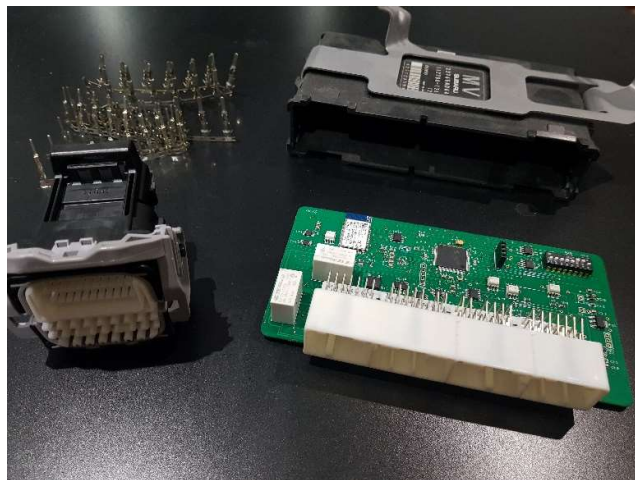


LS-BRZ/86/FRS PnP CANBUS Translator

Overview - Installation and Operating Instructions

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Overview

Canbus is a communications protocol used in late model vehicles to enable the various computers within the vehicle to talk to each other over a twisted pair wire. The Canbus protocol is standard, however the messages that are sent are manufacturer (and sometimes model) specific. The Canbus translator allows engine conversions with different messaging to the original engine management system to integrate into the vehicle by translating the messaging from the new engine to the existing vehicle's messaging system.

The “plug and play” Canbus translator comes from an expansion of the original BRZ/86/FRS Canbus Translator that was introduced in 2016 which concentrated on the basics. To add functions such as cruise control, air conditioning, pushbutton start and reverse lamp control, a lot of extra wiring is needed. All of this extra (and original) wiring exists at the original OEM ECU plugs with no ECU plugged into it. It makes perfect sense to utilise these plugs to directly interface to the translator.

The “plug and play” translator also enables wiring from the GM wiring loom in the engine bay to be passed to the vehicle via the redundant 54pin FA20 Engine plug. The Translator then patched wiring from the plug to the appropriate vehicle wiring or used to the translator. The wiring through the FA20 engine plugs includes the GM power wiring, PCM, fan and AC relay controls. Further details can be found on pages 10-12.

Like the new series of AGT Engineering Canbus Translators and Emulators, the “plug and play” translator comes with Bluetooth connectivity, which allows a live data display through an Android Smartphone or Tablet device. The Bluetooth module can also be used so the user can easily adjust settings, activate a test mode and allow end user upgrading of the device software. The new series of translator also includes throttle pedal analog conversion. You can now keep the original BRZ/86/FRS accelerator pedal. The translator adjusts the standard pedal voltages to the GM pedal voltages.

One of the big advantages of the “plug and play” system is that no wiring modifications are needed to the vehicle to get it to work. Knowledge of the BRZ/86/FRS wiring is not required, and no need to get the wiring installed by an expensive auto electrician. The LS Harness needs just minor modification by cutting off the bulkhead and fusebox connectors from the LS harness, and crimping these cut wires to the 54pin FA20 engine plug as per the wiring guide (this is easiest with the LS harnesses with the two PCM plugs on the engine harness).

Installation

Basic Install

The Canbus translator is installed in the original FA20 ECU plastic enclosure. To install, remove the 4 plugs on the original ECU (located near the passenger A-Pillar under the glovebox). Pry the plastic retaining clips at the side of the enclosure slightly to enable the face plate surrounding the plug receptacle to be removed. Slide out the original ECU circuit board and replace with the translator circuit board. Re-install the unit to the vehicle and reconnect all four plugs.

Hardware Setup

The translator will come pre-set for your application stated at time of order. However, this can be changed if the setup changes.

