FOUNDATION FIELDBUS INTEROPERABILITY TEST AND SYSTEM CONFIGURATION AND DEVELOPMENT - FOXBORO

By

Ab. Wafi Bin Ab. Aziz

Final report submitted in Partial Fulfillment of
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Universiti Teknologi PETRONAS
Bandar Seri Iskandar
31750 Tronoh
Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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Approved:

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(Ir. Dr. Idris Bin Ismail)
Project Supervisor

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

Ab. Wafi Bin Ab. Aziz

ABSTRACT

Before a new technology is introduced to the industry, it will undergo a few tests to make sure it is safe reliable and ready for implementation. Because of that, Petronas was doing this project to evaluate the suitability of Foundation Fieldbus being used at their plants. Foundation Fieldbus is digital based communication that allow bidirectional signal transferring mode.

This project is about doing basic tests of Foundation Fieldbus technology to make sure it is compatible enough to be implemented in industry especially in Malaysia. The main test is focused on the basic test that consists of commissioning, decommissioning, drop out test, and online device replacement test. This is to emulate the normal activities performed in a plant. The second part it focused on to stress test of the system. For stress test, it cover test for noise effect on the foundation fieldbus communication.

This entire test is to measure the interoperability and reliability of the system being implemented in plant. From the overall test and finding, foundation fieldbus was achieved the required reliability and interoperability as specified by Petronas.

ACKNOWLEDGEMENTS

On this part I would like to take this opportunity to acknowledge and express my gratitude to everyone that has given me all the supports and guidance throughout the whole period completing the final year project. First of all, I would like to express my utmost appreciation for the endless help and support received from my supervisor, Ir. Dr. Idris Ismail. His guidance and advices are very much appreciated. I also want to acknowledge Mr. Azhar, technician of Electrical and Electronics department Universiti Teknologi Petronas, who supported me greatly with his sharing experience and gave me his hand when I need some help. Lastly, to my parents and all my friends that continuously give me support so that I can complete this project with flying colors.

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LIST OF ABBREVIATIONS AND DEFINITIONS

AI	Analog Input
CSD	Control Strategy Diagram
DD	Device Description
FF	Foundation Fieldbus
HMI	Human-machine Interface
I/A	Intelligent Automation
IACC	I/A Series System Configuration Component
SMDH	System Management Display Handler
mV	miliVolt
LAS	Link Active Scheduler
OOS	Out of Service
UTP	Universiti Teknologi Petronas

Commission	To put device in online/ functional mode
Compound	Subset of control processor
Decommission	To put device in offline mode
Download	Loading data from host to device

CHAPTER 1
INTRODUCTION

1.1 Background Of Study

Foundation Fieldbus (FF) is digital based communication that allow bidirectional signal transferring mode. Unlike conventional method, FF used smart field devices that have function block build-in in the devices [10][11]. Having function block in a device make the device can doing calculation regarding process control by itself. This technology make a statement "control in field" come to reality and hopefully this will be a new era of control system in industries. Interoperability and reliability are the important criteria need to be included to a system so that it can be used effectively and safely to human life. Because of that this project will focus on the interoperability and reliability of the FF system.

1.2 Problem Statement

FF is still not widely used in industries in Malaysia although the technology has been introduced in 1980's a ago and a few plant that implement foundation fieldbus such as Petronas Penapisan Melaka, faced with many problems related to the technology. Some of the problems faced by Petronas is that they do not have standardize procedures to execute activities such as commissioning of device, decommissioning of device, and online device replacement. They also do not have the expertise to trouble shoot the system when problems such as device failed to communicate to the system or devices went offline. Unfamiliarity with the system and lack in capability of staff are some of the issues related to these problems. Because of that, this project will aim on building knowledge about FF and testing the suitability of the system being implemented in plant.

1.3 Objectives And Scope Of Study

1.3.1 Objective

- To perform technical verification on the technology as specified by Petronas
- To test interoperability (i.e. field transmitter to host) of Foundation Feildbus devices from different vendors. This objective is to test whether all the devices from different vendors can operate smoothly although being connected to only one specific host.
- To test reliability of Foundation Fieldbus being used at plant

1.3.2 Scope of study

Reliability is one of the main aspect should be included in a system. Industry that has high risk of operation needs a system that has high reliability. Because of that, reliability becomes one of the scopes of study in this project. For this project, reliability is looked at the hardware and software part of the system such as the backup devices that can be added for critical devices and the robustness of the software to operate for a long time.

Interoperability is the second scope of study in this project. Interoperability is important to a system because to make sure the system is flexible or can communicate to other types of device. In a plant, normally there are several types of devices from different manufacture. Interoperability is to make sure all the devices can operate and communicate with the system. In this project, the field devices being used are from Honeywell, Emerson, Yokogawa, Foxboro and Endress+Hauser, while the host system is from Foxboro. The tests are to make sure all the devices can operate with the host system.

The third scope of study is stress test. Stress test is type of testing to measure the robustness of the system. It is important for the system to be robust because there are many uncertainties and situations in a plant that will alter the reading or process of a system.

CHAPTER 2
LITERATURE REVIEW

2.1 Topology

Topology is shape and design of fieldbus network. There a few type of topology available for fieldbus, there are Tree topology, Spur topology and Combination topology [1]. The topology selected usually depends on the field devices location in order to reduce installation cost [1]. For this project, the selected topology is **Tree topology**. The diagram of this topology is shown on **Figure 1** below.

Field devices for Tree topology are connected to a common junction box to form a network. From this junction box, only one cable that will go out to H1 card in the system cabinet [1]. Cable that connects field devices to the junction box is called 'spur' while cable that connect junction box to the H1 card is called 'trunk'.

