Professional Electronics
for Automotive and Motorsport

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F90RX ECU
Datasheet

The F90RX ECU has been introduced to allow easy and cost effective control for challenging applications with high pin count and up to 12 fully sequential cylinders.

This twin processor unit uses a high-speed RISC processor for code execution and an additional large FPGA for high-speed engine position tracking, allowing the scheduling of code to be independent of signal patterns, increasing flexibility, efficiency and accuracy under transient conditions. This powerful combination also allows advanced control algorithms but yet easy to map for the end user.

The F90RX is designed to control complex engines including, turbocharged, supercharged, twin drive by wire, quad cam, quad vvt, vtec, gdi, gearbox, differential and much more! The unique crank and cam sync logger allow the flexibility of controlling the most awkward trigger patterns capable of running all current known patterns and even future OEM timing wheels.

This powerful hardware is packaged within a lightweight CNC billet aluminium case. Designed to be installed in the harshest of motorsport environments.

10/09/2021 v2.1

Processing:

- Powerful RISC CPU for advanced strategy execution
- Custom synchronous FPGA processor for engine position tracking up to 25,000rpm

Outputs:

- 50 user configurable general purpose Pulse Width Modulated power outputs, including:
- 12 ignition coil outputs IGBT or TTL (software configurable)
- 24 general PWM/Fuel injector outputs
- 8 additional general PWM outputs pin shared with 8 analogue inputs (software configurable)
- 3 full bridges also configurable as 6 half bridges or 6 PWMs

Inputs:

- 28 user configurable general purpose analogue sensor inputs, including 16 bipolar, inductive or hall effect speed / engine position inputs
- 8 additional analogue inputs pin shared with general PWM outputs (software configurable)
- 8 dedicated inputs, including:
- 4 acoustic knock sensor inputs
- 2 wideband (NTK) lambda sensor interface
- 2 K-type thermocouple sensor interfaces

Interfaces:

- 100 MHz full duplex Ethernet for calibration, configuration and data download
- 3 CAN 2.0B interfaces for communication with other controllers or logging systems
- RS232 serial interface for communication with other controllers or logging systems

Memory:

- 128MB battery backed internal logging memory
- Ultra-Fast data download via Ethernet
- Time/Date stamped data via real time clock

Power Supply:

- 6V to 32V input voltage range with reverse polarity protection
- 2 regulated 5V sensor supply output with individual short circuit protection
- Software configurable (5V to 12V) sensor supply output (e.g. for 10V load cells)
- 5 Separately protected sensor and communication ground input

Physical:

- Twin split sealed connector with a total of 121 pins
- CNC machined sealed anodised aluminium case
- Maximum dimensions, including the connector, are 178mm x 161mm x 41mm
- Max operating temperature 85°C
- Total mass 670 grams

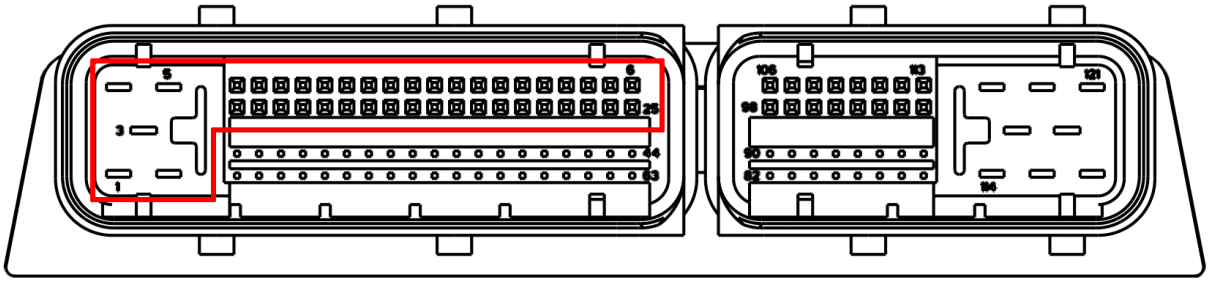
Available Upgrade Features:

- Adaptive Knock Control
- Diesel Control
- Direct Injection Pump Control
- Direct Motor Control
- Gearbox Control
- Traction Control
- Custom Security

Ordering Information:

