BNR ASC Training

ASC name

Location, date

CRANE PAYMENT INNOVATIONS

Training Agenda

- Review of BNR principles, modules, and basic operations
- Overview of the BNR technical documentation
  - BNR Service manual, BNR User Manual, BNR Integration Manual, BNR Specifications
- Other BNR resouces
- The BNR Support Tool and its functions
- The BNR Flash Tool
- Overview of BNR Servicing and Maintenance
  - ASC System / Process

Training Agenda

- BNR diagnostics, troubleshooting, error reporting
- BNR Testing
  - BNR inspection checklist (before repair), BNR testing procedures (after repair)
- BNR servicing and maintenance
- Hints and review of jam clearing
- CPI Service Management and its importance
- BNR Spare parts
- BNR Web site & FTP site and CPI periodic communications (new FW releases, bulletins, etc.)

Training Agenda

- BNR Repair workshop: modules disassembly
  - Resources: the BNR Repair Guide and Repair videos
  - Loader (full module disassembly)
  - Chassis
  - Spine
  - Main Module

- BNR Repair workshop: modules adjustments and other service procedures
  - Bundler Slippage Calculation
  - Main Module Diverter Adjustment
  - Recycler Tape Cleaning & Adjustment
  - Main Module calibration
  - BNR Modules testing procedures