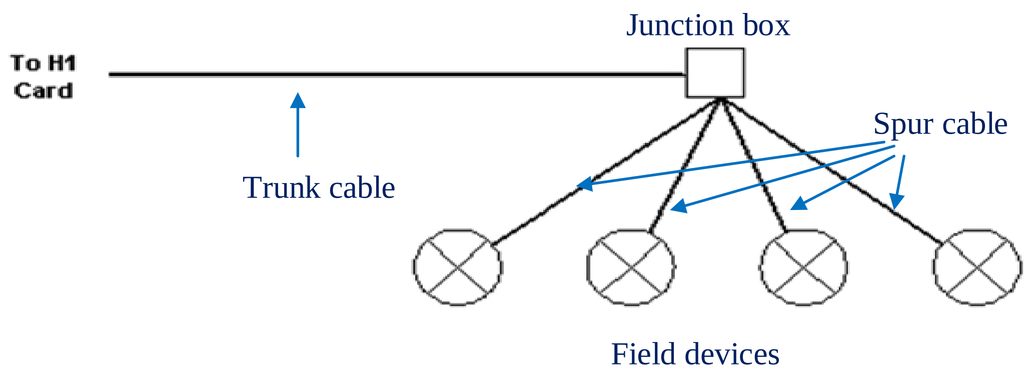

Figure 1 : Tree Foot topology

2.2 Reliability

In field of engineering, reliability is ability of a system or component to perform its required functions under stated conditions for a specified period of time [12]. In other words, a system is called reliable if it can maintain its performance although there are some failures occurred. Normally, reliability of a system can be increase by adding backup for critical part [3].

2.2.1 Hardware

For technology used in critical area likes in process plants, reliability is one of the important aspects need to be taken seriously. For Fieldbus, there are four main reliability issues that related to hardware:

- Spur short circuit
- Trunk failures
- Power supply failures
- Link Active Scheduler (LAS) failure

2.2.1.1 Spur short circuit

Short circuit is common problem that might be happen to electrical network. Since fieldbus used shared wiring, short circuit in one device or on the spur cable will disables the segment and hence the whole process that depends on it [3]. This phenomenon can happen when installing new device, a device is serviced or the device become waterlogged.

To overcome this problem, current limiter can be installed between spur cable and the trunk cable[3]. The current limiter is built into a wiring block in the junction block at the Tree topology. The current limiter only allows a given amount of current to be used by each device. If a spur is shorted, the current will be limited in a few microseconds. So, only the shorted device is affected and the rest of the devices continue operates [3]. **Figure 2** shows how the current limiter is connected in wiring block.

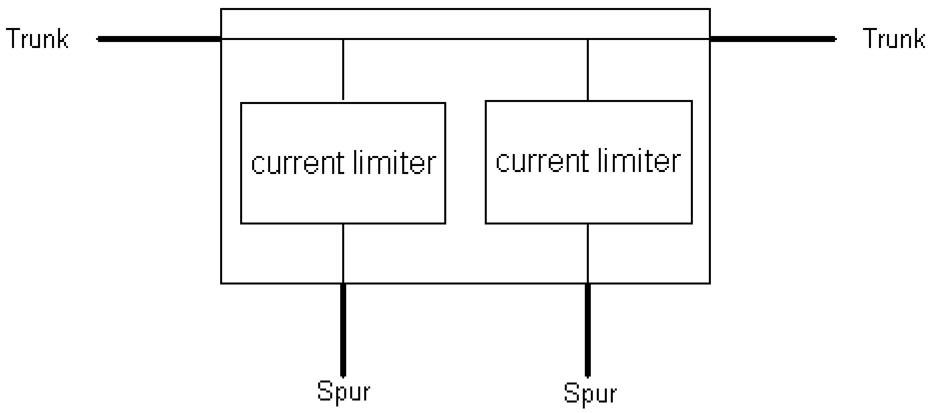

Figure 2 : Current limiter in wiring block

2.2.1.2 Trunk Cable Failure

From **Figure 1**, it is shown that trunk cable is the only cable that connects the field devices to H1 card. If the cable is cut, then the power to the field devices is lost. To overcome this problem, redundant system can be applied, but this is too expensive. So, another way to overcome this problem is to protect the cable from being cut. To do so, the trunk cable can be located in a conduit or a sturdy cable tray [3].

2.2.1.3 Power Supply Failures

Power supply failure is another reliability issue of fieldbus. If fieldbus segment power fails, the entire fieldbus segment will go down and control will be lost. So, this is another important reliability issue to be concerned with.

Usually, to overcome this problem, redundant power supply will be used. If primary power supply fails, the secondary power supply will take over all jobs to supply the power to field [3]. An alarming system also must be installed. This is because, without alarming, if a power supply fails, the system will continue operate until there is a second failure of power supply [3]. So, operator will not be informed of the failures until both power supply fail. If this happened, the objective of redundancy power supply to overcome the problem of power supply failures is not achieved.

2.2.1.4 Link Active Scheduler (LAS) Failure

Link Active Scheduler (LAS) as shown in **Figure 3** is a device that acts as the centralized arbitrator of the bus that is used for communication. All the digital communication signals on a link (fieldbus segment) are synchronized by LAS [7]. LAS distribute time to the bus to permit all devices to share the same sense of time. Device sends out transmission frames on the bus only when so instructed by LAS [7]. Only one LAS will control the traffic on the bus at a time [7]. LAS prevent the signals from colliding with each other [7]. If the LAS fail, the primary Link master (LM) will takes over as backup LAS [7]. LM can be DCS or other device such as valve or transmitter as shown in **Figure 4** [7].

