LifeRacing

Professional Electronics for Automotive and Motorsport
6 Repton Close | Basildon | Essex | SS13 1LE | United Kingdom
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F90F ECU

The **F90F** ECU caters for advanced and challenging applications. The 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 remains easy to calibrate for the end user.

Processing

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

Outputs

52 user configurable general purpose Pulse Width Modulated power outputs, including:
- **12 ignition coil outputs IGBT or TTL (Software configurable)**
- **24 fuel injector outputs**
- **8 general PWM outputs or 8 analogue inputs (Software configurable)**
- **4 full bridges also configurable as 8 half bridges or 8 PWMs**

Inputs

64 user configurable general purpose analogue sensor inputs, including up to 20 bipolar, inductive or hall effect speed / engine position inputs

8 dedicated inputs, including:
- **4 acoustic knock sensor inputs**
- **2 wideband (NTK UEGO) lambda sensor interfaces**
- **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
4 regulated 5V sensor supply outputs with individual short circuit protection
Software configurable (5V to 12V) sensor supply output (eg for 10V load cells)
Unregulated sensor supply output which tracks the ECU supply voltage with nominal 17V clamp
7 separately protected sensor and communication ground inputs

Physical

4 Deutsch Autosport connectors with a total of 191 pins
CNC machined, 'O' ring sealed, black anodised aluminium case
Maximum dimensions including the connectors are 197 x 182 x 44 mm
Operating Temperature -25 to +85°C
Total mass is ~1250 grams

Upgrades

Adaptive Knock Control
Direct Injection Pump Control
Direct Motor Control
Gearbox Control
Traction Control

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F90F ECU Pinout

CONNECTOR 1

Mating Connector: AS616-26SA-HE

PIN	FUNCTION	SOFTWARE I/O ASSIGNMENT
A	POWER GROUND	N/A
B	POWER GROUND	N/A
C	POWER GROUND	N/A
D	POWER GROUND	N/A
E	POWER GROUND	N/A
F	POWER GROUND	N/A
G	POWER GROUND	N/A
H	IGNITION #01	IGNITION #01
J	IGNITION #02	IGNITION #02
K	IGNITION #03	IGNITION #03
L	IGNITION #04	IGNITION #04
M	IGNITION #05	IGNITION #05
N	IGNITION #06	IGNITION #06
P	IGNITION #07	IGNITION #07
R	IGNITION #08	IGNITION #08
S	IGNITION #09	IGNITION #09
T	IGNITION #10	IGNITION #10
U	IGNITION #11	IGNITION #11
V	IGNITION #12	IGNITION #12
W	BATTERY SUPPLY	N/A
X	BATTERY SUPPLY	N/A
Y	BATTERY SUPPLY	N/A
Z	BATTERY SUPPLY	N/A
a	BATTERY SUPPLY	N/A
b	BATTERY SUPPLY	N/A
c	BATTERY SUPPLY	N/A

FOOTNOTES:

(1) INPUT in TH mode utilises a 47K pull-up, all other TH inputs utilise a 3K pull-up
(2) Variable voltage supply pin - maximum current capability of 15mA
(3) LR internal use or custom projects only
(4) Optional connection required for advanced firmware programming
(5) "Adaptive Knock Control" upgrade required for use otherwise DO NOT CONNECT
(6) Recommended connection for cam phase sensor
(7) Recommended connection for crank position sensor

