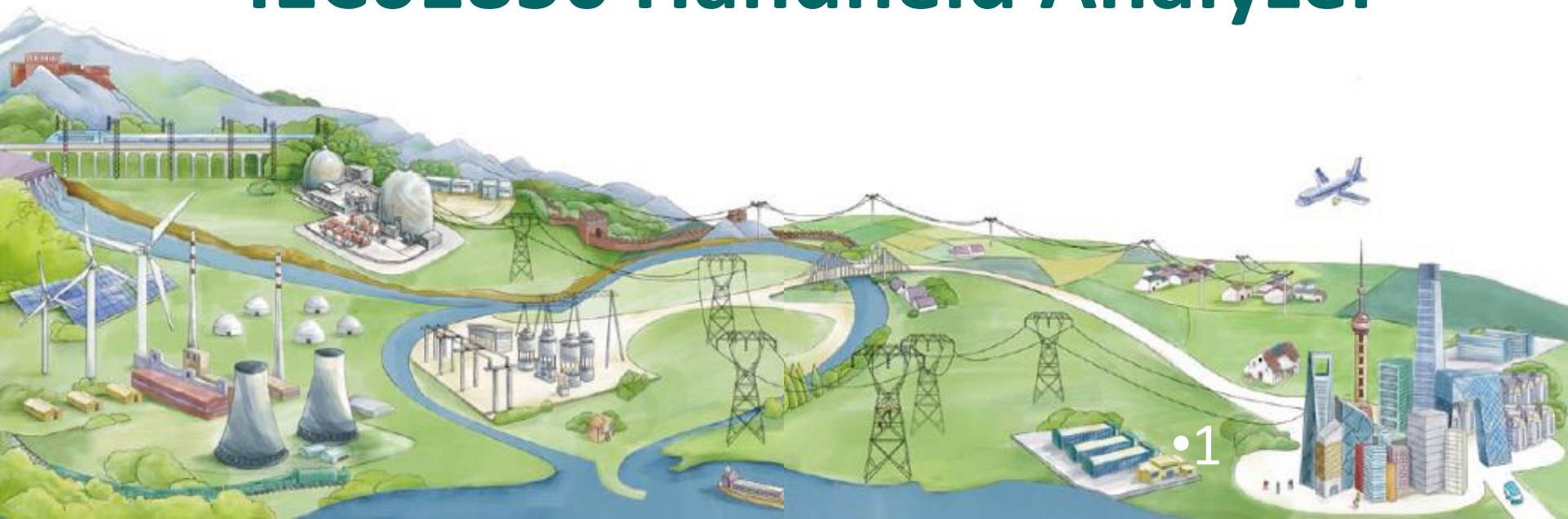


PONOVO PNS630 IEC61850 Handheld Analyzer



IEC 61850 – Types of Messages

GOOSE 

SMV



MMS



IRIG-B



PTP
(IEEE1588)

PNS630 ALL-IN-ONE Features



GOOSE TESTING

SMV TESTING

MMS TESTING

TIME SOURCE TESTING

NETWORK TRAFFIC TESTING

OPTIC-POWER TESTING

WAVEFORM RECORDING

PNS630 Benefits



- LICENSE-FREE
- PROGRAM RUNS FROM SD CARD
- NO FIRMWARE TO UPDATE
- BATTERY OPERATED
- SIMPLE APP-LIKE MODULES
- IMPORT OF IEC61850 SCD FILES

