



Waters 2020 FPY Improvement Activities

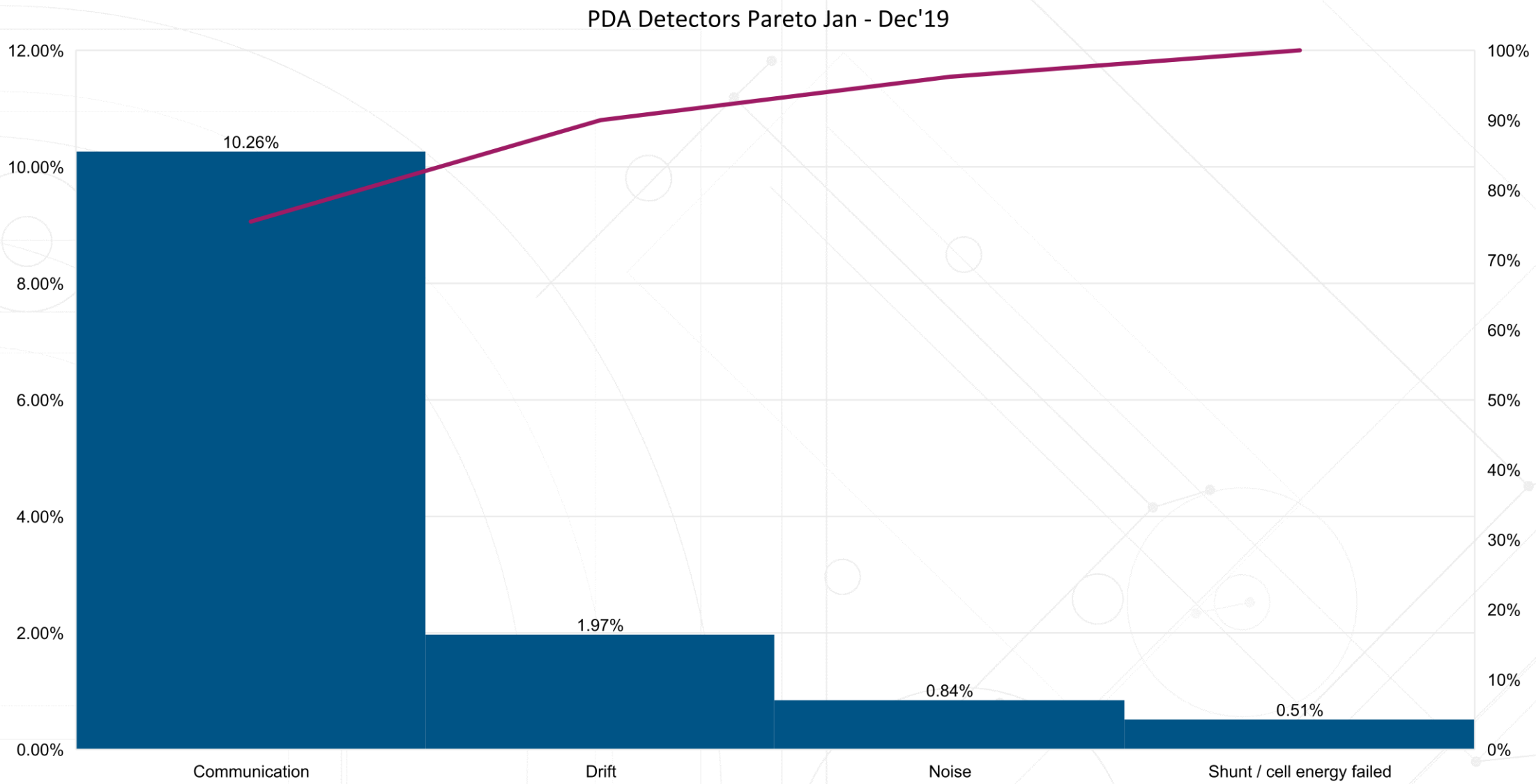
13 Aug 2020

FPY Improvement Summary

Model	Target 2020	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Item	Progress
PDA Detectors	77.44 %	77.52 %	65.19 %	49.08 %		Communication Failure	Completed 100 data points on all 6x Testers (EVALS20015) TE82882-9, 10, 14 showing better yield TE82882-8, 11, 13 showing low yield
						Drift	Low priority to work on as current yield is 1.39%
						Final Drift	Low priority to work on as current yield is 0.86%

