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प्रयोग नं: ई एस एल 45

IRISET
ELECTRICAL SIGNALLING LABORATORY
EXPERIMENT NO.: ESL – 45

नाम

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STUDY OF DATALOGGER FAULT LOGICS ENTRY

It is an application software used in Data logger Systems to generate Fault Reports basing on the digital & analog data recorded in the Data logger.

Fault Entry software is installed in every FAS/CMU for getting fault reports.

Many Fault logics have been defined for generating fault reports for different type of signal incidences & failures. A list of some different fault logics used in different Railways is mentioned in Annexure –A.

Basing on the user defined Fault logics, logics are created for each station data logger system using the Fault Entry Software.

At the time of Installation of a data logger all the fault logics of the station are created & uploaded in the data logger system by the OEM.

Provisions are made in the Fault Entry software to create a New fault logic or to modify or delete an existing logic.

The entire fault entry process is divided into two sections.

Section-I: Creation of Fault logics basing on user defined fault logics

Section-II: Fault Entry into the system basing on the created Fault Logics.

Section -- I Creation of Fault Logics:

Railways have to provide the following information to the OEM of Data loggers for the creation of Fault logics for a particular station.

- 1) Fault messages.
- 2) Description of Faults.
- 3) Inputs to be considered for the Fault.

Basing on this information the OEM creates Fault logics for a particular station.

The following steps are involved in the creation of the Fault Logics.

- 1) Select “Fault Entry” exe icon on the desktop of data logger PC/CMU.
- 2) Fault Entry window opens with all its options

3) At the bottom of the Fault Entry window 2 options.

- a) New Logic
- b) View Logic is available.

“New Logic” option is for creation of a New Logic

“View Logic” option is for viewing, modifying and deleting an existing Fault logic.

- 4) For creation of fault logic select “New logic” option.
- 5) The “New Logic” window opens with all its fields.
- 6) Enter the data required for the different fields & finally click “Save” button to save the entered logic.
- 7) After the creation of a new logic, one can view the fault name, fault condition & the inputs state in the fault entry window.

The different fields of **New logic window** which need to be filled up at the time of creation of a new logic are:

- 1) Fault Name
- 2) Number of Functions
- 3) Number of Timers
- 4) Number of Triggering Signals
- 5) Number of Delete Trigger Signals
- 6) Fault description
- 7) Function order
- 8) Selection of logic in Logic Tables.

The screenshot shows the 'NewLogic' window with the following fields and tables:

- Fault Name**: [Empty text field]
- Fault Description**: [Empty text area]
- Time Gap**: [Empty text field]
- No. Of Functions Allowed**: 0
- No. Of Timers Allowed**: 0
- No. Of Triggering Signals**: 0
- No. Of DeleteTriggerSignals**: 0
- No. Of Flts To Occur**: 1
- Fault Information Type**: G
- Fault Department Type**: S&T
- Function Order**:

Fn1	Fn2	Fn3	Fn4
- Logic Table**:

1	2	3	4	T/F
- Triggering and Delete Triggering Inputs Status Selection**:

Inputs	Ip1
Trig	
DelTrig	N0
- Pseudo Flt Name**: [Empty text field]
- Fault Level**: M
- Fault Logic Status**: OCCURANCE

Buttons: Save, Delete, Help, Close.

Fault Name:

It is at the top of the “New logic” window. The fault type is to be entered in this field.

Number of Functions:

Number of functions means the total number of tasks to be performed for the application of the logic. Here tasks involved are

- a) Checking the status of some inputs.
- b) Checking a condition
- c) Checking a route sequence
- d) Displaying the message (to indicate the failure of a function).

i.e. If 3 signal (inputs) status are to be checked when they are all down→ It is the first task.

If a condition that 1st signal down time is greater than the 2nd signal down time has to be checked→It is the 2nd task.

Then the total number of functions is 2.

Note: Timers are not counted for calculating the Number of functions.

Ex: - Late operation of signal S1.

