



SWTEST

PROBE TODAY, FOR TOMORROW

2022 CONFERENCE

Control System for Enhancing the Life and Capability of Legacy, Modern and Mixed-Floor Probe Systems



SOTO TECHNOLOGIES
INTERNATIONAL

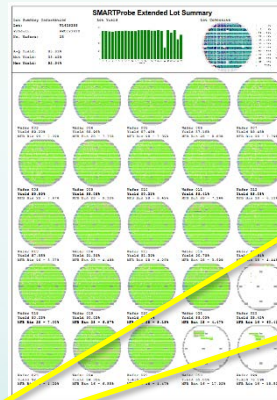
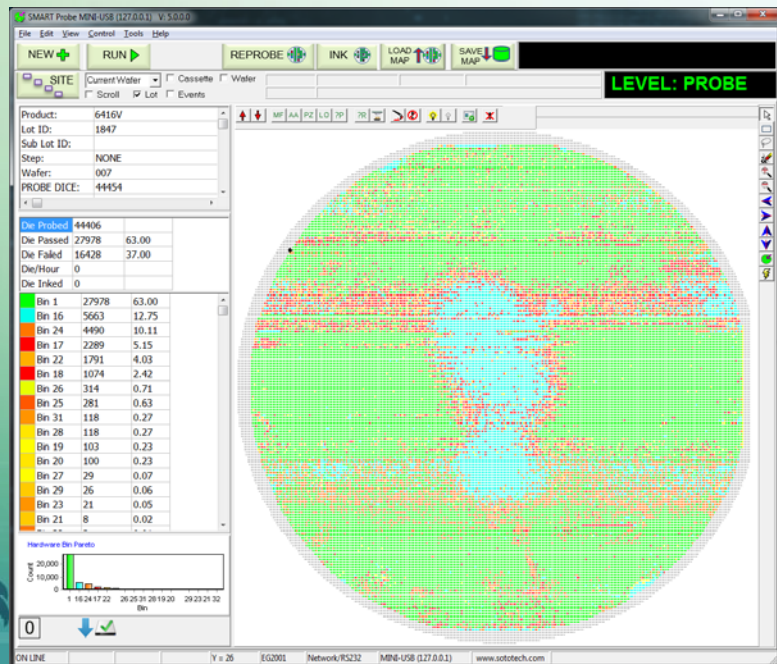
Albert Soto
President

June 5 - 8, 2022

Legacy Equipment & Mixed Equipment Floors

ISSUES:

- Lacking Modern Features
 - SINF Merge, Re-Probe specific Bins, Alerts, change setup, Lasso etc.
- Cannot Duplicate Setups Across Probers
- No Single/Common Interface
- Different Prober GPIB Protocols

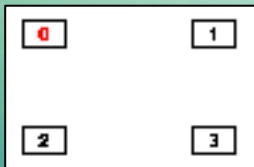
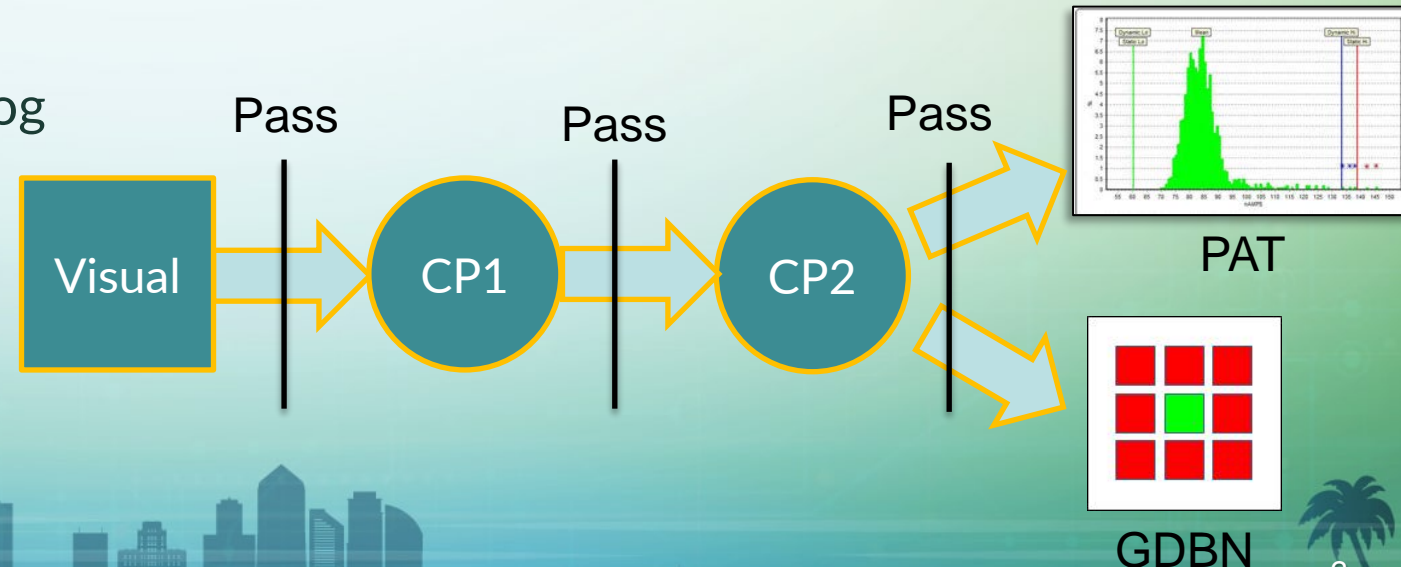
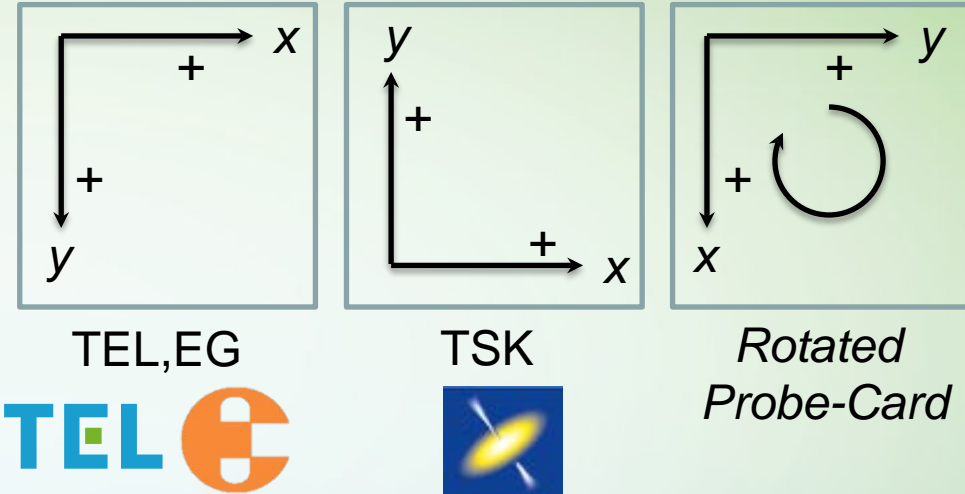