PDA Detectors – Yield Improvement

Pareto Chart for PDA Detectors

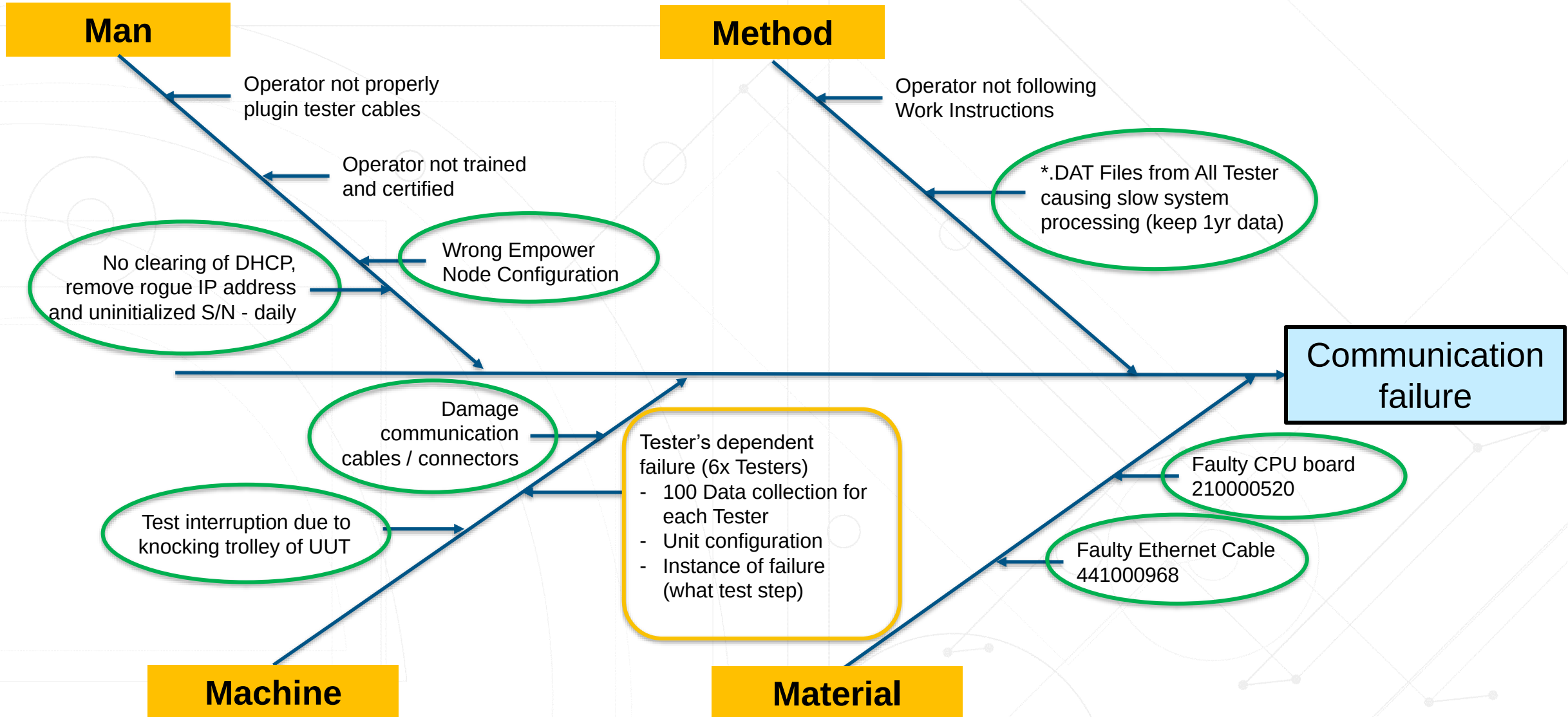


PDA Detectors – Failure Mode

Failure Modes	PDA Detectors
Communication	10.26%
Drift	1.97%
Noise	0.84%
Shunt / cell energy failed	0.51%
Total failure % contributed	13.59%

- Yield from Jan-Dec'19

Yield Improvement – Communication Failure



Yield Improvement – Communication Failure 4M

	Possible Causes	Verification	Possible cause (Y / N)	Proposed Actions
Man	1) Operator not properly plugin tester cables	Verified that Tech/Operators performing test for detectors as per document 735001613. No abnormality found	N	N/A
	2) Operator not trained and certified	Verified that Tech/Operators performing test for detectors as per document 735001613. No abnormality found	N	N/A
	3) Wrong Empower Node Configuration	Test EA verifying each test tester before start of build	N	N/A
	4) No clearing of DHCP, remove rogue IP address and uninitialized S/N - daily	Daily clearing of DHCP, remove rogue IP address and uninitialized S/N is performed by production	N	N/A
Method	1) Operator not following Work Instructions	All test procedures as per TSP provide by Waters test PDA Detector Family. Refer to PN table at 735001613 No abnormality found	N	N/A
	2) *.DAT Files from All Tester causing slow system processing (keep 1yr data)	Performed by Test EA	N	N/A
Material	1) Faulty CPU board 210000520	Verified NCMR flow and did not see reject related to CPU related to loss com	N	N/A
	2) Faulty Ethernet Cable 441000968	Verified NCMR flow and did not see reject related to Ethernet Cable related to loss com	N	N/A
Machine	1) Damage communication cables / connectors	Verified with use of checklist	N	N/A
	2) Test interruption due to knocking trolley of UUT	Verification in progress	N	Installed separating fence at TE82882-13
	3) Tester's dependent failure (6x Testers)	Data points per EVALS20015 showing high failure on 28 Testers TE82882- 10, 11, 13	Y	28 May 20 start to deactivate Testers TE82882- 10, 11, 13

PDA Detectors – 2020 FPY Improvement Plans

No	Failure	% Fail 2019	% Improve 2020	Actions & Results	
				Flex	PIC / Date
1	Communication Failure	10.26%	5.00%	Tester ID: •TE82882-8 ,TE82882-9, TE82882-10, TE82882-11, TE82882-13, TE82882-14 Communication Failure: • Removed old *DAT Files from 2016 to 2019. Implemented. • Review Ethernet\RS232 interface headers. Implemented. • Mount separating fence at TE82882-13. Implemented. • Removed Empower Node with conflict. Implemented. • Test Operator daily clearing of DHCP, remove rogue IP and initialize the SN. Implemented. • To collect 100 data points for TE82882- 8, 9, 10, 11, 13 and 14. Completed total 600 data points on 29 Jul 20 • Next Actions to be confirmed • Re-imaging • Swapping of CPU	Joel, David / 26 Dec 19 Joel / 27 Mar 20 Joel, Aldwin / 09 Mar 20 Joel, David / 06 Mar 20 Joel, Shamsul / 06 Mar 20 Joel / 24 Apr 20

