EMIT Data Translator (EDT)

Installation, Operation, and Troubleshooting Manual

Stand-Alone Mode

April 2024

TABLE OF CONTENTS

CONVENTIONS USED

Bold text indicates the title of a screen

Italicized text indicates active security mode of the system

‘Single quotes’ are used for button names

“Double quotes” are used for specific values or titles of a value shown on a screen

	Important notes or warnings

	Tips, examples, and suggested practices

C1D2 NOTICE

This apparatus is suitable for use in Class 1, Division 2, Groups A, B, C & D, or unclassified locations.

WARNING

IT IS IMPORTANT TO READ AND UNDERSTAND ALL THE INSTRUCTIONS AND WARNINGS LISTED IN THIS MANUAL BEFORE USING OR INSTALLING THE ETS SYSTEM.

FAILURE TO FOLLOW INSTALLATION INSTRUCTIONS MAY LEAD TO ENGINE DAMAGE AND PERSONAL INJURY TO OPERATORS OR NEARBY PERSONNEL.

DO NOT CUT HOLES IN THE EIM ENCLOSURE OR THE WARRANTY WILL BE VOIDED.

EXPLOSION HAZARD - DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.

DO NOT OPEN OR REMOVE COVER UNLESS THE POWER IS DE-ENERGIZED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.

THE INSTALLER SHOULD BE FAMILIAR WITH AND OBSERVE ALL LOCAL, STATE, AND FEDERAL CODES.

EXPOSURE TO SOME CHEMICALS MAY DEGRADE THE SEALING PROPERTIES OF MATERIALS USED IN THE FOLLOWING DEVICE: PANASONIC EW TX2SA-5V.

Cet appareil convient pour une utilisation en Classe 1, Division 2, les emplacements Groupes A, B, C & D ou non classifiés.

ATTENTION

IL EST IMPORTANT DE LIRE ET COMPRENDRE TOUTES LES INSTRUCTIONS ET MISES EN GARDE CONTENUES DANS CE MANUEL AVENT D'UTILISER OU D'INSTALLER LE ETS SYSTÈME.

LE NON-RESPECT DES INSTRUCTIONS D'INSTALLATION PEUT ENTAÎNER DES DOMMAGES AU MOTEUR ET DE BLESSURES POUR LES OPÉRATEURS OU LE PERSONNEL À PROXIMITÉ.

NE PAS PERCER DES TROUS DANS L'ENCEINTE EIM OU LA GARANTIE SERA ANNULÉE.

RISQUE D'EXPLOSION – NE PAS DÉBRANCHER LORSQUE LE CIRCUIT EST SOUS TENSION SAUF SI RÉGION EST CONNU POUR ÊTRE NON DANGEREUX.

NE PAS OUVRIR LE CAPOT OU MOINS QUE LE ALIMENTATION EST COUPÉE OU DE LA RÉGION EST CONNUE POUR ETRE NON DANGEREUX.

RISQUE D'EXPLOSION – SUBSTITUTION DE COMPOSANTS PEUT NUIRE À LA CONFORMITÉ CLASSE 1, DIVISION 2.

L'INSTALLATEUR DOIT CONNAÎTRE ET RESPECTER TOUTES LES RÉGLEMENTATIONS LOCALES, ÉTATIQUES ET FÉDÉRALES CODES.

EXPOSITION À CERTAINS PRODUITS CHEMIQUES PEUT DÉGRADER LES PROPRIÉTÉS D'ÉTANCHÉITÉ DES MATÉRIAUX UTILISÉS DANS L'APPAREIL SUIVANT: PANASONIC EW TX2SA-5V.

EXTERNAL LABEL / ÉTIQUETTE EXTERNE

EMIT Technologies, Inc.