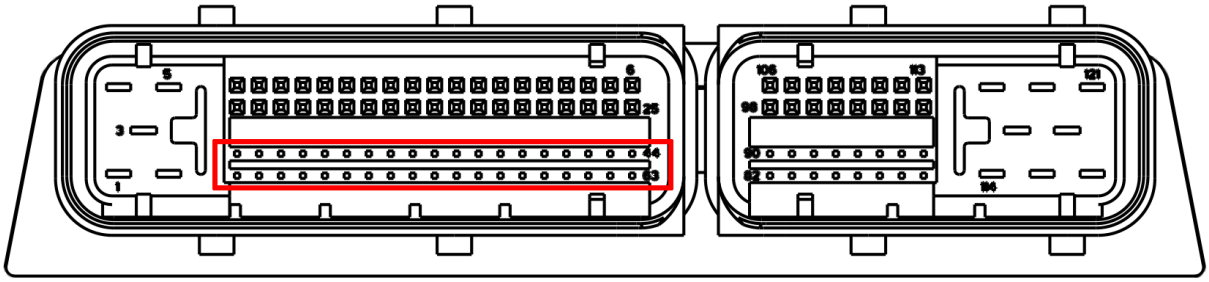
Description	Part number
F90RX ECU	ECU-B01
121Way Connector Kit	CON-B02
Adaptive Knock Control	ECU-FEAT-K
Diesel Control	ECU-FEAT-D
Direct Injection Pump Control	ECU-FEAT-I
Direct Motor Control	ECU-FEAT-E
Gearbox Control	ECU-FEAT-G
Traction Control	ECU-FEAT-T

Wiring Information:



View looking into the 121 way connector highlighting pins 1-43 in red

Pin	Gauge	Signal Name	Signal Notes
1	18-20AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible
2	18-20AWG	IGNITION #01	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
3	18-20AWG	IGNITION #02	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
4	18-20AWG	IGNITION #03	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
5	18-20AWG	IGNITION #04	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
6	22-24AWG	INPUT #25	Analogue input 0-5V
7	22-24AWG	KNOCK #04[1]	Knock sensor input
8	22-24AWG	KNOCK GROUND[1]	Knock sensor ground
9	22-24AWG	THERMO+ #02	Thermocouple positive [K-Type]
10	22-24AWG	INPUT #21	Thermistor input; analogue 0-5V with fixed 3kΩ pullup to 5V
11	22-24AWG	INPUT #18	Analogue input 0-5V
12	22-24AWG	INPUT #14	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
13	22-24AWG	INPUT #11	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
14	22-24AWG	INPUT #07	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
15	22-24AWG	INPUT #04	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
16	22-24AWG	INPUT #01	Generic input; analogue or frequency; 0-5V, -5V to +5V, 47kΩ (software pullup)
17	22-24AWG	LAMBDA I #01	Lambda current pump [Ip]
18	22-24AWG	CAN LO #02	CAN communication port 120Ω terminated
19	22-24AWG	RS232 TX	RS232 transmit
20	22-24AWG	LAN RX-	Ethernet PC communication port
21	22-24AWG	FUEL #07	Port fuel injector or low-side PWM 10A peak
22	22-24AWG	FUEL #03	Port fuel injector or low-side PWM 10A peak
23	22-24AWG	BATTERY SUPPLY	ECU positive, must be as short as possible
24	22-24AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible
25	22-24AWG	INPUT #26	Analogue input 0-5V
26	22-24AWG	5V OUT #01	Regulated 5V sensor supply rail, maximum current capability of 100mA
27	22-24AWG	KNOCK #01[1]	Knock sensor input
28	22-24AWG	THERMO- #01	Thermocouple negative [K-Type]
29	22-24AWG	INPUT #22	Thermistor input; analogue 0-5V with fixed 3kΩ pullup to 5V
30	22-24AWG	INPUT #19	Analogue input 0-5V
31	22-24AWG	INPUT #15	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
32	22-24AWG	INPUT #12	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
33	22-24AWG	INPUT #08	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
34	22-24AWG	SENSOR GROUND #01	Protected sensor ground
35	22-24AWG	INPUT #02	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
36	22-24AWG	LAMBDA V #01	Lambda voltage signal [Vs]
37	22-24AWG	CAN HI #03	CAN communication port 120Ω terminated
38	22-24AWG	RS232 RX	RS232 receive
39	22-24AWG	LAN RX+	Ethernet PC communication port
40	22-24AWG	FUEL #08	Port fuel injector or low-side PWM 10A peak
41	22-24AWG	FUEL #04	Port fuel injector or low-side PWM 10A peak
42	22-24AWG	BATTERY SUPPLY	ECU positive, must be as short as possible
43	22-24AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible