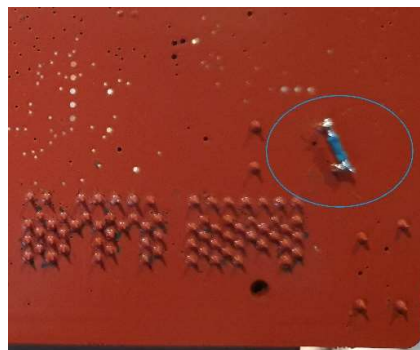
To allow Canbus channel-A (the one used in LS conversions), DIP switches 6 and 7 and must be ON.

To enable the optional OLED screen option (as used in version1 translators), DIP Switch 3 must be ON. If the screen is not present, this should be OFF.

If the BRZ/86/FRS chassis was originally automatic, DIP Switch 4 must be ON. If the chassis was originally manual, DIP Switch 4 must be OFF.



If the vehicle is a conventional key start (non-pushbutton start), the **Starter Cut** relay needs to be wire bridged on the back of the circuit board as shown below. If the vehicle is a pushbutton start model, the wire bridge must be removed.



Wiring of the LS loom to the AC1 FA20 Engine Plug

There are a few different types of LS looms depending on the country, options and year of the vehicle the loom is sourced from. The “Plug and Play” translator has been designed to be used with all types of looms, however the wiring can differ slightly to the AC1 engine plug. Use the following notes and the AC1 wiring table and diagram to help wire the LS loom to the plug.

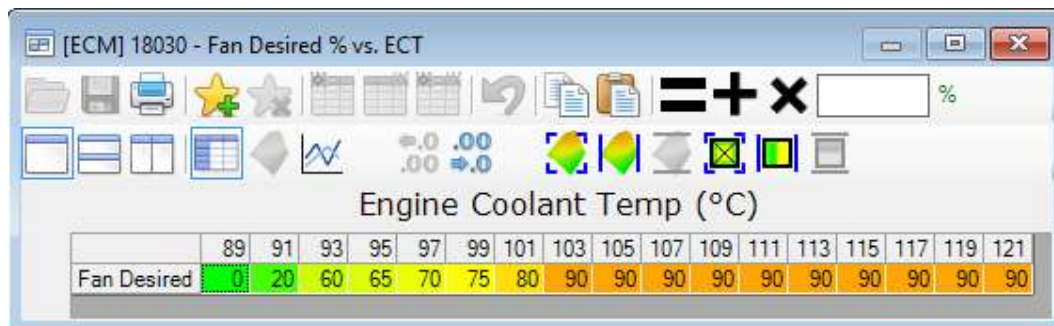
Reverse Lamps – The reverse lamps actually have nothing to do with the LS wiring, A two pin gearbox reverse switch receptacle comes with the translator kit and is used to plug into the plug where the FA20 gearbox reverse switch plugged into. The reverse lamps are activated from a relay within the translator from the reverse lamp signal over Canbus. Pin6 is the IGN Power supply from the 2pin Reverse lamp connector. Pin44 is the switched 12V to the Reverse Lamp.

Radiator Fans – There are two ways to wire up the radiator fans:

If your LS loom has both HI and LOW speed trigger wires, they can be wired into pins 7 and 16 which are then wired to trigger the BRZ/86/FRS radiator fan relays. With this setup, the PCM tune will be configured as **“FAN TYPE – DISCRETE”**

Later LS looms without the radiator fan HI and LOW speed trigger wires run via PWM and these signals are transmitted over Canbus in which case the Translator controls the fan relays. For this setup, the PCM tune will be configured **“FAN TYPE – PWM ELECTRIC”**

WARNING, there is a little flaw in the Canbus messaging from the GM PCM where anything over 90% is transmitted as 0%, which will turn off your fans when they need to be running at maximum. For this to work correctly you must alter the tune so that anything above 90% fans is changed to 90% as shown below. This is only applicable to the PWM fan type.



Oil Pressure Loop – The LS looms do not have an oil pressure warning lamp wire. The oil pressure warning is transmitted on the LS system over Canbus. The BRZ/86/FRZ has a discrete wire to drive the warning lamp. A loop is required between AC1 pins 19 and 22 to allow the Canbus Translator to drive the warning lamp from signals over Canbus.

