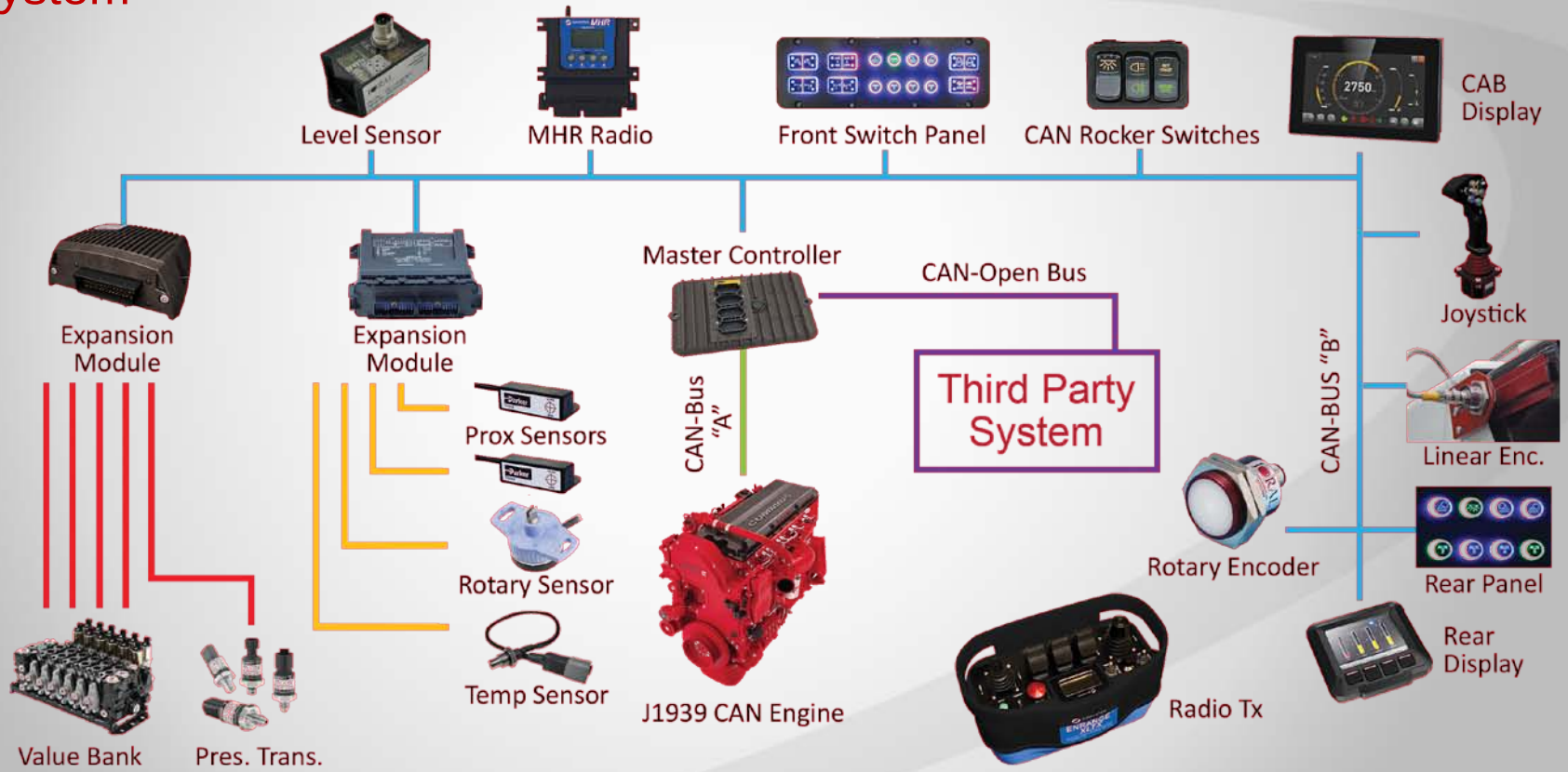
GS GLOBAL RESOURCES

Foremost in Machine Performance for Life

IQAN CREATIVE SOFTWARE

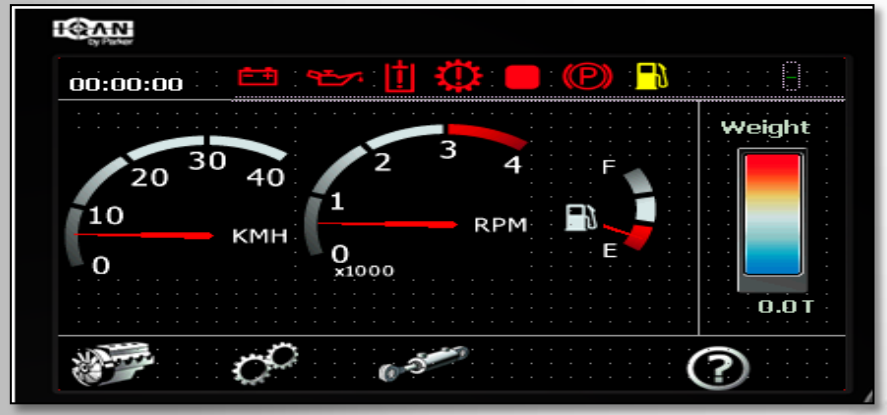
CAN System


Level Sensor
MHR Radio
Front Switch Panel
CAN Rocker Switches
CAB Display
Joystick
Expansion Module
Expansion Module
Master Controller
CAN-Open Bus
Third Party System
CAN-Bus "A"
CAN-BUS "B"
Prox Sensors
Rotary Sensor
Temp Sensor
Linear Enc.
Rotary Encoder
Rear Panel
Rear Display
Value Bank
Pres. Trans.
J1939 CAN Engine
Radio Tx

Overview

IQAN is a state-of-the-art system, developed by Parker Hannifin, for electronically controlling and monitoring hydraulics in mobile machines. IQAN communicates with the other systems in the machinery, such as diesel engines and transmission systems. IQAN master units display data from these systems and also allows control of them.

IQAN is user-programmable via a high level graphical design tool, which dramatically simplifies development. Simulation of the control system takes place in parallel with the programming of machine functions. The IQAN software tools cover all phases of a machine's life cycle, from development through productions to after sales.



Custom Programming in House

IQAN's greatest feature is the ability for any engineer to program the system.

