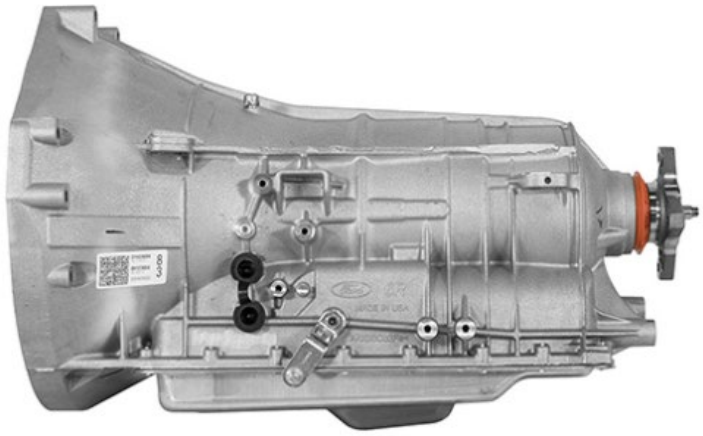
6R80 TRANSMISSION PACKAGE



MoTeC has developed a general-purpose firmware ("Package") that provides integrated engine and transmission control of powertrains comprised of any engine mated to the Ford 6R80 automatic transmission. The 6R80 Transmission Package provides standalone transmission control that can be paired with any engine controller capable of either CAN based communications or decoding digital output signals.

An M130 ECU along with the RaceGrade 6 Channel current sensor are all that are required. The MoTeC M130 ECU provides the flexibility and power to complete your transmission swap with confidence knowing you have a robust controller in command of your transmission.

KIT CONTENTS (RG.KT.PV0211.01)

- **Hardware**
  - **M130 –** M130 ECU
  - **RG.DV.PV0170.01 –** RaceGrade 6 Channel Current Sensor
  - **M 12-1121K –** 6R80 Transmission Connector Kit
  - **M800 ECU CONN –** M130 ECU Connector Kit
  - **DT-12SK and DT-4SK –** RaceGrade 6 Channel Current Sensor Connector Kit
- **Licenses**
  - **23523 –** M1 LIC – MoTeC USA 6R80 TCM

  This license is required to run the 6R80 Transmission control package. This part number is also available separately.

GENERAL TRANSMISSION FEATURES

- Full control of all shift patterns available in the transmission. This includes sequential upshifts, sequential downshifts and skip shift downshifts. Several unique to MoTeC shift patterns are also provided. Refer to the sample base file for a full list of shift patterns.
- User selectable shifting schedules for Drive and SelectShift "Sport" mode switchable with driver switches or OE shifter.
- Manual shift scheduling available via two driver switches (up/down paddles).
- One-way clutch control.
- Closed loop torque converter lockup control targeting torque converter slip. Standard and Power On modes.
- Torque converter apply/release rates.
- Torque converter control adaptation.
- Torque converter lockup schedules.
- Line pressure control for steady state operation as well as each available shift pattern – including special conditions such as one-way clutch control.
- Line pressure apply/release rates.
- Adjustable calibration of Turbine Speed and Output Shaft Speed inputs, allowing for utmost accuracy of these critical speeds on a case per case basis.
- Drag race creep function using closed loop transmission brake control to allow precise entry into staging lights
- User accessible calibration of factory Shift Selector reported position to ensure accurate command of the system