GM Accelerator Pedal APP1 & APP2– The analog voltages of the BRZ/86/FRS accelerator pedal are not the same as the GM pedal voltages. The Translator reads the voltages of the BRZ/86/FRS pedal and converts them to the correct pedal voltages used by the GM PCM. The accelerator pedal consists of two separate circuits APP1 and APP2 for error/fault detection. It is important that these

are wired correctly, otherwise the GM throttle control will fault and be locked at idle. There is also a 5V power supply and ground (Vref) circuit for both pedal circuits which are all wired to the 54pin plug. Therefore, there are 6 wires that form the pedal circuit. The two power supply circuits are also used to power the BRZ/86/FRS pedal and also the Digital-Analog converters within the translator.

Fuel Pressure/Temp – These are not really required and are optional, the wires may not be present depending on the year/country the LS looms or originated from.

Brake/Clutch Inputs – Needed for Cruise Control. There is one analog clutch input, a discrete brake switch input (0-12V), and sometimes an analog brake input.

Variable Displacement Air Conditioning Compressor – For LS models that include a Variable Displacement Compressor, the displacement control solenoid is to be wired to AC1 pins 38 and 39. For LS engines without the Variable AC Compressor, pins 38 and 39 can be left blank. For both standard clutch, and variable displacement compressors, the AC clutch is controlled via the LS PCM and is wired to control the BRZ/86/FRS clutch relay via pin 24. The power supply to the compressor clutch (after being switched by the relay) returns via pin50 and is wired directly to the AC compressor clutch actuator.

Power Supply Wiring

The LS power supply system had one large PCM relay, controlled by the PCM with several fused feeds from the relay. The BRZ/86/FRS has several smaller relays, with a sperate fuse for each relay. These relays are EFI MAIN1, EFI MAIN2, and the INJ relay. The LS PCM controls these three relays as if it was the PCM relay. It is recommended to wire the Injector/Coil powers (Evan/Odd) to AC1 pins 42 and 4. These are then powered from the INJ Relay. Other feeds to the PCM and other devices can be wired up to the EFI MAIN1/2 Relays.

The ignition sense wire is wired to AC1 pin 47.

The Constant 12V (Backup) power supply is wired to AC1 pin 46.

Ground (Earth) Wiring

The translator is earthed to the engine earth along with the Engine PCM. On the LS loom there are a number of earth points on the engine harness. It is critical that all of these are connected to a good clean earth point on the engine for not only the translator, but the GM PCM to work correctly. Also ensure that a good solid engine earth is run from the battery to the engine block.

Operation

The “Plug and Play” Canbus Translator is designed to provide a full factory OEM experience. Once set up correctly, it should operate as any normal vehicle and give the same indication on the dash just like the original FA20 Engine.

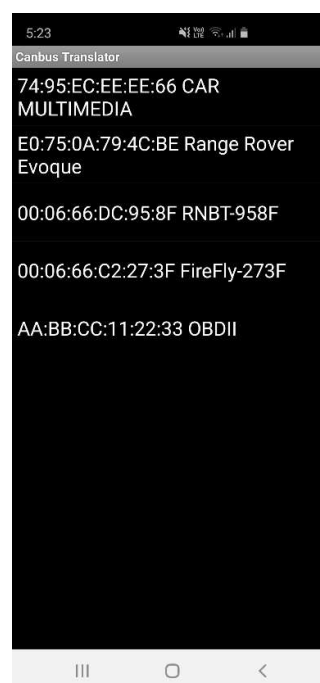
With the ignition ON, The Oil Pressure, Alternator and MIL (Check Engine) lamps should be illuminated. These should extinguish once the engine is running. Cruise control also works as standard with the Cruise and SET lamps showing the status on the dash cluster display.

Bluetooth information App

Download the AGT Engineering LS Canbus Translator App from Google Playstore to enable an android smartphone or tablet to show running data and Input/Output status.

To connect to the translator, the phone/tablet must be first paired with the translator. To pair the translator to your phone, do a bluetooth device scan within 1 minute of turning the ignition on. The translator bluetooth device will be an RNBT-xxxx or FireFly-xxxx. Pair to this device, clicking OK for the default PIN code.