PNS630 Hardware

7" Touchscreen

Function Keys

Home Key

Enter & ESC

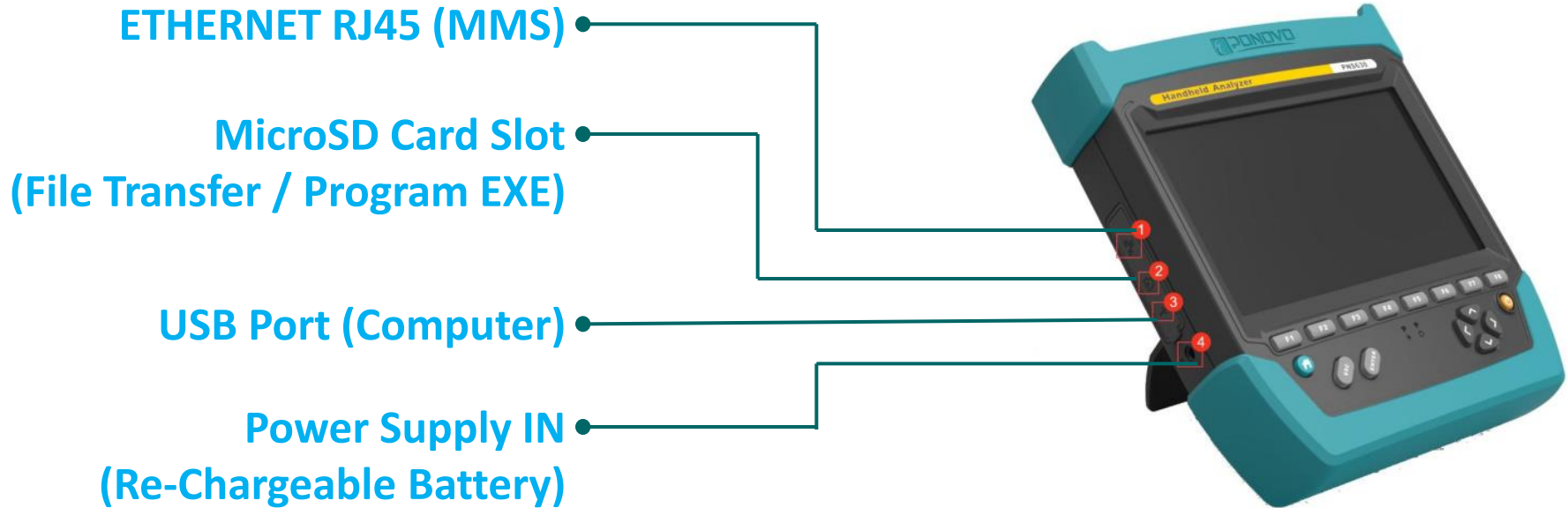
Navigation Buttons

Power ON/OFF

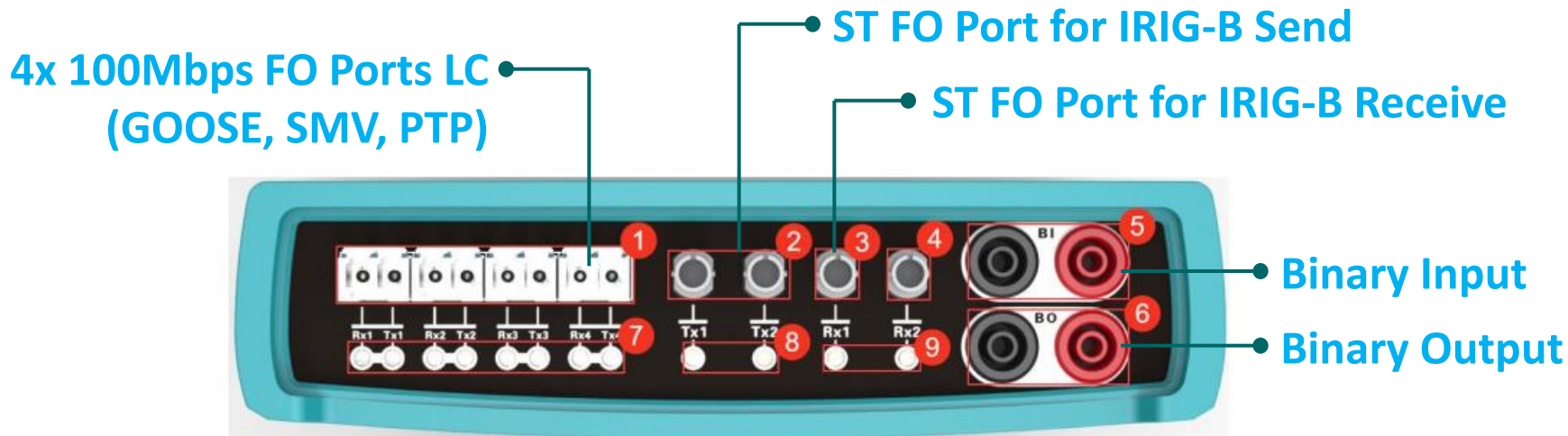
Charge/Run LED



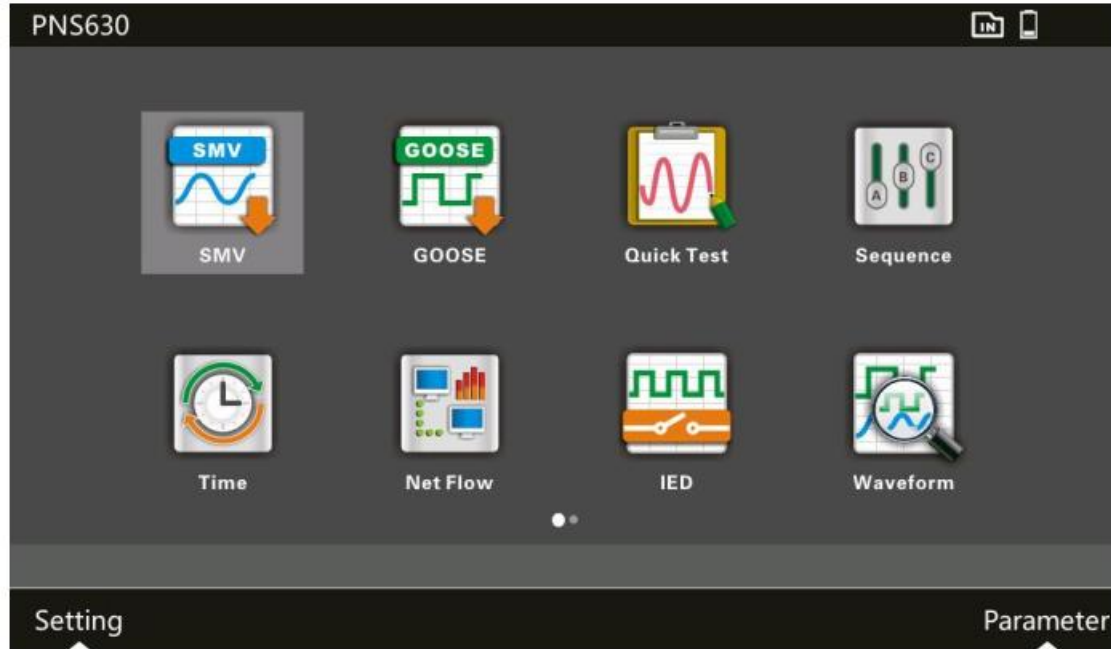
PNS630 – Hardware



PNS630 – Connection Ports

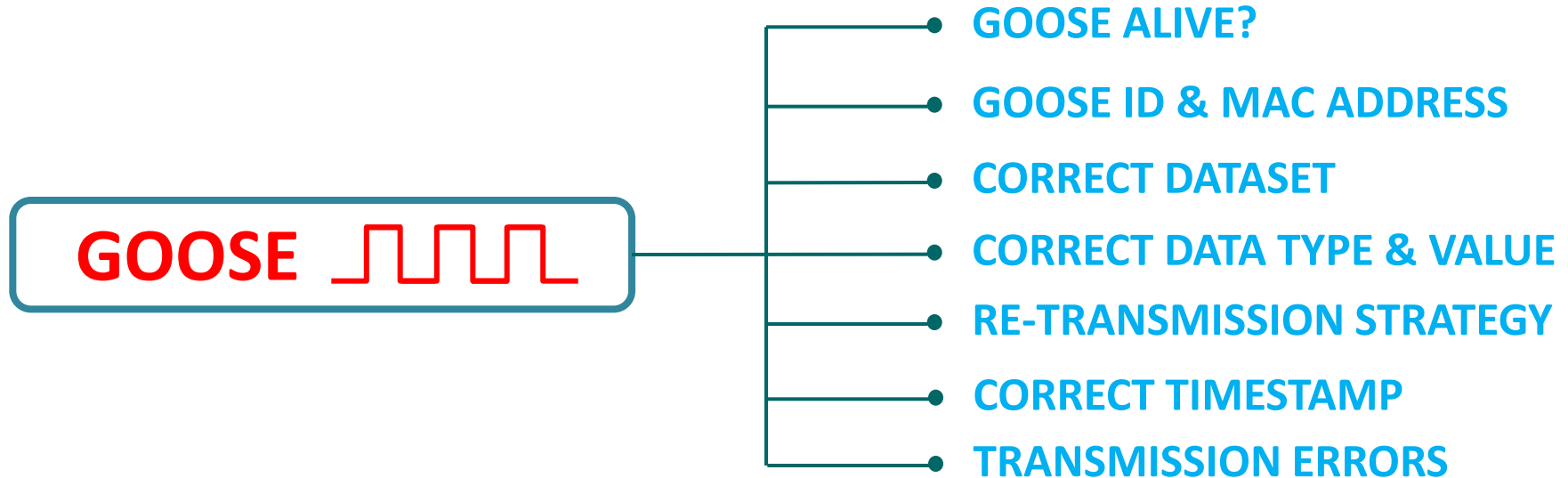


PNS630 – Testing APPS



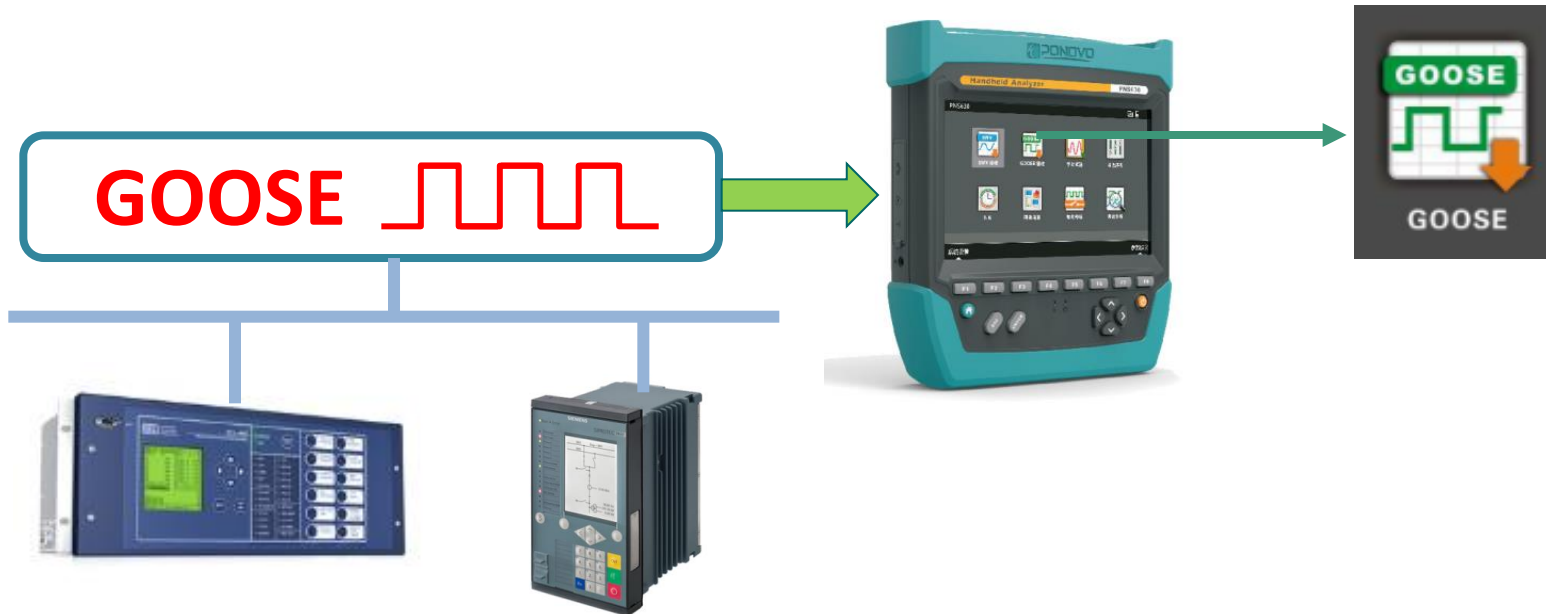
GOOSE TESTING

GOOSE – What To Check?



GOOSE Subscription

PNS630



GOOSE Alive?

GOOSEDetect

Type	APPID	Description	Optic port
<input checked="" type="checkbox"/> GOOSE	0x0116		1

Detecting.....

Exit Refresh Enter

PNS630 - GOOSE Function List

Real-time value 0x0116

No.	Channel	Type	Value
1		1:BitStr	[01]
2		2:Time	2017-09-21 00:31:06.0...
3		3:BitStr	[01]
4		4:Time	2017-09-21 00:31:06.0...
5	Real-time value	5:BitStr	[01]
6	Bit-change list	6:Time	2017-09-21 00:31:06.0...
7	Statistic	7:BitStr	[01]
8	Monitor	8:Time	2017-09-21 00:31:06.0...
9	GOOSE publish	9:BitStr	[01]
	GOOSE bit-chan		

Back Function Block



GOOSE ID & MAC Address / Dataset / Timestamp

Monitor 0x0116

Item	Value	Original message	SCL Value
Reserved1:	0x0000	0000	
Reserved2:	0x0000	0000	
PDU			
PDU Length	383	6182017f	
gcRef:	CL16GOLD/LLN0\$GO...	8016434c3136474f4c...	
TTL:	10000	81022710	
datSet:	CL16GOLD/LLN0\$dsG...	8216434c3136474f4c...	
gcID:	CL16GOLD/LLN0.gocb0	8313434c3136474f4c...	
Timestamp:	1970-01-01 00:00:00....	84080000000000000000...	