Yield Improvement – Communication Failure

Monitoring in 2020 – Communication Failure

Model – PDA Detectors Family

Month	Total Unit Tested	Communication (failure%)
		2019 Ref rate 10.26%
Jan -2020	347	12.68%
Feb -2020	379	14.78%
Mar -2020	305	12.13%
Apr -2020	187	19.25%
May -2020	199	17.09%
Jun -2020	178	11.24%
Jul -2020	248	29.03 %

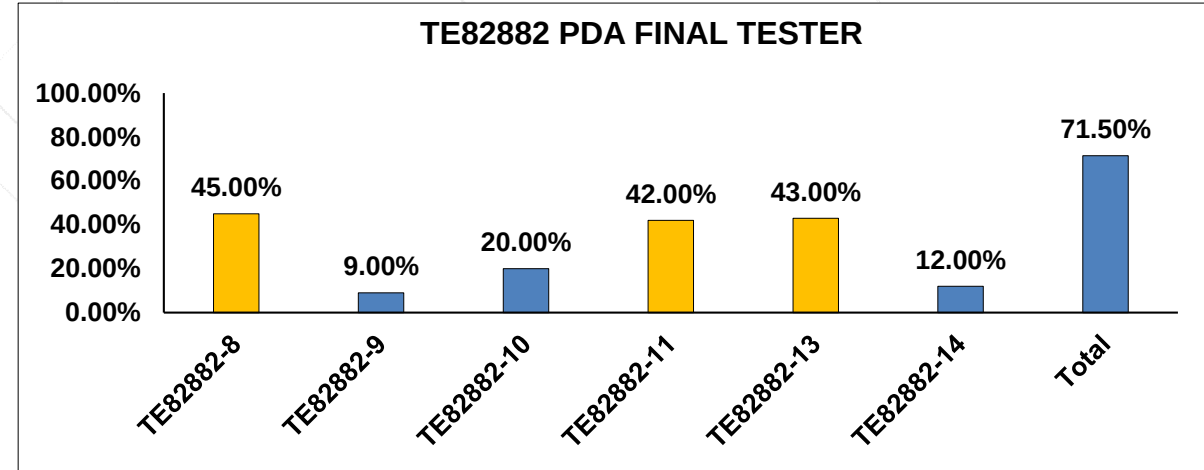
Detector PDA – Communication Failure

Aug 2020	Detector PDA 2019 Ref failure rate – 10.26% Achieved – 16.60% (Jan-May'20)	Improvement			
PIC	Joel, Aldwin				
Purpose					
- High failure rate affecting first pass yield - Focus on communication failure - Testers TE82882-8, 11 and 13 are contributing to low yield.					
Progress		Project Status			
- Completed 4M analysis. Testers TE82882-8, 11 and 13 are contributing to low yield. - Raised EVALS20015, To collect 100 data points for TE82882- 8, 9, 10, 11, 13 and 14. - EVALS20015 Completed total 600 data points on 29 Jul 20.		Q1	Q2	Q3	Q4
		4M Analysis Completed	Data Collection Completed	Target closure	
Next Steps		Risks & Issues			
- TE82882-8, 11 and 13 next actions to be confirmed: - Re-imaging - Swapping of CPU		No risk as unit able to passed communication failure by retest without doing anything.			

Yield Improvement – Communication Failure

Collect 100 data points for each 6 Testers:

Manual Data Collection as of 29 Jul 2020							
TE82882	TE82882-8	TE82882-9	TE82882-10	TE82882-11	TE82882-13	TE82882-14	Total
TESTED	100	100	100	100	100	100	600
LOSS COMM	45	9	20	42	43	12	171
Failure Rate %	45.00%	9.00%	20.00%	42.00%	43.00%	12.00%	71.50%



- Loading of PDA Family Detectors completed the 600 units
- Refer to manual data collection table.

TE82882-9, 10, 14 showing better yield
TE82882-8, 11, 13 showing low yield

Discussion between Flex \WPPL Ops Team (30 July 2020)

- Yield impact to detectors line is a direct result of our evaluation EVALS20015
- Bad yield performance is a direct result from testers performance (Waters consign) and not contributed by Flex production processes.
- Waters acknowledged its impact to production yield and agree Flex processes is not the cause, WPPL unable to exclude the yield loss as this affect data integrity in reporting. Still, Waters will work with Flex to mitigate this impact on Flex overall performance.

PDA Detectors – Yield Improvement (Backup)

Communication Failure

In Progress
 Complete

Soft Failures	Oct'19	Nov'19	Dec'19	Jan'20	Feb'20	Mar'20	Apr'20	May'20	Jun'20	Jul'20	Aug'20
Comm Failure	11.51%	11.05%	11.11%	12.68%	14.78%	12.13%	19.25%	17.09%	11.24%	29.03	

4M	Actions	Dec' 19	Jan' 20	Feb' 20	Mar' 20	Apr' 20	May' 20	Jun' 20	Jul' 20	Aug' 20
Method	Removed old *DAT Files from 2016 to 2019. Implemented (26 Dec 19)									
Method	Removed Empower Node with conflict. Implemented. (06 Mar 20)									
Man	Test Operator daily clearing of DHCP, remove rogue IP and initialize the SN. Implemented. (06 Mar 20)									
Machine	Mount separating fence at TE82882-13. Implemented. (09 Mar 20)									
Machine	Review Ethernet\RS232 interface headers. Implemented (27 Mar 20)									
Machine	To collect 100 data points for TE82882- 8, 9, 10, 11, 13 and 14. In progress. (24 Apr 20)									
Machine	Review 100 data points for each tester.									
Machine	Block diagram details on when Comm Failure is likely to occur.									
Machine	Continue Gemba observation on Detectors Line.									