Logic: If 1HECR /1DECR is up when 1ATPR is down & the time difference between 1ATPR down and HECD/DECD up is greater than 300 m sec then the fault should generate for late operation of signal S1.

Here No. of tasks = 2

Task 1: verification of Input status - (1HECR /1DECD is up when 1ATPR is down)

Task 2 : checking a condition – (The time difference between 1ATPR down and HECD/DECD up is greater than 300 ms).

Hence, Number of functions = 2.

Number of Timers:

It is the Number of timer functions defined in the fault logic. Timers are designated as T1, T2 etc.

Number of Triggering Signals:

A triggering signal is an Input at which the fault should be triggered by considering the status of other Inputs. There may be one or more triggering signals for a fault logic.

Ex: - Late operation of signal S1.

Inputs involved: S1 HECD /S1 DECD –input 1

1ATPR - input 2

Number of functions is 2.

Logic: If 1HECD /1DECD is up when 1ATPR is down & the time difference between 1ATPR down and HECD/DECD up is greater than 300 sec then the fault should generate for Late operation of signal S1.

Triggering Signal: Here S1HECR/DECR is the triggering signal, because the fault is recokned from up time of S1HECR/S1DECR while 1ATPR is down.

EX 2: - Failure of point No 20.

Logic: If both 20NWKR & 20 RWKR are down for more than 20 seconds then it is a point failure.

Triggering Signal: Here both 20NWKR & 20 RWKR are triggering signals.

Number of Delete Triggering Signals:

The Number of delete triggering signals should not exceed the number of triggering signals. A signal which picks up and again drops during fault triggering process is known as a delete trigger signal. That is an input whose status need not be available continuously during fault triggering process is known as Delete triggering signal

Ex: GNR, UNR, some TPR inputs etc.

Fault Condition:

The definition of the fault logic is to be mentioned here.

Ex: Definition of“Point Failure” logic can be written as:

“If NWKR (input1) RWKR (input2) both are down for more than a specified time interval then it is point failure. Both inputs are triggering signals.”

Function Order:

A Function order grid is automatically generated in the new logic window, as soon as number of Functions & Number of Timers is entered in the respective fields.

Ex : A logic for which Number of functions is 2(i.e, status of 3 inputs is to be verified along with a condition C) and if a Timer T1 is also mentioned then Function order Grid is to be filled up as below .

Fn1	Fn2	Fn3
3	C	T1

Fault Triggering is based on the Function order. So at first we have to finalise the Function order based on Fault condition.

Function order= Number of Functions+ No of time intervals.

To finalize function order, study the fault condition and find out the following information

How many inputs are taken & what is their status?

How many triggering inputs are taken?

How many tasks are to be performed?

How many time intervals are required?

Is there any condition is required? (i.e., if any operations are to be performed).

Symbols used for entering the function order in the function order grid:

The following symbols are used for entering the condition in the grid for condition.

Up - Up time

Dt – Dn time

St - Status time

Pst – Previous status time

Ppst – Previous previous status time

Pppst - Previous previous previous status time

AND, OR operators – these are used between two conditions.

None: This is used where condition is completed

How to fill up the function order grid?

Step-I

In Fn1 mention the number of inputs whose status is to be checked.

In Fn2 column mention 'C' if any condition is there in the fault logic.

In Fn3 & Fn4 column write down T1,T2 if any timers are there in the logic.

Waiting timers (if any) are to be entered next to function before C.

Step-II

Double click on **Fn1** column. A logic table appears. The number of columns in the logic table is equal to number of inputs plus one.

Now select the appropriate logic of the logic table which satisfies the status of all inputs to be checked as per the logic.

Go to **T/F** column of the selected logic & double click there. The 'o' in the column changes to '1'.