Back Function Block To top

Function: Monitor

GOOSE Data Type & Values

Real-time value 0x0116

No.	Channel	Type	Value
1		1:BitStr	[01]
2		2:Time	2017-09-21 00:31:06.0...
3		3:BitStr	[01]
4		4:Time	2017-09-21 00:31:06.0...
5		5:BitStr	[01]
6		6:Time	2017-09-21 00:31:06.0...
7		7:BitStr	[01]
8		8:Time	2017-09-21 00:31:06.0...
9		9:BitStr	[01]

Back Function Block

Function: Real-Time Value

GOOSE Re-Transmission Strategy

GOOSE publish 0x0116

SN	Absolute time	Interval(ms)	StNum	SqNum
0	1970-01-03 11:14:34.317	0	15	11
1	1970-01-03 11:14:39.318	5001	15	12

Back Function Block Refresh Find

Function: GOOSE Publish

GOOSE Transmission Errors

Statistic 0x0116

Item	NO.
Total frame	57
SqNum lost	1
SqNum initial value error	2
SqNum repeat	0
SqNum disorder	0
StNum disorder	0
Virtual displacement	0
Test mode	0
Unsync	0

Back Function Block Refresh

Function: Statistics

GOOSE Bit Change List & Info

Bit-change list 0x0116

No.	SwitchTime(ms)	Channel
1	1970-01-03 11:12:45.716	Channel1;Channel3;Channel5;Cha...
2	1970-01-03 11:12:50.923	Channel1;Channel3;Channel5;Cha...

Back Function Block Enter

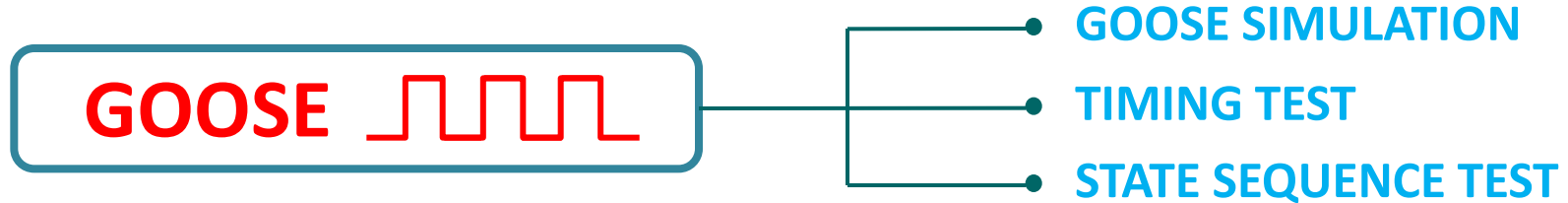
Bit-change info

Channel	Channel	Type	Switch
0		1:BitStr	[10]-->[01]
2		3:BitStr	[10]-->[01]
4		5:BitStr	[10]-->[01]
6		7:BitStr	[10]-->[01]
8		9:BitStr	[10]-->[01]
10		11:BitStr	[10]-->[01]
12		13:BitStr	[10]-->[01]
14		15:BitStr	[10]-->[01]
16		17:BitStr	[10]-->[01]

Back Page down Page up

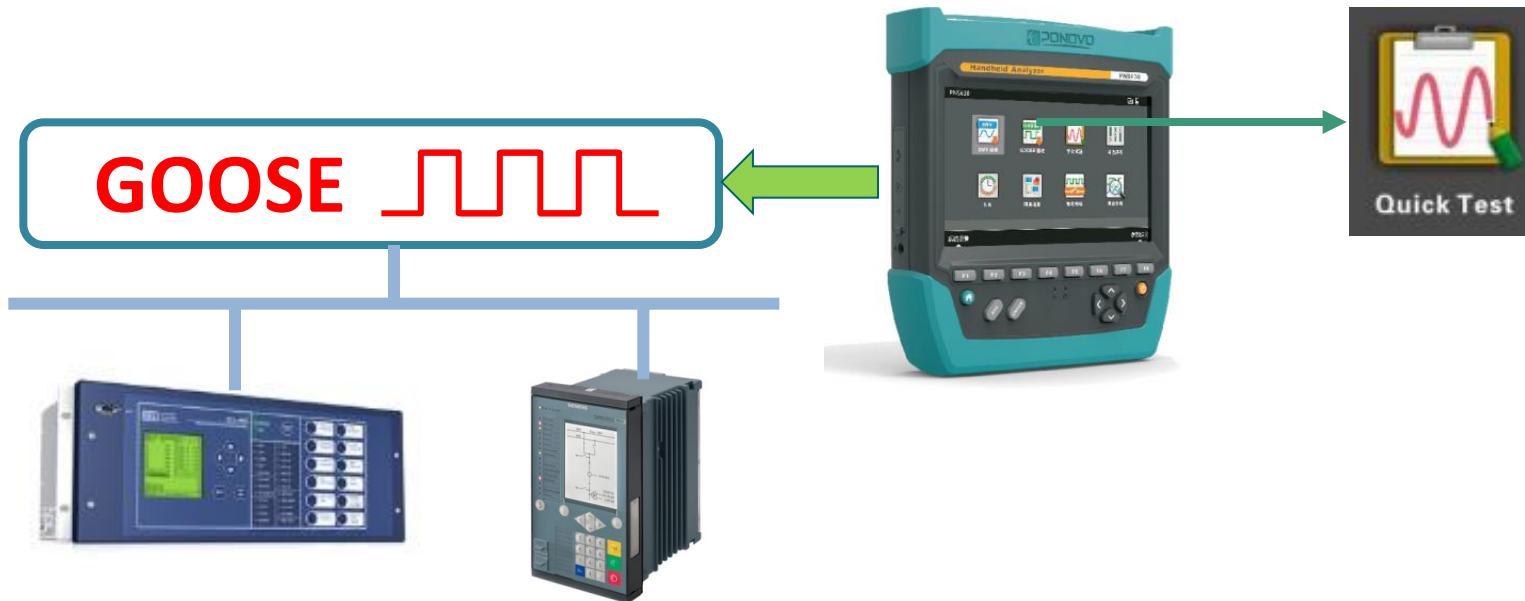
Function: Bit Change

GOOSE – Functional Test



GOOSE Simulation

PNS630




Quick – SMV Simulation

8x Virtual
Binary Inputs
(Mapped
from GOOSE)

Manual

Channel	Amplitude	Phase	Frequency	AmplitudeStep	PhaseStep
<input type="checkbox"/> Ia1	9A	0°	50Hz	1A	0°
<input type="checkbox"/> Ib1	10A	120°	50Hz	1A	0°
<input type="checkbox"/> Ic1	1A	-120°	50Hz	0A	0°
<input type="checkbox"/> Iz1	1A	0°	50Hz	0A	0°
<input type="checkbox"/> Ua1	57.74V	0°	50Hz	0V	0°
<input type="checkbox"/> Ub1	57.74V	-120°	50Hz	0V	0°
<input type="checkbox"/> Uc1	72.74V	120°	50Hz	3V	0°
<input type="checkbox"/> Uz1	57.74V	0°	50Hz	0V	0°

BI1 BI2 BI3 BI4 BI5 BI6 BI7 BI8

Exit SMV  Send Group Lock Extended

Quick – GOOSE Simulation

8x Virtual
Binary Inputs
(Mapped
from GOOSE)

AppID:01-CSC101First setProtectionCSC-10:

No.	Description	Type	Value
1	Trip Bus CB PhA	Single...	FALSE
2	Trip Bus CB PhB	Single...	FALSE
3	Trip Bus CB PhC	Single...	FALSE
4	Bus CB Init CBFA	Single...	FALSE
5	Bus CB Init CBFB	Single...	FALSE
6	Bus CB Init CBFC	Single...	FALSE
7	Bus CB Blk AR	Single...	FALSE
8	Trip Tie CB PhA	Single...	FALSE

BI1 BI2 BI3 BI4 BI5 BI6 BI7 BI8

Exit GSE ^{SMV} Send GOOSE All off All reversed Test Extended

Quick – Results

Result			
No.	Change time	Item	BI change
1	0.0 s	StartSendSMV	--
2	24.0 s	SMV amplitude changed	--
3	26.297 s	SMV amplitude changed	--
4	27.575 s	SMV amplitude changed	--
5	29.757 s	SMV amplitude changed	--
6	30.783 s	SMV amplitude changed	--
7	97.68 s	Stop	--