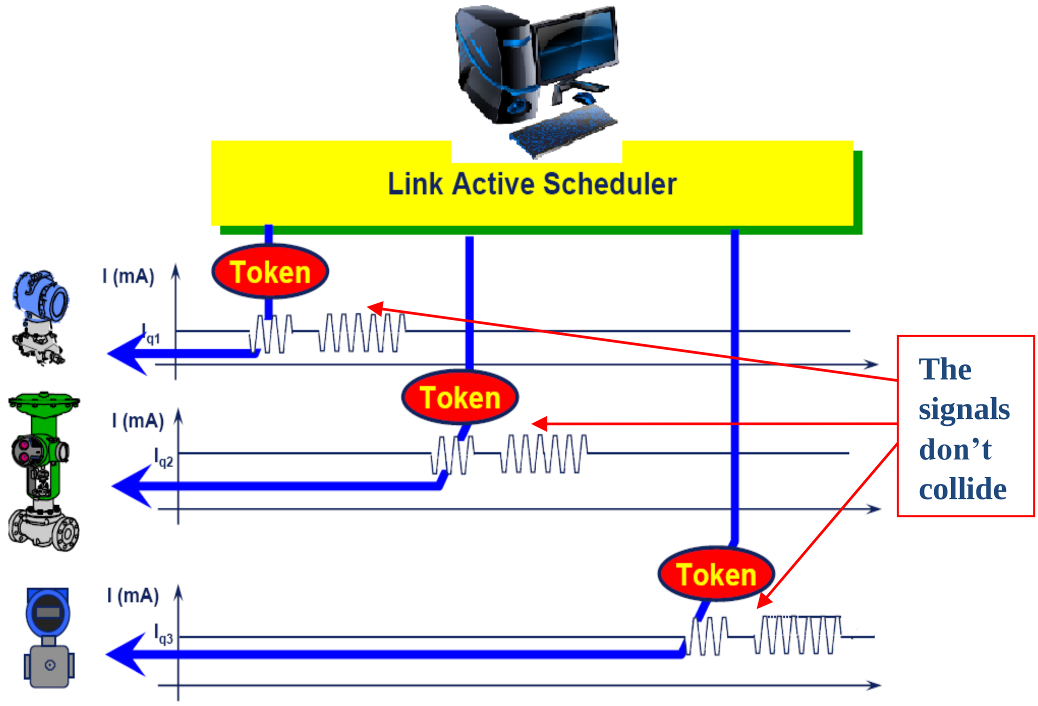

Figure 3 : LAS as a traffic police

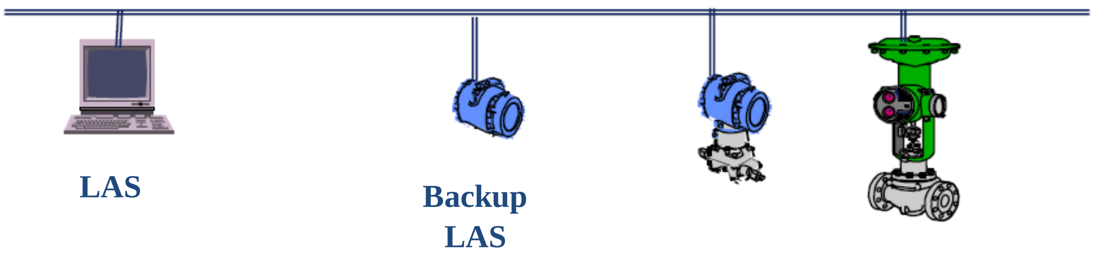

Figure 4 : Backup LAS

2.3 Interoperability

By definition Interoperability is a property that allows several items of equipment to ‘work’ together for a given goal or the capability of one piece of equipment to work within an existing system [14]. Interoperability also is a capability of a system or device to operate smoothly with other systems or devices [13]. For this project, interoperability is looked at the ability of a specific host system (Foxboro) to work with field devices from different vendors (Emerson, Yokogawa, Honeywell, etc). To be able to do that, device description (DD) is being introduced by Foundation Fieldbus.

Device Description (DD) is the resultant computer readable file written in Device Description Language (DDL) that describes all of the data in a field device [4]. DDL is an electronic computer language use to describe the data in a field device which is used by host application like personal computer (PC) or a handheld communicator for engineering, commissioning, monitoring, operation and diagnostics. DDL is a text based language [4].

DD provides description of each object in the Virtual Field Device (VFD), and information needed for a control system to understand the meaning of data in the VFD [1]. DD allow the host system to communicate with field devices without the need for custom programming.

DD is like a “driver” for the fieldbus devices. When a new device is added to the fieldbus segment, DD file must be provided as well to the control system or host. DD contains universal parameters, function block parameters and transducer block parameters for fieldbus devices [7].

This DD enable devices from different suppliers on the same fieldbus network to interoperate with only one version of the host human interface [8]. This technology makes sure the interoperability of Foundation Fieldbus (FF) [7].

2.4 Issue On Implementation Of Intrinsically Safe (IS)

Intrinsically safe (IS) is a requirement for device that are being operate in areas with flammable gases or fuels [9]. This requirement makes sure all the devices are incapable of igniting those gases [5].

There are several methods that being used to fulfill this requirement, there are Fieldbus Intrinsically Safe Concept (FISCO), Entity Concept and the latest one is Fieldbus Barrier (FB) [1][3]. For this project FB as shown in **Figure 5** is being used to get intrinsically safe condition.

FB can be used in Zone 1 (gas) or Zone 2 (dust) hazardous area. It provides IS spur cable from non-intrinsically safe trunk cable. That means, only voltage at spur cable was being limited to the range of intrinsically safe [6].