Once paired, open the app and press the Bluetooth symbol on the top left of the screen. Select the RNBT/FireFly device. Some phones/tablets may not connect first go. If it does not connect, just try again. Once connected, the main display will show the main running data of the engine, and Inputs/Outputs to the translator, which can be useful for diagnostic purposes.



Main Status Screen

The main status screen shows the running data of the translator, including main Canbus data, analog input, analog output, digital inputs and digital outputs. This data is good to view the overall workings of the system and particularly useful for fault finding. A log of the data can be taken by simply doing a video screen record from the mobile device. The main screen data can be split into the following sections.

Canbus Data

RPM 658	ENGINE RPM
TEMPERATURE 69°C	ENGINE TEMPERATURE
GMLAN VERSION 2	GMLAN VERSION DETECT (0-NON, 1-GENiii, 2-GENiv)
VEHICLE SPEED 2kmh	GM VEHICLE SPEED
GM TORQUE 8Nm	ENGINE TORQUE ESTIMATED
TORQUE ALLOWED FULL	TORQUE ALLOWED (GOES RED WITH VALUE IF ENABLED)

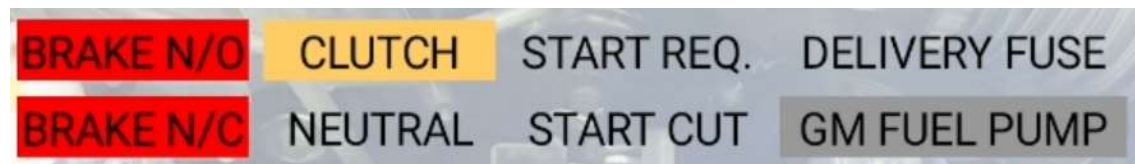
Analog Inputs and Analog Outputs

APP1 IN 1.08V	BRZ/86/FRS ACCELERATOR PEDAL1 VOLTAGE
APP2 IN 1.07V	BRZ/86/FRS ACCELERATOR PEDAL2 VOLTAGE
BATT. CURRENT 3A	BATTERY CURRENT (- DRAW, +CHARGING)
CRUISE SW 5.11V	CRUISE SWITCH VOLTS (~5V NO PRESS, 0V ON/OFF PRESSED)
APP1 OUT 1.00V	ACCELERATOR PEDAL1 OUTPUT TO GM PCM
BRAKE OUT 3.79V	BRAKE PEDAL OUTPUT TO GM PCM
CLUTCH 0.50V OUT	CLUTCH PEDAL OUTPUT TO GM PCM

Engine Running Status (From GM PCM via Canbus) and AC Request (From Climate Control or Body ECU via Canbus)

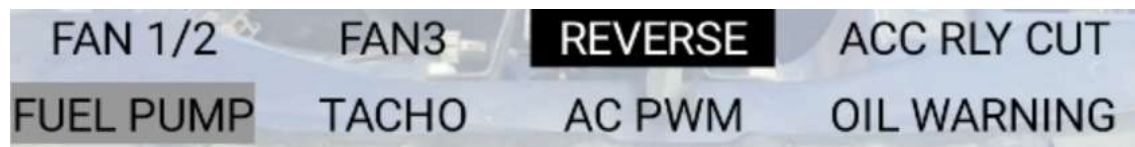


Digital Input Status



BRAKE N/O	Highlights RED when the brake Normally Open switch Closes (Brakes Applied)
BRAKE N/C	Highlights RED when the brake Normally Closed switch Opens (Brakes Applied)
CLUTCH	Highlights ORANGE when clutch is depressed
NEUTRAL	Highlights when the NEUTRAL switch is in NEUTRAL
START REQ.	Highlights when the Pushbutton Start system is in CRANK mode
START CUT	Highlights when engine has started (signal to cut engine cranking)
DELIVERY FUSE	Highlights when the delivery fuse is connected
GM FUEL PUMP	Highlights when the GM PCM triggers the fuel pump (discrete or PWM)