Back Refresh

SOE of SMV
or GOOSE
Change

Shows
changes of
Virtual BI's

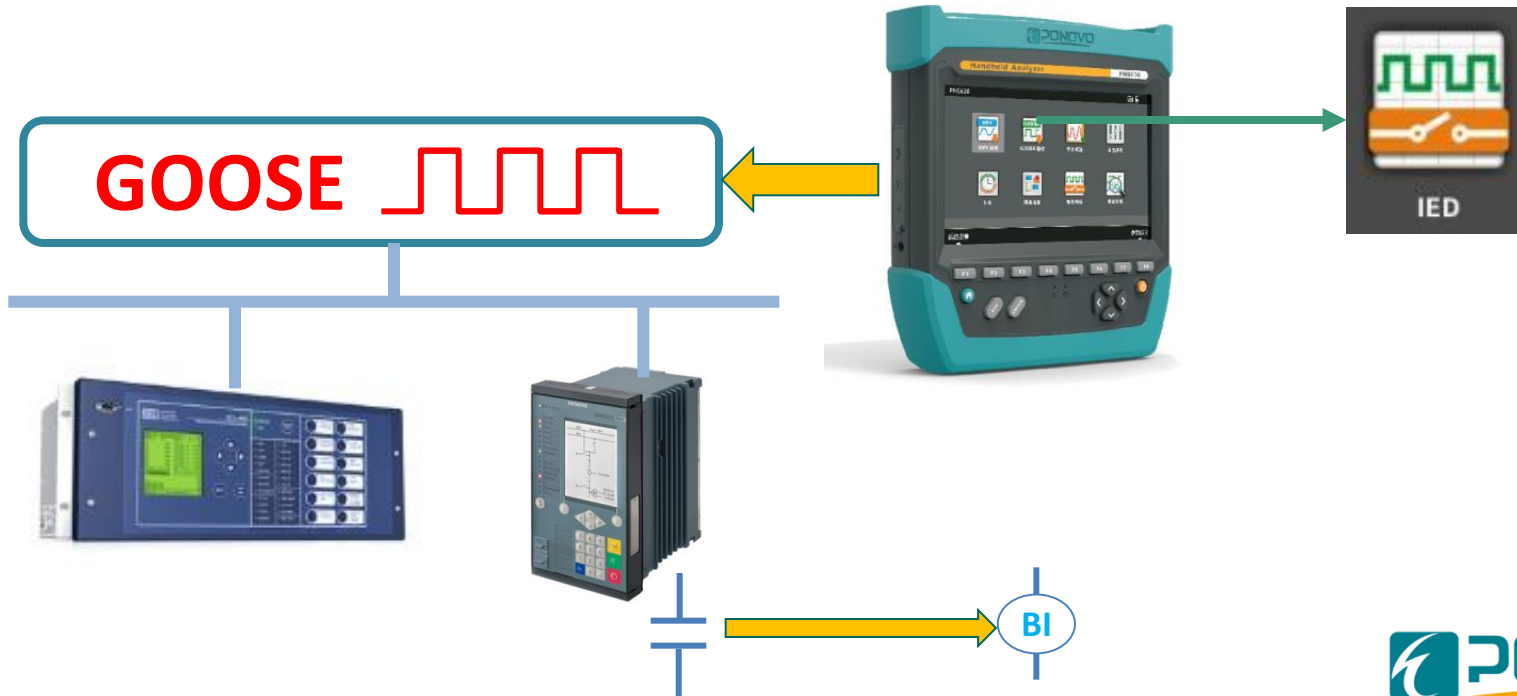
GOOSE Timing Tests

PNS630



Round-Trip Time Test

PNS630



IED – GOOSE->BI Test

GSE->Bin. in 0C03-XLBH931

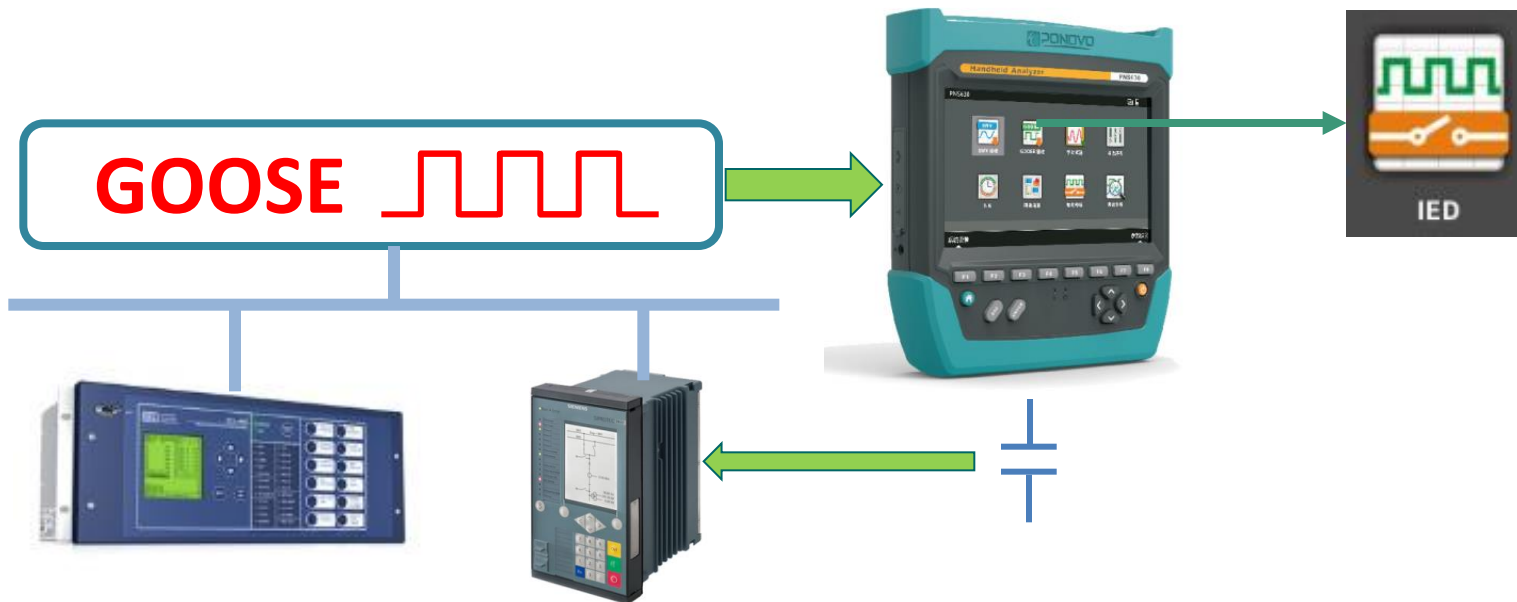
No.	DescribeText	Type	Value	Time
1	Trip CB	Boolean	TRUE	5ms
2	Trip CB	Boolean	FALSE	
3	Start Failure	Boolean	FALSE	
4	Start Failure	Boolean	FALSE	
5	Start Failure	Boolean	FALSE	
6	Reclosing Block	Boolean	FALSE	
7	Reclosing	Boolean	FALSE	
8	Remote 1 BO	Boolean	FALSE	

BI

Exit Stop GSE->BI BO->GSE SOE Reset OOSE Grou Other

GOOSE Publish Time Test


PNS630



IED – BO->GOOSE Test

Bin. In->GSE

Map	DescribeText	State	Time
D11	0002-5-0X0002-DI1 Binary input (CB Closed)	TRUE	8ms
D12		FALSE	
D13		FALSE	
D14		FALSE	
D15		FALSE	
D16		FALSE	
D17		FALSE	
D18		FALSE	

BO 

Exit Stop GSE->BI **BO->GSE** SOE binaryout Other

IED – SOE Test (GOOSE->BI)

SOE

Test Type	Goose to Bin. in
Bit interval(ms):	10
Bit times	10
Tprefault(s):	2

Back Send Para. Result Refresh

SOE

Total No.	10	Ave. Time(ms)	4
Trip times	Goose bit time	Bin. bit time	Time difference(r
Ordinal	0 ms	5 ms	5
Ordinal	10 ms	14 ms	4
Ordinal	20 ms	25 ms	5
Ordinal	30 ms	34 ms	4
Ordinal	40 ms	45 ms	5
Ordinal	50 ms	53 ms	3
Ordinal	60 ms	65 ms	5
Ordinal	70 ms	74 ms	4
Ordinal	80 ms	85 ms	5

Back Send Para. Result Refresh Other

IED – SOE Test (BO->GOOSE)

SOE

Test Type	Bin. out to Goose
Bit interval(ms):	1000
Bit times	10
Tprefault(s):	2

Back Send Para. Result Refresh

SOE

Total No.	10	Ave. Time(ms)	9
Trip times	Bin. bit time	Goose bit time	Time difference(r
Ordinal1	0 ms	9 ms	9
Ordinal2	1000 ms	1009 ms	9
Ordinal3	2000 ms	2009 ms	9
Ordinal4	3000 ms	3009 ms	9
Ordinal5	4000 ms	4009 ms	9
Ordinal6	5000 ms	5009 ms	9
Ordinal7	6000 ms	6009 ms	9
Ordinal8	7000 ms	7009 ms	9
Ordinal9	8000 ms	8009 ms	9

Back Send Para. Result Refresh Other

GOOSE – State Sequence Test

Status sequence

No.	StatusSwitch	StatusData
1	ManualTrigger	Ia1=0.000;Ib1=0.000;Ic1=0.000;Iz1=0.000;Ua1=0.000;Ub1...
2	ManualTrigger	Ia1=0.000;Ib1=0.000;Ic1=0.000;Iz1=0.000;Ua1=0.000;Ub1...