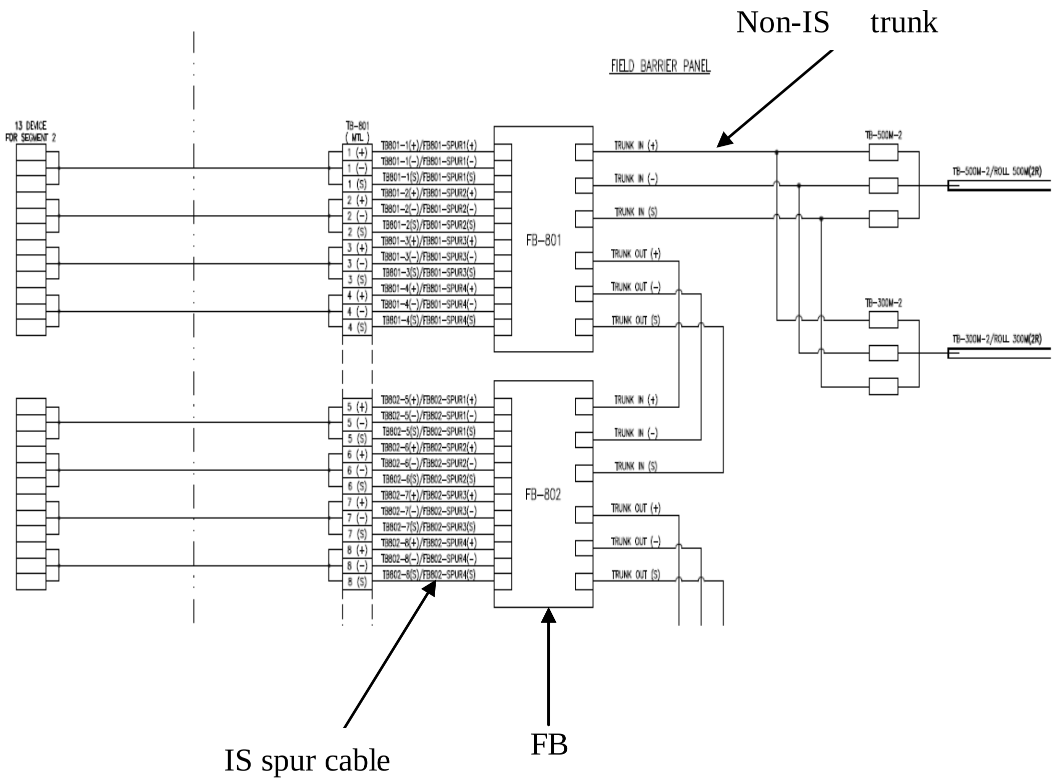

Figure 5 : Schematic diagram from trunk cable to field devices for segment 2

CHAPTER 3
METHODOLOGY

3.1 Procedure Identified

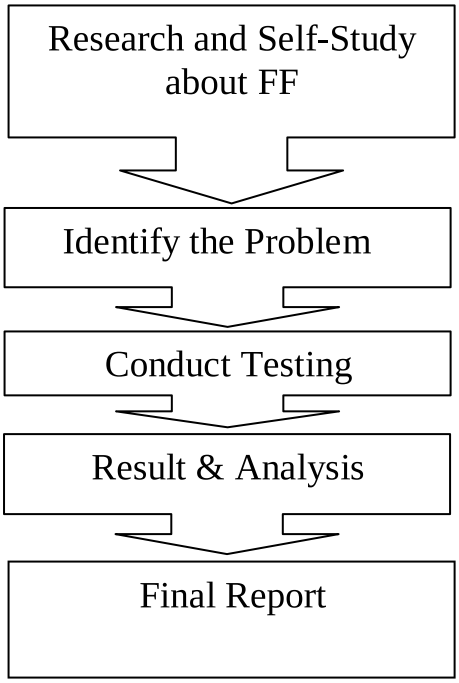

Figure 6 : Flow-Chart of the project

This project starts with doing research about foundation fieldbus technology. The flow chart of the project is shown in **Figure 6**. In the beginning the research is focus on understanding the basic principal of this technology then move on to the interoperability concept of fieldbus and its reliability. There is also self-study on how to use Foxboro I/A Series System and IACC since this software is the main software that will be used during doing this project. Once got the idea about the system, next step is to identify the problem to implement this technology in industries especially in Malaysia and define testing that should be conduct to solve the problem. Result from the test conducted will be record and analyzed to make the final conclusion. Lastly, writing the final report that consist all the finding of the whole project.

3.2 Tools And Equipments

During doing this project, there are several tools and equipments that being used. The main devices being used from Foxboro are Fieldbus Module (FBM) or H1 card, Control Processor (CP), operator and engineering workstations, and system cabinet. All these devices have its own function on control system process. The field devices like temperature transmitter, level transmitter, pressure transmitter, flow transmitter and valve are from Foxboro and other vendors like Yokogawa, Honeywell, Emerson, and Endress+Hauser. Figure 7 shows a typical FF system architecture.

H1 card works as a medium between host system and field devices. Signals received from field devices (input) will be convert to the form that can be understand by the host system. The function of CP is to doing calculation of received signal from field (Input) and decides the action to be taken. CP is the device that controls all the process in the field. All these devices are placed in the system cabinet. There are also other devices in the cabinet like power supply, power conditioner, main circuit breaker (MCB), terminal block and other devices that necessary to complete the system.

Engineering workstation is a computer that use by engineer to do all necessary things to control a system like drawing graphic for human interface (HMI), make the configuration, doing sequence of process, set value and many more while operator workstation is a computer used by operator to monitor the running process n the field. **Figure 8** shows the field transmitter in building 23.