TE82882 PDA Final Tester

TE82882 PDA Final Tester

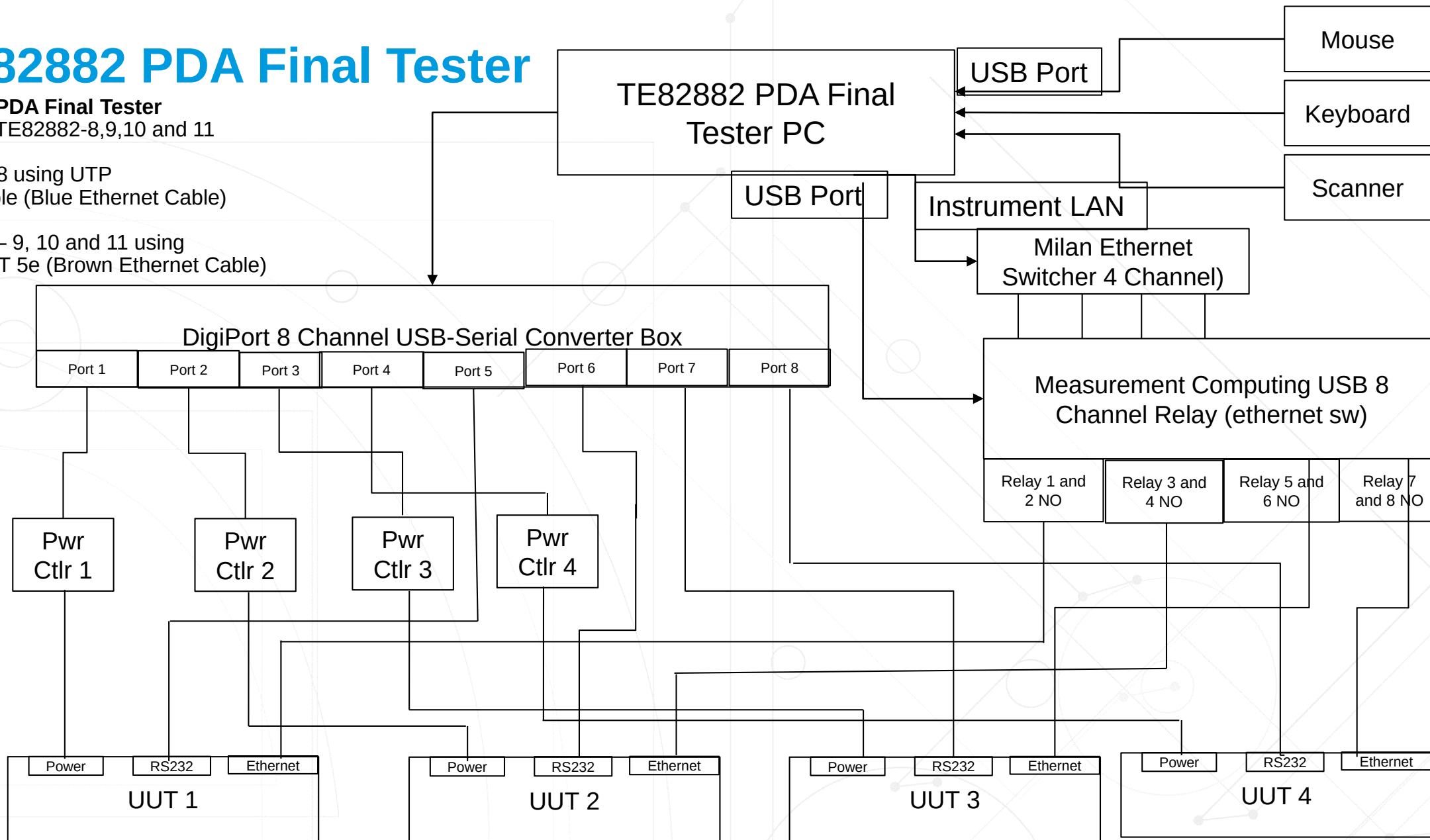
Setup for TE82882-8,9,10 and 11

TE82882-8 using UTP

CAT 6 cable (Blue Ethernet Cable)

TE82882 – 9, 10 and 11 using

LCOM CAT 5e (Brown Ethernet Cable)