Exit Start Edit Add Delete Clear Extended

GOOSE – State Sequence Test

Status sequenceStatus1

Channel	Amplitude	Phase	Frequency
Ia1	0.000A	0°	50Hz
Ib1	0.000A	-120°	50Hz
Ic1	0.000A	120°	50Hz
Iz1	0.000A	0°	50Hz
Ua1	0.000V	0°	50Hz
Ub1	0.000V	-120°	50Hz
Uc1	0.000V	120°	50Hz
Uz1	0.000V	0°	50Hz

Back **SMV** Goose Parameter Status Group calculate Extended

Set SMV Values

GOOSE – State Sequence Test

Status sequenceStatus1

No.	Description	Type	Value
1	Trip Bus CB PhA	Single...	FALSE
2	Trip Bus CB PhB	Single...	FALSE
3	Trip Bus CB PhC	Single...	FALSE
4	Bus CB Init CBFA	Single...	FALSE
5	Bus CB Init CBFB	Single...	FALSE
6	Bus CB Init CBFC	Single...	FALSE
7	Bus CB Blk AR	Single...	FALSE
8	Trip Tie CB PhA	Single...	FALSE

Back SMV **Goose** Parameter Status GOOSE calculate Extended

Set GOOSE Values

GOOSE – State Sequence Test

Status sequenceStatus1

TriggerCondition ManualTrigger

Hold time(ms) 2000

BI: ☒ BI1 ☐ BI2 ☐ BI3 ☐ BI4
☐ BI5 ☐ BI6 ☐ BI7 ☐ BI8

GSE trigger ☒ TRUE

BO ☒ BO1

Back SMV Goose **Parameter** Status calculate Extended

Set Trigger

SMV TESTING

SMV – What To Check?

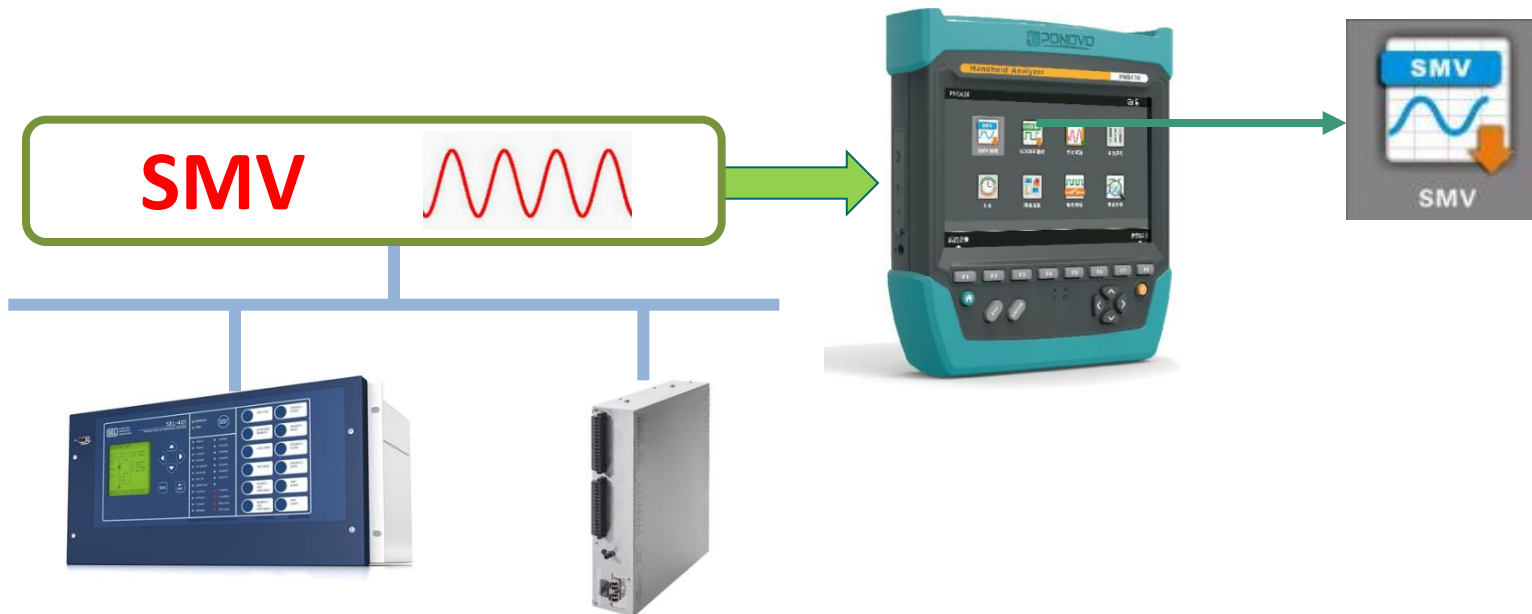
SMV



- SMV ACTIVE?
- MAG/PH/FREQ AS EXPECTED
- VECTORS CORRECT
- POWER, HARMONIC
- PHASE CHECK OF TWO SMV's
- TIME SYNCHRONIZATION
- TRANSMISSION ERRORS
- TIME DISPERSION

SMV Subscription

PNS630



MERGING UNITS

SMV Active?



The screenshot shows a handheld device screen with the 'SMVDetect' application. At the top, the title bar says 'SMVDetect' with icons for a folder and a phone. Below is a table with four columns: 'Type', 'APPID', 'Description', and 'Optic port'. The first row is checked with a green box and contains the text 'SMV92', '0x0001', 'CSD602First setMerging unitsCSD602', and '1'. Below the table is a large dark grey rectangular area. At the bottom of the screen, a status bar shows 'Detecting.....' and a navigation bar with buttons for 'Exit', 'Refresh', '9-2' (in red), 'FT3', and 'Enter'.

Type	APPID	Description	Optic port
<input checked="" type="checkbox"/> SMV92	0x0001	CSD602First setMerging unitsCSD602	1

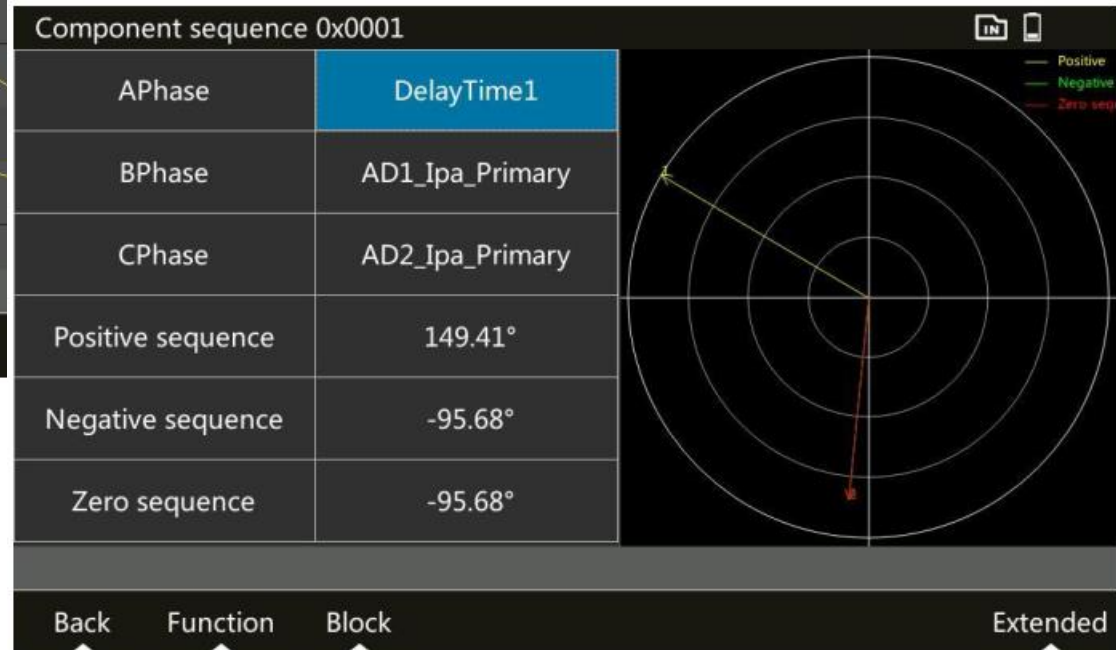
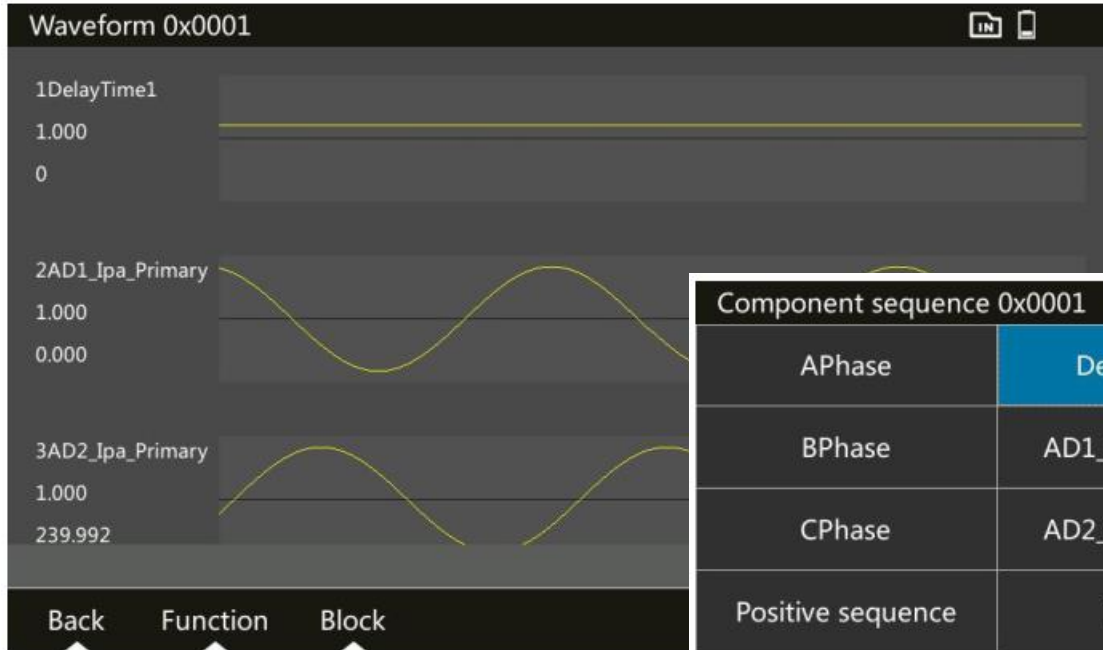
Detecting.....