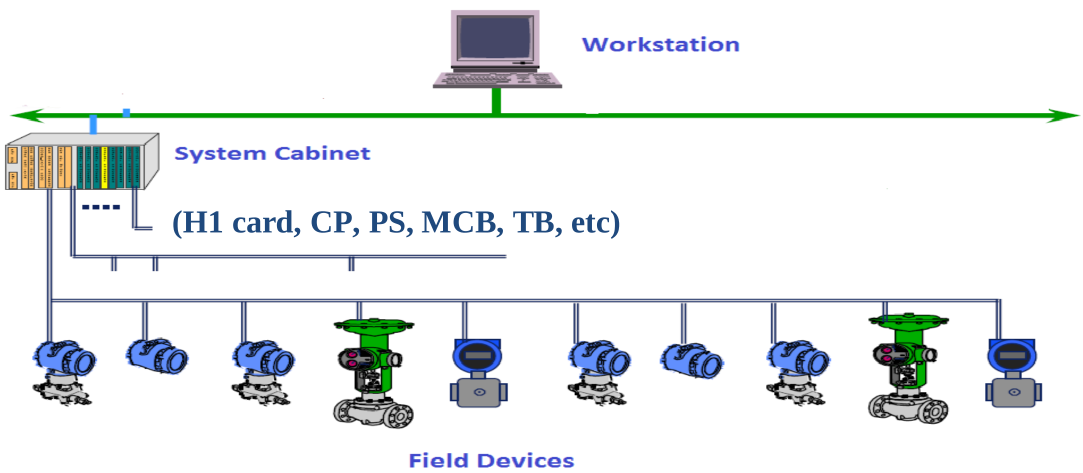

Figure 7 : Foundation Fieldbus system architecture

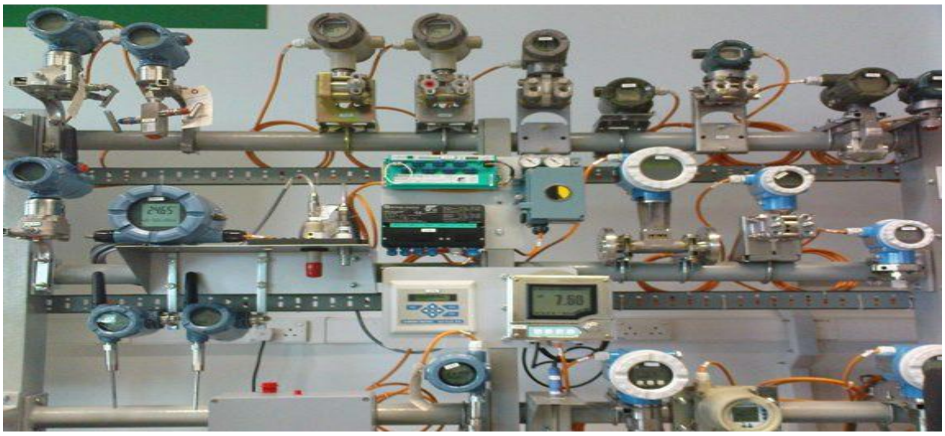

Figure 8 : Field devices installed at Lab FF in Building 23

There are two software that being used in this project that are Foxboro I/A Series V.8 and I/A Series Configuration Component (IACC). I/A Series as shown in **Figure 9** is a software for users see what happened in the plan and also for engineer to draw graphic for HMI. IACC is a software use to make configuration to the system component like commissioning, decommissioning, set value to variable, and many more.

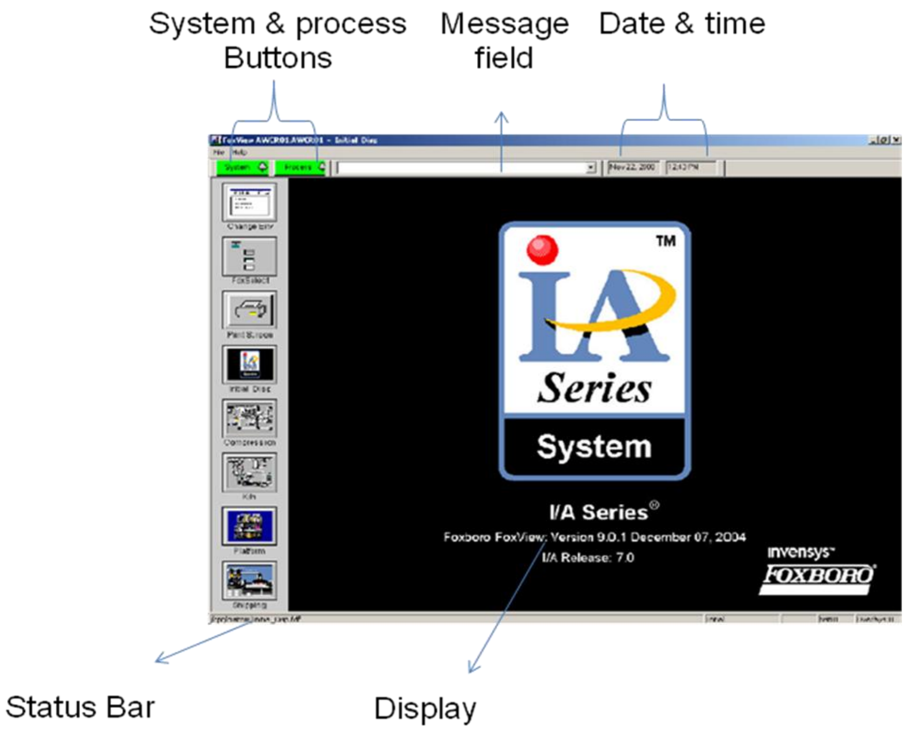

Figure 9 : I/A series interface

3.3 Project Works

3.3.1 Basic Tests

Overall purpose of this testing is to test whether FF system can perform all the common activities (commissioning, decommissioning, online device replacement, etc) that normally done to set up a plant. Other purpose is to test the interoperability between foundation fieldbus devices from different types and manufacturers (Emerson, Yokogawa, Honeywell and Endress+Hauser) to only one host manufacturer (Foxboro). The Basic test consist of several tests that are:

- Device commissioning
- Device decommissioning
- Online device replacement
- Drop out test

Device commissioning consists of two parts, one is initial download and the other one is commissioning device. Initial download is downloading field devices configuration to the system after its being connected to the host system (switch on cabinet is turned to Foxboro host). Commissioning device is process to add new device configuration to the system. This part is about producing a standard procedure or steps that must be following in other to add new device to the system. Device decommissioning is a process to remove device configuration from the system.

Online device replacement is a process to remove device while the device is still connected to the system. In real situation, this process is being used to do maintenance to the device. The device will be put on out of service (OOS) mode while doing this process. Other test is drop out test. This test is done by unplug device cable and then connect it back. The objective of this testing is to ascertain that device failure would not affect the overall segment or any other healthy devices in the segment. Other objective is to see whether signal is automatically recovered once the device is online back. Procedures for the entire basic test are shown in APPENDIX A.

3.3.2 DC Voltage Test

The purpose of doing this testing is to compare measure voltage at spur cable (voltage after fieldbus barrier) and measure voltage at trunk cable (Voltage before field barrier).

Below are the procedures for DC Voltage test:

1. Connect the multi-meter probe parallel to the terminal block (TB) in cabinet that going to the field
2. Make sure the terminal is correct (positive (+) to positive (+) and negative (-) to negative (-)). Wrong connection will make short-circuit to the system.
3. Record the measurement
4. Repeat procedures 1 until 3 for all spur cable at TB that connect to field devices

3.3.3 Noise Signal Generator Effect On FF Communication

The purpose of this testing is to demonstrate the effect of noise when present on the FF network. The significant of this testing is to know the level of noise that fieldbus network can tolerate. Normally, in a plant there is a lot of noise that come from the operation surrounding. So, it is important to know the level of noise fieldbus can tolerate to make sure the reliability of the system being used.

Tools that being used for this testing are signal generator, oscilloscope, signal generator probe, oscilloscope probe and screw driver while device that being test is Endress & Hauser temperature transmitter.

