V Reference with short to battery protection (See note in Section 6.1)

NOTE: The **Sensor 0V Reference** pin(s) are specialised ground outputs for all analog sensors. Connect direct to the sensor 0V pin, **DO NOT** connect to the Engine Block or ECU Ground.

5.0 ECU Channel Assignment

ECU Channel - Injection	Function
Injection Channel 1	Primary Injector Cylinder 1
Injection Channel 2	Primary Injector Cylinder 2
Injection Channel 3	Primary Injector Cylinder 3
Injection Channel 4	Fuel Pump 1 (+Main relay)
Injection Channel 5	Cooling Fan 1
Injection Channel 6	User Output 3 - Park Belt Buzzer
Injection Channel 7	Start Relay Control
Injection Channel 8	User Output 2 - Air Induction Relay

ECU Channel - Ignition	Function
Ignition Channel 1	Ignition Coil Cylinder 1
Ignition Channel 2	Ignition Coil Cylinder 2
Ignition Channel 3	Ignition Coil Cylinder 3
Ignition Channel 4	User Output 1 - Seat Belt Pilot Lamp

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ECU Channel - Analog Inputs	Function
Analog Voltage 1	TPS
Analog Voltage 2	Manifold Pressure – Bank 1 (Cyl 1 – Sync)
Analog Voltage 3	Manifold Pressure
Analog Voltage 4	Gear Voltage
Analog Voltage 5	Lean Angle Sensor
Analog Voltage 6	User Analog Input
Analog Voltage 7 (Pull-up Channel)	Engine Temperature
Analog Voltage 8 (Pull-up Channel)	Inlet Air Temperature
Analog Voltage 9 (Pull-up Channel)	Trans ECU Current Feedback / User Analog Input
Analog Voltage 10 (Pull-up Channel)	Neutral Switch
Analog Voltage 11 (Pull-up Channel)	YXZ Differential Lock Rotary Switch 1
Analog Voltage 12 (Pull-up Channel)	YXZ Differential Lock Rotary Switch 2

NOTE: Analog Voltage Channels 7-12 have switchable pull-ups which are suitable for temperature measurement.

ECU Channel - Digital Inputs	Function
Digital Input 1	Oil Pressure Switch
Digital Input 2	Drive Speed / Vehicle Speed
Digital Input 3	Battery Voltage Monitor
Digital Input 4	User DI (Ethanol / Launch Sw)
Digital Input 5	Start/Stop switch
Digital Input 6	Clutch Switch
Digital Input 7	YXZ Differential Servo Position 1
Digital Input 8	YXZ Differential Servo Position 2
Digital Input 9	YXZ Differential Servo Position 3
Digital Input 10	YXZ Differential Switch 12
Digital Input 11	YXZ Differential Switch 1
Digital Input 12	YXZ Seat Belt Switch
Digital Input 13	Handbrake Switch
Digital Input 14	Brake Switch 1
Dedicated – Ign Sw	Ignition Switch
Internal G-Force	Lateral G Force
Internal G-Force	Longitudinal G Force
Internal G-Force	Vertical G Force

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ECU Channel - Auxiliary Outputs	Function
Auxiliary 1	YXZ Differential Lock relay 1
Auxiliary 2	YXZ Differential Lock relay 2
Auxiliary 3	Tacho (Used for drive to EPS & Trans)
Auxiliary 4	PVC Solenoid (Paddle Model Only)
Auxiliary 5	Idle Stepper Motor A1
Auxiliary 6	Idle Stepper Motor A2
Auxiliary 7	Idle Stepper Motor B1
Auxiliary 8	Idle Stepper Motor B2
Auxiliary 9	Spare User Output
Auxiliary 10	Spare User Output
Auxiliary 11	Fan Relay 2 (Paddle Model Only)
CAN BUS OEM	CE Light
Internal EFI Relay Ctrl	EFI Relay Control
No Pin Assignment	User Output 4 – Start Lockout

ECU Channel - Crank/Cam	Function
Crank Index	Crank Sensor
Sync Sensor	Manifold Pressure – Bank 1 (Cyl 1)

5.1 CAN Bus 2 Wiring

The ECU CAN Bus 2 is reserved for Emtron CAN Bus devices, expanding the IO capability of the ECU. The following devices can be connected:

- ELC1/2 (Emtron Lambda to CAN 1/2 channel)
- ETC4/ETC8M (Emtron Thermocouple to CAN 4/8 channels)
- EIC10/EIC16M (Emtron Input to CAN 10/16 Channel)

For more information on each device refer to the downloads section on the website: (https://emtron.world/downloads/)

Emtron ELC/ETC4/EIC10 to CAN

All these CAN devices share a common power, ground and CAN pinout using a 4-way DTM.