Review of BNR basic principles, BNR modules and BNR basic operations

CRANE PAYMENT INNOVATIONS

Training Overview

- BNR Modules
- BNR codification, the BNR family
- How BNR processes the bills

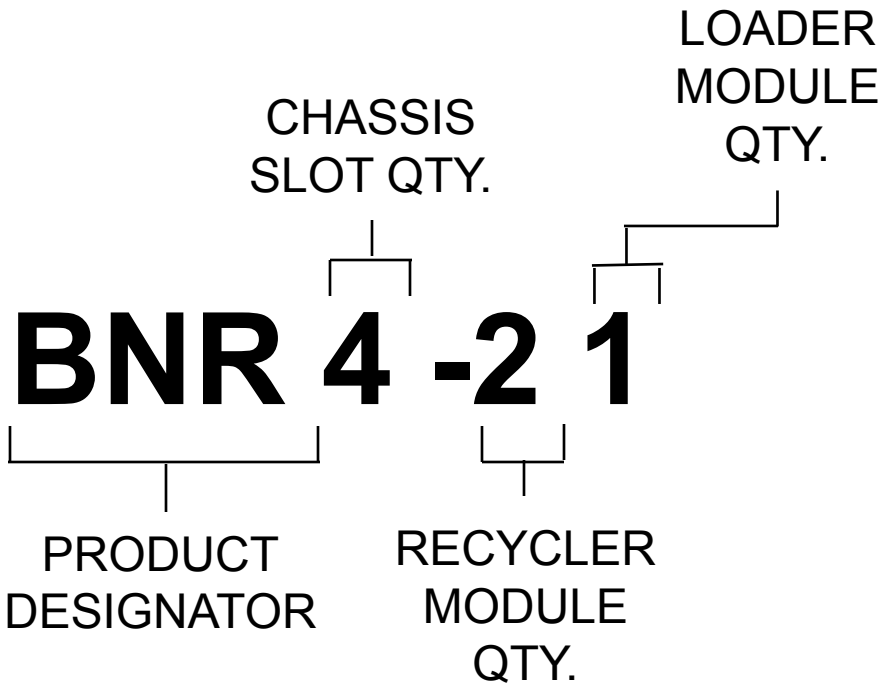
Final Bill Flow w naration.wmv

BNR Modules

CashCode CONLUX mei Money Controls NRI Telequip

BNR Codification

Model Versioning



BNR Codification

BNR4-21

BNR4-11

BNR4-20

BNR4-10

BNR3-11

BNR3-20

BNR3-10

BNR3-00

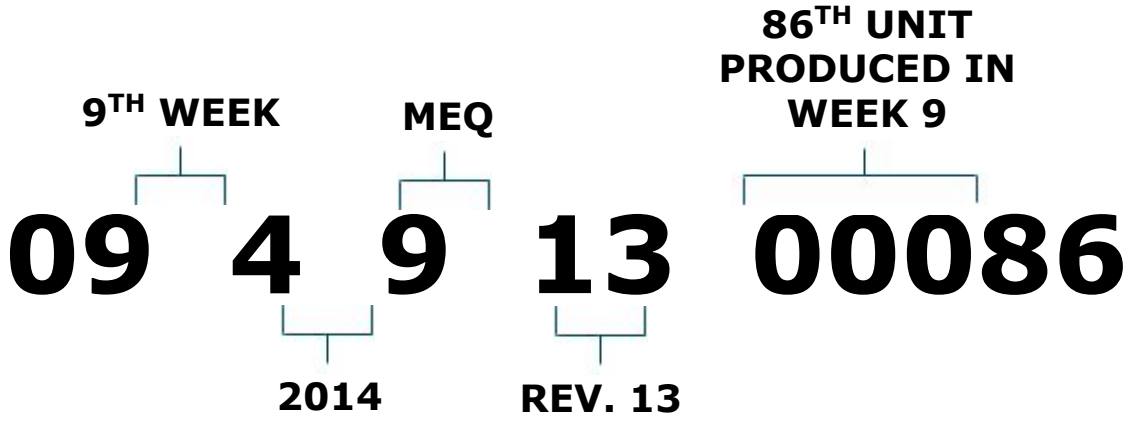
CashCode CONLUX mei Money Controls NRI Telequip

BNR Codification

- Module Serial Number (MSN)
- CTO Serial Number (CTO)