TEL



No Standards

- **Coordinate Frames**
 - Convert Product Setup between Probers
- **Process Steps**
 - Merge Visual Inspection. AOI SINF
 - Multi-Pass for Temp, Bake, etc.
SINF->CP1->CP2->PAT/GDBN
 - Only Test Passing per Process Step
- **Tester Program**
 - Different Syntax per Prober
 - Die X,Y Coordinates for Tester Data-log
- **Prober Steps Scaling**
 - Prober are inherently single-site steps

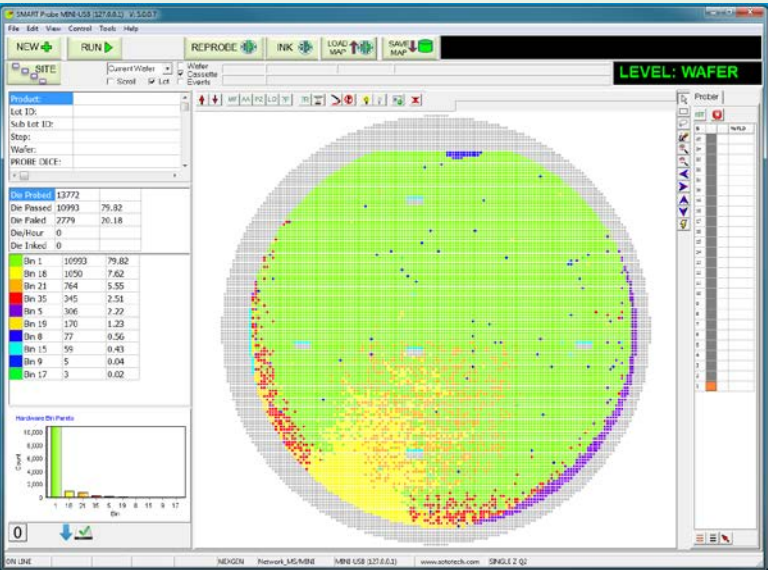


Solution

Tester
Verse

Prober
Verse

SMART Probe



TERADYNE

ADVANTEST



USB



NI GPIB

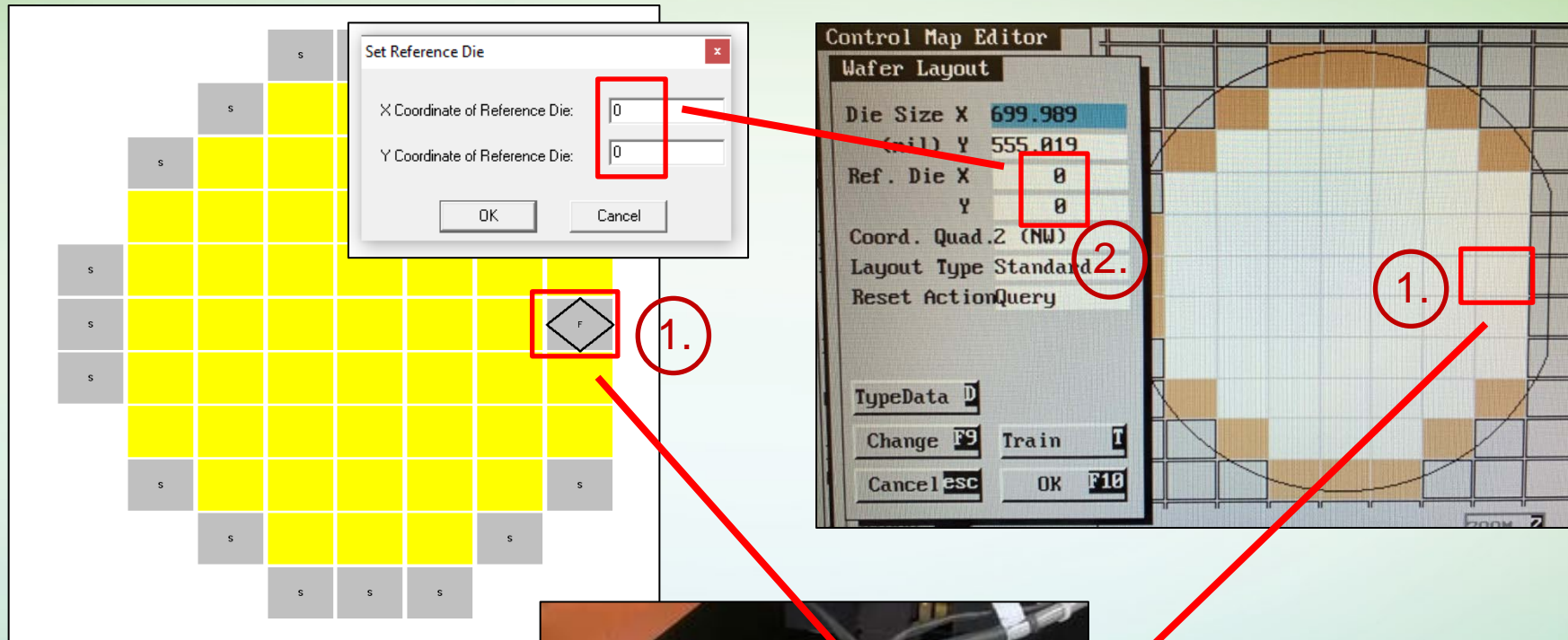
Supported:
TTL
Network
RS232



NI GPIB

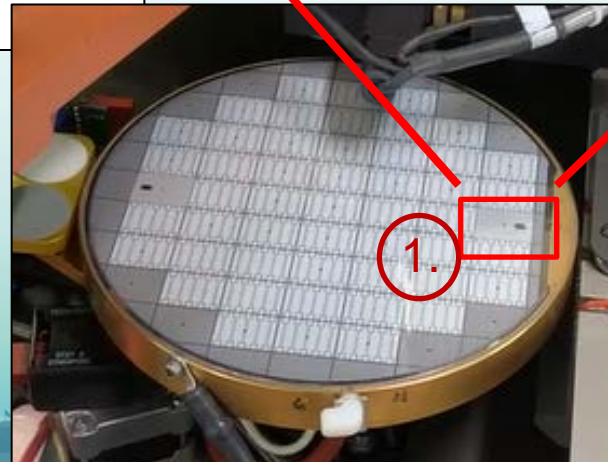


Standardized Control Maps

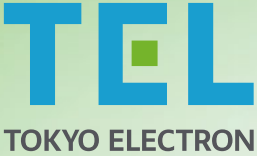


Match Map to Physical Wafer:

1. Match Physical Die
2. Match Coordinates



Convert Existing Prober Maps



Prober Binary File

```
1 464d 4e20 2020 2020 2020 2020 2020 2020
2 2020 2020 5754 3334 3730 2020 2020 2020
3 2020 2020 0078 0000 001f d957 0020 1b84
4 0000 0000 000d 000d 0000 0000 3642 3039