IQAN by Parker

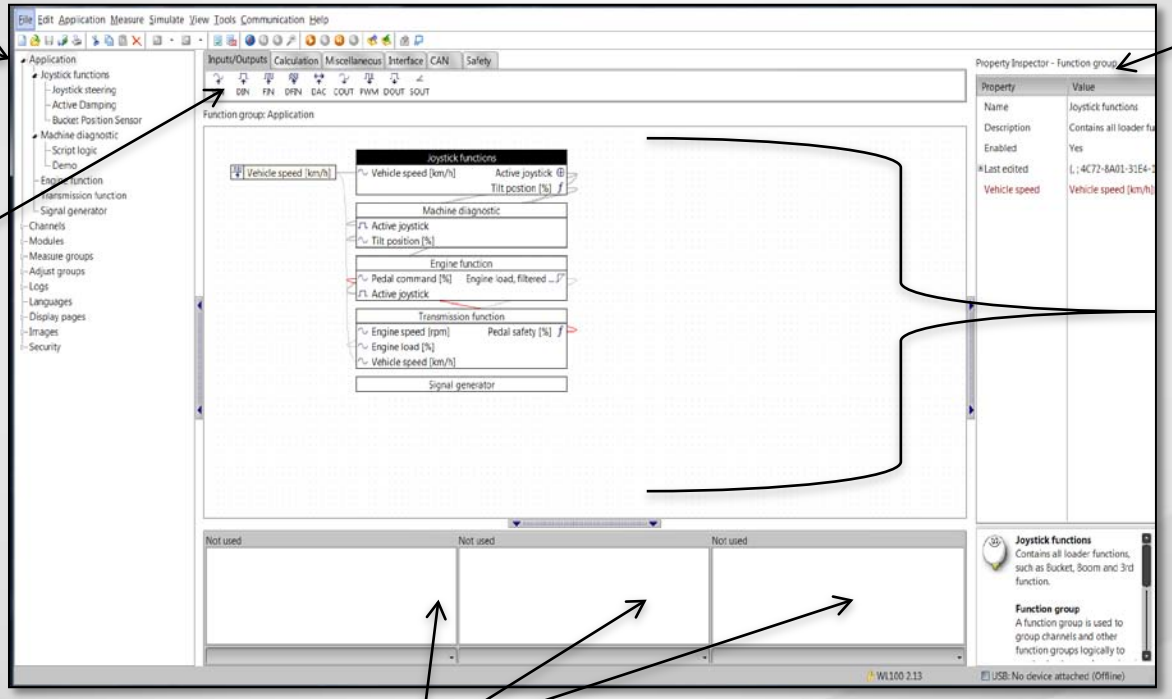
Main IQAN Window Screen Displaying Function Windows

APPLICATIONS

Details all functions that are being used on the Main Window Screen.

TAB BAR

Featured in a bar on top of the page. It highlights tabs for Inputs/ Outputs, Calculations, Miscellaneous, Interface, CAN, and Safety Functions.



PROPERTY SCREEN

Shows properties of items highlighted in Main Window Screen.

MAIN WINDOW

Screen showing details of highlighted Action of Application Screen. It is also the viewing space for all program links and interlocks.

LOWER SUB WINDOWS

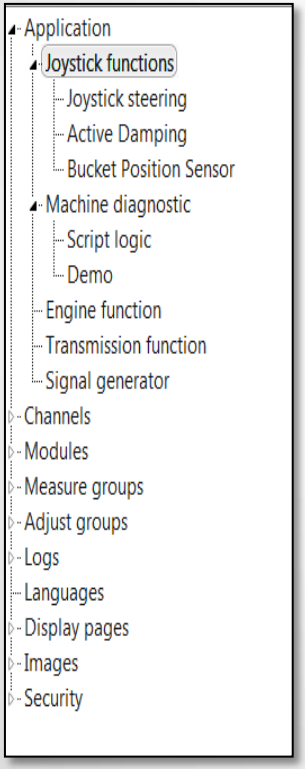
These three windows are where the actual Math Function and program interlocks are defined.

Application Window and Programming Tabs

APPLICATION WINDOW

This gives definition to the Main Screen and shows all the primary Design and Program groups of the program.

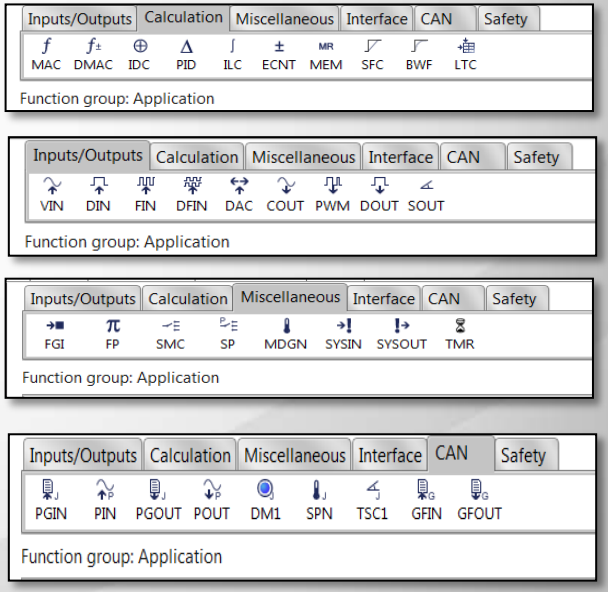
Application, Channels, Modules, Measure Groups, Adjust Groups, Logs, Languages, Display pages, Images, and Security Screens all get defined to some level from a simple default selection to detailed and intricate interlocks.



PROGRAMMING TABS

The function of the tab bars allow for definition of Inputs and Outputs, as well as Math Functions, Function Groups for variables to defined from the screen, and CAN communication for the program interlocks.

TAB OPTIONS SCREENS



Application Group and Functions (as seen on the main screen)

DEFINING AN APPLICATION GROUP

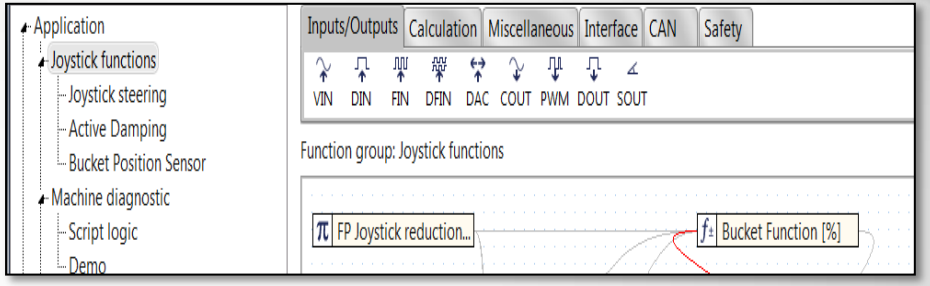
To the right, you will see that the Joystick Group has been selected. This allows for Definition of all the Joystick Functions.