See Table 3.1.

Pin	Function	Wire Colour
1	Ground	BLACK
2	CAN Lo	GREEN
3	CAN Hi	YELLOW
4	12V Supply	RED

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Table 3.1. CAN Device Power and CAN Deustch Connector Pinout

Each CAN Device must be wired & connected directly to the ECU Header Plug.

Pinout information is shown Table 3.2.

Name	ECU Header Pin	CAN Device 4-Way DTM
Ground	Pin A1/2 - ECU Ground – (Splice)	Pin 1
CAN 2 Lo	Pin B19 (Pinned Directly)	Pin 2
CAN 2 Hi	Pin B13 (Pinned Directly)	Pin 3
Power	Pin B1 - 14V - (Splice)	Pin 4

Table 3.2. YXZ1000R ECU Header to CAN Device wiring

The following points should be noted when using the CAN Bus:

- CAN Bus High and Low are differential signals, so twisted pair **MUST** be used. Failing to do so will compromise the entire CAN Bus System. It is recommended to twist the CAN wire pairs at a minimum one twist per 40mm of cable.
- In some extreme environments, shielded twisted pair may be required to help with reliability and data integrity.
- The less connectors in any transmission system the better. Unnecessary connectors are almost guaranteed to present an impedance discontinuity and hence may cause reflections and data loss.
- CAN Bus termination must be done correctly by using a 120 ohm 0.25W resistor at each END of the bus system. See the example in Figure 3.1.
- Maximum Stub length to a device from the main Bus is recommended at 0.3m, in accordance with High-Speed ISO 11898 Standard specification. See Figure 3.2.

ALL Emtron CAN devices do **not** include an on-board CAN termination resistor, allowing the device to be wired at any position on the Bus. CAN Bus termination must be done correctly by using a 120 ohm 0.25W resistor at each end of the bus system as mentioned above. Figure 3.1. CAN Bus Wiring