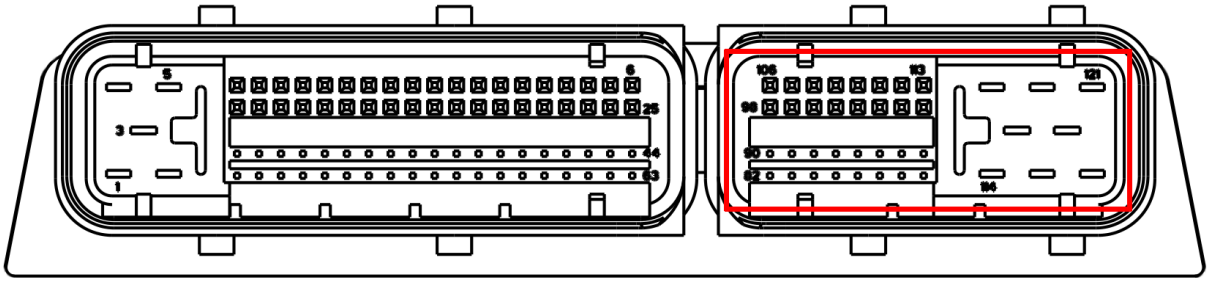


View looking into the 121 way connector highlighting pins 44-81 in red

Pin	Gauge	Signal Name	Signal Notes
44	22-24AWG	INPUT #27	Analogue input 0-5V
45	22-24AWG	5V OUT #02	Regulated 5V sensor supply rail, maximum current capability of 100mA
46	22-24AWG	KNOCK #02[1]	Knock sensor input
47	22-24AWG	THERMO+ #01	Thermocouple positive [K-Type]
48	22-24AWG	INPUT #23	Thermistor input; analogue 0-5V with fixed 3kΩ pullup to 5V
49	22-24AWG	INPUT #20	Analogue input 0-5V
50	22-24AWG	INPUT #16	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
51	22-24AWG	SENSOR GROUND #02	Protected sensor ground
52	22-24AWG	INPUT #09	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
53	22-24AWG	INPUT #05	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
54	22-24AWG	SENSOR GROUND #01	Protected sensor ground
55	22-24AWG	LAMBDA V #02	Lambda voltage signal [Vs]
56	22-24AWG	CAN LO #03	CAN communication port 120Ω terminated
57	22-24AWG	COMMS GROUND	Protected communication ground
58	22-24AWG	CAN HI #01	CAN communication port 120Ω terminated
59	22-24AWG	LAN TX-	Ethernet PC communication port
60	22-24AWG	FUEL #05	Port fuel injector or low-side PWM 10A peak
61	22-24AWG	FUEL #01	Port fuel injector or low-side PWM 10A peak
62	22-24AWG	H-BRIDGE #05	H-bridge, low-side PWM or full bridge[1], 20A peak
63	22-24AWG	INPUT #28	Analogue input 0-5V
64	22-24AWG	10V OUT	Variable voltage supply pin, maximum current capability of 15mA
65	22-24AWG	KNOCK #03[1]	Knock sensor input
66	22-24AWG	THERMO- #02	Thermocouple positive [K-Type]
67	22-24AWG	INPUT #24	Thermistor input; analogue 0-5V with fixed 3kΩ pullup to 5V
68	22-24AWG	SENSOR GROUND #02	Protected sensor ground
69	22-24AWG	INPUT #17	Analogue input 0-5V
70	22-24AWG	INPUT #13	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
71	22-24AWG	INPUT #10	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
72	22-24AWG	INPUT #06	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
73	22-24AWG	INPUT #03	Generic input; analogue or frequency; 0-5V, -5V to +5V, 3kΩ (software pullup)
74	22-24AWG	LAMBDA I #02	Lambda current pump [Ip]
75	22-24AWG	LAMBDA GROUND	Lambda ground [Vs/Ip]
76	22-24AWG	CAN HI #02	CAN communication port 120Ω terminated
77	22-24AWG	CAN LO #01	CAN communication port 120Ω terminated
78	22-24AWG	LAN TX+	Ethernet PC communication port
79	22-24AWG	FUEL #06	Port fuel injector or low-side PWM 10A peak
80	22-24AWG	FUEL #02	Port fuel injector or low-side PWM 10A peak
81	22-24AWG	H-BRIDGE #06	H-bridge, low-side PWM or full bridge[1], 20A peak