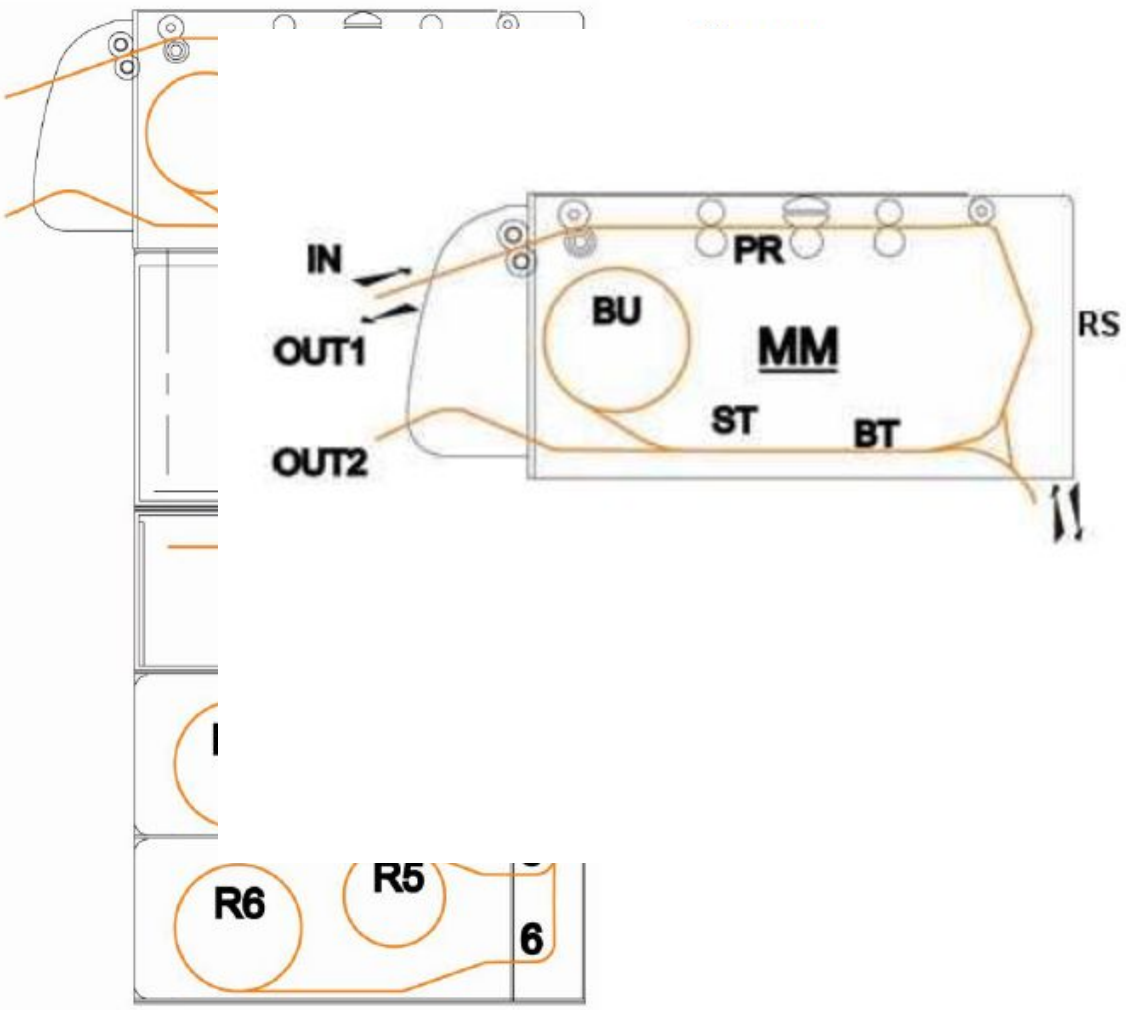
Understanding Serial Numbers

- All Serial Numbers are 11-digit
- Example: MSN# 09491300086 (Main Module)



Review of BNR principles and modules

- Modules and sub-modules designation



BNR Service Manual

MM =	Main Module
IN =	Inlet for banknote insertion
OUT1 =	Outlet for banknote rejection
OUT2 =	Outlet for banknote return or dispense
PR =	Positioner
RS =	Recognition Sensors (Reading Heads)
BT =	Bottom Transport
ST =	Stacker
BU =	Bundler
▬ =	Banknote path

BNR technical documentation overview

CRANE PAYMENT INNOVATIONS

BNR Technical Documentation

BNR Product Specifications

Every possible nominal value that identifies and describes the BNR characteristics and performance, including: system codification, EMC compliancy, power supply, mounting, validation parameters, expected life, expected performance (MCBJ), cleaning intervals, etc.