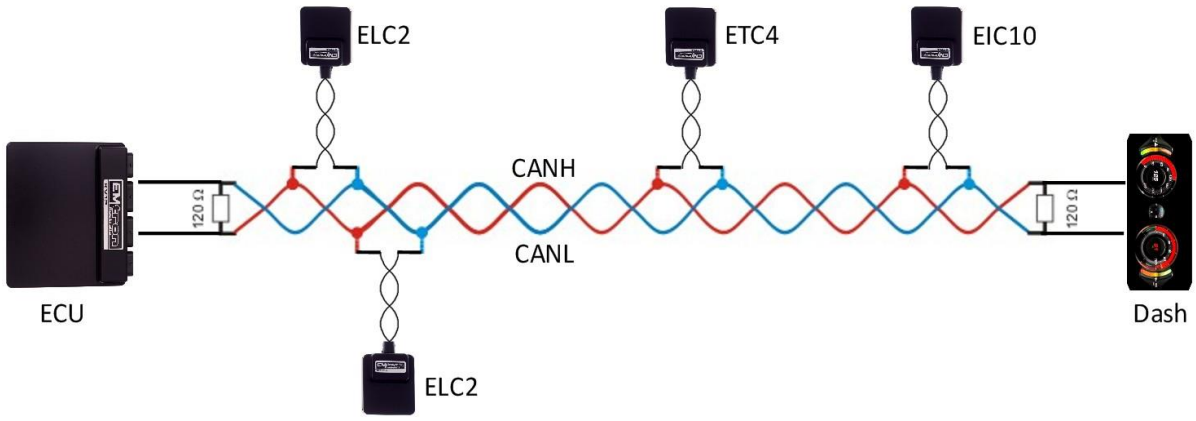


Figure 3.1. Example. ECU and Dash at each end with 120 Ohm Termination

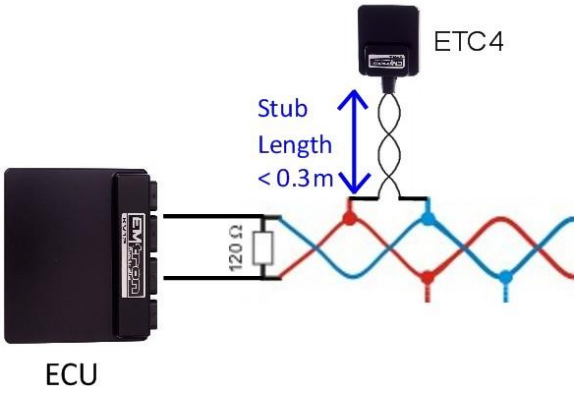


Figure 3.2. CAN Bus Wiring Example. Stub Length less than 0.3m

5.1a Emtron CAN Gauge specific wiring

Name	YXZ1000R ECU Header Pin	CAN Gauge Wire Colour
Ground	Pin A1/2 - ECU Ground – (Splice)	Black
CAN 2 Lo	Pin B19 - Pinned Directly or add to CAN Bus 2	Green
CAN 2 Hi	Pin B13 - Pinned Directly or add to CAN Bus 2	White
Power 14V	Pin B1 - 14V - (Splice)	Red
Illumination 14V	N/A - Splice to Headlamp Switch	Orange

Figure 3.3.

For more information regarding the Emtron CAN Gauge please visit
https://emtron.world/download/5155/

5.2 Sensor Wiring

5V VRef2 Sensor Supply Pin (Pin B7 of ECU Header)

This is a 250mA 5V output designed to supply automotive sensors.

Sensor 0V Reference Pin (Pin B16 of ECU Header)

This pin should be connected directly to the 0V (Ground) pin on any low current analog sensor, for example Pressure or Temperature.

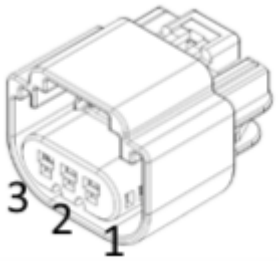
- **DO NOT** connect the 0V Reference pin directly to the Engine Block or ECU Ground. This is a dedicated and specialised 0V/ground output for analog sensors.
- **DO NOT** connect frequency-based sensor grounds to the 0V Reference pin; for example, an Ethanol content sensor. Use Pin A1 or A2 in the ECU Header.

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5.3 Ethanol Content Sensor wiring

An Ethanol Content sensor can be wired into the ECU using the Expansion port. The following channel assignment is recommended for the GM sensor:

GM Sensor Pinout	YXZ1000R Plugin ECU Pin	Description
Pin 1	Pin B1 - 14V	Supply - 14V
Pin 2	Pin A1/2 - ECU Ground	Ground
Pin 3	Pin B30 - DI 4	Output. Temperature and Ethanol Content

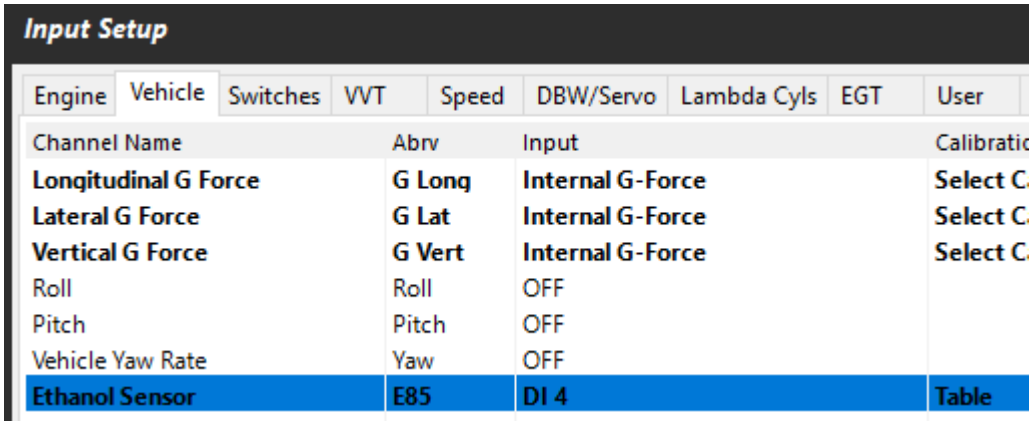


NOTE:

- **DO NOT** connect the Ethanol Content sensor ground to the "Analog Sensor 0V Reference". Splice into the ECU Ground from Pin A1 or A2.
- The Ethanol sensor produces a frequency based output. Suitable ECU channels are DI 1-8.