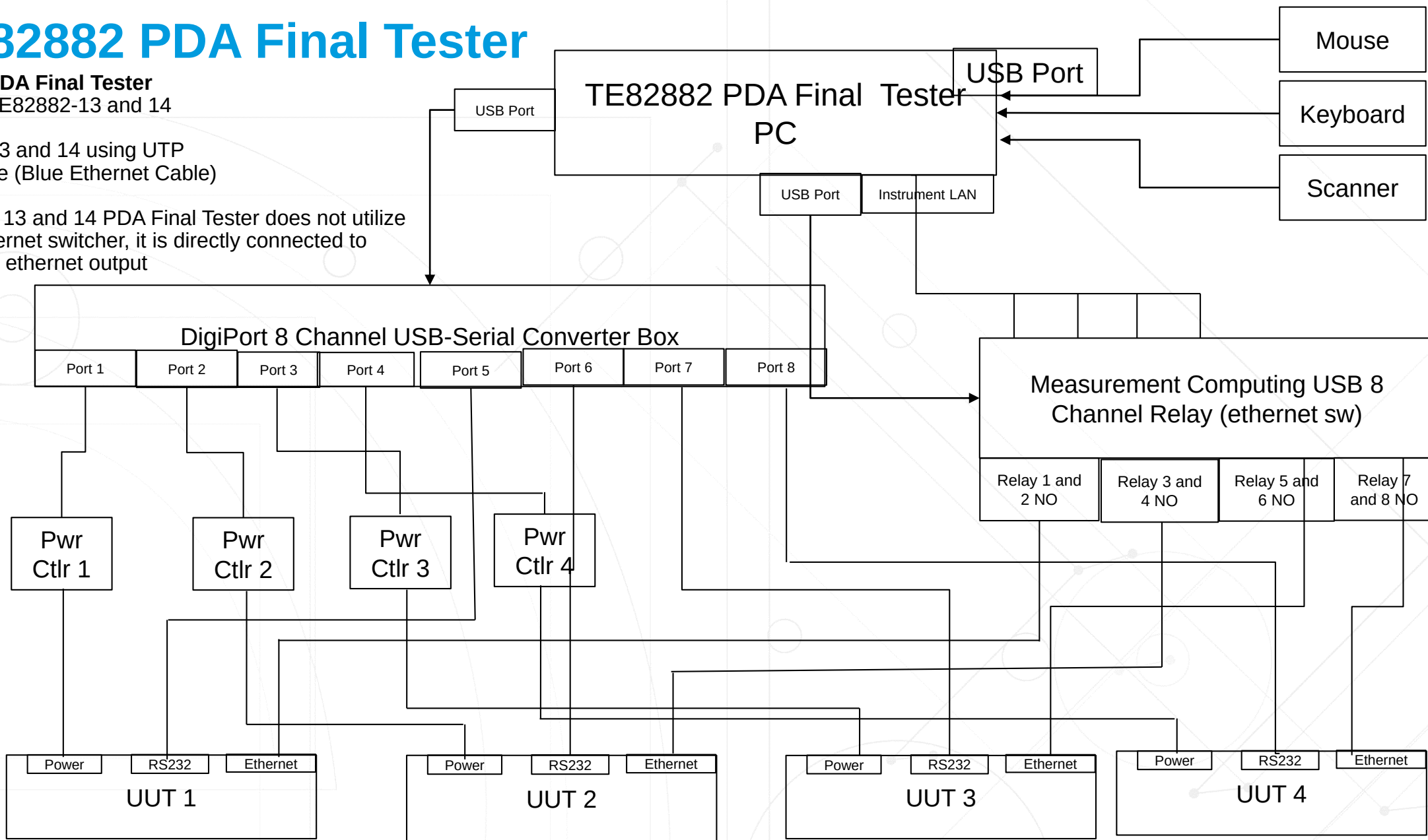


TE82882 PDA Final Tester

TE82882 PDA Final Tester
Setup for TE82882-13 and 14

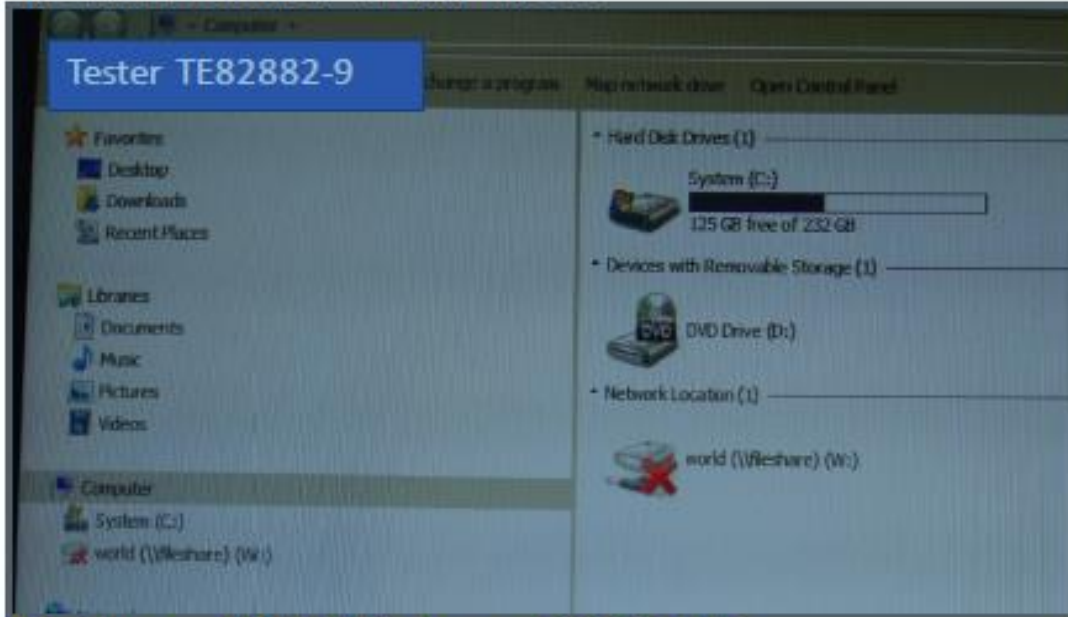
TE82882-13 and 14 using UTP
CAT 6 cable (Blue Ethernet Cable)