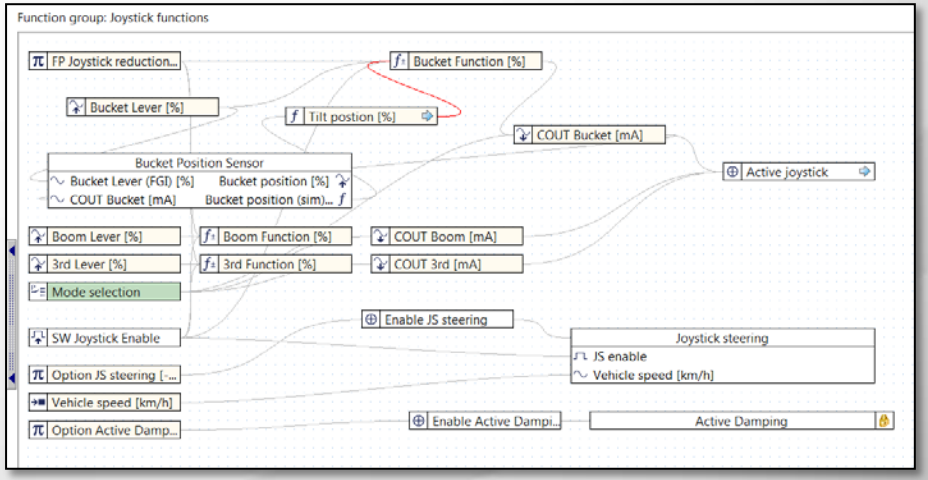
MAIN SCREEN

The Main Screen, as it is seen on the right , displays the Function Parameter (FP) Joystick Reduction.

This screen shows the interlocks of the definition of the Inputs with respect to the sensors and the Math Functions which define the Outputs for the machine control.

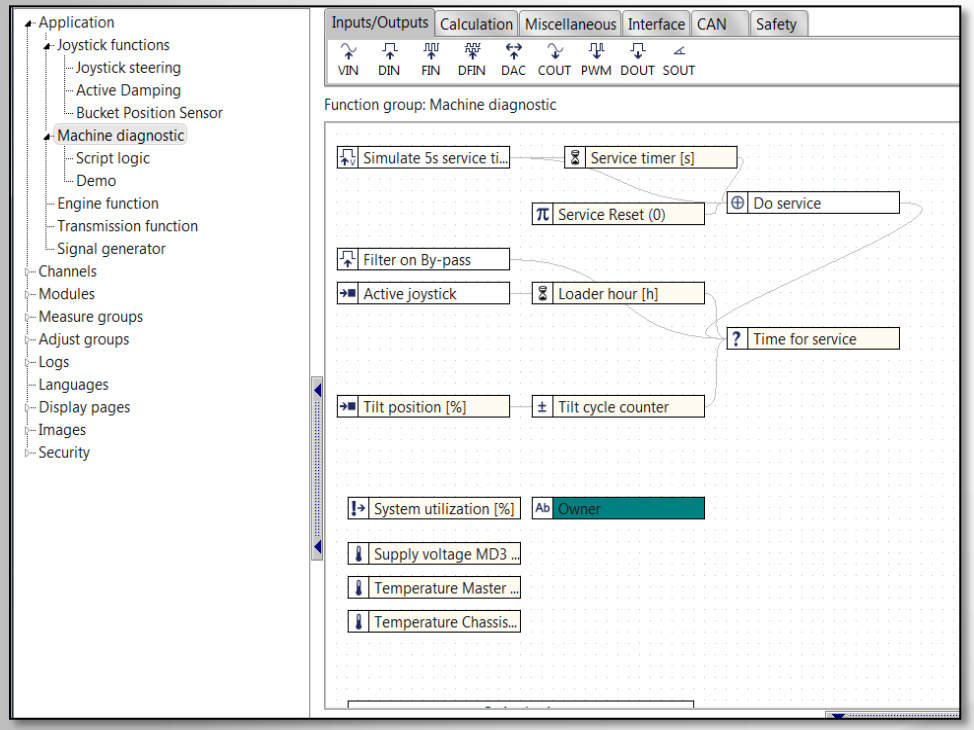
Listed is the Joystick Functions Screen.





Machine Diagnostics

MACHINE DIAGNOSTICS APPLICATION SCREEN



MACHINE DIAGNOSTICS (IN THE APPLICATION WINDOW)

By selecting Machine Diagnostics in the Applications Window, the Main Screen changes to show all the interlocks and definitions of Machine Diagnostics.

Examples include Service timers, Filter status, Joystick status, Loader Hours, and status of all the modules for the system.

Channels Screen and Benefits

- Channels
  - Current out
  - Digital in
  - Dual direction math
  - Event counter
  - Frequency in
  - Function group interface
  - Function parameter
  - Integrating limiting
  - Interactive message
  - Internal digital
  - Math
  - Module diagnostic
  - Parameter group in
  - Parameter in
  - Slope/Filter
  - State machine
  - State parameter
  - System output
  - Text formatting
  - Text parameter
  - Timer
  - TSC1
  - Virtual digital in
  - Voltage in

CHANNELS SCREEN

In this screen, Design can review all Inputs, Outputs, and every single function defined in the program.

The key advantage of this screen is a quick view of any type of item, such as Digital In, Voltage In, or Frequency In.

Now you can look quickly and review any input into the control system and ensure that the scaling is defined correctly and to your satisfaction.

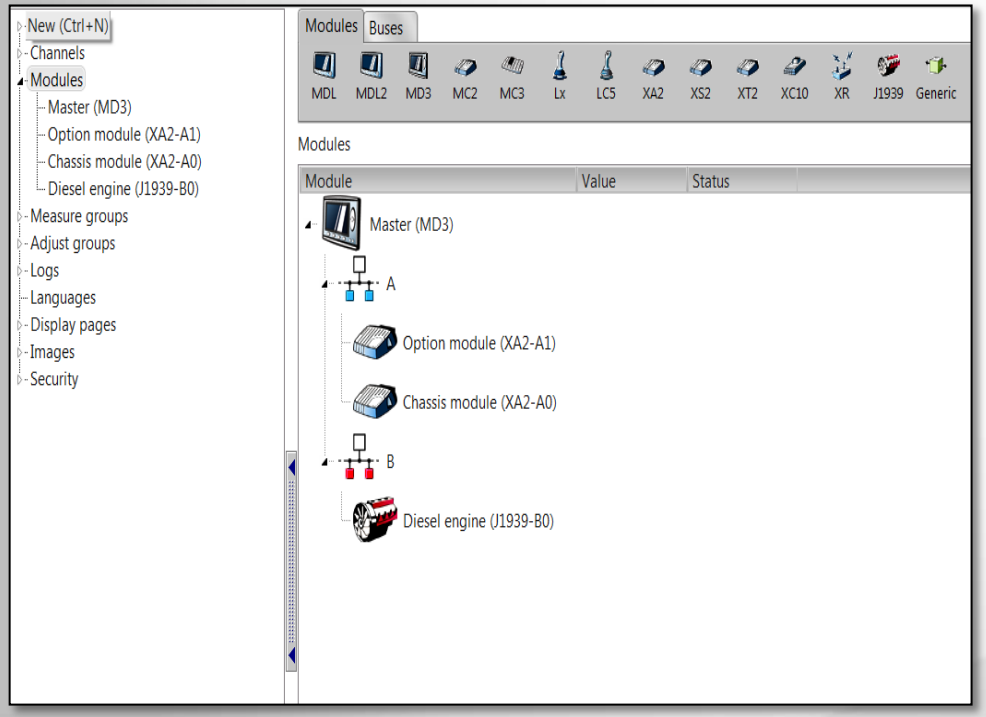
VIEW OF MAIN SCREEN WHEN CHANNELS OPTION IS SELECTED

Channels: All

Name	Order	Type	Module	Function group
Vehicle speed [km/h]	0	Frequency in	Chassis module (XA2-A0) ...	Application
Mode selection	1	State parameter		Joystick functions
FP Joystick reduction [%] (100)	2	Function parameter		Joystick functions
Bucket Lever [%]	3	Voltage in	Master (MD3) (VIN-F)	Joystick functions
SW Joystick Enable	4	Digital in	Master (MD3) (DIN-A)	Joystick functions
Bucket Function [%]	5	Dual direction math		Joystick functions
Boom Lever [%]	6	Voltage in	Master (MD3) (VIN-E)	Joystick functions
Boom Function [%]	7	Dual direction math		Joystick functions
3rd Lever [%]	8	Voltage in	Master (MD3) (VIN-G)	Joystick functions