- User defined transmission protection that allows forcing the transmission into neutral or activation of a warning light when parameters are met.
- Adjustable current control profiles for each transmission control element, including line pressure and torque converter.
- Adjustable shift element periodic prime pressures as well as steady state hold pressures.
- Dyno mode – settings to shift up to and hold a specific gear for dyno testing.
- Start in Second – ability to indicate when the driver wishes to start in second gear via a user defined input
- Anti-Flare logic to catch transmission flares to help prevent them from damaging transmission components.
- Shift inhibit function that will hold the current gear during rapid driver throttle lift off.
- Power Management – torque reduction tuning for each available shift pattern, as well as torque reduction and reintroduction rates to protect the transmission and adjust shift feel.
- Turbine Speed Matching – "throttle blipping" to ensure downshifts completely smoothly and accurately without dragging of the oncoming clutch during power off downshifts.
- Torque Limits – used to limit engine power when engaging Drive/Reverse or executing any downshift.
- Closed loop PID control during the clutch to clutch phase of all upshifts, including the turbine speed pull down phase.
- Closed loop PID control on all downshifts to control the turbine speed trajectory.
- Sequential downshifting management to ensure proper holding pressure is applied to the outgoing element on rapid downshifts.
- Gear Minimum – ability to indicate that the transmission should never shift below second gear.
- Gear Maximum – ability to indicate the maximum gear in the transmission.
- Automatic shift scheduling during coastdown (rapid deceleration).
- Predictive shift scheduling of upshifts based on vehicle acceleration rate.
- Adaptive – "learning" to allow some adjustability for flares/binding as transmission ages.

TRANSMISSION UPSHIFT CONTROL

These are the features available for tuning each upshift on the transmission.

- Oncoming element base pressure.
- Oncoming element boost time.
- Oncoming element boost pressure.
- Oncoming element preparation hold time.
- Oncoming element open loop ramp.
- Oncoming element closed loop slip target.
- Oncoming element control time bias.
- Oncoming element pressure capacity increase.
- Outgoing element base pressure.
- Outgoing element rapid pressure decay time.
- Outgoing element open loop ramp.
- Outgoing element closed loop slip target
- Outgoing element control time bias.
- Delay indicating if outgoing or oncoming element needs to be phased relative to the other.
- Torque reduction in normal mode.
- Torque reduction in sport mode.
- Thresholds indicating shift progression and thresholds for power management.

TRANSMISSION DOWNSHIFT CONTROL

These are the features available for tuning each downshift on the transmission.

- Oncoming element base pressure.
- Oncoming element open loop ramp.
- Oncoming element boost time.
- Oncoming element boost pressure.
- Oncoming element nominal preparation hold pressure.
- Oncoming element preparation hold time.
- Outgoing element base pressure.
- Outgoing element open loop ramp.
- Outgoing element rapid pressure decay time.
- Delay indicating if outgoing or oncoming element needs to be phased relative to the other.
- Closed loop downshift turbine speed trajectory over time.
- Torque reduction.
- Thresholds indicating shift progression based on turbine speed trajectory as well as power management.

SAMPLE M130 PINOUT

This is a sample pin out that demonstrates how the 6R80 transmission should be wired to the M130 ECU. M150 ECU is not supported by the Transmission control only package.

M130 Connector A – 34 Way

A1	HB2	Half Bridge Output 2	RaceGrade DT12S Pin 11 - SSB
A2	SEN_5V_A	Sensor 5.0V A	
A3	IGN1	Low Side Ignition 1	
A4	IGN2	Low Side Ignition 2	
A5	IGN3	Low Side Ignition 3	
A6	IGN4	Low Side Ignition 4	
A7	IGN5	Low Side Ignition 5	
A8	IGN6	Low Side Ignition 6	
A9	SEN_5V_B	Sensor 5.0V B	-
A10	NEG1	Battery Negative	Ground
A11	NEG2	Battery Negative	Ground
A12	IGN7	Low Side Ignition 7	
A13	IGN8	Low Side Ignition 8	
A14	AV1	Analogue Voltage Input 1	6R80 Connector Pin 6 (4.7K OHM Pull Up to C2) – Transmission Temp
A15	AV2	Analogue Voltage Input 2	
A16	AV3	Analogue Voltage Input 3	
A17	AV4	Analogue Voltage Input 4	
A18	HB1	Half Bridge Output 1	RaceGrade DT12S Pin 12 - SSA
A19	PH1	Peak Hold Injector 1	
A20	PH2	Peak Hold Injector 2	
A21	PH3	Peak Hold Injector 3	
A22	PH4	Peak Hold Injector 4	
A23	INJ_LS1	Low Side Injector 1	
A24	INJ_LS2	Low Side Injector 2	6R80 Connector Pin 8 - SSE
A25	AV5	Analogue Voltage Input 5	
A26	BAT_POS	Battery Positive	Switched 12V
A27	PH5	Peak Hold Injector 5	
A28	PH6	Peak Hold Injector 6	
A29	PH7	Peak Hold Injector 7	
A30	PH8	Peak Hold Injector 8	
A31	HB3	Half Bridge Output 3	RaceGrade DT12S Pin 10 - SSC
A32	HB4	Half Bridge Output 4	RaceGrade DT12S Pin 9 - SSD
A33	HB5	Half Bridge Output 5	RaceGrade DT12S Pin 8 - TCC
A34	HB6	Half Bridge Output 6	RaceGrade DT12S Pin 7 - LPC