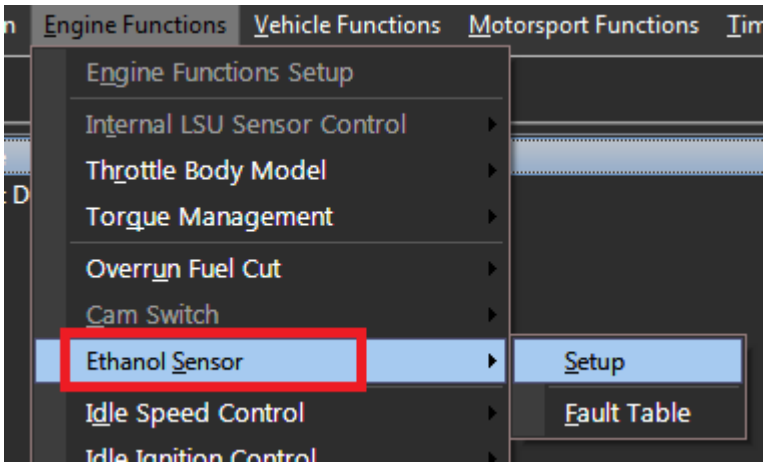
Description	Calibration
Ethanol Content (%)	50Hz = 0% Ethanol 150Hz = 100% Ethanol
Fuel Temperature	1ms = -40 DegC 5ms = 125 DegC

To Config the ECU for this sensor, select the Ethanol Sensor Input Source to DI 4. The ECU will automatically decode the Ethanol Content and Fuel Temperature.



Once the Ethanol Senor has been assigned an input, more settings become available in the Tuning View -> Engine Functions menu.

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6.0 Communications

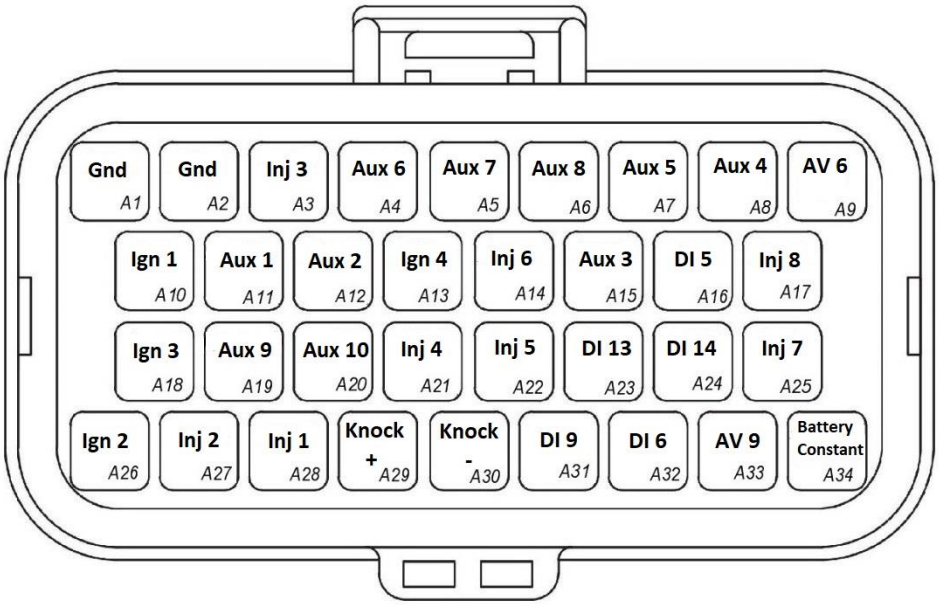
- 1x High Speed Ethernet 100Mbps for tuning software connection
- 2x CAN 2.0B 1Mbps/ 6 Channels per node, total 128 messages

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7.0 YXZ1000R Pinout

Connector A: Injection/Ignition/Auxiliary Outputs

(15.0A Max continuous current - wire gauge dependant)