TE82882 – 13 and 14 PDA Final Tester does not utilize
MILAN ethernet switcher, it is directly connected to
CPU with 4 ethernet output

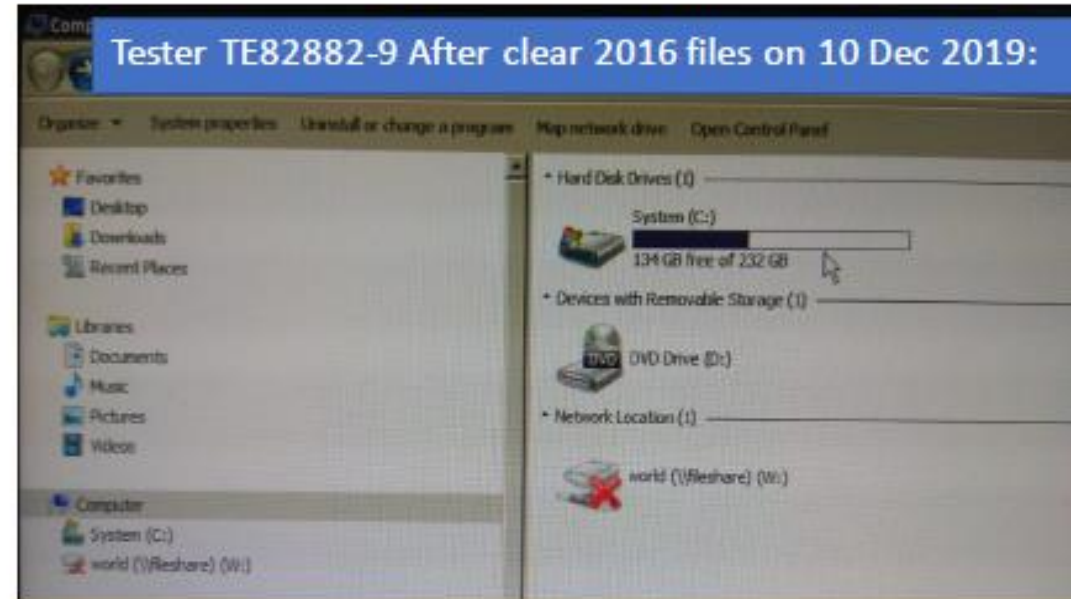


Yield Improvement – Communication Failure

Removed old *.DAT files.



Before : 125 GB free of 232 GB



After : 134 GB free of 232 GB

Plan Activity	Tester	Date	Status
Remove old DAT files	8, 13, 14	22 Nov 2019	Completed
Remove old DAT files (2016)	9	10-Dec-19	Completed
Remove old DAT files (2017-2018)	9	13-Dec-19	Completed
Remove old DAT files	10, 11	26-Dec-19	Completed

26 Dec – 2019 Completed the removal of old *.DAT to all TE82882 PDA Final Tester.

Yield Improvement – Communication Failure

- Updated the Empower Node Properties for Testers TE82882-8, -9, -10, -11, -13, -14 per TSP under section 6.5.1

6.5. To troubleshoot Lost Comm errors:

- 6.5.1. In the list of instruments, there should only be up to 20 systems (Address ACQ-PDA#1 through #4, and #9 through #12, W2998#5 through #8, A10#13-16, A30#17-20). If there are any other systems listed with typical serial numbers (A09UPD011M) or 'serial number uninitialized', click **remove**.