5 4c32 3130 534f 4634 2020 2020 2020 2020
6 2001 3832 4b43 5430 3930 3030 2020 2020
7 2020 2020 0001 0004 0202 0100 0000 0000
8 0000 0000 0080 0080 0102 0000 0000 0016
9 ffff efb9 0000 0080 0000 0080 0000 007a
10 0000 0086 3230 3031 3234 3136 3139 0000
11 3230 3031 3234 3136 3139 0000 3230 3031
```

Multi-Site Testing

Single/Dual	Quad	Octal	12 Sites	16 Sites	20 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

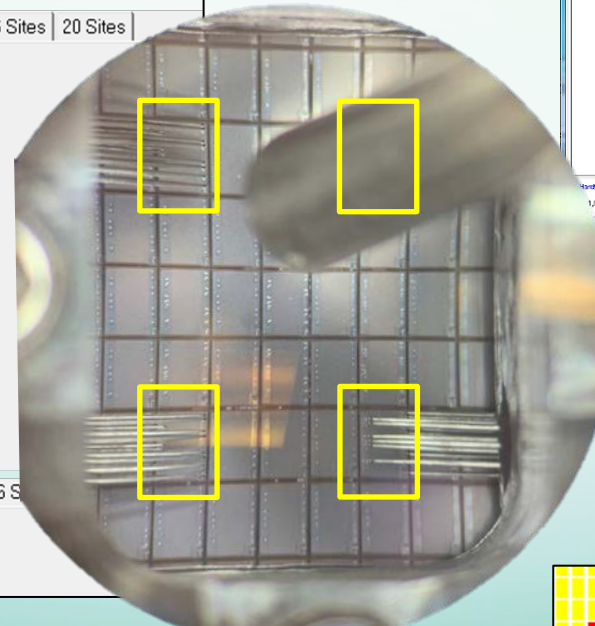
Single/Dual	Quad	Octal	12 Sites	16 Sites	20 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Single/Dual	Quad	Octal	12 Sites	16 Sites	20 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Single/Dual	Quad	Octal	12 Sites	16 Sites	20 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Single/Dual	Quad	Octal	12 Sites	16 Sites	20 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Single/Dual	Quad	Octal	12 Sites	16 Sites
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

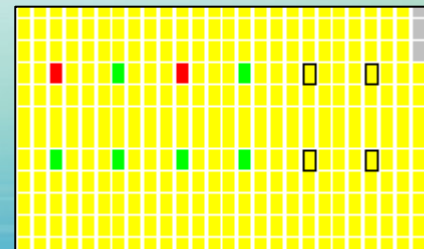
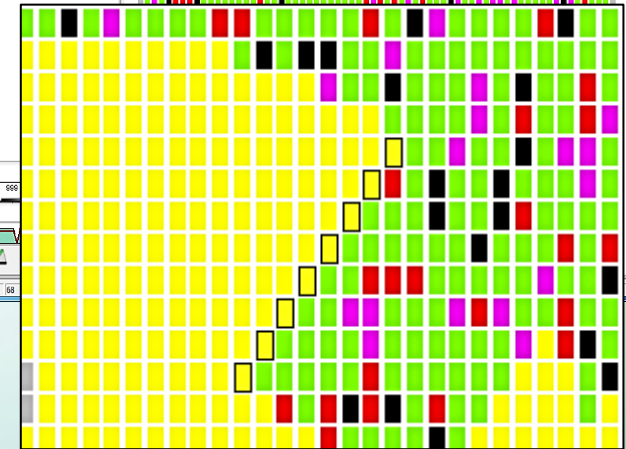