Exit Refresh 9-2 FT3 Enter

SMV MAG/PH/FREQ

RMS 0x0001				
No.	Channel	Amplitude	Phase	Frequency
1	DelayTime1	0.000	0.00	0.000
2	AD1_Ipa_Primary	0.000	0.00	0.000
3	AD2_Ipa_Primary	0.000	0.00	0.000
4	AD1_Ipb_Primary	0.000	0.00	0.000
5	AD2_Ipb_Primary	0.000	0.00	0.000
6	AD1_Ipc_Primary	0.000	0.00	0.000
7	AD2_Ipc_Primary	0.000	0.00	0.000
8	AD1_Ima_Primary	0.000	0.00	0.000
9	AD1_Imb_Primary	0.000	0.00	0.000
Back Function Block Extended				

SMV WAVEFORM & VECTORS



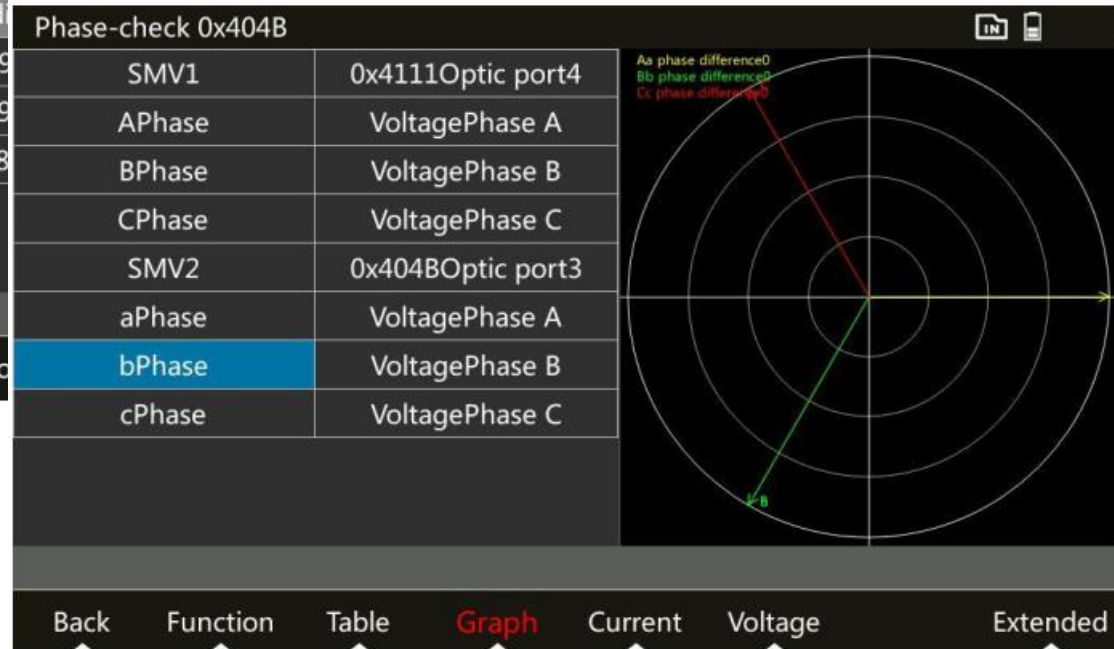
SMV POWER/HARMONICS

Power 0x0001				
	APhase	BPhase	CPhase	Gross power
Voltage	1-DelayTime1	2-AD1_Ipa_Pri...	3-AD2_Ipa_Pri...	
Current	4-AD1_Ipb_Pri...	5-AD2_Ipb_Pri...	6-AD1_Ipc_Pri...	
VoltageRMS	1.000V 80.53°	1.000V 0.00°	1.000V 239.99°	
CurrentRMS	0.000A 80.53°	1.000A 120.00°	1.000A 120.00°	
Active power	0.000W	-0.500W		
Reactive power	0.000var	-0.866var		
Apparent power	0.000VA	1.000VA		
Power factor	nan	-0.500		
Back Function Block				



SMV PHASE CHECK

Phase-check 0x404B				
SMV1	0x4111Optic por...	Frequency=50.00...	L-LVector difference	PositiveVector dif...
APhase	ProtectionPhase A	200.028A 0.00°	AB:346.472A 30.00°	Aa:200.028A 0.00°
BPhase	ProtectionPhase B	200.029A 239.99°	BC:346.472A -150....	Bb:2306.866A -17...
CPhase	ProtectionPhase A	200.028A 0.00°	CA:0.000A 0.00°	Cc:2306.875A 55....
SMV2	0x404BOptic por...	Frequency=50.00...	L-LVector d	
aPhase	Voltage	0.000V 0.00°	ab:2200.319	
bPhase		2200.319V 0.00°	bc:3811.199	
cPhase		2200.328V 239.99°	ca:2200.328	
Back Function Table Graph Current Voltage				



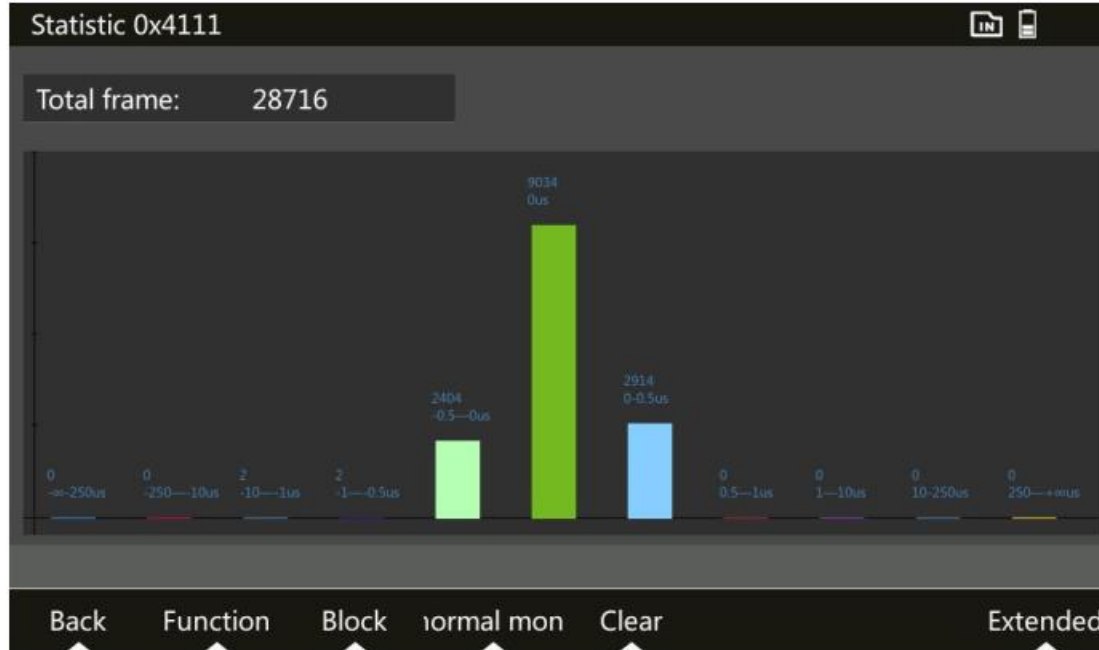
SMV TIME SYNC & TRANSMISSION ERRORS

Statistic 0x4111

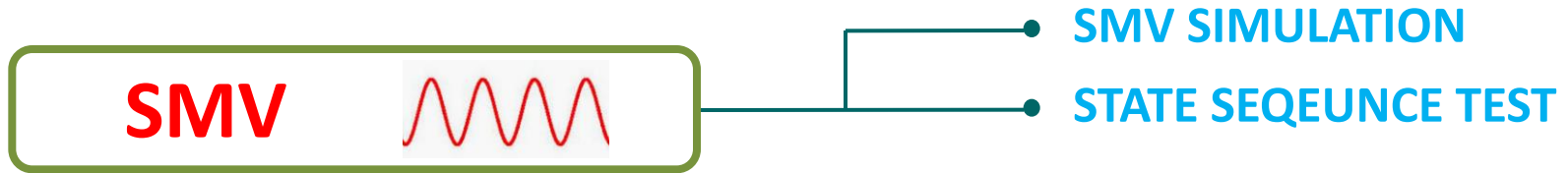
Item	NO.
Total frame	17288
Frame drop	0
Disorder	0
Repeat	0
Shake	0
Out of step	0
Quality abnormal	0
Quality abnormal:invalid	0
Quality abnormal:maintenance	0