EIM	P/N: 20200	12-30V, 1A	Class 1, Div. 2, Groups A, B, C, & D	T5 Amb. Temp. -40 to 149°F (-40 to 65°C)
AFRCA	P/N: 20230	12-30V, 6A	Class 1, Div. 2, Groups A, B, C, & D	T5 Amb. Temp. -40 to 149°F (-40 to 65°C)
EMD	P/N: 20240	12-30V, 1A	Class 1, Div. 2, Groups A, B, C, & D	T5 Amb. Temp. -40 to 149°F (-40 to 65°C)
AFRCL	P/N: 20250	12-30V, 3A	Class 1, Div. 2, Groups A, B, C, & D	T5 Amb. Temp. -40 to 149°F (-40 to 65°C)
ICM2–8	P/N: 20290	12-30V, 5A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. 14 to 158°F (-10 to 70°C)
ICM2–16	P/N: 20300	12-30V, 7A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. 14 to 158°F (-10 to 70°C)
ICM1–8	P/N: 20270	12-30V, 5A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 158°F (-40 to 70°C)
ICM1–16	P/N: 20280	12-30V, 7A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 158°F (-40 to 70°C)
GOV	P/N: 20310	12-30V, 3A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 149°F (-40 to 65°C)
ANN	P/N: 20320	12-30V, 3A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 149°F (-40 to 65°C)
AEM	P/N: 20330	12-30V, 3A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 149°F (-40 to 65°C)
EDT	P/N: 20350	12-30V, 1A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 149°F (-40 to 65°C)
LEDB	P/N: 14431-0004	12-30V, 1A	Class 1, Div. 2, Groups A, B, C, & D	T4 Amb. Temp. -40 to 149°F (-40 to 65°C)

ETL CLASSIFIED
Intertek
4008500

Conforms to ANSI/ISA Std 12.12.01

Certified to CSA Std C22.2 No. 213

WARNING: EXPOLOSION HAZARD – DO NOT DISCONNECT WHILE CIRCUIT IS LIVE UNLESS AREA IS KNOWN TO BE NON-HAZARDOUS.
WARNING: DO NOT OPEN OR REMOVE COVER UNLESS THE POWER IS SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
WARNING: EXPLOSION HAZARD - SUBSTITUTION OF COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS 1, DIVISION 2.
WARNING: SEE INSTRUCTION MANUAL
ATTENTION: RISQUE D'EXPLOSION – NE PAS DÉBRANCHER LORSQUE LE CIRCUIT EST SOUS TENSION SAUF SI RÉGION EST CONNU POUR ÊTRE NON DANGEREUX.
ATTENTION: NE PAS OUVRIR LE CAPOT OU MOINS QUE LE ALIMENTATION EST COUPÉE OU DE LA RÉGION EST CONNUE POUR ETRE NON DANGEREUX.
ATTENTION: RISQUE D'EXPLOSION – SUBSTITUTION DE COMPOSANTS PEUT NUIRE À LA CONFORMITÉ CLASSE 1, DIVISION 2.
ATTENTION: CONSULTER LE MANUEL D'INSTRUCTIONS

OVERVIEW

The Engine Data Translator (or EMIT Data Translator) is a module for translating engine information from a non-EMIT system. The EDT can be used in two ways- either in conjunction with an EMIT panel (through the EIM interface), or as a stand-alone translator to Modbus. This version of the manual covers the second use case.

When used as a stand-alone module, the EDT is used only for communicating to Caterpillar ® ADEM 3 and 4 engines via the CAN bus and/or CDL (CAT data link) bus.

INSTALLATION

PHYSICAL INSTALLATION

The EDT comes with DIN rail feet pre-installed. Select a location on a DIN rail and snap the module into place starting with the side away from the screwdriver release tabs.

The EDT should be installed in a suitable tool-accessible enclosure that is IP54 or higher. The enclosure should suitably protect the equipment from deterioration that would affect its suitability for Class I, Division 2 locations.

WIRING

The EDT has the following connections:

- Power connection
- ECU connection(s)
- Modbus connection

Additionally, some setups will use the second Modbus port if needed.

POWER/COMM WIRING

The Power/Comm block (Pins 1-6) connect to the EIM, or only power and ground when used stand-alone. If multiple EMIT modules are present, any module in the middle of the chain (i.e. with two harnesses connected to the Power/Comm block) should have the CAN TERM switch off (to inside of module).

Install power to pins 4 and 5 while including a 1 A fuse.