0 1
3 DIE STEPPING
 2 3

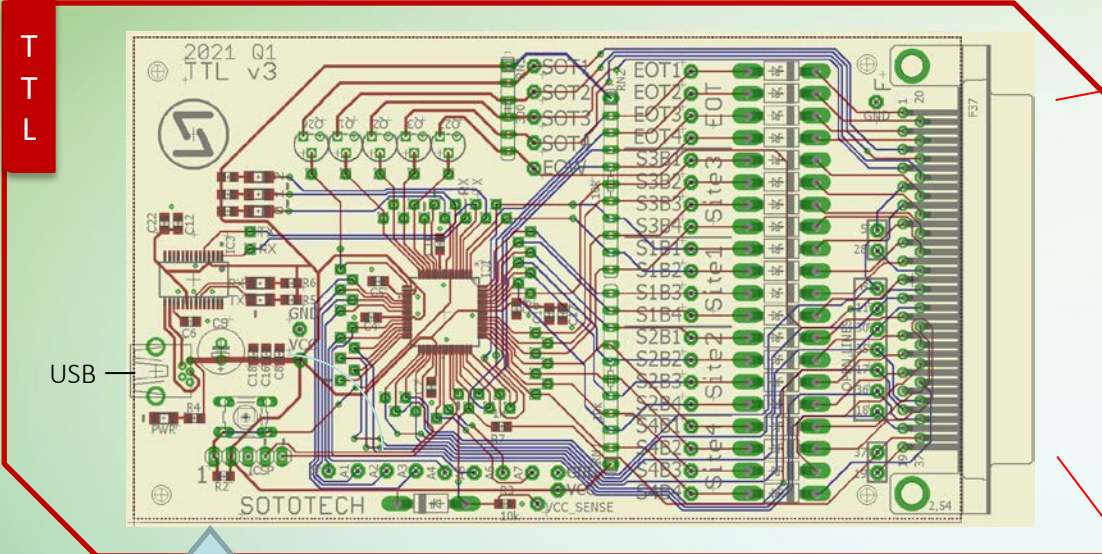
SMART Probe MINI-USB V.5.0.0.0
 Product: AW850T_P9415-2Y
 Lot ID: 111
 Sub Lot ID:
 Step: CP1
 Wafer: 025
 PROBE DICE: 2270

Die Probed	2270
Die Passed	1564 68.90
Die Failed	706 31.10
Die/Hour	9569

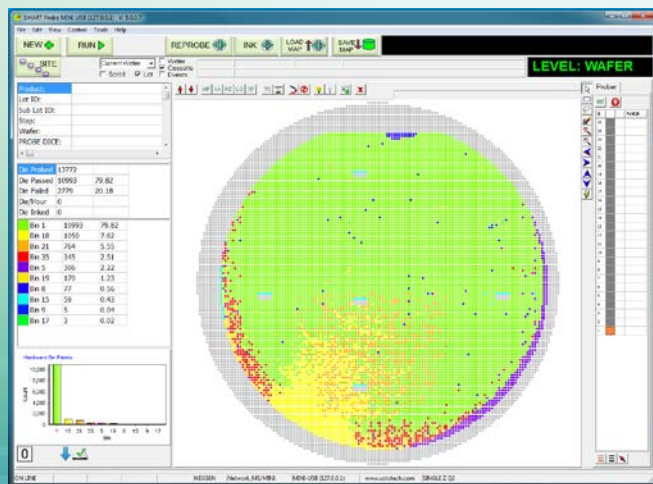
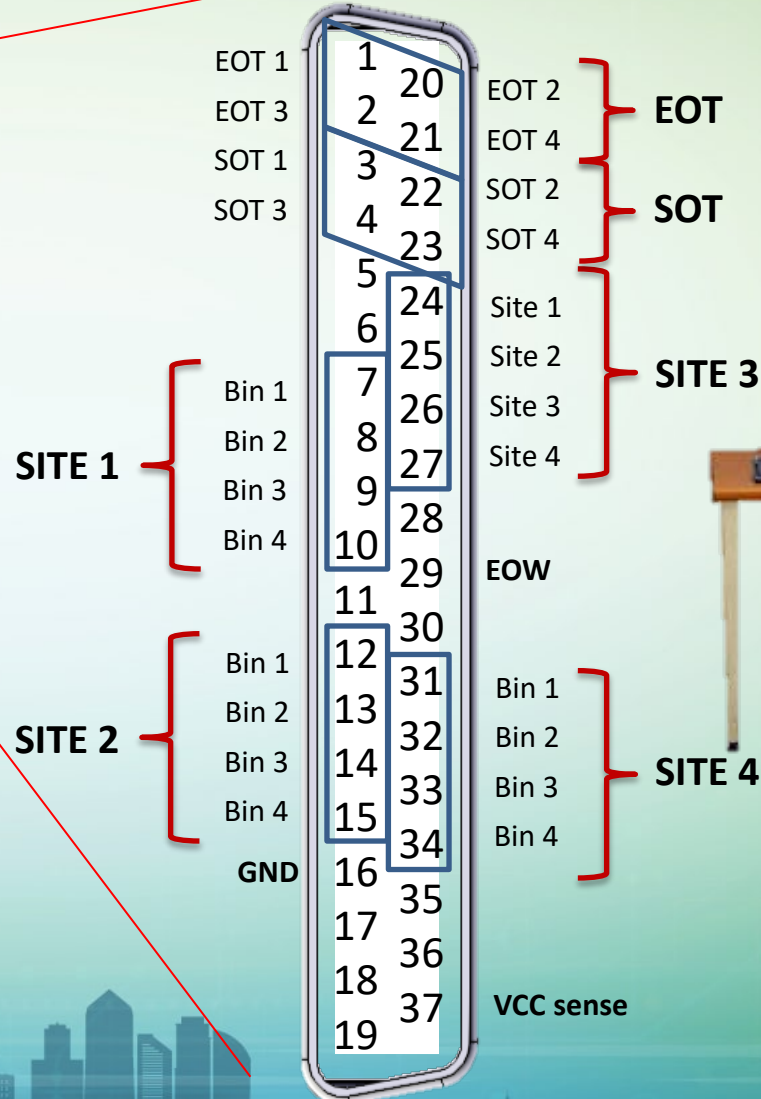
Bin	Count	Yield
Bin 1	1564	68.90
Bin 999	241	10.62
Bin 2	239	10.53
Bin 3	226	9.96