BEFORE

Empower Node Properties													
Empower	Node TE82882-8 Properties		Node TE82882-9 Properties		Node TE82882-10 Properties		Node TE82882-11 Properties		Node TE82882-13 Properties		Node TE82882-14 Properties		
	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	
1	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#12	W2998	W2998#5	W2998	W2998#5	A10-PDA	A10-PDA#16	
2	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#11	W2998	W2998#6	W2998	W2998#6	A10-PDA	A10-PDA#15	
3	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#10	W2998	W2998#7	W2998	W2998#7	A10-PDA	A10-PDA#14	
4	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#9	W2998	W2998#8	W2998	W2998#8	A10-PDA	A10-PDA#13	
5	W2998	W2998#5	W2998	W2998#8	W2998	W2998#5	ACQ-PDA	ACQ-PDA#9	A10-PDA	A10-PDA#13	W2998	W2998#5	
6	W2998	W2998#6	W2998	W2998#7	W2998	W2998#6	ACQ-PDA	ACQ-PDA#10	A10-PDA	A10-PDA#14	W2998	W2998#6	
7	W2998	W2998#7	W2998	W2998#6	W2998	W2998#7	ACQ-PDA	ACQ-PDA#11	A10-PDA	A10-PDA#15	W2998	W2998#7	
8	W2998	W2998#8	W2998	W2998#5	W2998	W2998#8	ACQ-PDA	ACQ-PDA#12	A10-PDA	A10-PDA#16	W2998	W2998#8	
9	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#1	W2998	W2998#4	A10-PDA	A10-PDA#7	
10	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#2	W2998	W2998#1	ACQ-PDA	ACQ-PDA#4	
11	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#3	A10-PDA	A10-PDA#7	ACQ-PDA	ACQ-PDA#9	
12	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#4	A10-PDA	A10-PDA#6	ACQ-PDA	ACQ-PDA#10	
13	A30-PDA	A30-PDA#18	A10-PDA	A10-PDA#14	A30-PDA	A30-PDA#20	A10-PDA	A10-PDA#14	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#11	
14	A30-PDA	A30-PDA#17	A10-PDA	A10-PDA#13	A30-PDA	A30-PDA#17	A10-PDA	A10-PDA#15	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#12	
15	A30-PDA	A30-PDA#19	A10-PDA	A10-PDA#15	A30-PDA	A30-PDA#19	A10-PDA	A10-PDA#16	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#1	
16	A30-PDA	A30-PDA#20	A10-PDA	A10-PDA#16	A30-PDA	A30-PDA#18	A10-PDA	A10-PDA#13	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#2	
17	A10-PDA	A10-PDA#13	ACQ-PDA	ACQ-PDA#5	A10-PDA	A10-PDA#14	A10-PDA	A10-PDA#7	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#3	
18	A10-PDA	A10-PDA#14	ACQ-PDA	ACQ-PDA#7	A10-PDA	A10-PDA#16			ACQ-PDA	ACQ-PDA#1			
19	A10-PDA	A10-PDA#15	ACQ-PDA	ACQ-PDA#8	A10-PDA	A10-PDA#15			ACQ-PDA	ACQ-PDA#3			
20	A10-PDA	A10-PDA#16	W2998	W2998#3199998578A	A10-PDA	A10-PDA#13			ACQ-PDA	ACQ-PDA#4			
21	W2998	W2998#2			A10-PDA	A10-PDA#7							

Unknown Red syten

AFTER

Empower Node Properties													
Empower	Node TE82882-8 Properties		Node TE82882-9 Properties		Node TE82882-10 Properties		Node TE82882-11 Properties		Node TE82882-13 Properties		Node TE82882-14 Properties		
	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	Type	Address	
1	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#12	W2998	W2998#5	W2998	W2998#5	A10-PDA	A10-PDA#16	
2	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#11	W2998	W2998#6	W2998	W2998#6	A10-PDA	A10-PDA#15	
3	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#10	W2998	W2998#7	W2998	W2998#7	A10-PDA	A10-PDA#14	
4	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#9	W2998	W2998#8	W2998	W2998#8	A10-PDA	A10-PDA#13	
5	W2998	W2998#5	W2998	W2998#8	W2998	W2998#5	ACQ-PDA	ACQ-PDA#9	A10-PDA	A10-PDA#13	W2998	W2998#5	
6	W2998	W2998#6	W2998	W2998#7	W2998	W2998#6	ACQ-PDA	ACQ-PDA#10	A10-PDA	A10-PDA#14	W2998	W2998#6	
7	W2998	W2998#7	W2998	W2998#6	W2998	W2998#7	ACQ-PDA	ACQ-PDA#11	A10-PDA	A10-PDA#15	W2998	W2998#7	
8	W2998	W2998#8	W2998	W2998#5	W2998	W2998#8	ACQ-PDA	ACQ-PDA#12	A10-PDA	A10-PDA#16	W2998	W2998#8	
9	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#4	
10	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#2	ACQ-PDA	ACQ-PDA#9	ACQ-PDA	ACQ-PDA#9	
11	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#10	ACQ-PDA	ACQ-PDA#10	
12	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#11	ACQ-PDA	ACQ-PDA#11	
13	A30-PDA	A30-PDA#18	A10-PDA	A10-PDA#14	A30-PDA	A30-PDA#20	A10-PDA	A10-PDA#14	ACQ-PDA	ACQ-PDA#12	ACQ-PDA	ACQ-PDA#12	
14	A30-PDA	A30-PDA#17	A10-PDA	A10-PDA#13	A30-PDA	A30-PDA#17	A10-PDA	A10-PDA#15	ACQ-PDA	ACQ-PDA#1	ACQ-PDA	ACQ-PDA#1	
15	A30-PDA	A30-PDA#19	A10-PDA	A10-PDA#15	A30-PDA	A30-PDA#19	A10-PDA	A10-PDA#16	ACQ-PDA	ACQ-PDA#3	ACQ-PDA	ACQ-PDA#2	
16	A30-PDA	A30-PDA#20	A10-PDA	A10-PDA#16	A30-PDA	A30-PDA#18	A10-PDA	A10-PDA#13	ACQ-PDA	ACQ-PDA#4	ACQ-PDA	ACQ-PDA#3	
17	A10-PDA	A10-PDA#13			A10-PDA	A10-PDA#14							
18	A10-PDA	A10-PDA#14			A10-PDA	A10-PDA#16							
19	A10-PDA	A10-PDA#15			A10-PDA	A10-PDA#15							
20	A10-PDA	A10-PDA#16			A10-PDA	A10-PDA#13							

- 06 March 2020** After the Empower Node Properties update:
 - Tester TE82882-8, -10 having 20 system address.
 - Tester TE82882-11, -13, -14 having 16 system address.
 - A10-PDA and A30-PDA are not currently running at Flex

Yield Improvement – Communication Failure

Table hit by another table while UUT test in progress

BEFORE :



Tester without spacer in between UUT

Tester with spacer in between UUT accidental bumps on the UUT potentially disturbing communication between UUT and Tester