ADEM WIRING

There are two data buses that could be used: CAN and CDL. For ADEM 4 engines, only CAN will be used. For ADEM 3 engines, both will be used

Direct Panel Wiring- ADEM 4

For an ADEM 4, run a cable from the “ECU CAN” port of the EDT to the “CAN H/L/SHLD” of the ADEM control panel. Typically, the CANH is Yellow and the CANL is Green. The terminal block number of the ADEM CAN wires vary by engine- see the engine schematic if unsure.

Direct Panel Wiring- ADEM 3

For an ADEM 3, there will be two cables required. Run the first cable from the “ECU CAN” port of the EDT to the “CAN H/L/SHLD” of the ADEM control panel. Typically, the CANH is Yellow and the CANL is Green. Run the second cable from the “CDL” port of the EDT to the “CDL+/-“ connections in the ADEM panel. (Note: CDL A on the EDT is CDL+ on the ADEM, and CDL B is CDL –). Typically, CDL+ is pink

and CDL- is purple in the CAT panel. The terminal block numbers in the CAT panel for the CAN and CDL wires vary by engine- see the engine schematic if unsure.

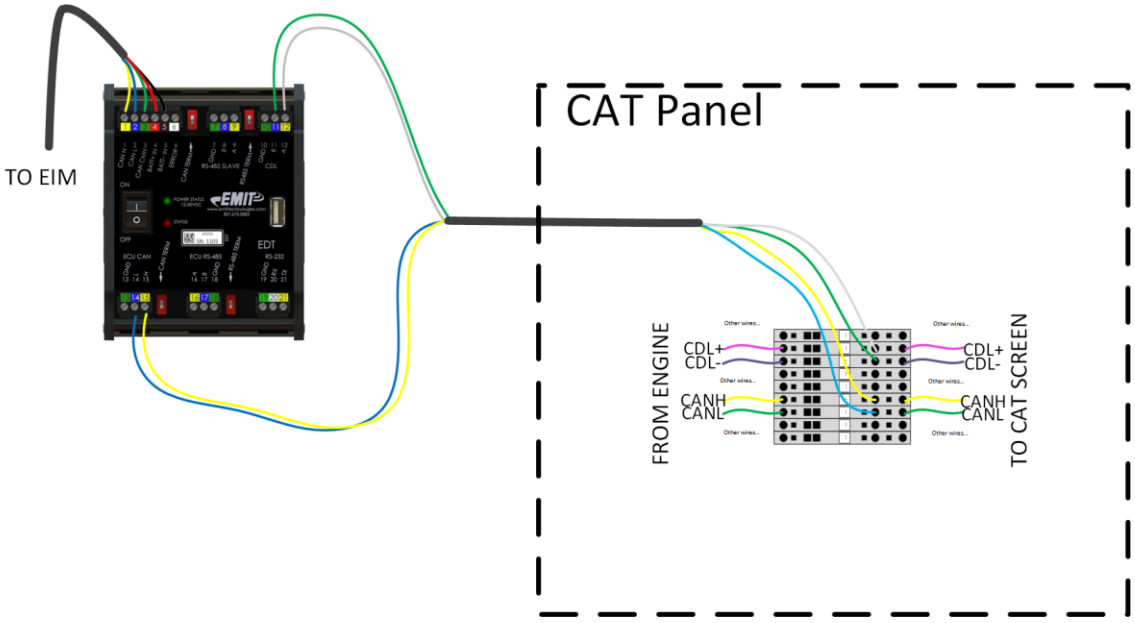


Figure 1. Direct ADEM wiring example. Not all CAT Panels have both CDL and CAN.

RESISTOR NOTE

For any CAN network, only the ends should be ‘terminated’ with a resistor. This ensures that data moves through the cable correctly. In most cases the CAN connection from the ADEM terminal blocks to the EDT creates a new end at the EDT module. This means the ECU CAN switch should be terminated on the EDT (switched to the outside of the board) and the termination should be removed from the CAT panel. The termination in the CAT panel is usually a triangular plug cap at a Y junction of the CAN bus.

Example CAN termination (circled) can be removed when the switch on the EDT is terminated

SETUP AND OPERATION

INITIAL POWER-UP

After wiring is completed, install the fuse and turn the EDT module. The module should have the green power LED light up. If it doesn't, or it is red, check the power wiring.