BNR Integration Manual

Includes: BNR naming and codification, banknotes processing, mechanical and electrical integration, mounting options, SW integration, Support Tool .zconf file for FW update through Flash Tool, etc.

BNR User Guide

Includes: modules basic handling, BNR LEDs and troubleshooting codes, Easy Jam clearing

BNR Technical Documentation

BNR Service Manual

Includes: unpacking the BNR and mounting, getting started with the ST, advanced jam clearing, preventive maintenance reco, cleaning instructions, basic disassembling (exchanging modules and basic parts)

Other Documentation and Resources

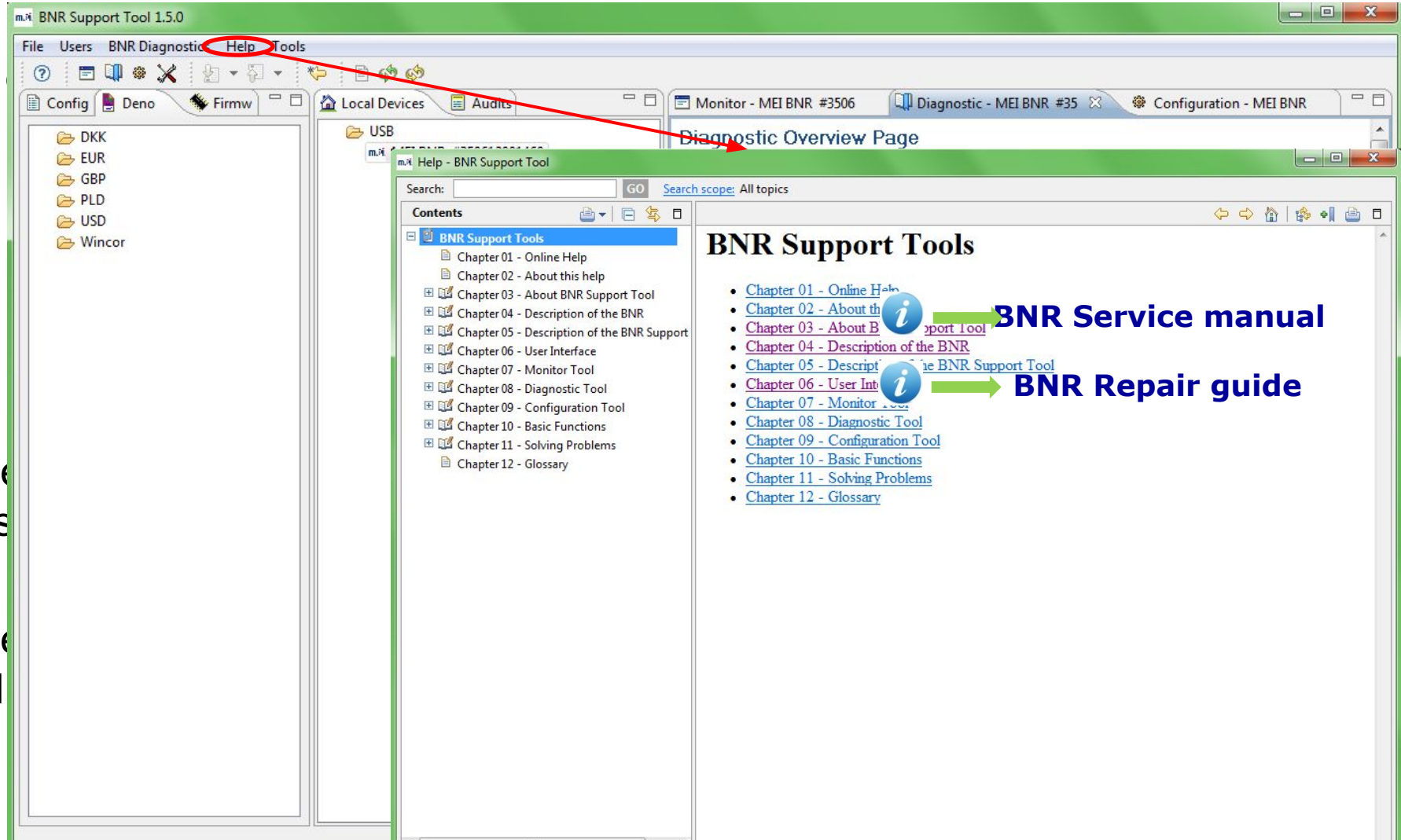
- BNR Official Training Videos
- BNR “How to…” Files (Unofficial)
- BNR Sensors and Troubleshooting Diagrams
- BNR Repair and Maintenance Guide
- BNR Troubleshooting Guide (Unofficial)
- BNR Fault Code Spreadsheet (Unofficial)
- BNR Spare Parts Catalogue