Digital Output / PWM Output Status



FAN 1 / 2	Highlights when the translator is activating FAN1/2 Relay (Via Canbus)
FAN 3	Highlights when the translator is activating FAN3 Relay (Via Canbus)
REVERSE	Highlights when the REVERSE relay is energised (Via Canbus from GM PCM)
ACC RLY CUT	Highlights when accessories are to be cut (while cranking)
FUEL PUMP	Highlights when the fuel pump controller is ON
TACHO	Highlights a TACHO RPM signal to the pushbutton start system
AC PWM	Highlights when the Variable Solenoid AC Compressor is active
OIL WARNING	Highlights when the dash cluster oil lamp light output is activated

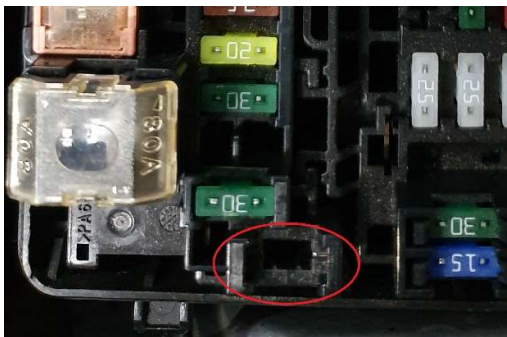
Note: Fan speed low - FAN1/2 energised. Speed Medium – FAN3 energised. Speed High - FAN1/2 & 3 energised.

Test Mode

If the engine is NOT running. The translator can be put into “Test Mode” by long pressing the “TEST MODE” button on the top of the phone/tablet display. Once in test mode, the translator will cycle various outputs to enable you to check they function correctly. This includes the radiator fans (3 speeds), Reverse Lamp, AC Variable Displacement Solenoid and the variable speed fuel pump. It also shows a fake tachometer display proportional to the accelerator pedal position. The oil pressure lamp will turn off in this mode and will illuminate if the brake or clutch pedals are depressed.

To exit TEST MODE, press the TEST MODE button on the display to exit and return to normal operation.

Test mode can also be engaged by placing a spare fuse in the delivery connector “fuse holder” in the engine bay fusebox. This must be done after the ignition is turned on. Do not leave the fuse in there permanently. If the fuse is present on power-up, the translator will enter UPGRADE mode and be inoperable until the fuse is removed and the ignition is cycled off and on again.



No Delivery Fuse (normal operation)



Delivery Fuse connected (Test /Upgrade Mode)