Modules

MODULES SCREEN
SHOWING CAN BUSES AND MODULES ON EACH COMMUNICATION BUS



MODULES WINDOW

The Modules and Application Windows are the most critical for Machine Control function. The module windows is where all control modules for the control system are defined. Any controller for the CAN system is selected and defined in the window including all custom CAN/J1939 modules, such as Engines.

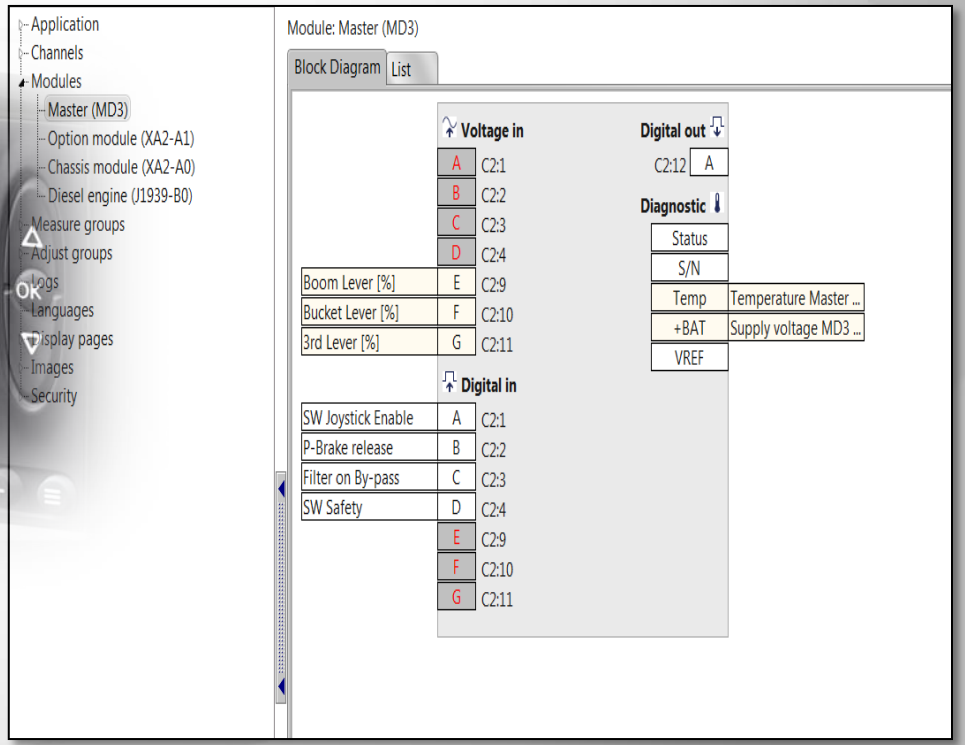
Modules

MD3 MASTER CONTROLLER (BLOCK DIAGRAM VIEW)

By selecting the MD3 under the Modules column you will be shown the Block Diagram of the MD3. The key of this main screen is it shows all connection points on the MD3 and what function is occupying the Inputs, Voltage In, Digital In, etc.
The grayed boxes show items used or not allowed on the module.

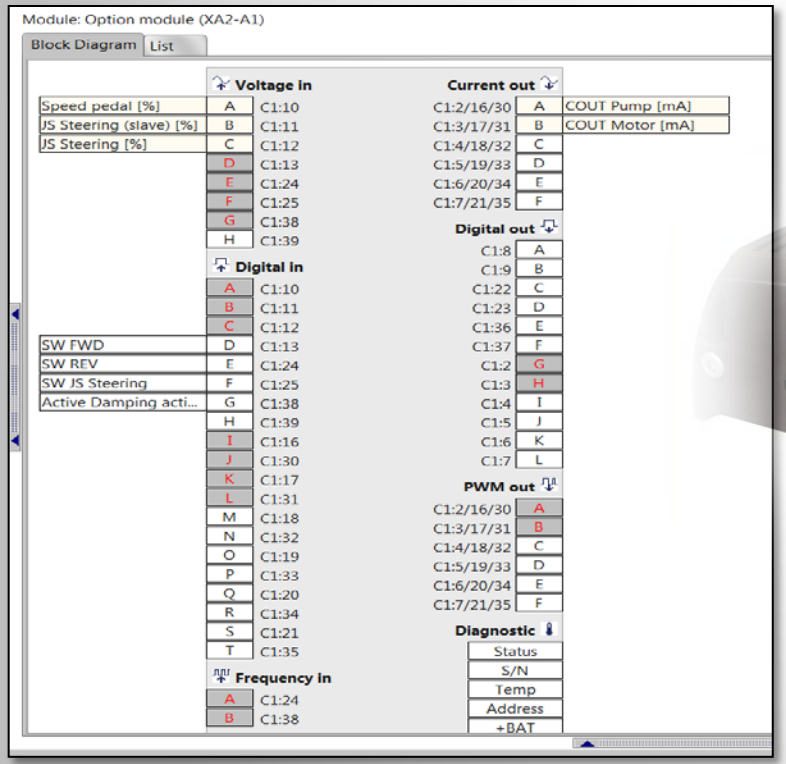
A key advantage to IQAN Design is the ability of every I/O point to be a real name and not defined as in PLC program, such as I01a-b, where it is often unclear as to what this means. In the screen shot below, you see a Boom Lever or P-Brake Release.

BLOCK DIAGRAM OF MD3 MODULE



XA2 Module

BLOCK DIAGRAM OF XA2-A1 MODULE



XA2 MODULE

This screen shows the XA2-A1 Module Block Diagram. The reason this has a designator of XA2-A1 is that there are two XA2 modules on the system. Each has a unique address to define the difference between the two. A0 and A1 are the designators.

Each module is defined by a address tag in the harness so a replacement module can be generic and be installed into the system as required.

A system can take up to four modules of any type on each CAN bus.