The BNR Support Tool

CRANE PAYMENT INNOVATIONS

The BNR Support Tool

The powerful tool that serves every purpose on the BNR:



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Support Tool Demonstration

- "Diagnostics" Tool
  - Troubleshooting and Analytic Purposes
- "Configuration" Tool
  - Creating and Applying Unit Configurations
- "Monitor" Tool
  - Bill Handling and Unit Operations

Use the BNR Support Tool to...

- Add/download bills
- Delete bills
- Generate and save a diagnostic file
- Park recyclers
- Add a cash unit module and set it
- Inhibit/activate bills
- Download FW
- Point to the proper FW/Billset/Audit Repositories
- Create a Configuration File

BNR "How to" files

CashCode CONLUX mei Money Controls NRI Telequip

BNR Diagnostic Collection

"Unofficial" Document

Explaining How-to

BNR DIAGNOSTIC COLLECTION PROCEDURE

Below is a detailed procedure regarding the collection of diagnostic files via the BNR Support Tool:

1) Ensure that the unit is powered correctly via the host or other external power source
2) Disconnect the USB / NCR cable from the host
3) Power up your PC and open the BNR Support Tool
   a. Username: admin / Password: admin

4) At the next pop-up (below) select "Direct Access" from the two options provided.

1

The BNR Flash Tool

CRANE PAYMENT INNOVATIONS

The BNR Flash Tool

- Very simple to use, once zconf file is
- Specific manual is provided
- Examples on how to create and use a

BNR User manual

BNR "How to..."

MEI BNR

Banknote Recycler

BNR Flash utility

User manual

Release G4

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Information subject to change without prior notice

BNR diagnostics, troubleshooting and error reporting

CRANE PAYMENT INNOVATIONS

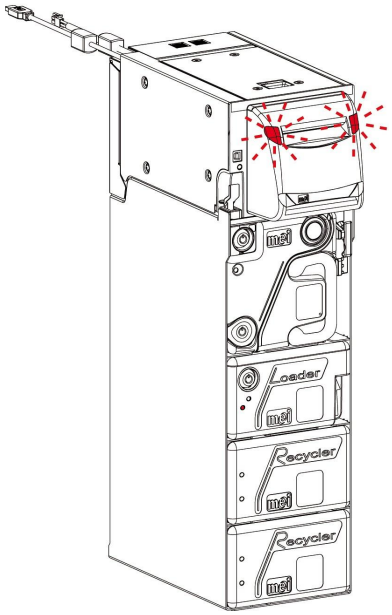
BNR diagnostics, troubleshooting and error reporting