AFTER:



Tester with spacer in between UUT

Tester with spacer in between UUT avoid accidental bumps on the UUT potentially disturbing communication between UUT and Tester



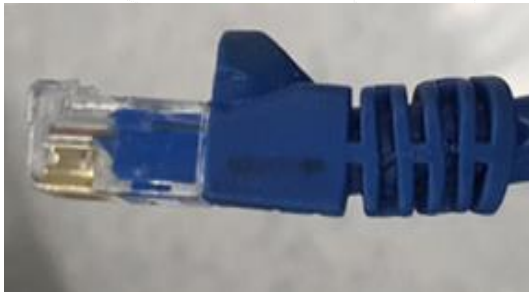
09 Mar 2020 – TE82882-13 Introduced a spacer between test position to avoid knocking table

Yield Improvement – Communication Failure

Damage communication cables / connectors



Ethernet Connector Lock
– Good Condition



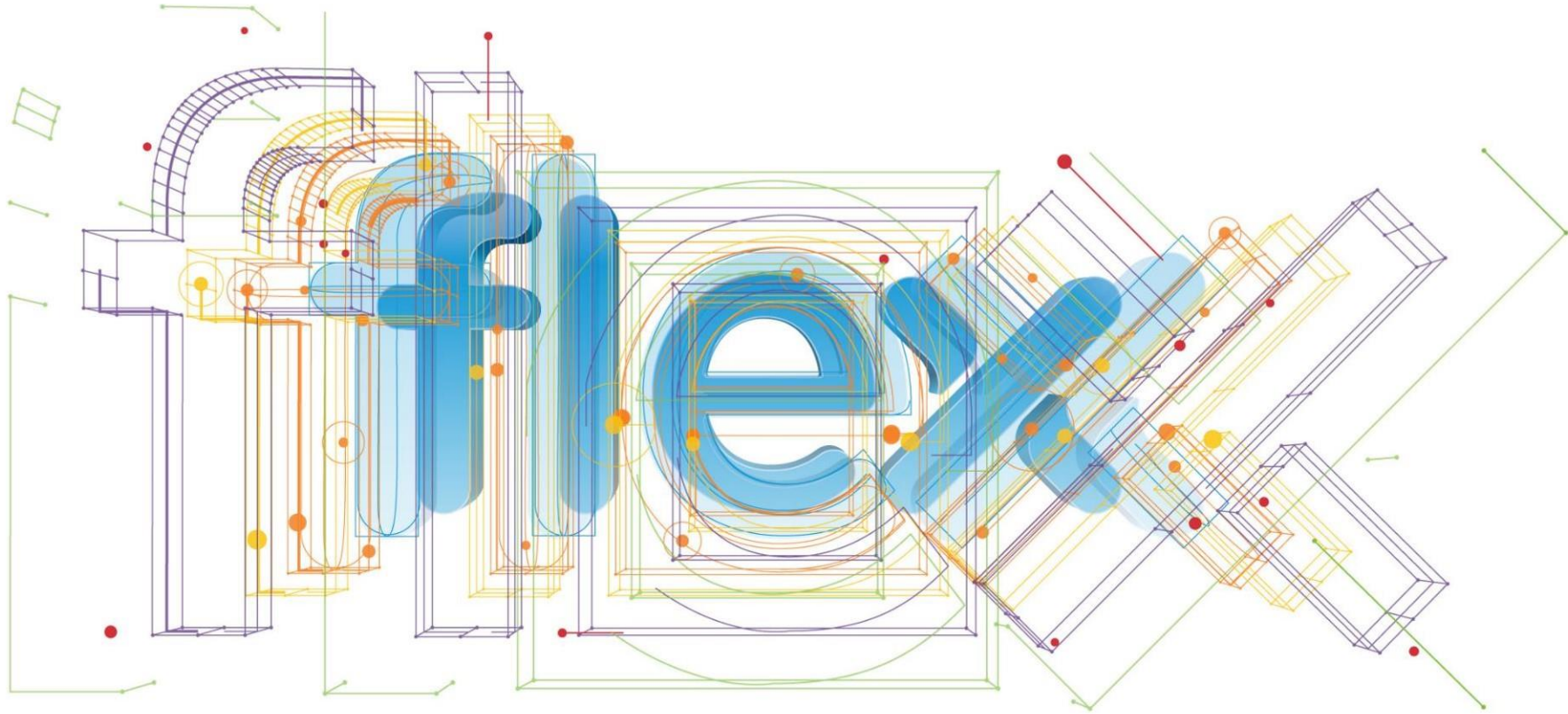
Ethernet Connector Lock
– Not good Condition

	PDA FAMILY TEST STATION with Good Latch																								Check Date
Tester ID	TE82882-8				TE82882-9				TE82882-10				TE82882-11				TE82882-13				TE82882-14				
Position	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	
Good Lock																									
Damage Lock																									20-Mar-20
Good Lock																									
Damage Lock																									23-Mar-20
Good Lock																									27-Mar-20
Damage Lock																									

27 Mar 2020 – Completed All ethernet ports has been verified in good condition. Monitoring in progress through daily checking of Ethernet Cable and Lock not broken or damage. From 26 to 31 Mar 2020, there were no report of broken or damage cable and locks.

Apr 2020 – for the whole month there were no report of broken or damage Ethernet cable and locks

May 2020 – 1st to 6th of the month there were no report of broken or damage Ethernet cable and locks



Thank You