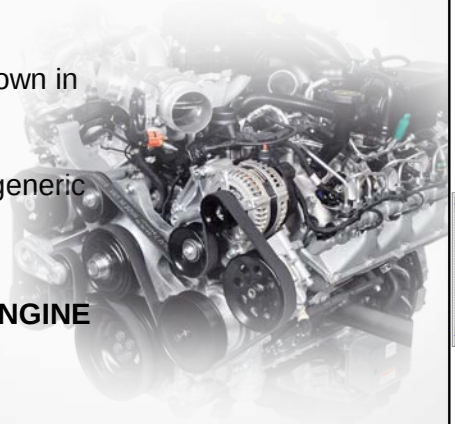
Definition of a CAN-bus Module

DIESEL ENGINE DEFINITION ON CAN BUS AS A MODULE

Since the Engine communicates its status via CAN J1939 messages broadcast on the bus, the system must be told which messages to receive, monitor, and advise the operator as to their status.

Some of the messages are critical, and some are background messages. All the messages can be defined here and are shown in the image on the right.

Note, that the engine is defined as J1939-B0 which means a generic J1939 unit on BUS B with address 0.



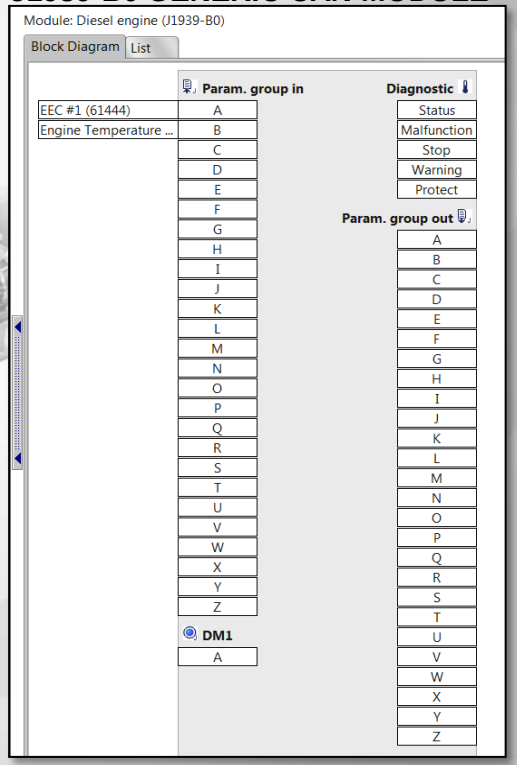
LIST OF ALL CAN MESSAGES DEFINED FOR THE ENGINE

Module: Diesel engine (J1939-B0)

Block Diagram | List

Pin	Name	Channel	Description
	PGIN-A	EEC #1 (61444)	Electronice engine controller #1.
	PGIN-B	Engine Temperature (65262)	Engine temperature #1 (ET1)
	TSC1-A	Engine command (TSC1) [RPM]	Torque/Speed control #1

BLOCK DIAGRAM OF DIESEL ENGINE J1939-B0 GENERIC CAN MODULE



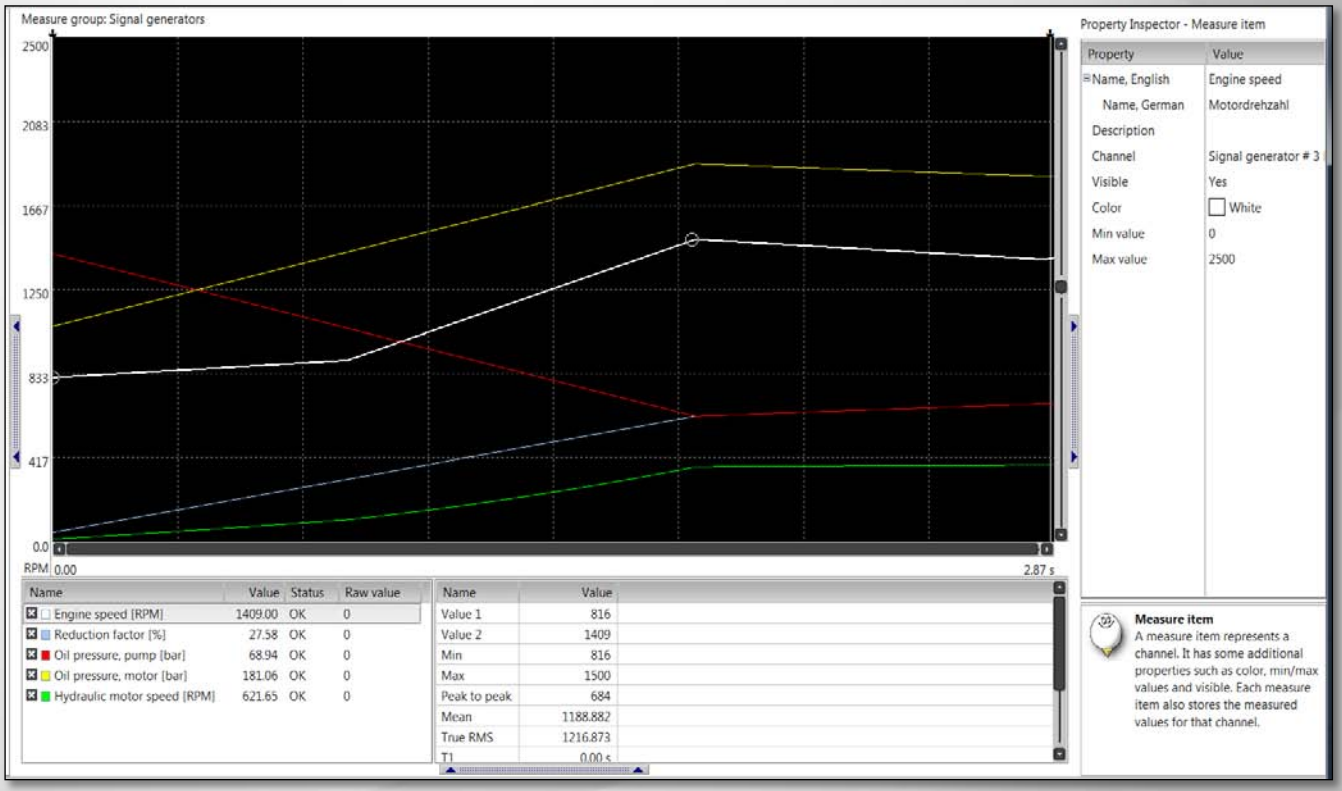
Measure Groups

MEASURE GROUP DEFINITION

In IQAN Design, the ability to measure Inputs/ Outputs, functions, and CAN messages via a real time graph solution can be defined in Measure Groups.

The advantage of Measure Groups as a defined set, is that items of a groups can be viewed together. (Engine, Transmission, Joysticks, etc.)