Footnotes:

[1]Relevant upgrade feature must be enabled



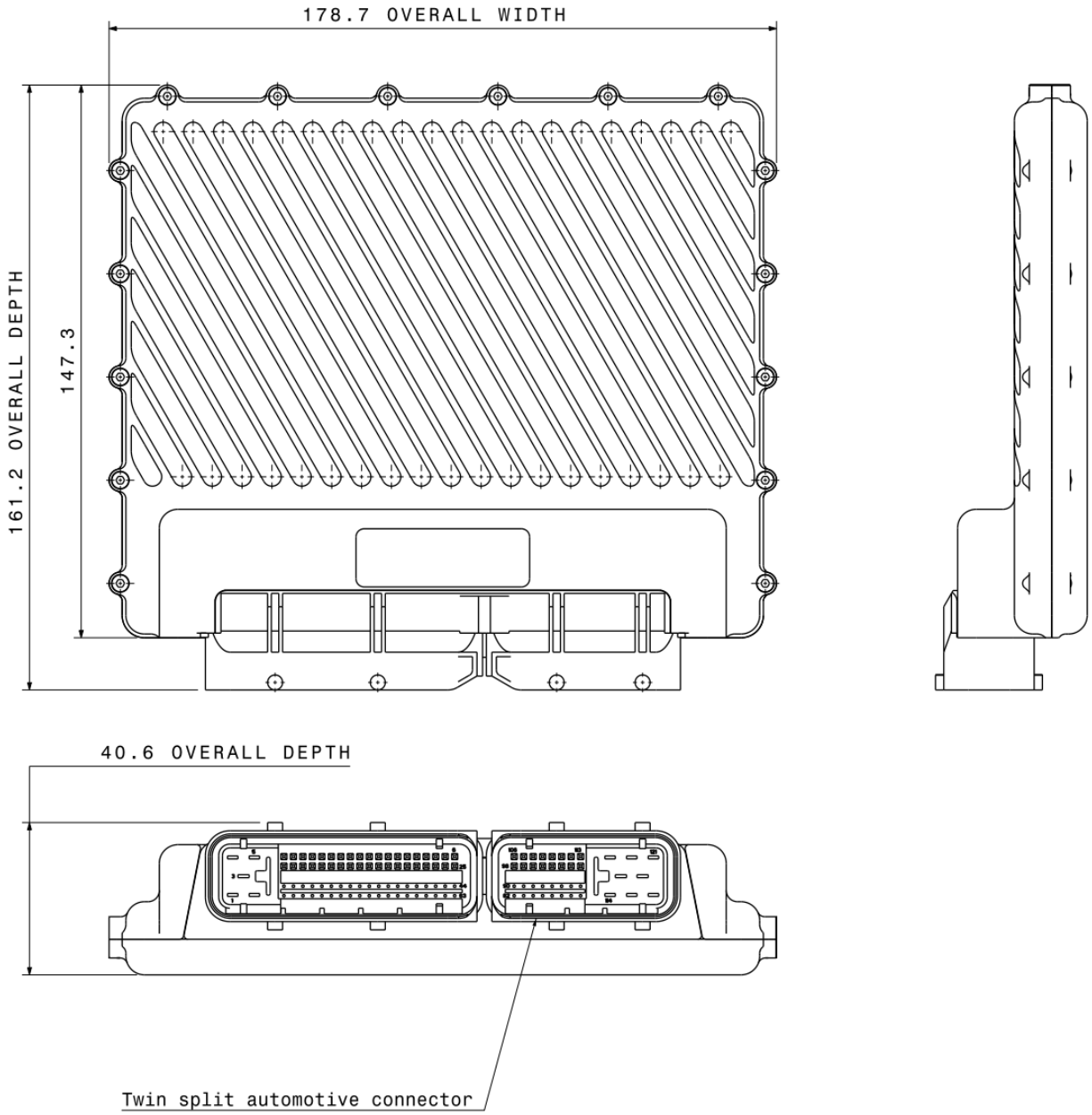
View looking into the 121 way connector highlighting pins 82-121 in red