Below are the procedures for Noise Signal Generator Effect test:

1. Set the generator to produce sine wave at 10kHz and 100mV amplitude peak-to-peak.
2. Connect the generator probe in series to TT308 transmitter
3. Connect oscilloscope probe in parallel to TT308 transmitter
4. See the signal shown on the oscilloscope
5. Slowly increase the amplitude voltage until the transmitter lost connection with host system
6. Record the amplitude voltage from the oscilloscope

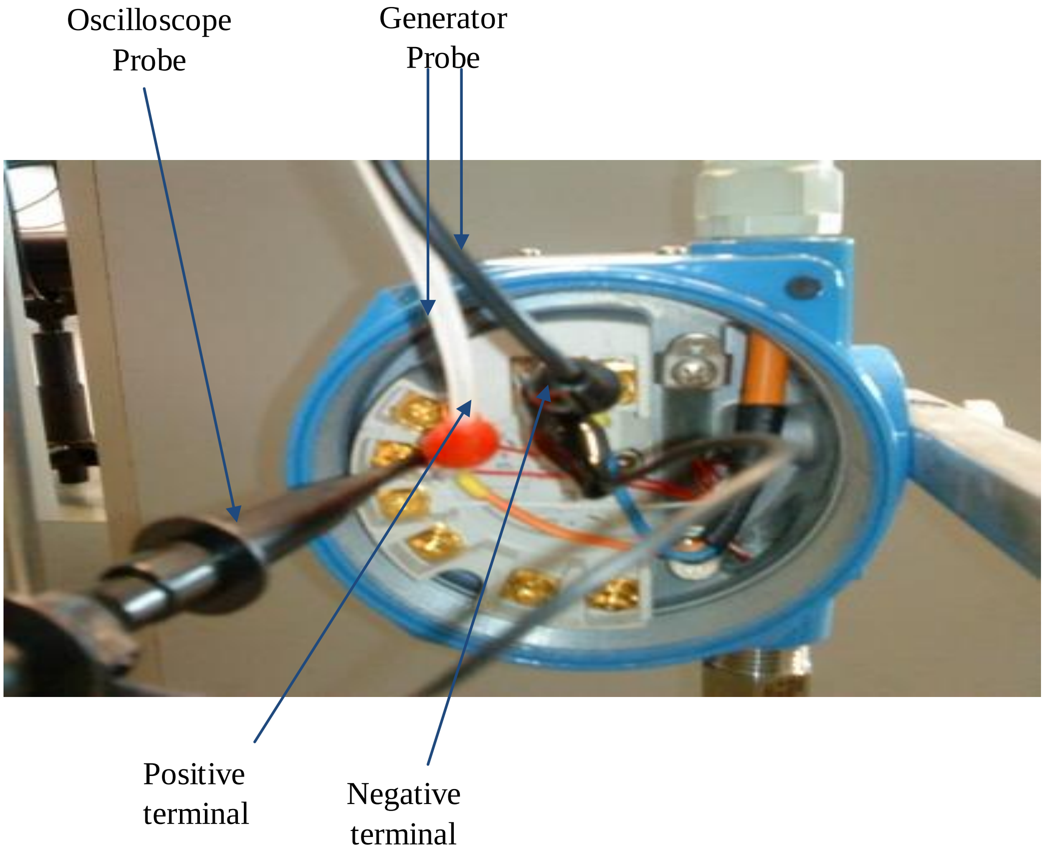

Figure 10 : Connection of generator and oscilloscope probes to the transmitter

Figure 11 shows the connection of generator and oscilloscope probes to the transmitter. It is important to make sure the generator probe is connected in series with the transmitter and the oscilloscope probe is connected in parallel with the transmitter. If the connection was wrong, the reading will be incorrect and short-circuit might happened.

CHAPTER 4
RESULTS AND DISCUSSIONS

4.1 Device Commissioning – Initial Download

This test is to simulate the time taken for the host system to stand-up the installation system after switch for segment 2 is switched to Foxboro system. Time taken for the system to response and download all devices in the segment is around 5 minutes. This indicates the entire instruments in segment able to commission within the specified period.

4.2 Device Decommissioning

After delete a device from segment 2 on IACC and download the changed made, the device no longer exist on the list of System Management Display Handler (SMDH) of FoxView but still exist on the live list of IACC. Live list of IACC show all devices that connected to the system. On the FoxSelect, the deleted device was marked with symbol “U” with mean undefined. The result of this test is summarized in the **Table 1** below.

Table 1 : Change on SMDH and Fox Select after devices been decommissioning

NO.	Device Tag	SMDH	Fox Select	Remark
1	FT101	Tag deleted	Symbol “U”	Successful deleted
2	LT302	Tag deleted	Symbol “U”	Successful deleted
3	PT303	Tag deleted	Symbol “U”	Successful deleted
4	FT307	Tag deleted	Symbol “U”	Successful deleted
5	PT402	Tag deleted	Symbol “U”	Successful deleted
6	LT301	Tag deleted	Symbol “U”	Successful deleted

4.3 Commission new device

After added new device on IACC using the procedure in APPENDIX A, the new device can be seen on the list device of IACC and System Management Display Handler (SMDH).

On the FoxSelect, the device was marked with symbol “A” with mean acknowledgement. Result for this test is shown in the **Table 2** below.

Table 2 : Change on SMDH and Fox Select after devices been commissioning

NO.	Device Tag	SMDH	Fox Select	Remark
1	FT101	Tag added	Symbol “A”	Successful added
2	LT302	Tag added	Symbol “U”	The device is unplug
3	PT303	Tag added	Symbol “A”	Successful added
4	FT307	Tag added	Symbol “A”	Successful added
5	PT402	Tag added	Symbol “A”	Successful added
6	LT301	Tag added	Symbol “A”	Successful added

Function of commissioning new device is to download device configuration into the system for set up purpose. From this test, conclusion can be make that Foundation Fieldbus is able to set up a system. LT302 shown symbol “U” because the device is unplug from the system.