- BNR diagnostics LEDs
- BNR Support Tool and diagnostic file
- Proper documentation: BNR troubleshooting Guide and
- BNR Sensors diagrams
- ....experience

BNR diagnostics, troubleshooting and error reporting

LEDs codes for basic troubleshooting

"BLINKING RED"

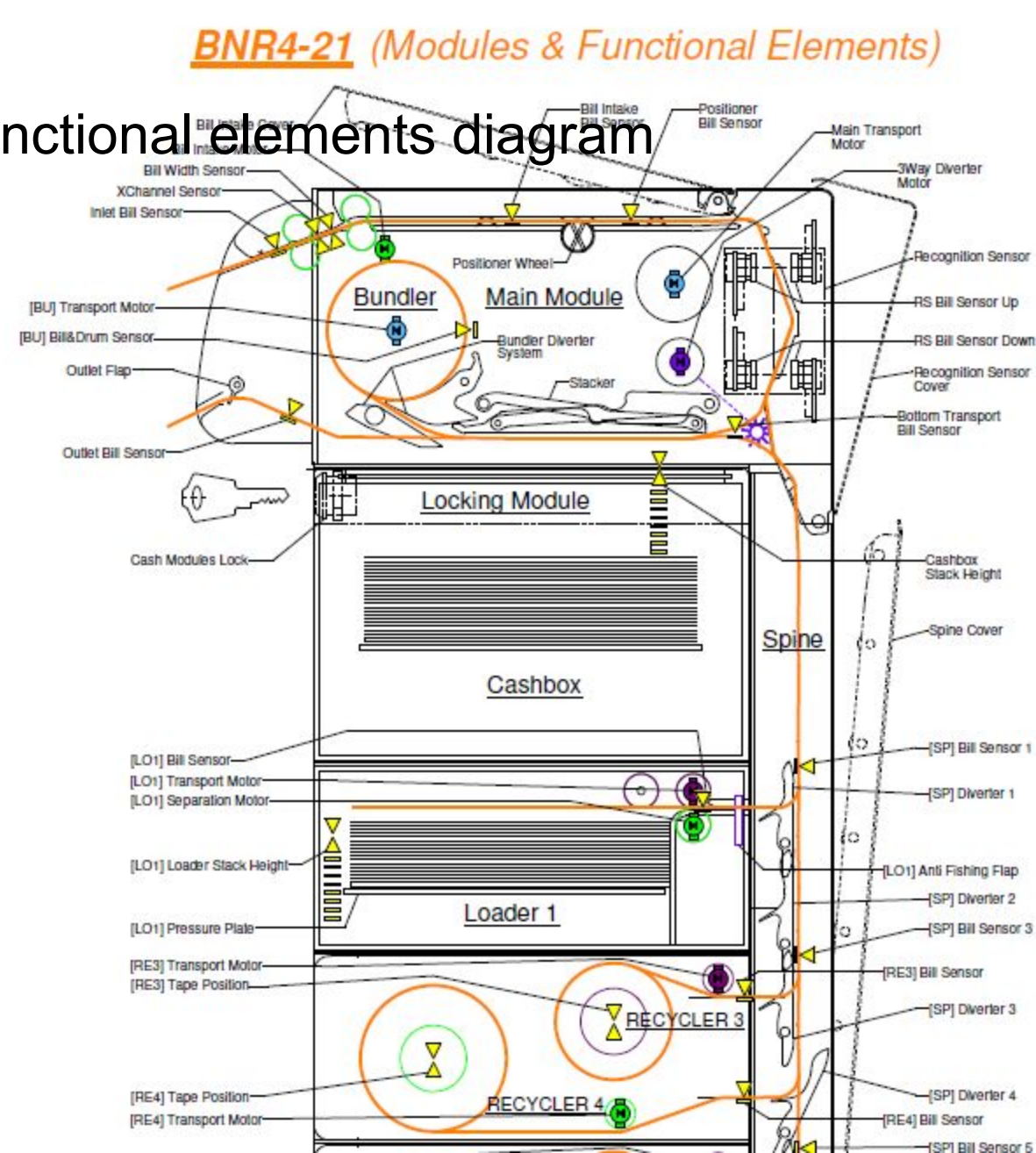


External Indicator – FW version 1.0.0				System / Module Status	You need to
			-	Locked	Take no action
Off	Off	Off	-	"Reset" required	After Switch-on, have the BNR to "Reset"
GREEN x1	GREEN x1	GREEN x1	-	Operational	Take no action *(CB ready to insert)*
Off	Off	GREEN	-	Bill Storage not OK *(Loader only)*	Fill the Loader Cassette with banknotes
Off	Off	RED x1 Long (1 sec.)	-	Cash type Status not OK *(Re, Lo)*	Configure the Module
Off	Off	RED x3 Fast continually	-	Remove Bill in Transport *(jam, stopped, bill error)*	Clear the Jam, refer to "EASY JAM CLEARING" or refer to the Service Manual
RED x3 Fast	Off	RED x3 Fast	-	Not Operational *(wrong module, OOS, transport error)*	Require a "Reset" command
RED	Off	RED	-	Cash-Box full or not rearmed	Empty the CB, rearmed it, refer to "CASH-BOX HANDLING"
-	-	-	GREY		