Multi-Site Testing



DB37F



Managing Device Profiles

Product Wizard
Page 3-Bin Setups

Bin Range	Color	Short Name	Pass	Mon. Threshold (%)	Reprobe	Retest Type	Retest Max(%)
0	Red	Bin 0	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Disabled	
1	Green	Bin 1	<input checked="" type="checkbox"/>	97.00	<input type="checkbox"/>	Disabled	
2	Blue	Bin 2	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00
3	Purple	Bin 3	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00
4	Orange	Bin 4	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00

Product Wizard
Page 3-Bin Setups

Bin Range	Color	Short Name	Pass	Mon. Threshold (%)	Reprobe	Retest Type	Retest Max(%)
0	Red	Bin 0	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Disabled	
1	Green	Bin 1	<input checked="" type="checkbox"/>	97.00	<input type="checkbox"/>	Disabled	
2	Blue	Bin 2	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00
3	Purple	Bin 3	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00
4	Orange	Bin 4	<input type="checkbox"/>	0.00	<input type="checkbox"/>	Wafer yield is below	91.00

Pass All Reprobe All Retest All
Pass Clear Reprobe Clear Retest Clear

Clone Product Bin Setup < Back Finish X Cancel

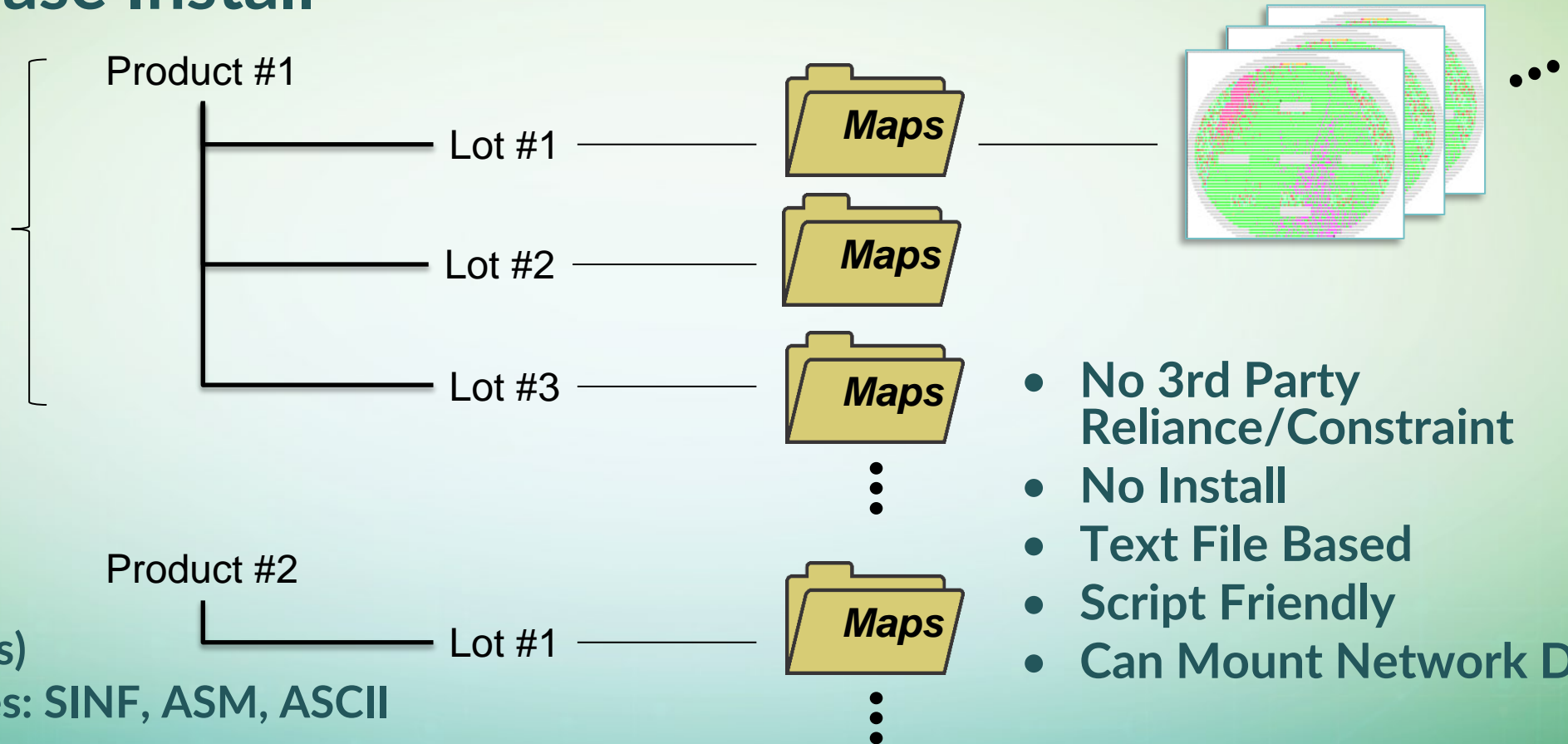
PRODUCT = Missing default.csv

Clone Recipes
to Save Time

NoSQL Database Approach

No Database Install

File-based Structure



Includes:

- Wafer Maps
- Reports (PDFs)
- Assembly Files: SINF, ASM, ASCII

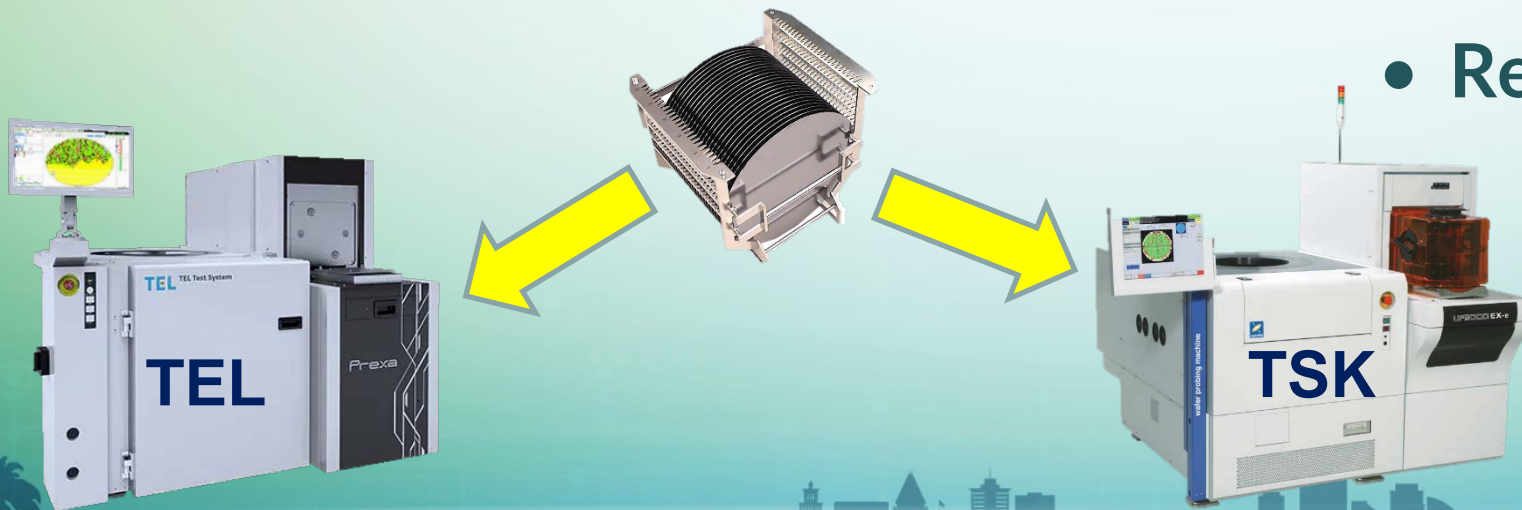
- No 3rd Party Reliance/Constraint
- No Install
- Text File Based
- Script Friendly
- Can Mount Network Drive

Single Lot

Sort Sessions



- Sort Across Many Probers
- Restart After Crash
- Restart on Different Prober



Pre-Sort Map Merge

Product: AW850T_P9415-2Y
 Lot ID: Q0HY094
 Sub Lot ID:
 Step: CP1
 Wafer: 001
 PROBE DICE: 2270

Die Probed	17	
Die Passed	0	0.00
Die Failed	17	100.00
Die/Hour	0	

Bin 12	17	100.00
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AOI Fail are loaded and assigned user defined B=12

XDIES:250.000
 YDIES:290.000

AOI SINF sample file

```

RowData:___ ___ ___ ___ ___ @@@ @@@ 001 @@@ @@@ ___ ___ ___
RowData:___ ___ ___ @@@ 001 001 001 001 001 001 @@@ @@@ ___ ___ ___
RowData:___ @@@ 001 001 001 001 001 001 001 001 001 001 @@@ @@@ ___ ___ ___
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RowData: @@@ 001 001 001 001 001 001 001 001 001 001 001 003 001 ___ ___ ___
RowData: @@@ 001 001 001 001 001 001 001 001 001 002 001 001 001 ___ ___ ___
RowData:___ 001 001 001 001 002 003 001 001 001 001 001 001 ___ ___ ___
RowData:___ @@@ 001 001 001 001 001 001 001 001 001 001 001 ___ ___ ___
RowData:___ ___ ___ @@@ 001 001 001 001 001 001 @@@ @@@ ___ ___ ___
RowData:___ ___ ___ ___ ___ @@@ 001 001 003 @@@ ___ ___ ___
  
```

Windows7_OS (C:) > chipbond_idt > AW850T_P9415-2Y > Q0HY094

Name	Date modified	Type	Size
Q0HY09-01F2	10/8/2019 3:33 PM	TXT File	12 KB
Q0HY09-02E5	10/8/2019 3:33 PM	TXT File	12 KB
Q0HY09-03E0	10/8/2019 3:33 PM	TXT File	12 KB
Q0HY09-04D3	10/8/2019 3:33 PM	TXT File	12 KB
Q0HY09-05C6	10/8/2019 3:33 PM	TXT File	12 KB
Q0HY09-06C1	10/8/2019 3:33 PM	TXT File	12 KB