Back Function Block Dispersion Clear Extended

SMV TIME DISPERSION

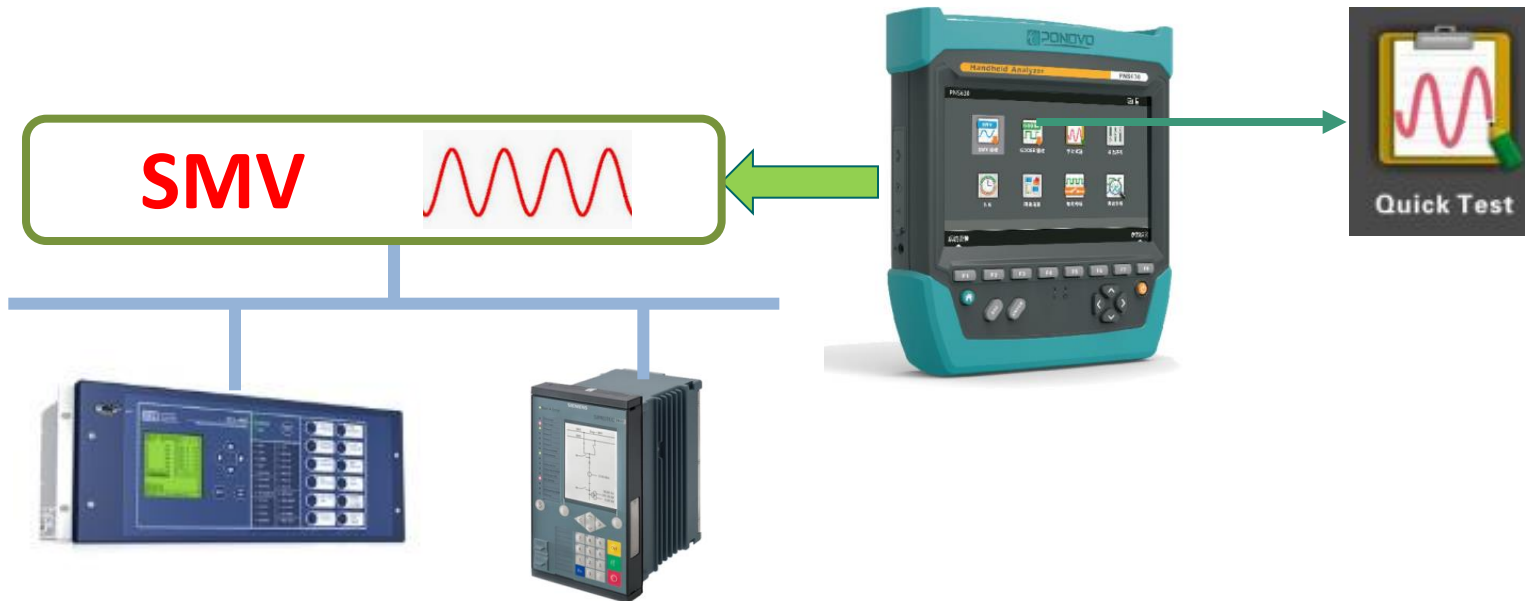


SMV – Functional Test



SMV Simulation

PNS630



IED's


Quick – SMV Simulation

8x Virtual
Binary Inputs
(Mapped
from GOOSE)

Manual

Channel	Amplitude	Phase	Frequency	AmplitudeStep	PhaseStep
<input type="checkbox"/> Ia1	9A	0°	50Hz	1A	0°
<input type="checkbox"/> Ib1	10A	120°	50Hz	1A	0°
<input type="checkbox"/> Ic1	1A	-120°	50Hz	0A	0°
<input type="checkbox"/> Iz1	1A	0°	50Hz	0A	0°
<input type="checkbox"/> Ua1	57.74V	0°	50Hz	0V	0°
<input type="checkbox"/> Ub1	57.74V	-120°	50Hz	0V	0°
<input type="checkbox"/> Uc1	72.74V	120°	50Hz	3V	0°
<input type="checkbox"/> Uz1	57.74V	0°	50Hz	0V	0°

BI1 BI2 BI3 BI4 BI5 BI6 BI7 BI8

Exit SMV  Send Group Lock Extended

State Sequence Test

Status sequence

No.	StatusSwitch	StatusData
1	ManualTrigger	Ia1=0.000;Ib1=0.000;Ic1=0.000;Iz1=0.000;Ua1=0.000;Ub1...
2	ManualTrigger	Ia1=0.000;Ib1=0.000;Ic1=0.000;Iz1=0.000;Ua1=0.000;Ub1...

Exit Start Edit Add Delete Clear Extended

SMV – State Sequence Test

Status sequenceStatus1

Channel	Amplitude	Phase	Frequency
Ia1	0.000A	0°	50Hz
Ib1	0.000A	-120°	50Hz
Ic1	0.000A	120°	50Hz
Iz1	0.000A	0°	50Hz
Ua1	0.000V	0°	50Hz
Ub1	0.000V	-120°	50Hz
Uc1	0.000V	120°	50Hz
Uz1	0.000V	0°	50Hz

Back SMV Goose Parameter Status Group calculate Extended

Set SMV Values

SMV – State Sequence Test

Status sequenceStatus1

No.	Description	Type	Value
1	Trip Bus CB PhA	Single...	FALSE
2	Trip Bus CB PhB	Single...	FALSE
3	Trip Bus CB PhC	Single...	FALSE
4	Bus CB Init CBFA	Single...	FALSE
5	Bus CB Init CBFB	Single...	FALSE
6	Bus CB Init CBFC	Single...	FALSE
7	Bus CB Blk AR	Single...	FALSE
8	Trip Tie CB PhA	Single...	FALSE

Back SMV **Goose** Parameter Status GOOSE calculate Extended

Set GOOSE Values

SMV – State Sequence Test

Status sequenceStatus1

TriggerCondition ManualTrigger

Hold time(ms) 2000

BI: ☒ BI1 ☐ BI2 ☐ BI3 ☐ BI4
☐ BI5 ☐ BI6 ☐ BI7 ☐ BI8

GSE trigger ☒ TRUE

BO ☒ BO1

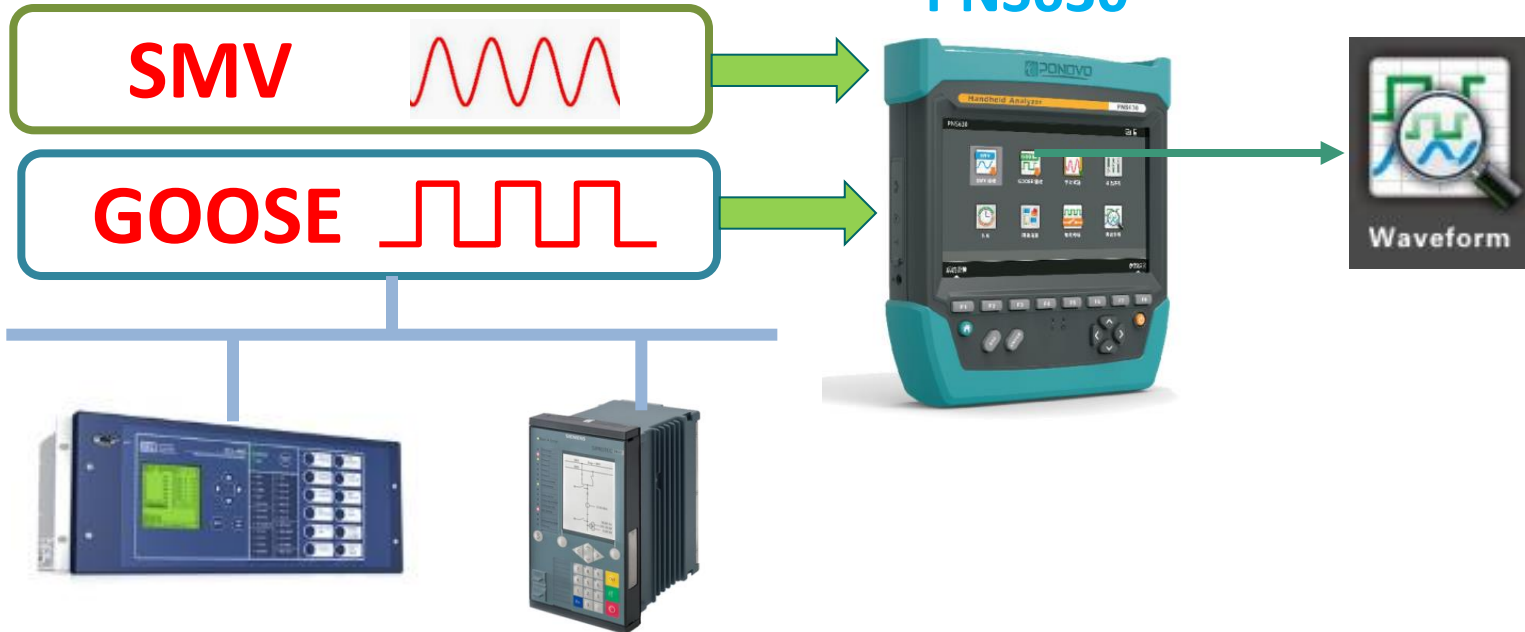
Back SMV Goose Parameter Status calculate Extended