SAMPLE M130 PINOUT

M130 Connector B – 26 Way

B1	UDIG1	Universal Digital Input 1	CRANKSHAFT POSITION
B2	UDIG2	Universal Digital Input 2	
B3	AT1	Analogue Temperature Input 1	
B4	AT2	Analogue Temperature Input 2	
B5	AT3	Analogue Temperature Input 3	
B6	AT4	Analogue Temperature Input 4	
B7	KNOCK1	Knock Input 1	
B8	UDIG3	Universal Digital Input 3	6R80 Connector Pin 1 (TSS)
B9	UDIG4	Universal Digital Input 4	6R80 Connector Pin 15 (OSS)
B10	UDIG5	Universal Digital Input 5	6R80 Connector Pin 4 (Selector)
B11	UDIG6	Universal Digital Input 6	Right Paddle
B12	BAT_BAK	Battery Backup	
B13	KNOCK2	Knock Input 2	
B14	UDIG7	Universal Digital Input 7	Left Paddle
B15	SEN_0V_A	Sensor 0V A	6R80 Connector Pin 5 – Transmission Temp 0V
B16	SEN_0V_B	Sensor 0V B	
B17	CAN_HI	CAN Bus 1 High	RaceGrade DT4S Pin 3
B18	CAN_LO	CAN Bus 1 Low	RaceGrade DT4S Pin 2
B19	SEN_6V3	Sensor 6.3V	
B20	AV6	Analogue Voltage Input 6	
B21	AV7	Analogue Voltage Input 7	
B22	AV8	Analogue Voltage Input 8	
B23	ETH_TX+	Ethernet Transmit+	WHITE/ORANGE
B24	ETH_TX-	Ethernet Transmit-	ORANGE
B25	ETH_RX+	Ethernet Receive+	WHITE/GREEN
B26	ETH_RX-	Ethernet Receive-	GREEN