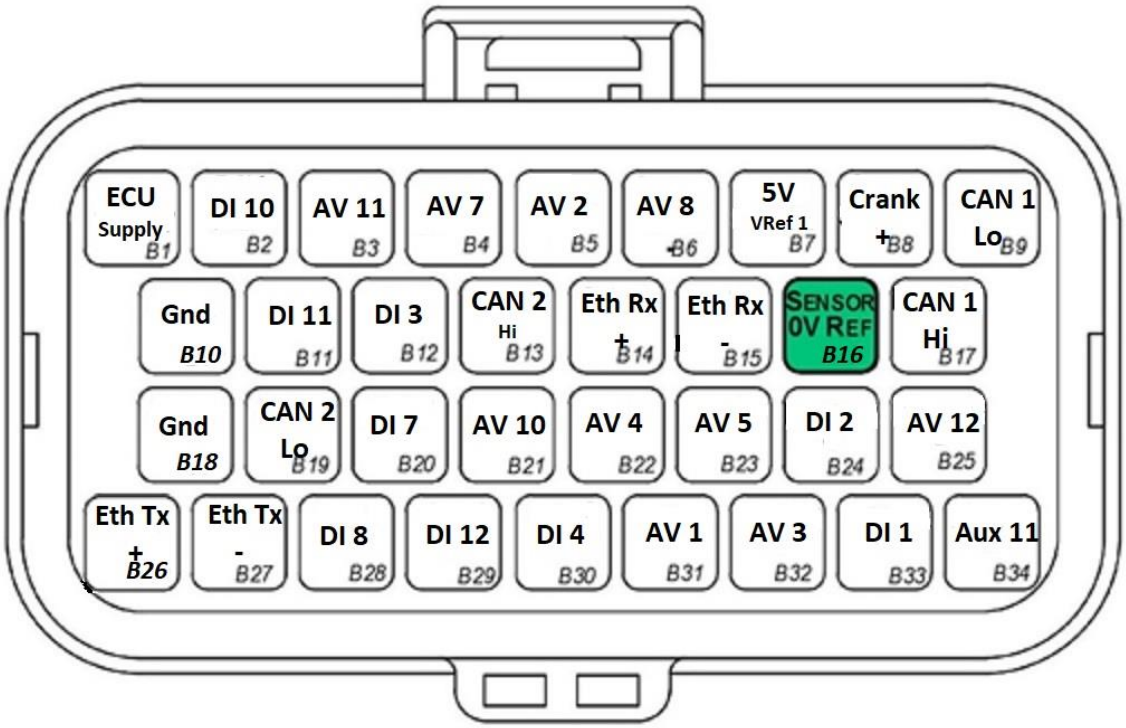
Looking into ECU connector

Pin	OEM	Channel Name	Pin	OEM	Channel Name
A1	**35**	Power System Ground 1	**A18**	**52**	Ignition Coil Cyl 3
A2	**36**	Power System Ground 1	**A19**	**53**	Emtron User Output (e.g. DBW +)
A3	**37**	Primary Injector Cyl 3	**A20**	**54**	Emtron User Output (e.g. DBW -)
A4	**38**	Idle Stepper – W2 - A	**A21**	**55**	Fuel Pump 1
A5	**39**	Idle Stepper – W1 - B	**A22**	**54**	Radiator Fan Relay 1
A6	**40**	Idle Stepper – W2 - B	**A23**	**57**	Hand Brake Switch
A7	**41**	Idle Stepper – W1 - A	**A24**	**58**	Brake Switch 1
A8	**42**	PVC Solenoid Output (**Paddle ONLY)**	**A25**	**59**	Starter Relay Control
A9	**43**	Emtron User Input	**A26**	**60**	Ignition Coil Cyl 2
A10	**44**	Ignition Coil Cyl 1	**A27**	**61**	Primary Injector Cyl 2
A11	**45**	YXZ Differential Lock Relay 1	**A28**	**62**	Primary Injector Cyl 1
A12	**46**	YXZ Differential Lock Relay 2	**A29**	**63**	Emtron Knock 1+ Input
A13	**47**	Seat Belt Pilot Lamp	**A30**	**64**	Emtron Knock 1- Input
A14	**48**	User Output 3 - Parking Brake Buzzer	**A31**	**65**	Differential Servo Position 3
A15	**49**	Tacho - (Drive for EPS /Trans)	**A32**	**66**	Clutch Switch (**Non-paddle ONLY)**
A16	**50**	Start/Stop Switch	**A33**	**67**	Trans ECU Current Feedback/ Emtron User Input
A17	**51**	User Output 2 - Air Induction Relay	**A34**	**68**	Battery Constant Voltage

