इ रि से ट
विद्युत सिगनल प्रयोगशाला
प्रयोग नं: ई एस एल -36

IRISET
ELECTRICAL SIGNALLING LABORATORY
EXPERIMENT NO: ESL- 36

नाम
Name : _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

अनुक्रमांक
Roll No : _ _ _ _ _ _ _ _ _ _ _ _ _ _

प्राप्त अंक
Marks Awarded :

पाठ्यक्रम
Course : _ _ _ _ _ _ _ _ _ _ _ _ _ _

दिनांक
Date : _ _ _ _ _ _ _ _ _ _ _ _ _ _

अनुदेशक का अधाक्षर
Instructor Initial :

VHLC – Vital Harmon Logic Controler
(RDSO/ SPN/192/2005)

## INTRODUCTION

It consists of

- Two sets of VHLC (A&B) in normal and standby configuration, This provides redundancy for both processors and I/O modules.
- One domino type operating cum indication panel for operation.
- Vital neutral line relays for interfacing VHLC I/O to field gears.
- One PC for VDU panel and another PC for maintenance purpose.

VHLC (Vital Harmon Logic Controllers)

- It contains main VHLC (A1/B1), which performs interlocking control functions and for vital inputs & outputs. where ever required additional VHLC (A2/B2) units are provided for additional inputs & outputs
- One VHLC chassis provides card slots for up to 12 plugs in modules.
- Standard modules: VLP, ACP & SSM at slots 1, 2 & 3 and power supply on the rear of chassis.
- Application modules: VGPIO, VGPI & NVIO at slots 4 to 12.

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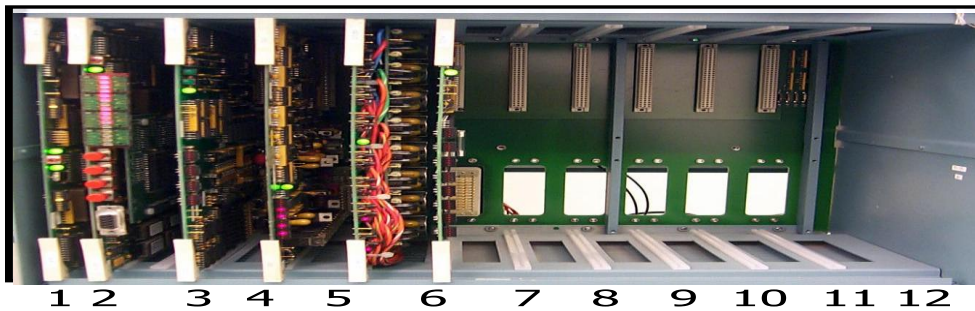
VLP module (Vital Logic Processor)

- Dual microprocessor **(Intel 80C186**) design assisted by dual co-processors, based on 2 out of 2 check redundant system.
- It has CPU & Bus master for VHLC.
- Controls all other modules in chassis through mother board.
- It performs all the vital logic equations and generates message packets for exchange with other units.
- On board reset switch resets all VLP circuits.
- LEDs & Check points for health of the card.

ACP module   (Auxiliary Communication Processor)

- It is a single microprocessor **(Intel 80C186)** controlled electronic assembly for managing the communications and diagnostic functions.
- Contains non-vital EPROM U9, U10 and processes non-vital logic equations.
- Also contains non-vital Executive EPROMs IC 30-33.
- Handles serial data communication up to five external devices.
- Maintains log of events with in system for diagnostic purposes.
- Contains 16 characters, four buttons, CDU for status checking.
- Front side, 9-pin RS232 connector for diagnostic purpose.
- On board reset switch resets all ACP circuits.

SSM module (Site Specific Module)

- Contains EPROMs (IC 14, 15, 17) of vital logic equations.
- Contains setup data for a particular site.
- It is half in size compared to any other card.
- Equation and configuration information is generated by ACE.

VGPIO & VGPI modules(Vital General Purpose Input Output module & Vital General Purpose Input module

- VGPIO accepts 8 vital inputs for sensing voltages & provides 8 vital outputs for driving relays.
- VGPI accepts 16 vital inputs for sensing voltages.
- Green LED shows module health.
- Red LEDs show input & output state.
- It buffers signals from VLP & provides address decoding & module enable circuits.
- Inputs are polarity sensitive & accepts voltages up to 32VDC. Hysterisis is included in input interface so that input voltage must rise above 8VDC for energized input & fall below 6VDC for de-energized input.
- Signature generator provides for rejecting the AC voltages that may be included into the wires connecting to de-energized vital input. It presents unique pattern identification for each input.
- Each output has two feedback circuits one for chopper AND gate and one for the power gate. Both gate must be energized for powered output.
- All VGPIO/VGPI module cables are uniquely keyed to prevent incorrect module installation.