CONFIGURATION

The simplest method of configuration is using an EIM screen and navigating to EDT setup. If an EIM is not available, a USB drive can be used.

USB FORMAT

A USB drive that is formatted with FAT or FAT32 filesystem is required. If the format is unknown, it can be reformatted. For example, on a Windows® computer right-click on the USB drive and select "Format…". For the file system type select FAT or FAT32. Note that formatting will remove all files from the drive.

DOWNLOADING CURRENT CONFIG

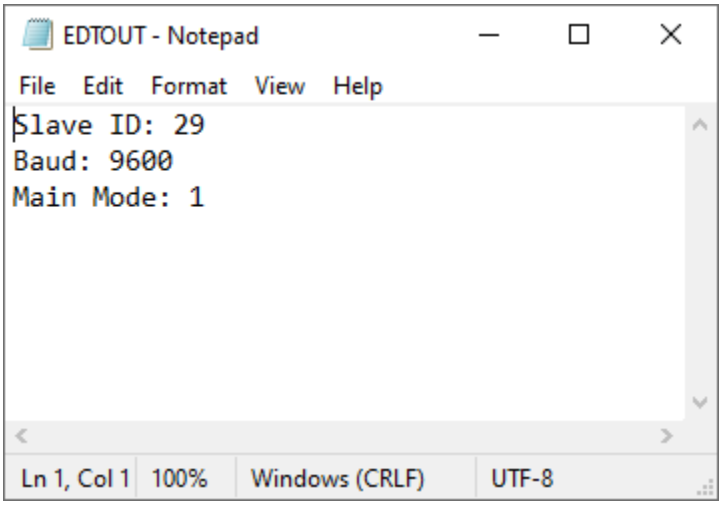
To download the active config:

1. Power cycle the EDT
2. Insert the USB drive
3. Wait about 20 seconds then remove the drive

The drive should have a file called "EDTOUT.CFG".

EDIT THE CONFIG

Put the USB drive in a computer. The drive should have a file called EDTOUT.CFG . This file is created any time a USB drive is inserted in the EDT and reflects the current settings. Open EDTOUT in a text file editor (such as notepad).



The config items are:

- “Slave ID”: Change this number to set the modbus slave/node ID value
- “Baud”: Change this number to set the baud rate
- “Main Mode”: This value selects the operating mode of the EDT. Relevant options are:
    - 1 : Standard default ADEM3 and/or ADEM4 mode, listen only
    - 3 : Send CAN requests to ECU for certain messages
    - 6 : ADEM3 send CDL requests to the ECU

For many ADEM3 engines the ECU will only send most data items when it is specifically requested. If data values are missing but are expected to be present, or go from reading normally to missing, most likely the EDT needs to be changed to mode 6.

After editing the file be sure to save.

UPLOAD THE CONFIG

Rename the file from “EDTOUT” to “EDT”. Eject the USB drive and remove from the computer.

Power cycle the EDT then insert the USB drive. Wait about 20 seconds, then remove the drive.

The EDT should recreate the EDTOUT file with the settings that are now loaded. Look at the EDTOUT file and verify that the values match the desired options that were put into the EDT file. If they match, the upload was successful. If they do not, make sure the EDT file is correct then try the upload again.

CONFIG TROUBLESHOOTING

If the EDT is not creating the EDTOUT file, try reformatting the drive. It is also possible that the software is out of date, the latest version can be downloaded from https://data.emittechnologies.com/wiki/ at the “Software updates” link near the top. In this case, the file EDT_[…].hex will be downloaded. To update the module, put the hex file on a USB, insert drive into the EDT, and power cycle the module. Wait about 30 seconds and the module should be updated. After removing the drive the module should have added the EDTOUT file.

MODBUS

The EDT uses standard Modbus RS-485 RTU, responding to requests on the slave port at pins 7,8,9. The EDT will collect any data it can via the communication buses and store them in the modbus table. If a value is not found on a particular engine, “-1” or “65535” will be placed in that register. All registers are 16 bits.