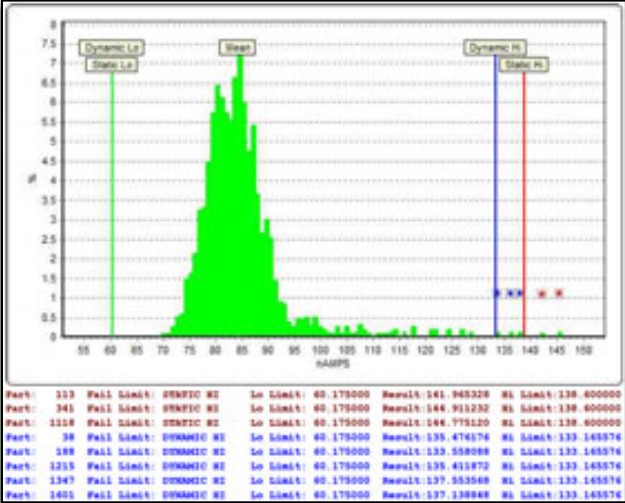
Mount Folder Product LOTID

AOI SINF Files

Post-Sort Analysis

Part Average Testing (PAT)

Statistical

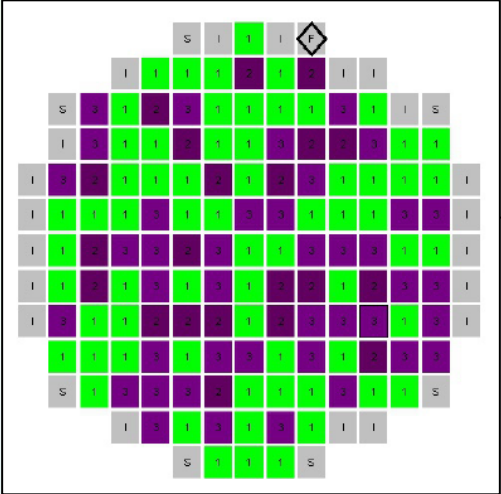


PAT

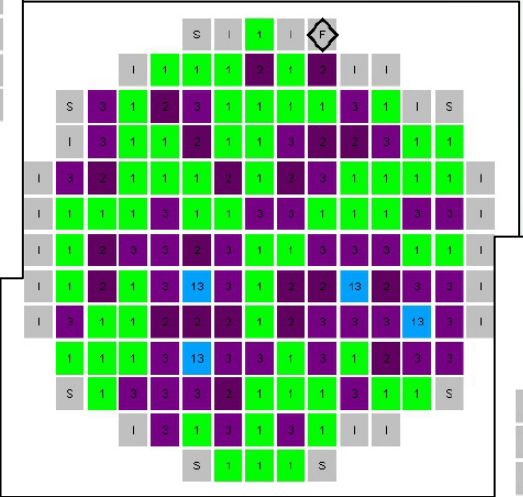
Remove Outliers

Good Die Bad Neighborhood (GDBN)

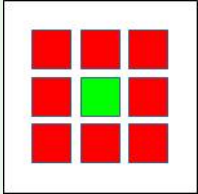
Spatial



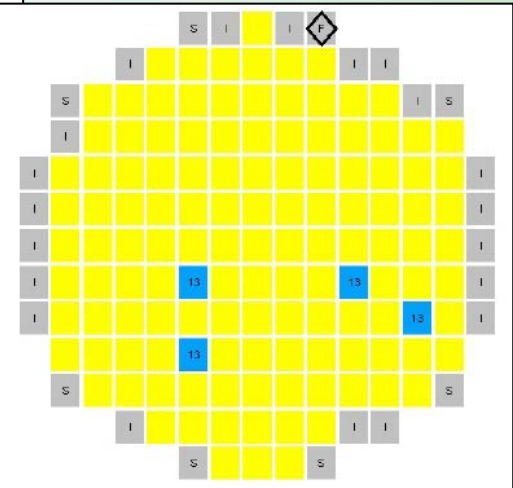
Original Map



GDBN Failures



GDBN 8-Die Pattern



GDBN Difference Map

Reports

SMART Probe Extended Lot Summary

Lot Summary Information
 Lot: W1625253
 Product: 980133XZ
 No. Wafers: 25

Avg Yield: 85.81%
 Min Yield: 33.42%
 Max Yield: 92.94%

Wafer Serial: W1625253.003
 System ID: J750-4
 Oper ID: 2016-03-02 21:18:14
 Tester ID: 2016-03-03 17:25:20

Wafer	0	1	2	3	4	5	6	7
0	0	0.00%	8	0	0.00%	16	20	0.43%
1	4154	88.20%	9	0	0.00%	17	0	0.00%
2	0	0.00%	10	0	0.00%	18	0	0.00%
3	0	0.00%	11	0	0.00%	19	61	1.31%
4	0	0.00%	12	0	0.00%	20	0	0.00%
5	0	0.00%	13	0	0.00%	21	0	0.00%
6	0	0.00%	14	0	0.00%	22	71	1.52%
7	0	0.00%	15	0	0.00%	23	63	1.35%

Wafer Serial: W1625253.004
 System ID: J750-4
 Oper ID: 2016-03-01 01:24:35
 Tester ID: 2016-03-01 23:17:34