Example: Consider a logic "Late start of Train". Here number of inputs whose status is to be checked is 3. Hence entry in function order grid in Fn-1 column is 3. Click on this 3, the following logic table appears. In this case, the status of inputs required to trigger the fault is Input- 1 (TPR1) –DN, Input -2 (HECR) – UP & Input-3 (TPR2) – DN. Hence the appropriate logic to be selected in the logic table is as below:

1	2	3	T/ F
DN	DN	DN	0
DN	DN	UP	0
DN	UP	DN	1
DN	UP	UP	0
UP	DN	DN	0
UP	UP	DN	0
UP	DN	UP	0
UP	UP	UP	0

Step-III

Double click on the Fn2 column of function order grid. If the Fn2 entry is C i.e a condition then a logic table for entering the condition appears.

The conditions of the logic are to be entered in this logic table using the options provided at the bottom of the table for each column.

No entry to be made in the 1st & 2nd column of the table.

Enter the condition using the symbols mentioned above.

Ex: - For a late start of train logic: TPR1(Sig-1) Down, HECR (Sig-2) UP, TPR2(Sig3) is Down. The time difference between HECR UP &TPR2 DN is more than given time interval & TPR1 is Down before HECR is up. TPR2 (Sig no 3) is triggering signal.

Here if $x_1 = \text{TPR1}$, $x_2 = \text{HECR}$ & $x_3 = \text{TPR2}$ then the conditions for the logic to be mentioned in the logic table as $[x_3 \text{ Dt} - x_2 \text{ Ut} > T1]$ AND $[x_2 \text{ Ut} > x_1 \text{ Dt}]$ NONE

Note:- Operators may be signs like <, >, =, +, <=, >=, / etc. These signs can be obtained in the option box below the operator column.

Initially the logic table appears with 10 columns.

If more conditions are to be added, then select **AND** in the 10th column by double click AND appears in 10th column & table extends with 10 more columns for adding extra conditions.

If more conditions are to be added with OR between conditions, then select OR in the 10th column by double click **OR** appears in the 10th column. Now add additional conditions on the 2nd row of the table.

If you do not need any of the parameters, you have to keep that particular column blank.

If any other characters other than what is present in the Option boxes is entered in the logic table, an error message pops up showing “**Invalid Entry**”.

Finally when all the logics are selected for all the functions in the function order grid (except timer functions) click **Save Fault** button.

This ends the fault logic creation process.

Viewing/modifying/deleting an existing logic:

1. Select View Logic option in the fault entry screen after selecting the Fault type from the Fault Type list.
2. Now the logic of the selected fault type can be viewed.
3. If no faults are entered for this logic and if the fault logic needs to be modified, then modify the logic.
4. Then click the Modify button or if the fault is to be deleted, click on the Delete button.

Procedure to add a condition to an existing logic:

1. Select the particular logic in the fault type list.
2. Click on the View logic button.
3. Increase the number of functions by one in the **No of Functions** field.
4. One new column appears in the function order grid. Enter 'C' in the required position of the function order grid.
5. Then double click on the functions in the function order grid & enter the data in logic tables as done for creation of new logic.
6. Finally click the Save fault button.

Section II Fault Entry basing on the created Fault Logics:

1. Select Fault Entry icon on the Desk top.
2. Select an empty row in the fault list grid .
3. Select the required type of fault from fault type list .

Once the fault type is entered, the signal list grid appears with the following columns

Inputs	Function Name	Function Type	Station	Trigger (Y / N)	UP/ DN	DelTrig Y/ N

4. Select the signals from the **Signals List** by double clicking the required signals .They will appear automatically in the **Function Name** column of the above table.
5. Enter **function type** and **station** name in respective columns
6. In **Trigger (Y/N)** Column select Y for the inputs which are triggering inputs for the logic
7. In **UP/DN** column select the status in which the input should be available for triggering the fault (UP or DN)
8. After entering data in the signal list grid ,enter the **fault message** and **time intervals** (if existed) [1 second = 100 units]
9. Fill in the **Pseudo fault message** field with the fault type data.
10. Click on **Add to save fault list**, **save** in Fault list and then select **create out put**.

This completes the procedure of fault entry .

Date:

Signature of the Trainee