REGISTER TABLE

Note: Registers listed with “PLC address” offset, e.g. raw address 1 = register 40001. Some SCADA will require adding or subtracting 1 from the register number. Some Waukesha registers are shown that would not be relevant in most stand-alone applications.

Input Register (Not Scaled)	Holding Register (US Units)	Description	Special Scaling
37000	47000	Engine speed	
37001	47001	Battery voltage	
37002	47002	Intake manifold 1 absolute pressure	
37004	47004	Engine oil pressure	
37005	47005	Engine actual timing	
37006	47006	Desired speed	
37007	47007	Engine oil temp	
37008	47008	Engine coolant temp	
37009	47009	Precat Temp	
37010	47010	Postcat Temp	
37011	47011	Diff CAT Temp	
37012	47012	Engine hours low	
37013	47013	Engine hours high	
37014	47014	Fuel Temperature	
37015	47015	Fuel specific gravity * 1000	Divide by 1000
37016	47016	Desired Timing 1	
37017	47017	Desired Timing 2	
37024	47024	WKI Value	
37025	47025	Throttle valve 1 position	
37026	47026	Intake manifold 1 absolute pressure high resolution	
37027	47027	Intake manifold 2 absolute pressure high resolution	
37028	47028	Exhaust manifold L temp	
37029	47029	Exhaust manifold R temp	
37030	47030	Air intake temp	
37031	47031	Ambient air temp	
37032	47032	Ignition Timing Cyl 1	
37033	47033	Ignition Timing Cyl 2	
37034	47034	Ignition Timing Cyl 3	
37035	47035	Ignition Timing Cyl 4	
37036	47036	Ignition Timing Cyl 5	
37037	47037	Ignition Timing Cyl 6	
37038	47038	Ignition Timing Cyl 7	
37039	47039	Ignition Timing Cyl 8	
37040	47040	Ignition Timing Cyl 9	
37041	47041	Ignition Timing Cyl 10	
37042	47042	Ignition Timing Cyl 11	

37043	47043	Ignition Timing Cyl 12	
37044	47044	Wauk Spark Reference #1	
37045	47045	Wauk Spark Reference #2	
37046	47046	Wauk Spark Reference #3	
37047	47047	Wauk Spark Reference #4	
37048	47048	Wauk Spark Reference #5	
37049	47049	Wauk Spark Reference #6	
37050	47050	Wauk Spark Reference #7	
37051	47051	Wauk Spark Reference #8	
37052	47052	Wauk Spark Reference #9	
37053	47053	Wauk Spark Reference #10	
37054	47054	Wauk Spark Reference #11	
37055	47055	Wauk Spark Reference #12	
37099	47099	Fuel valve one intake absolute pressure	
37100	47100	Fuel valve differential pressure	
37101	47101	Unfiltered oil pressure	
37102	47102	Turbocharger 1 inlet temp	
37103	47103	Turbocharger 1 outlet temp	
37104	47104	Turbocharger 2 inlet temp	
37105	47105	Turbocharger 2 outlet temp	
37106	47106	Engine exhaust port temp 1	
37107	47107	Engine exhaust port temp 2	
37108	47108	Engine exhaust port temp 3	
37109	47109	Engine exhaust port temp 4	
37110	47110	Engine exhaust port temp 5	
37111	47111	Engine exhaust port temp 6	
37112	47112	Engine exhaust port temp 7	
37113	47113	Engine exhaust port temp 8	
37114	47114	Engine exhaust port temp 9	
37115	47115	Engine exhaust port temp 10	
37116	47116	Engine exhaust port temp 11	
37117	47117	Engine exhaust port temp 12	
37118	47118	Engine exhaust port temp 13	
37119	47119	Engine exhaust port temp 14	
37120	47120	Engine exhaust port temp 15	
37121	47121	Engine exhaust port temp 16	
37122	47122	Oil filter differential pressure	
37123	47123	Engine coolant pressure	
37124	47124	First DTC detected	
37125	47125	Engine pct load at current speed	
37126	47126	CDL Code at last shutdown*	
37127	47127	Latest CDL Error code*	
37128	47128	Exhaust current NOx	
37129	47129	Fuel Correction Factor	
37299	47299	Detonation level (0-255)	
37300	47300	Detonation level Cyl 1	
37301	47301	Detonation level Cyl 2	
37302	47302	Detonation level Cyl 3	
37303	47303	Detonation level Cyl 4	
37304	47304	Detonation level Cyl 5	
37305	47305	Detonation level Cyl 6	
37306	47306	Detonation level Cyl 7	
37307	47307	Detonation level Cyl 8	