BNR User Manual

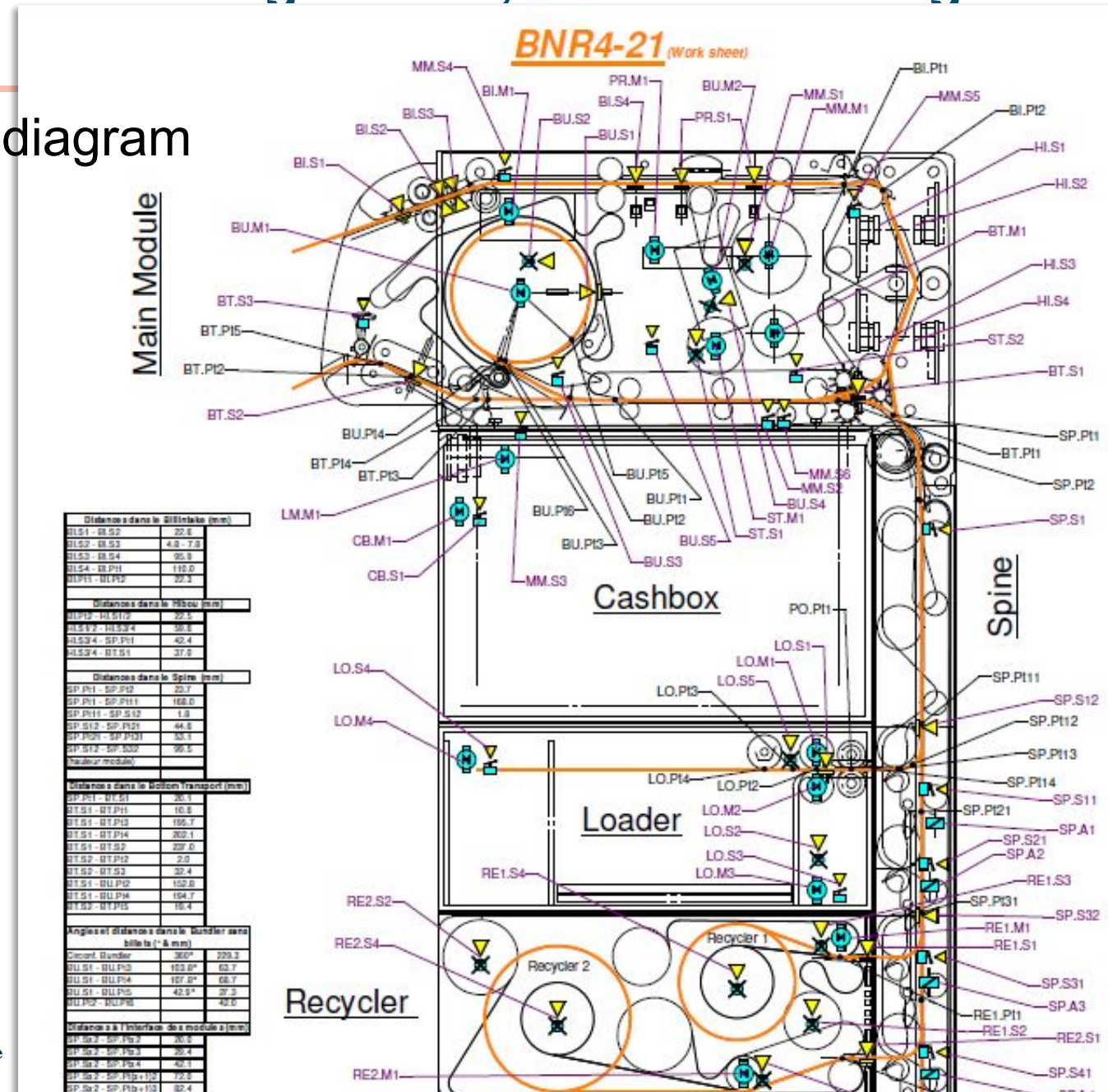
BNR diagnostics, troubleshooting and

The BNR modules and functional elements diagram



BNR diagnostics, troubleshooting and

The BNR sensors diagram



BNR

The BNR Troubleshooting guide

A powerful guide to the BNR troubleshooting (still to be officially released)

The BNR Troubleshooting guide

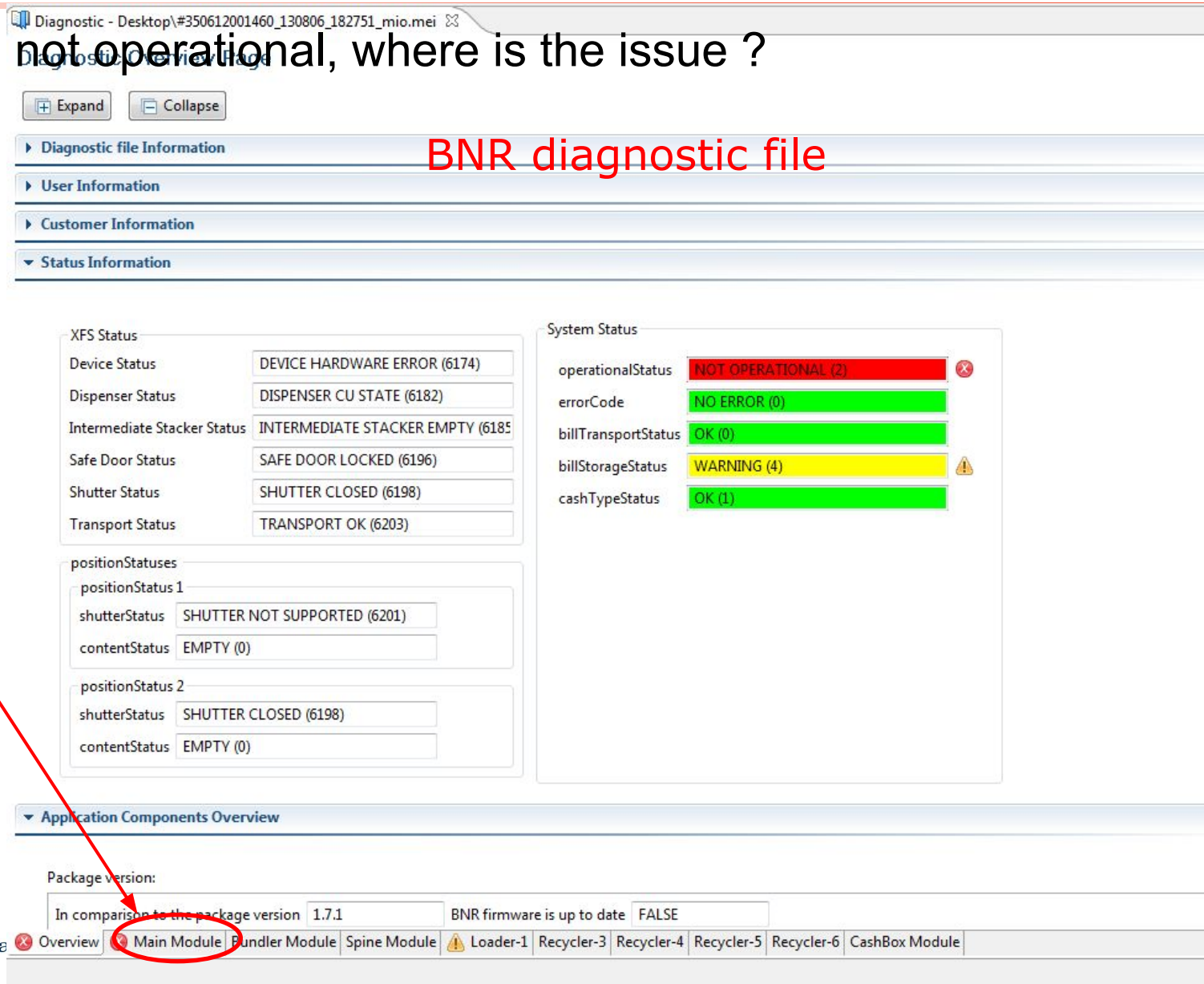
Provides the link between the info visible at ST and the corrective action. The info it provides is mainly at Service Technician level, but the indications can be useful also at ASC level to help locate and identify the issue.