Rear of the CHASSIS

- It contains +5 VDC power supply and up to 5 serial I/O module from A to E.
- Chassis ID is located behind the CPU which is 16 characters in length.
- Application logic program must match this ID.
- 'A' & 'C' ports are RS 485 which are used for communication between VHLC & PC(VDU panel -1 No & Maitainace PC – 1No).
- 'B' & 'D' ports are RS 232 which are used for communication between two VHLC units.
- 'E' port is for CLA (Current loop Adopter).
- Power supply module - it provides up to 40W of regulated +5 VDC output (adjustable form 4.5 to 5.5 VDC) from 10-16 VDC input and '2' is I/O cables.
- An output logic signal drops & initiates a VLP reset & holds it in reset when the output voltage drops 250 mV below the set point.
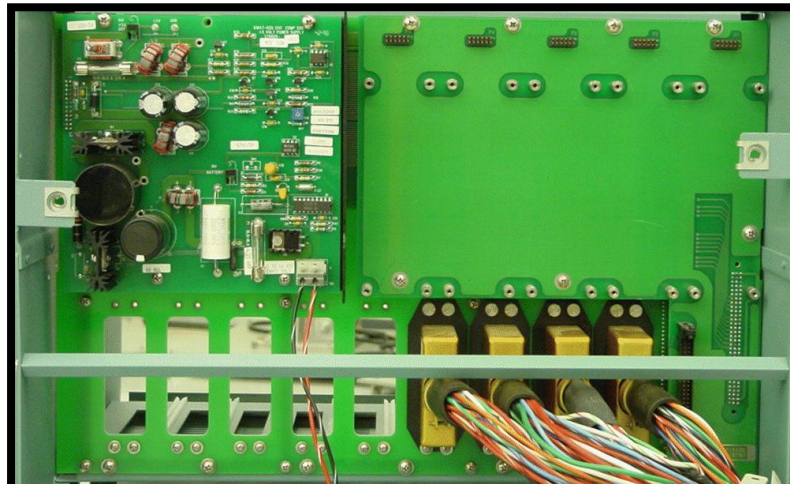
CLA (Current Loop Adaptor)

- Interface between VHLC & CLCP.
- Communicates serially with CLCP.
- It does not supply current to transmit or receive, it only switches the current supplied by the CLCP.
- Transmits & receive data for 128 outputs & 128 inputs.

CLCP (Custom Local Control Panel)

- CLCP works as a panel Processor.
- Interfaces CCIP to the VHLC on RS 232 Link using a 20 mA Current loop.
- Allows maximum of 128 Inputs (Panel Inputs) and maximum of 128 outputs to panel (Indication).
- A 12V to 5V, 20W Power Supply module powers the CLCP through Battery Surge Arrestor.
- One CLCP for each VHLC.

System Change Over and Debugging:-

- Transfer from system A to B and vice versa takes place with the help of 7nos 'Q' series Relays and a 3- position switch in V1 Rack front.
- Positions of the 3-position switch are system 'A', system 'B' and Auto.
- When in Auto, the transfer of system takes place automatically.
- When not in Auto mode, either 'A' system or 'B' system can be made to work with the help of 3-position switch.

Debugging:-

- There is one Debugging switch in V2 Rack front. With the help of this switch Stand by system can be switched ON in debug mode.

VHLC - Transfer Circuits Operation

- 3-position rotary transfer switch is provided for transfer circuits operation.
- Three positions of switch are as follows:
  Position A – To switch ON System A (12V dc power will be extended to System A)
  Position B – To switch ON System B (12V dc power will be extended to System B)
  Position Auto – To switch ON B when A fails or A if B fails
- For automatic operation, the transfer switch position must be in Auto.
- Consider both A & B systems are offline since power is OFF and transfer switch is in Auto position.
- When power is switched ON, 12V DC power is extended to System A and System B remains in power OFF state through the relay based external system transfer circuits.
- routines and become online within 60 seconds. System A will boot up, undergo internal self-check diagnostic All approach locking will be released after 120 seconds of system becoming online and then System A will be ready to control the interlocking.
- When system A fails, 12V DC power continues to be available to System A for 80 seconds. If System A does not resume online within 80 seconds, the system transfer circuit extends the 12V DC power to System B and disconnect the power to System A.
- System B will assume online and be ready to control the interlocking after system boot up, self-check diagnostic routines and approach locking time have been completed.
- System B to System A transfer will be similar to that of System A to B transfer.
- Transfer switch panel on VHLC rack provides A & B System ON, OFF indications.
- Control-cum-indication panel provides A & B System ON, OFF indications, System transfer buzzer and System transfer alarm acknowledge.

VHLC - Diagnostic Mode Operation

- Though System B is powered ON, station interlocking will be controlled by only System A. System B will not process and deliver any vital output. This measure has been considered in the application logic.
- Turn the diagnostic mode switch to DEBUG OFF and transfer switch to position AUTO, when maintenance activities are over.
- Turning on System A using diagnostic option when System B is working will be similar to that of turning ON the System B as explained above.
- Diagnostic switch panel on VHLC rack provides LED indications for DEBUG ON and DEBUG OK.

ACE (Application Compiler Editor)

- It is a window based computer program that allows an application engineer to input wayside site configuration and application logic.
- This software has four key features:

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1. Editing
2. Data entry
3. Compiling
4. Reports

Abbreviations :
VHLC : Vital Harmon Logic Controller
CLCP : Custom Local Control Panel
VLP : Vital Logic Processor
ACP : Auxiliary Communication Processor
SSM : Site Specific Module
VGPIO: Vital General Purpose Input Output module
VGPI : Vital General Purpose Input module
NVIO : Non Vital Input Output module
BSA : Battery Surge Arrester
CLA : Current Loop Adapter.
ACE : Application Compiler Editor
CDU : Control Display Unit.

Review Questions:

1) Draw block diagram of VHLC architecture.

2) How many cards can be installed in VHLC? Write the IRISET station card file configuration.

3) What is the power supply arrangement required for VHLC, CLCP?

4) How to transfer the system into warm standby-Diagnostic mode?

5) Draw the changeover circuit and explain it .

Date :   Signature of the trainee