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Connector: B Signal/Power/Communications/Triggers/Knock

(15.0A Max continuous current - wire gauge dependant)



Looking into ECU connector

Pin	OEM	Channel Name	Pin	OEM	Channel Name
B1	**1**	ECU 14V Supply	**B18**	**18**	Control System Ground 2
B2	**2**	YXZ Differential Switch 12	**B19**	**19**	Emtron CAN 2 Low
B3	**3**	YXZ Differential Lock Rotary Switch 1	**B20**	**20**	YXZ Differential Servo Position 1
B4	**4**	Engine Temperature	**B21**	**21**	Neutral Switch
B5	**5**	Manifold Pressure – Bank 1 (Cyl 1)	**B22**	**22**	Gear Position Sensor **(Non-paddle)**
B6	**6**	Inlet Air Temp	**B23**	**23**	Lean Angle Sensor
B7	**7**	Sensor 5V Power Source	**B24**	**24**	Speed Sensor
B8	**8**	Crank Position Sensor	**B25**	**25**	YXZ Differential Lock Rotary Switch 2
B9	**9**	CAN Bus Low (OEM)	**B26**	**26**	Emtron Ethernet Tx +
B10	**10**	Control System Ground 1	**B27**	**27**	Emtron Ethernet Tx -
B11	**11**	YXZ Differential Switch 1	**B28**	**28**	YXZ Differential Servo Position 2
B12	**12**	Battery Voltage Monitor	**B29**	**29**	YXZ Seat Belt Switch
B13	**13**	Emtron CAN 2 High	**B30**	**30**	User DI (Ethanol/Switch/Analog)
B14	**14**	Emtron Ethernet Rx +	**B31**	**31**	Throttle Position 1
B15	**15**	Emtron Ethernet Rx -	**B32**	**32**	Manifold Pressure
B16	**16**	Sensor System Ground	**B33**	**33**	Oil Pressure Switch
B17	**17**	CAN Bus High (OEM)	**B34**	**34**	Fan2 Relay (**Paddle**)

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7.1 Important Notes

Analog Sensor 0V Reference (Pin B16)

This pin should be connected directly to the 0V (Ground) pin on any low current analog sensor, for example Pressure or Temperature.

- **DO NOT** connect the ECU pin B16 directly to the Engine Block or ECU Ground. This is a dedicated and specialised ground output for all analog channels and should be connected directly to the sensor.
- **DO NOT** connect frequency-based sensors to these pins; for example, an Ethanol content sensor. The sensor 0V pin should be connected to the ECU ground.

Replacing the MAP Sensor for Boosted applications.

WARNING: The MAP sensor located on Cylinder 1 is used to synchronise the engine.
Do not replace this MAP sensor with an alternative item. Replacement will result in loss of 720 sync and engine start.

When shifting to a boosted application, the correct MAP sensor to replace is located on cylinder 2.
Input Channel AV3 – Manifold Pressure

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8.0 Software

Emtron's comprehensive Emtune tuning software is used to connect to the ECU.

- Microsoft Windows ™ 7 -10 compatible
- Free licence
- Memory requirements: 0.5GB RAM
- ECU connection using Ethernet, IPV4 protocol
- Tuning and data analysis
- PC and ECU data logging
- Live pause and data playback
- Advanced tuning functions
- Diagnostics
- Oscilloscope display

9.0 Ordering Information

Product	Part Number
Emtron YXZ ECU	1609-252426
Emtron Ethernet Tuning Cable (1.5m)	553-15
Emtron Communications Cable, Superseal to Emtron Connector 200mm	533-02

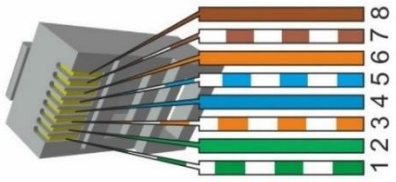
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Appendix A – YXZ1000R Series Ethernet Wiring – A26



Emtron Ethernet Pinout

RJ45 Pin	Emtron Pin	Description	Wire Colour / Cat 5e Standard
1	B26	Ethernet Tx +	white/green
2	B27	Ethernet Tx -	green
3	B14	Ethernet Rx +	white/orange
6	B15	Ethernet Rx -	orange



Title: YXZ1000R Series Ethernet Wiring – A26

Date: 19/04/2021 | **Revision: 1.1** | **Drawing Number: A26**

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