4.4 Drop Out Test

After cable of a device was taken out from the system, the changed that happened to the system after a few minutes wait was summarize below:

- SMDH – The tag color change from white to **Yellow** and finally **Red**
- Alarm Manager – Alarm occurred indicate **IOBAD** for the transmitter
- FoxView – On Instrument Skid the reading shown 'xxxx'

On SMDH, the yellow color means the system was lost connection to the device while the red color of tag indicated that the device is offline to the system or not been power up. "IOBAD" shown by Alarm Manager mean Input Output Bad. This alarm indicates that the system cannot get input signal or send output signal to the device.

When the unplugged cable was plug-in back, the changed that happened to the system after a few minutes wait was summarize below:

- SMDH – The tag color change from **Red** to **Yellow**
    - The tag change to **white** color after button enable communication been clicked
- Alarm Manager – No new alarm
- FoxView – The reading start showing the measurement

This confirms that device failure would not affect the overall segment or any other healthy devices in the segment.

4.5 DC Voltage Check

Measured voltage at terminal block (TB) in cabinet that connect to the field is **22.64V**. This value is near to the supply voltage that is 24V. Measured voltages at terminal block (TB801) that connect to field devices are shown in **Table 3.**

Table 3 : Measured voltages at spur cables on segment 2

NO.	Spur tag	Voltage (V)	Remark
1	FT101	12.41	< 17.5V (FISCO IS input Voltage)
2	LT302	12.34	< 17.5V (FISCO IS input Voltage)
3	PT303	12.34	< 17.5V (FISCO IS input Voltage)
4	FT307	12.49	< 17.5V (FISCO IS input Voltage)
5	PT402	12.18	< 17.5V (FISCO IS input Voltage)
6	LT301	12.48	< 17.5V (FISCO IS input Voltage)
7	AT305	12.06	< 17.5V (FISCO IS input Voltage)
8	FV102	12.71	< 17.5V (FISCO IS input Voltage)
9	TT308	12.56	< 17.5V (FISCO IS input Voltage)
10	PDT403	12.11	< 17.5V (FISCO IS input Voltage)
11	PDT304	12.40	< 17.5V (FISCO IS input Voltage)
12	FT306	12.31	< 17.5V (FISCO IS input Voltage)

From the Table 3, we can see that voltage at TB801 is smaller than voltage at TB in cabinet. This is because of the limitation than being performed by Field Barrier. This limitation of voltage is to provide IS current condition as requirement for operating devices at hazardous areas.

4.6 Noise Signal Generator Effect on FF Communication

Initially, the transmitter is still online to the host system. But, after increasing the amplitude to 120mV, the device went offline and alarm that indicates the device was disconnected appeared. **Figure 11** shows the initial 10 kHz sine wave with 100mV amplitude peak-to-peak that will be injected to the transmitter as noise.

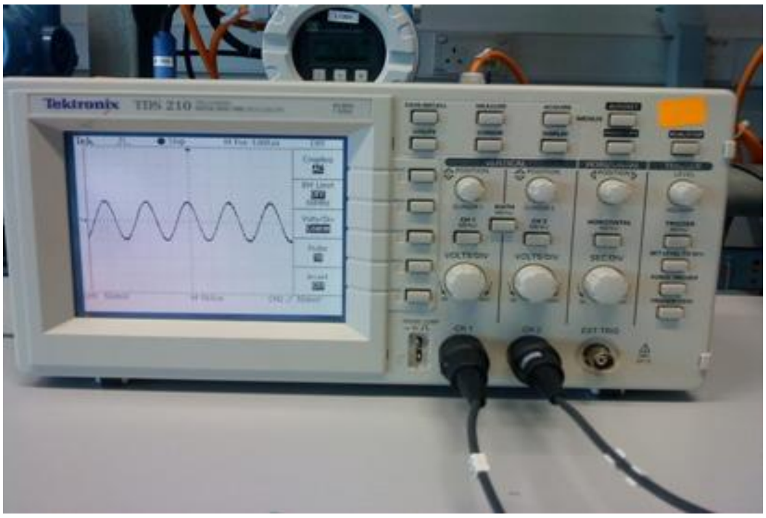

Figure 11 : Initial 10kHz and 100mV amplitude sine wave

Figure 12 shows the condition of the transmitter signal that has been injected with noise after increasing the amplitude of noise signal to 120mV. The transmitter when offline from the system at this moment.

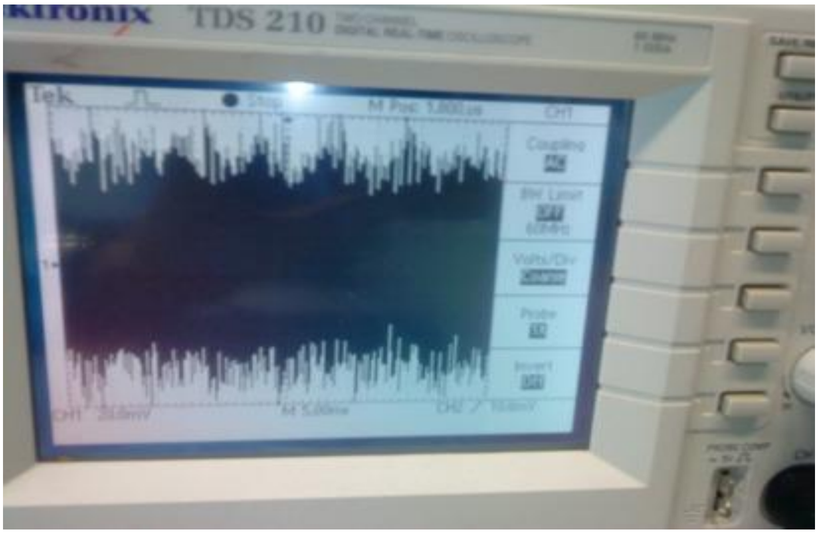

Figure 12 : Example of noise wave where the device start offline from the system

Increase the amplitude of the signal means increases the injected noise to the cable. This test shows that the network for Foundation Fieldbus only can tolerate noise up to 100mV. The condition of the cable to carry signal vary with amount of noise. The conclusion of this testing is shown in **Table 4**.

The testing should be conducted to all devices so that extended analysis can be done. However, due to the malfunction of the Foxboro system at the last minute, only one device can be done. Thus, the testing is recommended to be carried out by the new student that doing testing for Foxboro system.