LS - BRZ/86/FRS AC1 54PIN PLUG WIRING NOTES

Pin Number	Function	E38 Pin Number	AUS VE/VF Colour	US Generic Colour	Comment1	Comment2	Comment3
1	ACC PEDAL1 Sensor	X1:29	White/Yellow	Dark Blue			
2	ACC PEDAL 0V REF	X1:30	Black/Blue	Tan			
3							
4	PCM Relay Control	X1:59	Yellow	Yellow	Energises EFI1/2 and INJ Relays		
5	ACC PEDAL1 5V REF	X1:56	White/Red	White/Black			
6	REVERSE LAMPS (IGN SUPPLY)		RED/BLUE	RED/BLUE	Goes to BRZ/86/FRS Reverse switch connector		
7	COOLING FAN LO	X1:58	White/Black	Dark Blue	Optional if using CANBUS fan control	Active Ground by PCM	Fan Relay1/2
8	FUEL PRESSURE Sensor		Blue/White	Dark Green	Optional		
9							
10	ACC PEDAL2 5V REF	X1:36	Brown/Red	Brown/Yellow			
11	CLUTCH SENSOR 5V REF	X1:54	Grey/Red	Grey			
12							
13	CLUTCH SENSOR 0V REF	X1:42	Black/Grey	Black/Yellow			
14							
15	Fuel Temp		White	White	Optional		
16	COOLING FAN control	X1:17		Dark Green	Optional if using CANBUS fan control	Active Ground by PCM	Fan Relay3
17	BRAKE PEDAL Switch	X1:9	White/Blue	Blue/White	0V (Brake OFF) 12V (Brake ON)		
18	ACC PEDAL2 Sensor	X1:32	Green/White	Light Blue			
19	OIL PRESSURE LAMP LOOP				Join to Pin22		
20							
21							
22	OIL PRESSURE LAMP LOOP				Join to Pin19		
23	ACC WAKEUP Signal	X1:18	Violet/Yellow	Dark Blue			
24	AC COMPRESSOR CLUTCH control	X1:63	White/Grey	White/Grey	Required for AC optional		
25	BRAKE PEDAL Sensor	X1:26	White/Green			Analog 0-5V	
26							
27	START ENABLE	X1:52	Violet/Grey	Purple/White	Required for Pushbutton Start		
28	ALTERNATOR CHARGE LAMP	X2:61	Brown	Brown			
29	CANBUS LOW	X1:27	White	Tan			
30	CANBUS HIGH	X1:28	Blue	Tan/Black			
31	ACC PEDAL2 0V REF	X1:23	Black/Violet	Purple			
32	MIL LAMP	X1:68	Brown/White	Brown/White	Optional (also Via Canbus)	Active Ground by PCM	
33	FUEL PUMP RELAY Control	X1:50	Green/Grey	Green/White			
34	ENGINE GROUND	X1:73	Black/White	Black/White			
35							
36	ENGINE GROUND	X1:73	Black/White	Black/White			
37							
38	AV VARIABLE DISPLACEMENT SOLENOID		Blue/Brown		Only required for VD Compressors		
39	AV VARIABLE DISPLACEMENT SOLENOID		Blue/Yellow		Only required for VD Compressors		
40							
41	POWER SUPPLY		Violet/Blue	Violet/Blue		EFI Main2 Relay	EFI(HTR) Fuse
42	INJECTOR/COIL POWER (EVEN)		Violet/Blue	Violet/Blue		INJ Relay	INJ Fuse
43	INJECTOR/COIL POWER (ODD)		Violet/Blue	Violet/Blue		INJ Relay	INH Fuse
44	REVERSE LAMPS (SWITCHED TO LAMP)		Violet	Violet	Goes to BRZ/86/FRS Reverse switch connector		
45	POWER SUPPLY		Violet/Blue	Violet/Blue		EFI Main2 Relay	EFI(HTR) Fuse
46	12V CONSTANT POWER (BACKUP)	X1:20	Red/Brown	Red/White			EFI(+B) Fuse
47	POWER SUPPLY	X1:19	Violet/Green	Violet/Blue		Ignition Switch	IG2 Fuse
48	POWER SUPPLY	X1:47	Violet/Blue	Violet/Blue		EFI1 Main1 Relay	EFI(CTRL) Fuse
49							
50	AC CLUTCH POWER		Brown/Green	Dark Green	Required for AC (goes to AC Clutch)		
51	FUEL LEVEL 0V REF)	X1:31	Black/Green	Brown/Yellow	Optional		
52	PRIMARY FUEL LEVEL SENSOR	X1:16	Blue/Violet	Purple	Optional		
53	SECONDARY FUEL LEVEL SENSOR	X1:70	Blue/White	Blue/White	Optional		
54	CLUTCH SIGNAL	X1:26	Yellow	Yellow	Analog 0-5V		

AC1 AS VIEWED FROM BACK OF PLUG (ENGINE PLUG SIDE)

1 ACC PEDAL1 SENSOR WH/YE	2 ACC PEDAL1 0V REF BK/BU	3	4 PCM RELAY CONTROL YEL	5 ACC PEDAL1 5V REF WH/RD	6 REVERSE LAMPS RED/BLUE	7 COOLING FAN SPEED (Lo) WH/BLK	8 FUEL LINE PRESSURE SIG BLU/WH	9	10 ACC PEDAL2 5V REF BN/RD	11 CLUTCH SENSOR 5V REF GY/RD
12	13 CLUTCH SENSOR 0V REF BLK/GY	14	15 FUEL TEMP SIG COMPOSITION WH	16 HI SPEED FAN CONTROL	17 BRAKE SIGNAL WH/BLU	18 ACC PEDAL2 SENSOR GN/WH	19 OIL PRESSURE LOOP	20	21	22 OIL PRESSURE LOOP
23 ACC WAKEUP SIGNAL VT/YE	24 AC COMP CLUTCH CONTR. WH/GY	25 BRAKE PEDAL SENSOR W/GN	26	27 START ENABLE VT/GY	28 ALTERNATOR LAMP BN	29 CAN-L WH	30 CAN-H BLU	31 ACC PEDAL2 0V REF BLK/VT	32 MIL LAMP BN/WH	33 FUEL PUMP RELAY CONTROL GN/GY