Pin	Gauge	Signal Name	Signal Notes
82	22-24AWG	H-BRIDGE #01	H-bridge, low-side PWM or full bridge(1), 20A peak
83	22-24AWG	PWM #04 / INPUT #32	low-side PWM 10A or Analogue input 0-5V (software selectable)
84	22-24AWG	PWM #08 / INPUT #36	low-side PWM 10A or Analogue input 0-5V (software selectable)
85	22-24AWG	FUEL #12	Port fuel injector or low-side PWM 10A peak
86	22-24AWG	FUEL #16	Port fuel injector or low-side PWM 10A peak
87	22-24AWG	FUEL #20	Port fuel injector or low-side PWM 10A peak
88	22-24AWG	FUEL #24	Port fuel injector or low-side PWM 10A peak
89	22-24AWG	BATTERY SUPPLY	ECU positive, must be as short as possible
90	22-24AWG	H-BRIDGE #02	H-bridge, low-side PWM or full bridge(1), 20A peak
91	22-24AWG	PWM #03 / INPUT #31	low-side PWM 10A or Analogue input 0-5V (software selectable)
92	22-24AWG	PWM #07 / INPUT #35	low-side PWM 10A or Analogue input 0-5V (software selectable)
93	22-24AWG	FUEL #11	Port fuel injector or low-side PWM 10A peak
94	22-24AWG	FUEL #15	Port fuel injector or low-side PWM 10A peak
95	22-24AWG	FUEL #19	Port fuel injector or low-side PWM 10A peak
96	22-24AWG	FUEL #23	Port fuel injector or low-side PWM 10A peak
97	22-24AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible
98	22-24AWG	H-BRIDGE #03	H-bridge, low-side PWM or full bridge(1), 20A peak
99	22-24AWG	PWM #02 / INPUT #30	low-side PWM 10A or Analogue input 0-5V (software selectable)
100	22-24AWG	PWM #06 / INPUT #34	low-side PWM 10A or Analogue input 0-5V (software selectable)
101	22-24AWG	FUEL #10	Port fuel injector or low-side PWM 10A peak
102	22-24AWG	FUEL #14	Port fuel injector or low-side PWM 10A peak
103	22-24AWG	FUEL #18	Port fuel injector or low-side PWM 10A peak
104	22-24AWG	FUEL #22	Port fuel injector or low-side PWM 10A peak
105	22-24AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible
106	22-24AWG	H-BRIDGE #04	H-bridge, low-side PWM or full bridge(1), 20A peak
107	22-24AWG	PWM #01 / INPUT #29	low-side PWM 10A or Analogue input 0-5V (software selectable)
108	22-24AWG	PWM #05 / INPUT #33	low-side PWM 10A or Analogue input 0-5V (software selectable)
109	22-24AWG	FUEL #09	Port fuel injector or low-side PWM 10A peak
110	22-24AWG	FUEL #13	Port fuel injector or low-side PWM 10A peak
111	22-24AWG	FUEL #17	Port fuel injector or low-side PWM 10A peak
112	22-24AWG	FUEL #21	Port fuel injector or low-side PWM 10A peak
113	22-24AWG	POWER GROUND	ECU negative, must be engine ground and as short as possible
114	18-20AWG	IGNITION #05	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
115	18-20AWG	IGNITION #06	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
116	18-20AWG	IGNITION #07	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
117	18-20AWG	IGNITION #08	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
118	18-20AWG	IGNITION #09	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
119	18-20AWG	IGNITION #10	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
120	18-20AWG	IGNITION #11	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM
121	18-20AWG	IGNITION #12	Ignition coil can be “NORMAL” or “TTL” (set via software) or low-side PWM

Footnotes:

(1)Relevant upgrade feature must be enabled

Dimensions:



Warranty and Servicing:

- 1 year limited warranty when used within supplied specification
- Warranty may be extended on an annual basis via a system refurbishment scheme.
- This ECU contains a battery which can be returned to Life Racing for a replacement, a charge may be made for this service.