Set Trigger

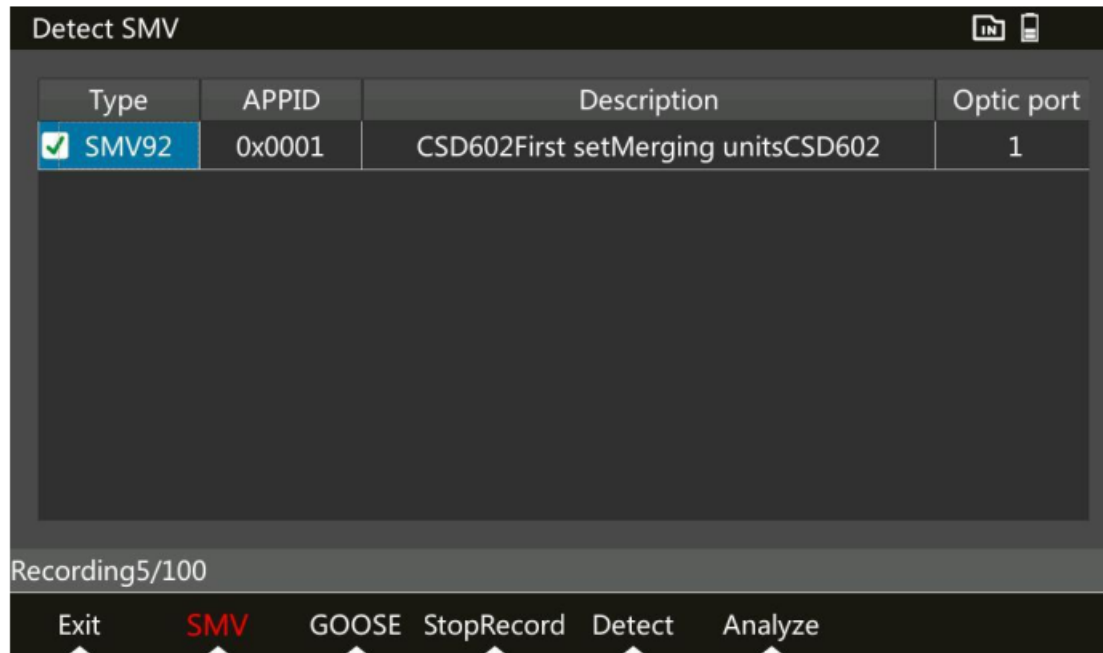
WAVEFORM RECORDING

1. *Journal of the American Medical Association*, 1997; 277: 1001-1005.

PNS630



Waveform Recording



OPTIC-POWER TESTING

100

Optic power				
Port	al-time value(dBm)	AVG(dBm)	Max.(dBm)	Min.(dBm)
Optic port1	-18.4164	-18.5136	-18.4164	-18.6012
Optic port2	0	0	0	0
Optic port3	0	0	0	0
Optic port4	0	0	0	0
Optic series po...				
Optic series po...				
Exit	Refresh			

TIME SOURCE TESTING

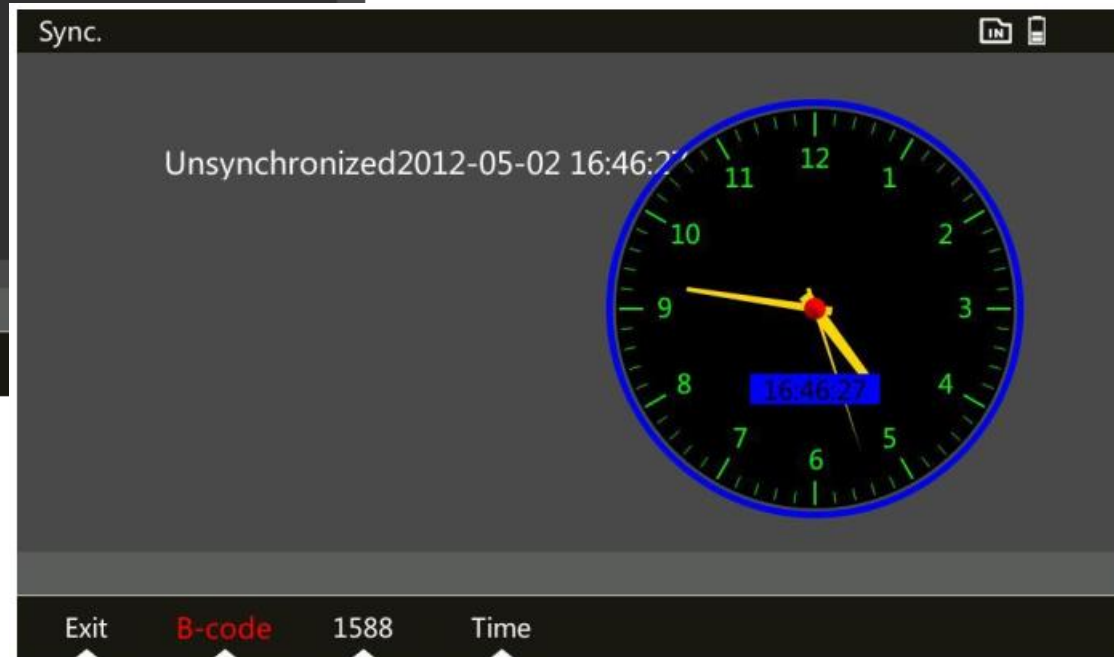
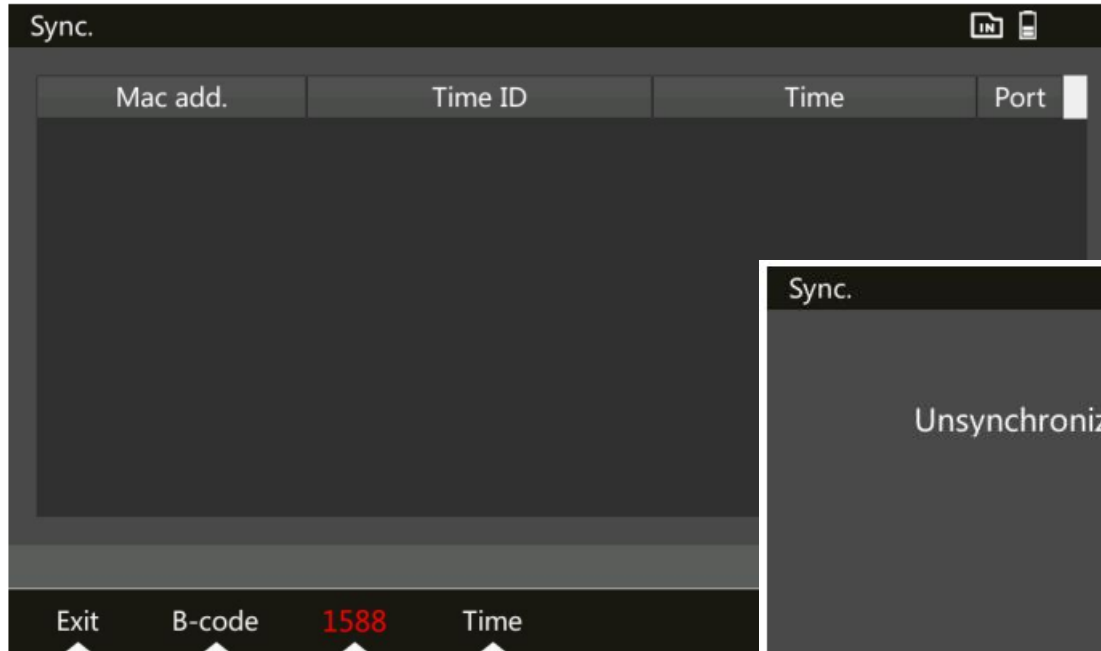
Time Source Testing



PNS630



Time Source Testing





NETWORK TRAFFIC TESTING

Network Testing



Network Traffic Testing

Net flowOptic port1

Type	No	FlowKB/s	Percent
SMV	415714	0	0%
GOOSE	21	0	0%
1588	0	0	0%
Other			
Total	0	0	0%

Exit Table Graph Optic port Refresh

Network Traffic Simulation

NetFlow test-Optic 1

Type	SMV	Goose	Message	Total flow
Flow rate	20%	20%	0%	40%
Output port	Optic 1			

Data sending

Exit

Stop