3 4 GROUND BLK/WH	3 5	3 6 GROUND BLK/WH	3 7	3 8 AC VAR. DISP SOLENOID BLU/BN	3 9 AC VAR. DISP SOLENOID BLU/YE	4 0	4 1 POWER SUPPLY F38UA VT/BLU
4 2 INJ/COIL POWER EVEN F37UA VT/BLU	4 3 INJ/COIL POWER ODD 51UA VT/BLU		4 4 REVERSE LAMPS VIOLET	4 5 POWER SUPPLY F50UA VT/BLU		4 6 +12V CONSTANT POWER RD/BN	4 7 POWER SUPPLY F71UA VT/BLU
4 8 POWER SUPPLY F38UA VT/BLU	4 9	5 0 AC CLUTCH BN/GN	5 1 FUEL LEVEL 0V REF BLK/GN	5 2 PRIM FUEL LEVEL SENS BLU/VIO	5 3 SECONDARY FUEL LEVEL SENS BLU/WH	5 4 CLUTCH SIGNAL YELLOW	

AUS VE/VF SS COMMODORE

AC1 AS VIEWED FROM BACK OF PLUG (ENGINE PLUG SIDE)

1 ACC PEDAL1 SENSOR D/BLU	2 ACC PEDAL1 OV REF TAN	3	4 PCM RELAY CONTROL YEL	5 ACC PEDAL1 5V REF WH/BLK	6 REVERSE LAMPS RED/BLUE	7 COOLING FAN SPEED (LO) D/BLU	8 FUEL LINE PRESSURE SIG D/GN	9	10 ACC PEDAL2 5V REF BN/YEL	11 CLUTCH SENSOR 5V REF GY
12	13 CLUTCH SENSOR OV REF BLK/YEL	14	15 FUEL TEMP SIG COMPOSITION WH	16 HI SPEED FAN CONTROL D/GN	17 BRAKE SIGNAL BLU/W	18 ACC PEDAL2 SENSOR L/BLU	19 OIL PRESSURE LOOP	20	21	22 OIL PRESSURE LOOP
23 ACC WAKEUP SIGNAL D/BLU	24 AC COMP CLUTCH CONTR. WH/GY	25 BRAKE PEDAL SENSOR	26	27 START ENABLE PU/WH	28 ALTERNATOR LAMP BROWN	29 CAN-L TN	30 CAN-H TN/BLK	31 ACC PEDAL2 OV REF PPL	32 MIL LAMP BN/WH	33 FUEL PUMP RELAY CONTROL GN/WH

3 4 GROUND BLK/WH	3 5	3 6 GROUND BLK/WH	3 7	3 8 AC VAR. DISP SOLENOID ---	3 9 AC VAR. DISP SOLENOID ---	4 0	4 1 POWER SUPPLY F38UA VT/BLU
4 2 INJ/COIL POWER EVEN F37UA VT/BLU	4 3 INJ/COIL POWER ODD 51UA VT/BLU		4 4 REVERSE LAMPS VIOLET	4 5 POWER SUPPLY F50UA VT/BLU		4 6 +12V CONSTANT POWER RD/WH	4 7 POWER SUPPLY F71UA VT/BLU
4 8 POWER SUPPLY F38UA VT/BLU	4 9	5 0 AC CLUTCH D/GN	5 1 FUEL LEVEL OV REF BN/YEL	5 2 PRIM FUEL LEVEL SENS PPL	5 3 SECONDARY FUEL LEVEL SENS BLU/WH	5 4 CLUTCH SIGNAL YELLOW	

USA LS3 CAMERO