REAL TIME GRAPH OF FUNCTIONS – RPM AS Y AND TIME AS X



Measure Groups

LIST OF ALL GROUPS DEFINED TO BE MEASURED

- Application
- Channels
- Modules
- Measure groups
  - Engine
  - Transmission
  - Signal generators
  - Joystick
- Adjust groups

Measure groups

Name	Order	Description	Channels	Log
Engine	0	SAE J1939 Engine diagnostics.	4	No
Transmission	1	Transmision I/O diagnostics.	7	No
Signal generators	2	Measures signal generators for display page simulation.	5	No
Joystick	3	Joystick signals.	3	No

ENGINE LIST OF ITEMS GRAPHED

rpm 0.00

Name	Value	Status	Raw value
Engine speed [rpm]	4681.13	OK	37449
Coolant temp [°C]	92.00	OK	132
Command (TSC1) [RPM]	1550	OK	0
Engine load [%]	0.00	OK	0

TRANSMISSION LIST OF ITEMS GRAPHED

Name	Value	Status	Raw value
Forward	False	Unkno...	1
Reverse	False	Unkno...	0
P-Brake released	False	Unkno...	1
Safety switch	False	Unkno...	1
Speed pedal [%]	0.00	Unkno...	2511
Pump output [%]		Unkno...	0
Motor output [%]		Unkno...	0

Adjust Groups

ADJUST GROUPS

Like Measure Groups, Adjust Groups and grouping of like functions in which parameters of the items can be changed by the operator while operating the machine or a change of performance for the machine during set up.

A good example is modifying the valve output's Maximum speed by changing maximum current, or changing the ramp up and ramp down times for the main boom cylinder to allow for smoother operation.

ADJUST GROUPS CONFIGURED FOR THE MACHINE CONTROL

- Application
- Channels
- Modules
- Measure groups
- Adjust groups
  - Loader
  - Hydraulic output
  - Engine
  - Transmission
  - Other
  - Production
  - Demo
- Logs
- Languages
- Display pages
- Images
- Security

Adjust groups

Name	Order	Description	Channels
Loader	0	Loader settings.	2
Hydraulic output	1	Adjustment of the current outputs for the hydraulics.	4
Engine	2	Engine speed function parameter.	1
Transmission	3	Transmission I/O adjustments.	4
Other	4	Steering input, Machine owner.	2
Production	5	These settings are adjusted in production.	8
Demo	6	Used for demonstration purpose only.	1

TRANSMISSION ADJUST GROUP DETAIL OF FUNCTIONS DEFINED

- Application
- Channels
- Modules
- Measure groups
- Adjust groups
  - Loader
  - Hydraulic output
  - Engine
  - Transmission
  - Other
  - Production
  - Demo
- Logs

Adjust group: Transmission

Name	Order	Channel name	Channel type
Motor	1	COUT Motor [mA]	Current out
Pump	0	COUT Pump [mA]	Current out
Max Speed	2	Max Speed [%] (100)	Function parameter
Speed pedal	3	Speed pedal [%]	Voltage in

Logs

LOG DETAIL OF ENGINE EVENTS

Log items

3% Value Event

Engine events

Name	Order	Description	Type	Value	Status
Oil Pressure [bar]	0		Value log item	False	Unknown
Engine Temperature [°C]	1		Value log item	False	Unknown

LOGS GROUP AS IT DEFINES THE LOG SETS TO BE MONITORED

- Application
- Channels
- Modules
- Measure groups
- Adjust groups
- Logs
  - System log
  - Engine events
  - Statistics temperature - MD3
  - Statistics temperature - XA2
- Languages
- Display pages
- Images
- Security

Logs

Event Statistics

Logs

Name	Order	Description	Type
Engine events	1	Logs engine related events.	Event log
System log	0	Logs system events. Can not be removed.	System log
Statistics temperat...	3	Logs temperature statistics for the expansion module.	Statistics log
Statistics temperat...	2	Logs temperature statistics for the master module.	Statistics log

LOGS

The Logs group allows you to define all items to Log of events and monitoring for status. A good example is Engine events for Oil Pressure and Engine temperature for over heat.

The Engine issue are critical for machine performance. Logs allow the machine design to monitor and record via a Real Time Clock the status of the machine for performance and Warranty.

All Logs can be defined as to who has access to the Logs. In the Security section the analysis of Logs can be determined.

Languages

IQAN Design Supports most languages on the globe in the program. The key aspect to languages is the machine designer selecting the languages that are preferred for the machine. As shown are English and German..

- The functional names of the machine must be defined in German by the machine designer
- As IQAN can covert the program phrase but not machine specific terms
- The ability to convert back and forth on the machine
  - To suit a operator or service technician
  - Easily done

LANGUAGE DEFINITIONS

Languages

Name	Or...	Language code
English	0	en-us
German	1	de

All | Channels | Modules | Measure groups | Adjust groups | Logs | Display pages | Security

Type	Component	Property	English	German
Adjust group	Engine	Name	Engine	Motor
Adjust group	Hydraulic output	Name	Hydraulic output	Hydraulik
Adjust group	Loader	Name	Loader	Lader
Adjust group	Other	Name	Other	Andere
Adjust group	Production	Name	Production	Production
Adjust group	Transmission	Name	Transmission	Fahrantrieb
Adjust item	3rd	Name	3rd	3te
Adjust item	3rd Lever	Name	3rd Lever	3rd Lever
Adjust item	Boom	Name	Boom	Heben

Display Configuration

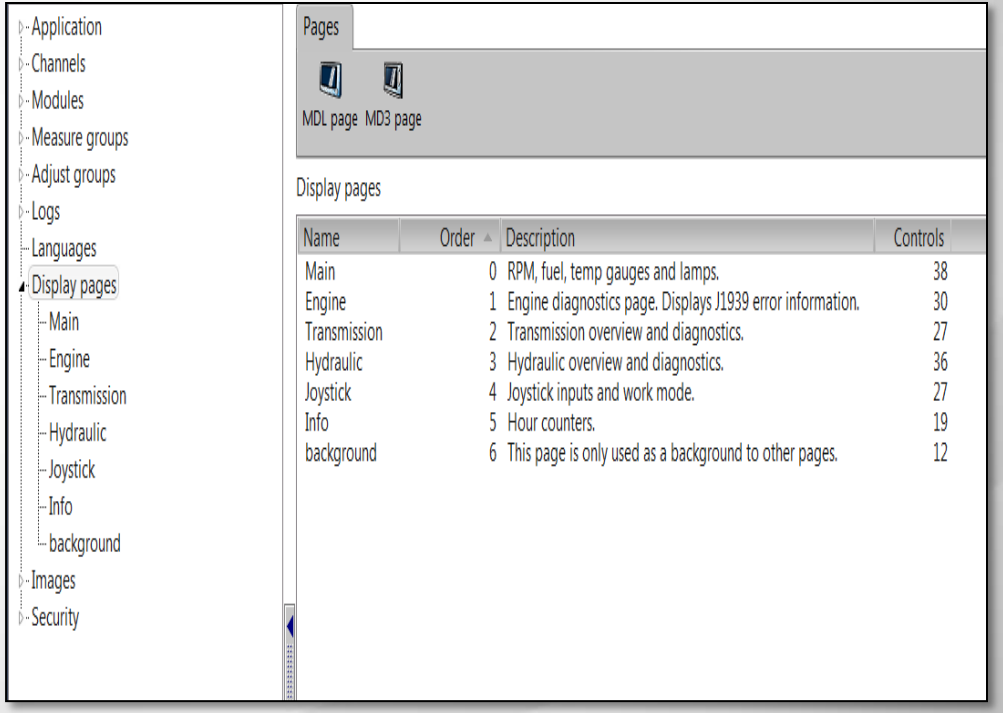
DISPLAY CONFIGURATION

If your system Design Includes a Display/Master controller. Then details of the display are defined at the point. This is a very powerful aspect of Machine design for the Human machine Interface (HMI).