Wafer	0	1	2	3	4	5	6	7
0	0	0.00%	8	0	0.00%	16	15	0.32%
1	4143	88.96%	9	0	0.00%	17	0	0.00%
2	0	0.00%	10	0	0.00%	18	0	0.00%
3	0	0.00%	11	0	0.00%	19	61	1.31%
4	0	0.00%	12	0	0.00%	20	0	0.00%
5	0	0.00%	13	0	0.00%	21	0	0.00%
6	0	0.00%	14	0	0.00%	22	0	0.00%
7	0	0.00%	15	0	0.00%	23	71	1.52%

Wafer Serial: W1625253.005
 System ID: J750-4
 Oper ID: 2016-02-29 05:20:52
 Tester ID: 2016-03-01 00:41:18

Wafer	0	1	2	3	4	5	6	7
0	0	0.00%	8	0	0.00%	16	94	2.02%
1	4074	87.48%	9	0	0.00%	17	0	0.00%
2	0	0.00%	10	0	0.00%	18	0	0.00%
3	0	0.00%	11	0	0.00%	19	56	1.20%
4	0	0.00%	12	0	0.00%	20	2	0.04%
5	0	0.00%	13	0	0.00%	21	0	0.00%
6	0	0.00%	14	0	0.00%	22	0	0.00%
7	0	0.00%	15	0	0.00%	23	59	1.27%

Wafer Serial: W1625253.006
 System ID: J750-4
 Oper ID: 2016-03-01 23:43:36
 Tester ID: 2016-03-02 21:21:21

Wafer	0	1	2	3	4	5	6	7
0	0	0.00%	8	0	0.00%	16	44	0.94%
1	4059	87.16%	9	0	0.00%	17	0	0.00%
2	0	0.00%	10	0	0.00%	18	0	0.00%
3	0	0.00%	11	0	0.00%	19	60	1.24%
4	0	0.00%	12	0	0.00%	20	1	0.02%
5	0	0.00%	13	0	0.00%	21	0	0.00%
6	0	0.00%	14	0	0.00%	22	0	0.00%
7	0	0.00%	15	0	0.00%	23	70	1.50%

SMART Probe Wafer Summary Report PAT Report Date: 10/8/2021 2:01:23 PM

SP v5.0.0.0/Wafer Summary v1.0.2.0

Wafer/Summary Information	System Information	Wafer Information
Lot ID: 924229	SubLot ID:	SystemID: PFORM
Wafer ID: 002	Test Sys.:	Flas Location: 180
OCR: L3499B-ZXV	Test Stat.:	Die Width: 34.000 MILS
Product ID: 91.26%	Prober: 192	Die Height: 83.000 MILS
Yield: 91.26%	Wafer Size: 150	

Start Time: 2019-05-27 18:09:44 User: SMRTPAT
 End Time: 2019-05-30 10:20:44 Program: LOAD EWR34992.00

Probe Card: LT9499#3
 Load Board: LT9499#P5
 Cable:

File System
 C:\SMART\PRODUCTION\L3499BAXVIS\924229\924229...

Wafer Map: C:\SMART\CONTROLMAPS
 Control Map Loc: C:\SMART\CONTROLMAPS
 Setup File:
 Setup File Loc:

Bin Information

Bin	Count	Yield	Color	Count	Yield	Color	Count	Yield
1	11291	91.26%	Green	0	0.00%	2	0	0.00%
4	0	0.00%	Blue	8	0.00%	6	0	0.00%
8	0	0.00%	Red	9	0.00%	10	0	0.00%
12	0	0.00%	Yellow	12	0.00%	14	0	0.00%
16	4	0.00%	Purple	17	0.00%	18	0	0.00%
20	517	4.20%	Orange	21	0.00%	22	1	0.01%
24	3	0.02%	Light Blue	25	0.00%	26	0	0.00%
28	0	0.00%	Light Green	29	0.00%	30	0	0.00%
32	0	0.00%	Light Purple	33	0.00%	34	0	0.00%

Wafer 001 Yield 63.78%
 Wafer 002 Yield 74.80%
 Wafer 003 Yield 68.50%
 Wafer 006 Yield 70.87%
 Wafer 007 Yield 62.20%
 Wafer 008 Yield 72.44%

SMARTProbe Extended L

Lot Summary Information
 Lot: 111
 Product: 5057
 No. Wafers: 25

Avg Yield: 68.66%
 Min Yield: 62.20%
 Max Yield: 77.17%

Wafer 001 Yield 63.78%
 Wafer 002 Yield 74.80%
 Wafer 003 Yield 68.50%
 Wafer 006 Yield 70.87%
 Wafer 007 Yield 62.20%
 Wafer 008 Yield 72.44%

XDIES:250.000
YDIES:290.000

RowData: _____ @@@ @@@ 001 @@@ @@@ _____

RowData: _____ @@@ 001 001 001 001 001 001 001 001 @@@ @@@ _____

RowData: @@@ 001 001 001 001 001 001 001 001 001 001 @@@ @@@ _____

RowData: @@@ 001 001 001 003 001 001 001 001 001 001 001 003 001 @@@ _____

RowData: @@@ 001 001 003 001 001 003 003 001 001 001 001 001 001 @@@ _____

RowData: @@@ 001 001 001 001 001 001 001 001 001 001 001 001 001 @@@ _____

RowData: @@@ 001 001 001 001 001 001 001 001 002 001 001 001 001 @@@ _____

RowData: @@@ 001 001 001 001 002 003 001 001 001 001 001 001 001 _____

RowData: @@@ 001 001 001 001 001 001 001 001 001 001 001 001 001 @@@ _____

RowData: _____ @@@ 001 001 001 001 001 001 @@@ @@@ _____

RowData: _____ @@@ 001 001 003 @@@ _____

Closing

- **Perfection is the Enemy of Good!**

William Donovan OSS WW2

- **“Hit’ em where they ain’t”, “Leap-frogging” and “Bypassing”**

Douglas MacArthur WW2