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F90F ECU Pinout

CONNECTOR 2

Mating Connector: AS616-35SN-HE

PIN	FUNCTION	SOFTWARE I/O ASSIGNMENT
1	5V OUT #01	N/A
2	5V OUT #02	N/A
3	10V OUT [2]	N/A
4	12V OUT	N/A
5	LAN TX -	N/A
6	LAN TX +	N/A
7	LAN RX -	N/A
8	LAN RX +	N/A
9	CAN LO #01	N/A
10	CAN HI #01	N/A
11	LAMBDA V #01	LAMBDA V #01
12	LAMBDA I #01	N/A
13	LAMBDA GROUND	N/A
14	LAMBDA V #02	LAMBDA V #02
15	LAMBDA I #02	N/A
16	THERMO + #01	THERMO + #01
17	THERMO - #01	N/A
18	THERMO + #02	THERMO + #02
19	THERMO - #02	N/A
20	INPUT #01 (5V/TH/BI/FREQ) [1]	AN #01 (GEN)
21	INPUT #02 (5V/TH/BI/FREQ)	AN #02 (GEN)
22	SENSOR GROUND #01	N/A
23	INPUT #03 (5V/TH/BI/FREQ)	AN #03 (GEN)
24	INPUT #04 (5V/TH/BI/FREQ)	AN #04 (GEN)
25	SENSOR GROUND #02	N/A
26	INPUT #05 (5V/TH/BI/FREQ)	AN #05 (GEN)
27	INPUT #06 (5V/TH/BI/FREQ)	AN #06 (GEN)
28	SENSOR GROUND #01	N/A
29	INPUT #07 (5V/TH/BI/FREQ)	AN #07 (GEN)
30	INPUT #08 (5V/TH/BI/FREQ)	AN #08 (GEN)
31	SENSOR GROUND #02	N/A
32	INPUT #09 (5V/TH/BI/FREQ)	AN #09 (GEN)
33	INPUT #10 (5V/TH/BI/FREQ)	AN #10 (GEN)
34	SENSOR GROUND #01	N/A
35	INPUT #11 (5V/TH/BI/FREQ)	AN #11 (GEN)
36	INPUT #12 (5V/TH/BI/FREQ)	AN #12 (GEN)
37	SENSOR GROUND #02	N/A
38	INPUT #13 (5V/TH/BI/FREQ) [6]	AN #13 (GEN)
39	INPUT #14 (5V/TH/BI/FREQ) [7]	AN #14 (GEN)
40	CRANK/CAM GROUND	N/A
41	INPUT #15 (5V/TH/BI/FREQ)	AN #15 (GEN)
42	INPUT #16 (5V/TH/BI/FREQ)	AN #16 (GEN)
43	SENSOR GROUND #02	N/A
44	INPUT #17 (5V)	AN #17 (5V)
45	INPUT #18 (5V)	AN #18 (5V)
46	SENSOR GROUND #01	N/A
47	INPUT #19 (5V)	AN #19 (5V)
48	INPUT #20 (5V)	AN #20 (5V)
49	SENSOR GROUND #02	N/A
50	INPUT #21 (TH)	AN #21 (TH)
51	INPUT #22 (TH)	AN #22 (TH)
52	SENSOR GROUND #01	N/A
53	INPUT #23 (TH)	AN #23 (TH)
54	INPUT #24 (TH)	AN #24 (TH)
55	SENSOR GROUND #02	N/A

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CONNECTOR 3

Mating Connector: AS616-35SB-HE

PIN	FUNCTION	SOFTWARE I/O ASSIGNMENT
1	5V OUT #03	N/A
2	5V OUT #04	N/A
3	CAN LO #03 (3)	N/A
4	CAN HI #03 (3)	N/A
5	INPUT #25 (5V/TH) (1)	SLAVE1 AN #01
6	INPUT #26 (5V/TH)	SLAVE1 AN #02
7	SENSOR GROUND #03	N/A
8	INPUT #27 (5V/TH)	SLAVE1 AN #03
9	INPUT #28 (5V/TH)	SLAVE1 AN #04
10	SENSOR GROUND #04	N/A
11	INPUT #29 (5V/TH)	SLAVE1 AN #05
12	INPUT #30 (5V/TH)	SLAVE1 AN #06
13	SENSOR GROUND #03	N/A
14	INPUT #31 (5V/TH)	SLAVE1 AN #07
15	INPUT #32 (5V/TH)	SLAVE1 AN #08
16	SENSOR GROUND #04	N/A
17	INPUT #33 (5V/TH/BI/FREQ)	SLAVE1 AN #09
18	INPUT #34 (5V/TH/BI/FREQ)	SLAVE1 AN #10
19	SENSOR GROUND #03	N/A
20	INPUT #35 (5V/TH/BI/FREQ)	SLAVE1 AN #11
21	INPUT #36 (5V/TH/BI/FREQ)	SLAVE1 AN #12
22	SENSOR GROUND #04	N/A
23	INPUT #37 (5V/TH)	SLAVE1 AN #13
24	INPUT #38 (5V/TH)	SLAVE1 AN #14
25	SENSOR GROUND #03	N/A
26	INPUT #39 (5V/TH)	SLAVE1 AN #15
27	INPUT #40 (5V/TH)	SLAVE1 AN #16
28	SENSOR GROUND #04	N/A
29	INPUT #41 (5V)	SLAVE1 AN #17
30	INPUT #42 (5V)	SLAVE1 AN #18
31	SENSOR GROUND #03	N/A
32	INPUT #43 (5V)	SLAVE1 AN #19
33	INPUT #44 (5V)	SLAVE1 AN #20
34	SENSOR GROUND #04	N/A
35	INPUT #45 (TH)	SLAVE1 AN #21
36	INPUT #46 (TH)	SLAVE1 AN #22
37	SENSOR GROUND #03	N/A
38	KNOCK #01 (5)	KNOCK #01
39	KNOCK #02 (5)	KNOCK #02
40	KNOCK GROUND	N/A
41	KNOCK #03 (5)	KNOCK #03
42	KNOCK #04 (5)	KNOCK #04
43	KNOCK GROUND	N/A
44	DO NOT CONNECT	N/A
45	DO NOT CONNECT	N/A
46	SENSOR GROUND #03	N/A
47	INPUT #47 (TH)	SLAVE1 AN #23
48	INPUT #48 (TH)	SLAVE1 AN #24
49	SENSOR GROUND #03	N/A
50	INPUT #49 (5V)	SLAVE1 LAMBDA V #01
51	INPUT #50 (5V)	SLAVE1 LAMBDA V #02
52	SENSOR GROUND #04	N/A
53	INPUT #51 (5V)	SLAVE1 THERMO+ #01
54	INPUT #52 (5V)	SLAVE1 THERMO+ #02
55	SENSOR GROUND #04	N/A