The IQNA program can take almost all forms of pictures, JPEG's, BMP's etc. Also, IQAN Design has a very extensive SAE and ISO Library of symbols for configuration as well as dynamic symbols(IBAR and IGAUGE) in gauges, bar graphs, and color coded symbols.

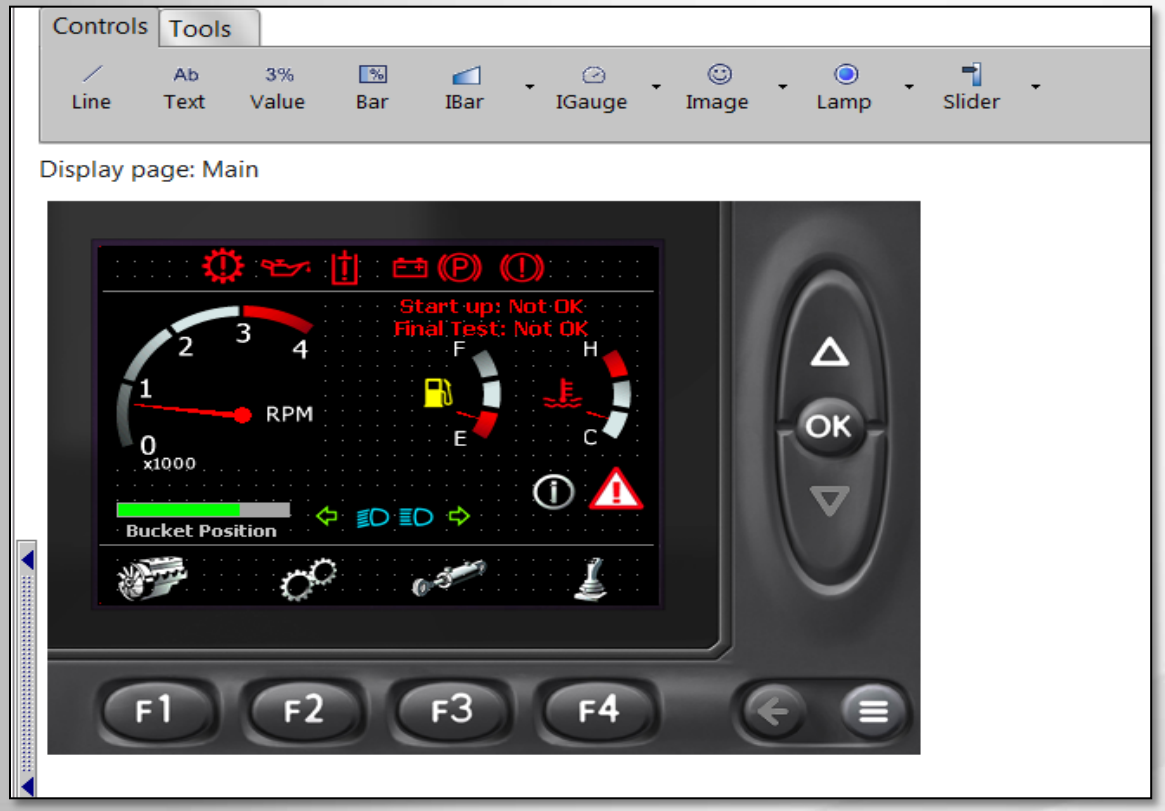
Display pages are defined as types and each pages is laid out for clear definition.

DISPLAY PAGES- EACH PAGE IS DEFINED FOR MACHINE FUNCTION



Name	Order	Description	Controls
Main	0	RPM, fuel, temp gauges and lamps.	38
Engine	1	Engine diagnostics page. Displays J1939 error information.	30
Transmission	2	Transmission overview and diagnostics.	27
Hydraulic	3	Hydraulic overview and diagnostics.	36
Joystick	4	Joystick inputs and work mode.	27
Info	5	Hour counters.	19
background	6	This page is only used as a background to other pages.	12