37308	47308	Detonation level Cyl 9	
37309	47309	Detonation level Cyl 10	
37310	47310	Detonation level Cyl 11	
37311	47311	Detonation level Cyl 12	
37312	47312	Detonation level Cyl 13	
37313	47313	Detonation level Cyl 14	
37314	47314	Detonation level Cyl 15	
37315	47315	Detonation level Cyl 16	
37316	47316	Actual Exhaust Oxygen	
37317	47317	Desired Rated Exhaust Oxygen	
37318	47318	Actual AFR	
37319	47319	Desired AFR	
37320	47320	Desired Full Load Exhaust O2	
37321	47321	Desired Nox Ppm	
37322	47322	Fuel Quality Setting	
37323	47323	Engine Rated Speed	
37324	47324	Cooldown Minutes Config	
37325	47325	Low Idle Config	
37326	47326	Max Hi Idle Config	
37327	47327	Min Hi Idle Config	
37328	47328	Percent Fuel Position	
37329	47329	Fuel Valve Position	
37330	47330	Fuel Rate	
37331	47331	Intake Manifold Air To Fuel Differential Pressure	
37332	47332	Gas Fuel Flow	
37333	47333	Fuel Actuator Command Position	
37334	47334	Wastegate Position Command	
37335	47335	Choke Position Command	
37336	47336	Turbo Bypass Command (Pressure)	
37337	47337	Throttle Actuator Command Position	
37338	47338	Throttle Valve Differential Pressure	
37339	47339	Jacket Water to Oil Temp Differential	
37340	47340	Desired Combustion Time	
37341	47341	Actual Air Pressure	
37342	47342	Desired Intake Manifold Pressure	
37343	47343	Intake Manifold Air Flow	
37344	47344	Specific Heat Ratio	
37345	47345	Transformer Voltage Cyl 1	
37346	47346	Transformer Voltage Cyl 2	
37347	47347	Transformer Voltage Cyl 3	
37348	47348	Transformer Voltage Cyl 4	
37349	47349	Transformer Voltage Cyl 5	
37350	47350	Transformer Voltage Cyl 6	

37351	47351	Transformer Voltage Cyl 7	
37352	47352	Transformer Voltage Cyl 8	
37353	47353	Transformer Voltage Cyl 9	
37354	47354	Transformer Voltage Cyl 10	
37355	47355	Transformer Voltage Cyl 11	
37356	47356	Transformer Voltage Cyl 12	
37357	47357	Transformer Voltage Cyl 13	
37358	47358	Transformer Voltage Cyl 14	
37359	47359	Transformer Voltage Cyl 15	
37360	47360	Transformer Voltage Cyl 16	
37361	47361	Transformer Voltage Cyl 17	
37362	47362	Transformer Voltage Cyl 18	
37363	47363	Transformer Voltage Cyl 19	
37364	47364	Transformer Voltage Cyl 20	
37369	47369	Mass fuel flow	
37379	47379	Detonation level cyl 17	
37380	47380	Detonation level cyl 18	
37381	47381	Detonation level cyl 19	
37382	47382	Detonation level cyl 20	
37383	47383	Ignition Timing Cyl 13	
37384	47384	Ignition Timing Cyl 14	
37385	47385	Ignition Timing Cyl 15	
37386	47386	Ignition Timing Cyl 16	
37387	47387	Ignition Timing Cyl 17	
37388	47388	Ignition Timing Cyl 18	
37389	47389	Ignition Timing Cyl 19	
37390	47390	Ignition Timing Cyl 20	

*For CDL type error codes, the system will add 32768 to E type (event) codes. Example, if register reads 100 the code is CID type 100. If the register reads 32868, the code is E-100 (32868-32768).