Table 4 : Wire condition correspond to noise level

Noise Level	**Wire Condition**	**Remark**
25 mV or Less	Excellent	Tested
25-50 mV	Okay	Tested
50-100 mV	Marginal	Tested
100 mV or More	Poor	Tested

Specification states by Pepperl+Fuchs Mobile Fieldbus Diagnostics DM-Am p/n 187225 on noise threshold for the FF bus is shown in **Table 5.**

Table 5 : Specification states by Pepperl+Fuchs Mobile Fieldbus

	Low Out of Spec.	Low Good	Excellent	High Good	High Out of Spec.
Voltage	<9.0V	9.0…11.0V	11.0…31.0V	31.0…32.0V	>32.0V
Unbalance	< -84%	-84…-60%	-60…60%	60…84%	>84%
Noise	-	-	<50mV	50…100mV	>100mV
Jitter	-	-	<2.4µs	2.4…3.2µs	>3.2µs
Signal Level	< 200mV	200…400mV	400-1200mV	-	>1200mV

CHAPTER 5
CONCLUSION AND RECOMMANDATION

5.1 Conclusion

From the current testing that been conducted, conclusion can be make that interoperability of FF system was successful and achieved the standard requirement of interoperability. The Foxboro system can communicate with the field devices from different vendor successfully without any major problem. All the basic tests were successfully conducted.

Base on redundant H1 card and redundant CP that installed in the FF lab in Building 23, and also current limiter and IS spur cable that provided by MTL field barrier conclusion can be make that this FF is reliable to be used in industries.

From the stress test that has been conducted, conclusion can be makes that fieldbus system should improve it wiring system so that it can be used in the high level noise environment. Cable that can adopt high level noise should be used.

5.2 Recommendation

Further testing should be conduct to make sure this system is suitable enough to replace current system. It is recommended that the system should be try to control the plant under the lab so that the interoperability of the system is really been tested.

The set-up system at the FF lab should be re-arrange so that the problem that occur to the system because of frequent changing the host system will be eliminate. The arrangement can be made so that only one host system will control one segment permanently. This is important to prevent the problem from getting worst.

The completed stress test is not enough to conclude the system robustness. Further advance test should be conducted so that in depth analysis can be makes before making the final conclusion.

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APPENDICES

APPENDIX A :
BASIC TEST PROCEDURES

<u>Device Commissioning – Initial Download</u>

1. Power up Host system at Cabinet 2
2. Power up switch for MTL and P+F at Cabinet 2.
3. At the selector switch (front panel of Cabinet 2), select Foxboro for Segment 1 and Segment 2.
4. Turn on PCs for Foxboro System. I/A Series System will appear (FoxView).

5. Select “System” tab at FoxView to open “System Management Display Handler”.
    i. Click “CP003” and select “CONFIG” button
    ii. Click “FBM00B” and select “Next Level”.
    iii. Select Port number and view status of all devices.
6. Record time taken to download all devices in segment and the response.

<u>Device Decommissioning</u>

1. Login IACC
2. Choose UTP_demo
    i. Username: Administrator
    ii. Password: UTP_fox_softw
3. At IACC Application, select “Network” tab.
    i. Expand “Configuration”
    ii. Expand HPS001
    iii. Expand SW0001(SW16P)
    iv. Expand CP0003 (FCP270)
    v. Expand FBM00B(FBM228)
    vi. Expand iom228r_FBM00B
    vii. Expand FBM00B (ECB 202)

4. Select device to be decommissioned
    i. Right click at the device, select “Properties”.
    Note device type, device revision (Vernum), port number, DD revision (DVtype, manftr, Dvaddr).
    ii. Right click at the device to be deleted.
    iii. Click “Delete” and proceed until device is deleted.
5. Download the changes made
    i. Right click at CP0003(FCP270) and choose “Download”
    ii. Follow the instruction for downloading.
6. Check the response at
    i. IACC : ensure device has been deleted from the list.
    ii. FoxSelect by clicking on “Option” and choose “Refresh all”: ensure device is mark as undefined.
    iii. FoxView to open “Instrument Skid” page: Ensure device has been deleted.
    iv. FoxView by selecting “System” tab to open “System Management Display Handler”.

<u>Commission New Device</u>

1. Open IACC and select “Network” tab.
    i. Expand “Configuration”
    ii. Expand HPS001
    iii. Expand SW0001
    iv. Expand CP0003
    v. Expand FBM00B (FBM228)
    vi. Expand iom228r_FBM00B
    vii. Expand FBM00B (ECB202)
2. Double click FBM00B. This will open Field Device Manager main page. Select Segment 1 or Segment 2 to view the live list. Ensure the system can view the device to be commissioned.
3. Right click at FBM00B (ECB202) and select “New Child Device”.
    i. Select device and change port number accordingly and click OK.
    ii. Rename the device following the original name.

iii. Right click the device and select “Properties”
iv. Enter the DVaddr for the device
v. Go to IACC “Plant” tab. Choose and expand the manufacturer name.
vi. Double click at device model (CSD Block) to view the function block.
vii. From IACC “Network” tab. Drag the commissioned device and drop at the function block page.
viii. Draw the connection from Input_1 (device block) to From_Fld1 (AI block).
ix. Download the changes made by choosing one from two steps
x. Right Click at CP0003 and choose “Download”. Follow the instruction for downloading.
xi. Right click at workspace of function block. Choose “Download” and “Changes”. Follow the instruction for downloading.
xii. Check the response at
    a) IACC : ensure device has been added
    b) FoxSelect by clicking on “ options” and choose “Refresh all” : ensure device has been added
    c) FoxView to open “Instrument skid” page : ensure device has been added.
    d) FoxView by selecting “System” tab to open “System Management Display Handler”. Select the device. Click “EQUIP CHG” and choose “ENABLE COMMS”.

<u>Drop Out Test</u>

1. Take out FT101 flow transmitter cable connected to the segment
2. Record the response of the segment at:
    i. System Management Display Handler
    ii. Alarm Manager
    iii. FoxView (Alarm status)
3. Plug-in the device cable
4. Record the response (self-recovery) of the device at :
    i. SMDH
    ii. Alarm Manager
    iii. FoxView (Alarm status)