SAMPLE PINOUT

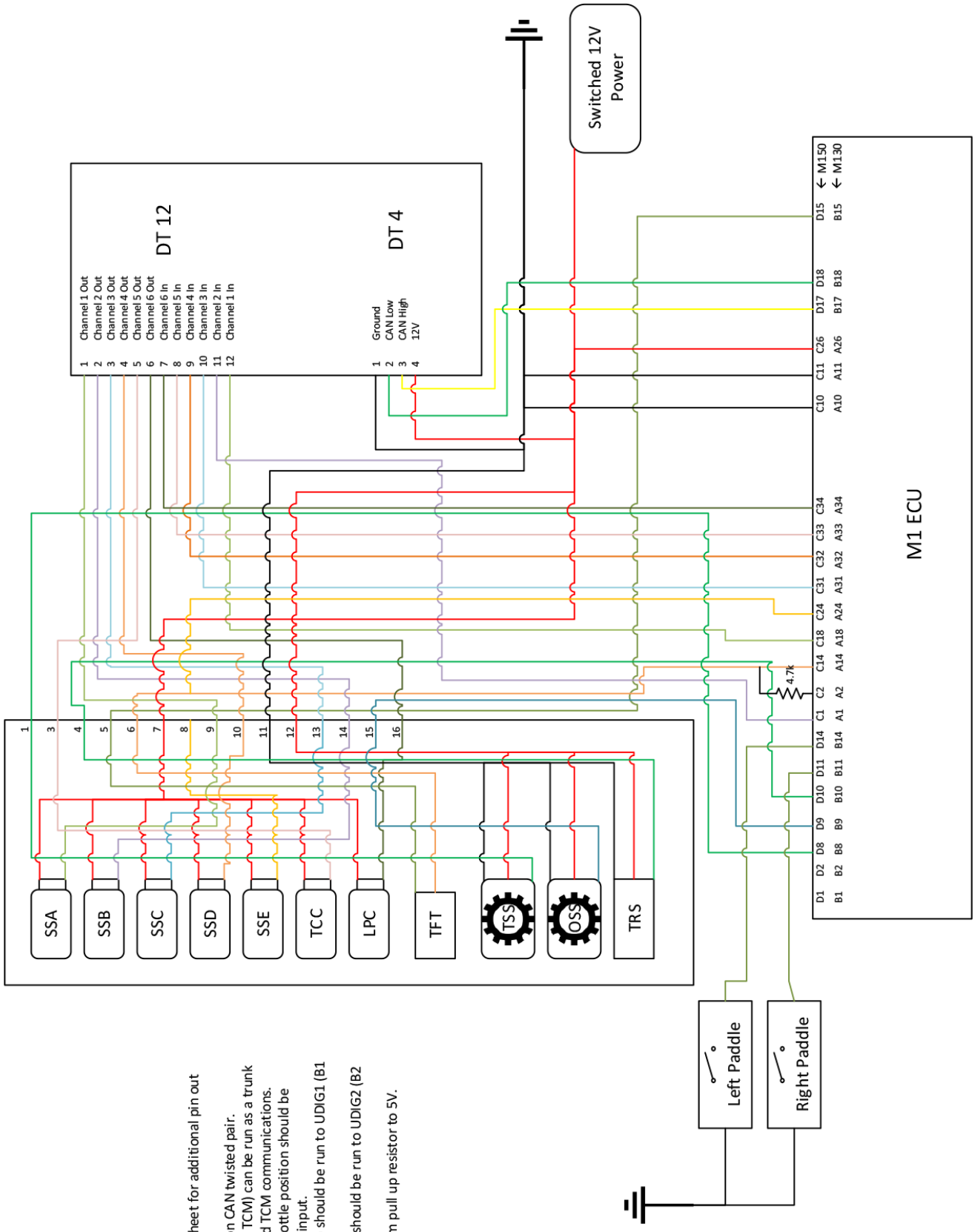
RaceGrade 6 Channel Current Sensor

DT12S

1	Channel 1	Channel 1 Out	6R80 Connector Pin 9 - SSA
2	Channel 2	Channel 2 Out	6R80 Connector Pin 14 - SSB
3	Channel 3	Channel 3 Out	6R80 Connector Pin 13 - SSC
4	Channel 4	Channel 4 Out	6R80 Connector Pin 10 - SSD
5	Channel 5	Channel 5 Out	6R80 Connector Pin 3 - TCC
6	Channel 6	Channel 6 Out	6R80 Connector Pin 16 - LPC
7	Channel 6	Channel 6 In	A34 – LPC
8	Channel 5	Channel 5 In	A33 – TCC
9	Channel 4	Channel 4 In	A32 – SSD
10	Channel 3	Channel 3 In	A31 - SSC
11	Channel 2	Channel 2 In	A1 – SSB
12	Channel 1	Channel 1 In	A18 – SSA

DT4S

1	Ground	Ground	Ground
2	CAN Low	Can Bus Low	M150 D18
3	CAN High	Can Bus High	M150 D17
4	12V	Switched Power	Switched Power



Notes:

- Refer to M130 or M150 datasheet for additional pin out details.
- 120 ohm resistor is required on CAN twisted pair.
- Additional ECU (if using M130 TCM) can be run as a trunk off the CAN Bus for CAN-based TCM communications.
- Additional sensors such as throttle position should be wired to any available Analog input.
- Engine Speed reference (REF) should be run to UDIG1 (B1 on M130).
- Cam sensor reference (SYNC) should be run to UDIG2 (B2 on M130).
- TFT Sensor requires a 4.7k ohm pull up resistor to 5V.