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CONNECTOR 4

Mating Connector: AS616-35SD-HE

PIN	FUNCTION	SOFTWARE I/O ASSIGNMENT
1	FUEL #01	FUEL #01
2	FUEL #02	FUEL #02
3	FUEL #03	FUEL #03
4	FUEL #04	FUEL #04
5	FUEL #05	FUEL #05
6	FUEL #06	FUEL #06
7	FUEL #07	FUEL #07
8	FUEL #08	FUEL #08
9	FUEL #09	FUEL #09
10	FUEL #10	FUEL #10
11	FUEL #11	FUEL #11
12	FUEL #12	FUEL #12
13	FUEL #13	FUEL #13
14	FUEL #14	FUEL #14
15	FUEL #15	FUEL #15
16	FUEL #16	FUEL #16
17	FUEL #17	FUEL #17
18	FUEL #18	FUEL #18
19	FUEL #19	FUEL #19
20	FUEL #20	FUEL #20
21	FUEL #21	FUEL #21
22	FUEL #22	FUEL #22
23	FUEL #23	FUEL #23
24	FUEL #24	FUEL #24
25	H-BRIDGE #04	H-BRIDGE #04
26	H-BRIDGE #03	H-BRIDGE #03
27	H-BRIDGE #01	H-BRIDGE #01
28	H-BRIDGE #02	H-BRIDGE #02
29	H-BRIDGE #08	SLAVE1 OUT #26
30	H-BRIDGE #07	SLAVE1 OUT #25
31	H-BRIDGE #05	H-BRIDGE #05
32	H-BRIDGE #06	H-BRIDGE #06
33	PWM #01 / INPUT #57 (5V)	PWM #01 / INPUT #29 (5V)
34	PWM #02 / INPUT #58 (5V)	PWM #02 / INPUT #30 (5V)
35	PWM #03 / INPUT #59 (5V)	PWM #03 / INPUT #31 (5V)
36	PWM #04 / INPUT #60 (5V)	PWM #04 / INPUT #32 (5V)
37	PWM #05 / INPUT #61 (5V)	PWM #05 / INPUT #33 (5V)
38	PWM #06 / INPUT #62 (5V)	PWM #06 / INPUT #34 (5V)
39	PWM #07 / INPUT #63 (5V)	PWM #07 / INPUT #35 (5V)
40	PWM #08 / INPUT #64 (5V)	PWM #08 / INPUT #36 (5V)
41	INPUT #53 (5V)	INPUT #25 (5V)
42	INPUT #54 (5V)	INPUT #26 (5V)
43	INPUT #55 (5V)	INPUT #27 (5V)
44	INPUT #56 (5V)	INPUT #28 (5V)
45	LAN RX + [3]	N/A
46	LAN RX - [3]	N/A
47	LAN TX + [3]	N/A
48	LAN TX - [3]	N/A
49	5V OUT #01	N/A
50	12V OUT	N/A
51	CAN LO#04 [3]	N/A
52	CAN HI#04 [3]	N/A
53	RS232 TX #01	N/A
54	SENSOR GROUND #01	N/A
55	RS232 RX #01	N/A