Display Configuration

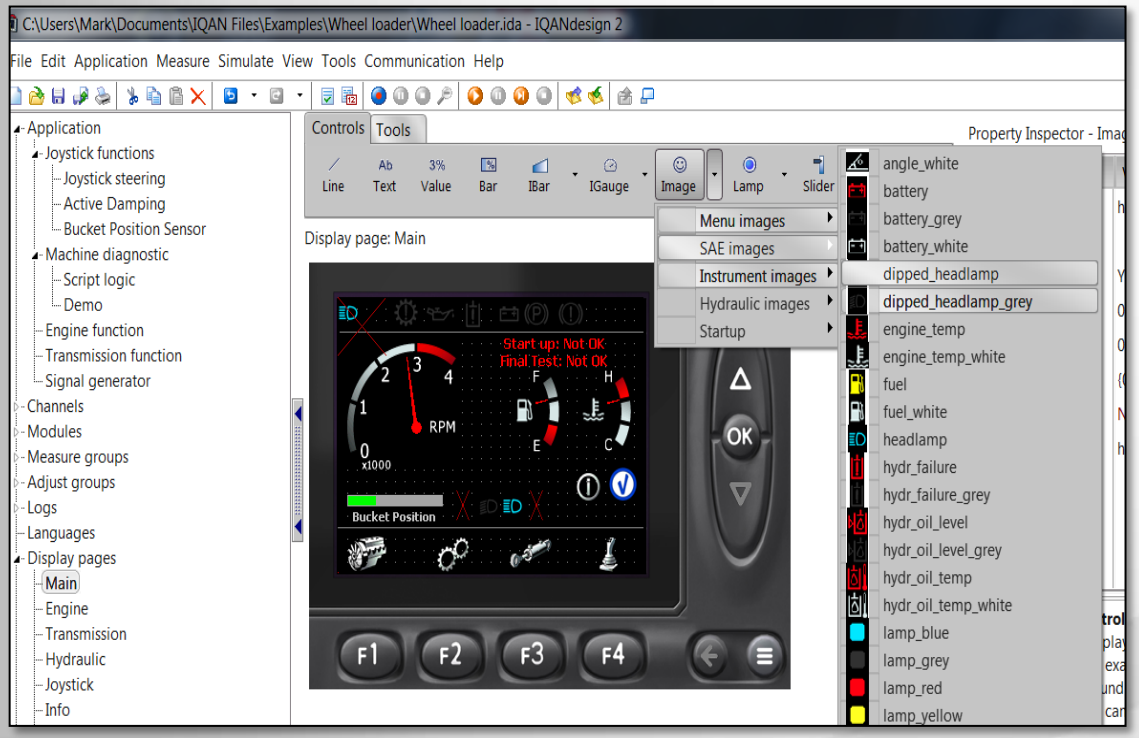


MAIN DISPLAY PAGE DETAIL

Explanation and Detail of Layouts and Soft button Functional Definition

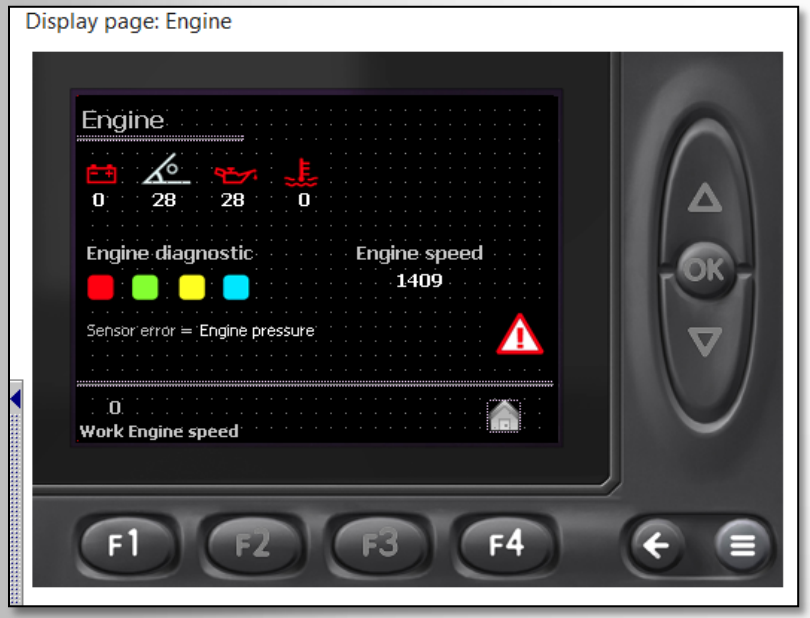
SAE Symbols and Library

SAE IMAGE EXAMPLE FROM PULL DOWN LIBRARY IN IQAN DESIGN

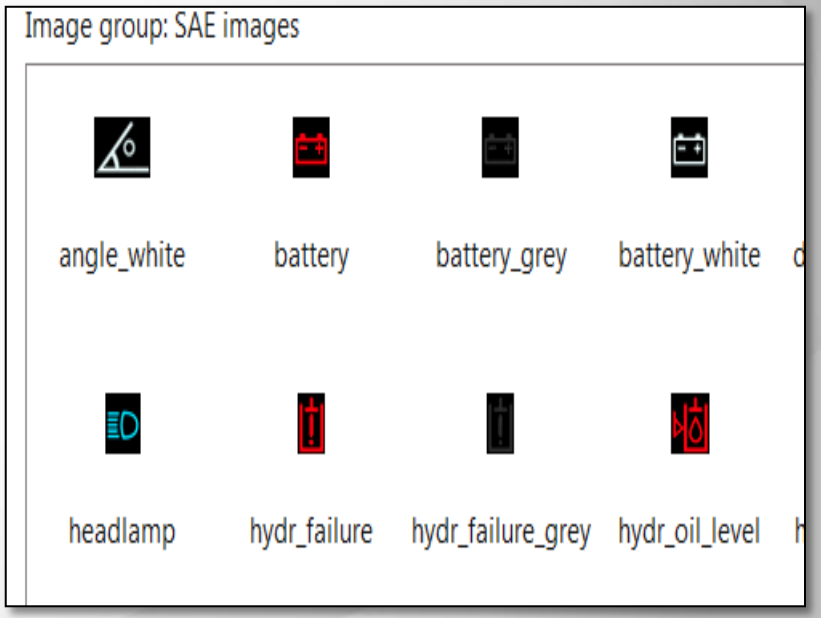


SAE Symbols and Library

DISPLAY PAGE OF ENGINE- SHOWING BITMAPS AND VARIABLES



SAE SYMBOL LIBRARY EXAMPLES

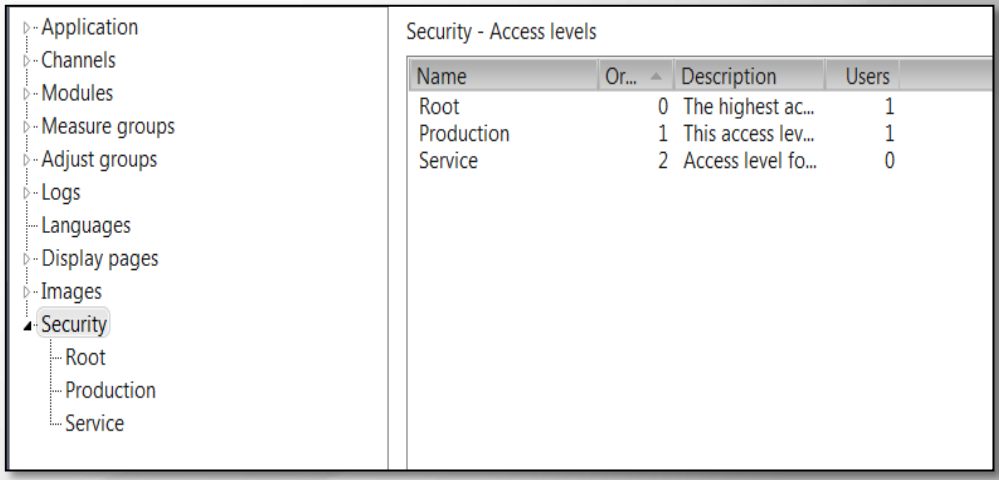


Security Groups

Security has several forms in IQAN design...the key and most important issue is to define the Security aspects of the program early in the design, so that the program is configured with the items in mind.

- Security for access to the program to view and change functional items to machine control
- Security Definition of what Display Screens can be seen by the operator as he runs the machine
- Display screens that only a service technician can view as a function of a PIN entered on the display
- Security of items that can be Accessed in the adjust groups Marine Navigation Systems

SECURITY GROUP SCREEN SHOWING DEFINITION OF THE SECURITY GROUPS



IQAN Creative Software Conclusion

Efficiency in focus – throughout the entire machine life cycle.

J1939 – Applications

- Agriculture
- Forestry
- Military Vehicles
- Fleet Management Systems
- Marine Navigation Systems
- Diesel Power-Train Applications
- In-Vehicle Networks for Trucks and Busses
- Truck-Trailer Connections
- Recreational Vehicles
- And more …

Intelligent Software – Electronic Control Made Easy

IQAN by Parker

GLOBAL RESOURCES

Foremost in Machine Performance for Life

Dedicated to Creating a Competitive Advantage for our Customers Through Innovative Solutions and Integrated Products

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