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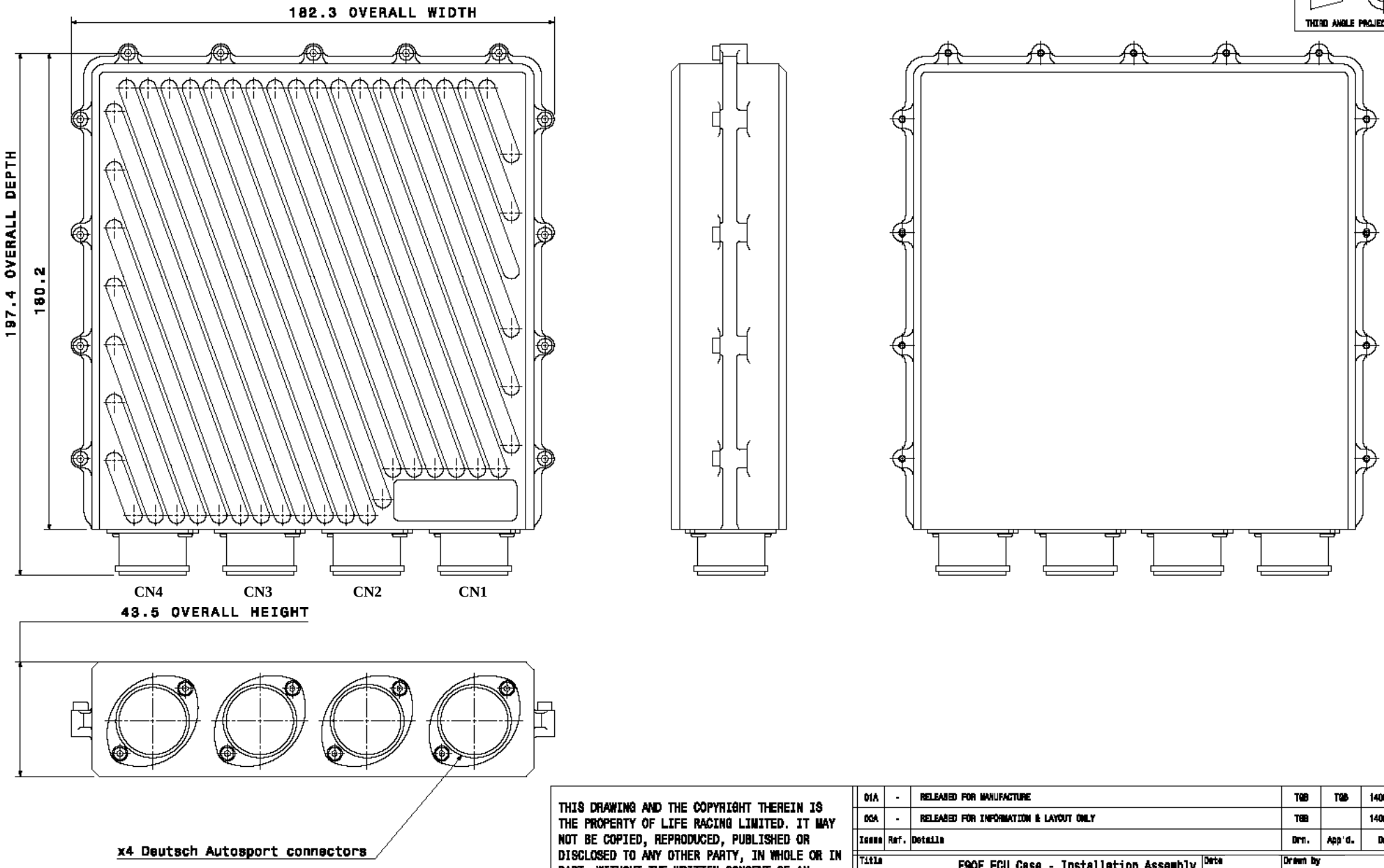
LFR-321-01A



THIRD ANGLE PROJECTION

GENERAL TOLERANCES:	
LINEAR AND RADIAL	0.50 ±0.05 0.5 ±0.2 0 ±0.5
ANGULAR	±1°

NOTES: UNLESS OTHERWISE STATED

1. ALL DIMENSIONS ARE IN MILLIMETRES (mm)
2. THREADS: ISO COARSE TO CLASS 6H/6g U.O.S
3. GENERAL FINISH $\sqrt{}$ REMOVE BURRS & LIGHTLY BREAK SHARP EDGES
4. DO NOT SCALE

Issue	Ref.	Details	Drn.	App'd.	Date
01A	-	RELEASED FOR MANUFACTURE	TGB	TGB	14062013
00A	-	RELEASED FOR INFORMATION & LAYOUT ONLY	TGB		14062013

Title	F90F ECU Case - Installation Assembly	Date	Drawn by
Dwg. No.	LFR-321-01A		
Matl.	N/A		
Heat Treat.	N/A		
Surface Finish	N/A		
Scale 1:1	Size A2	Sheet 1 of 1	Qty per Assy 1

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