Let's make an example !

BNR Advanced Troubleshooting

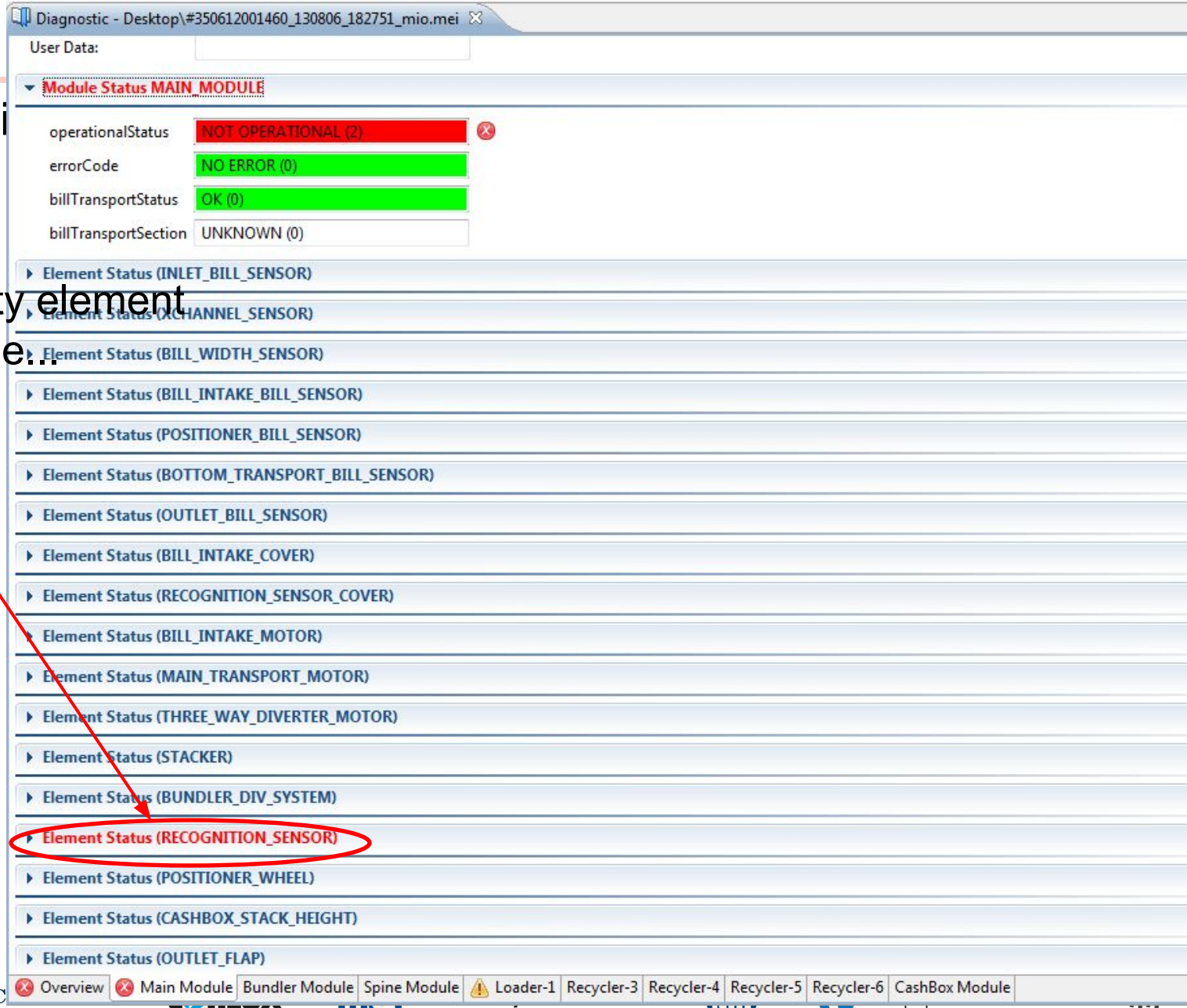
This BNR unit is not operational, where is the issue ?

locate the faulty module...



Which element i

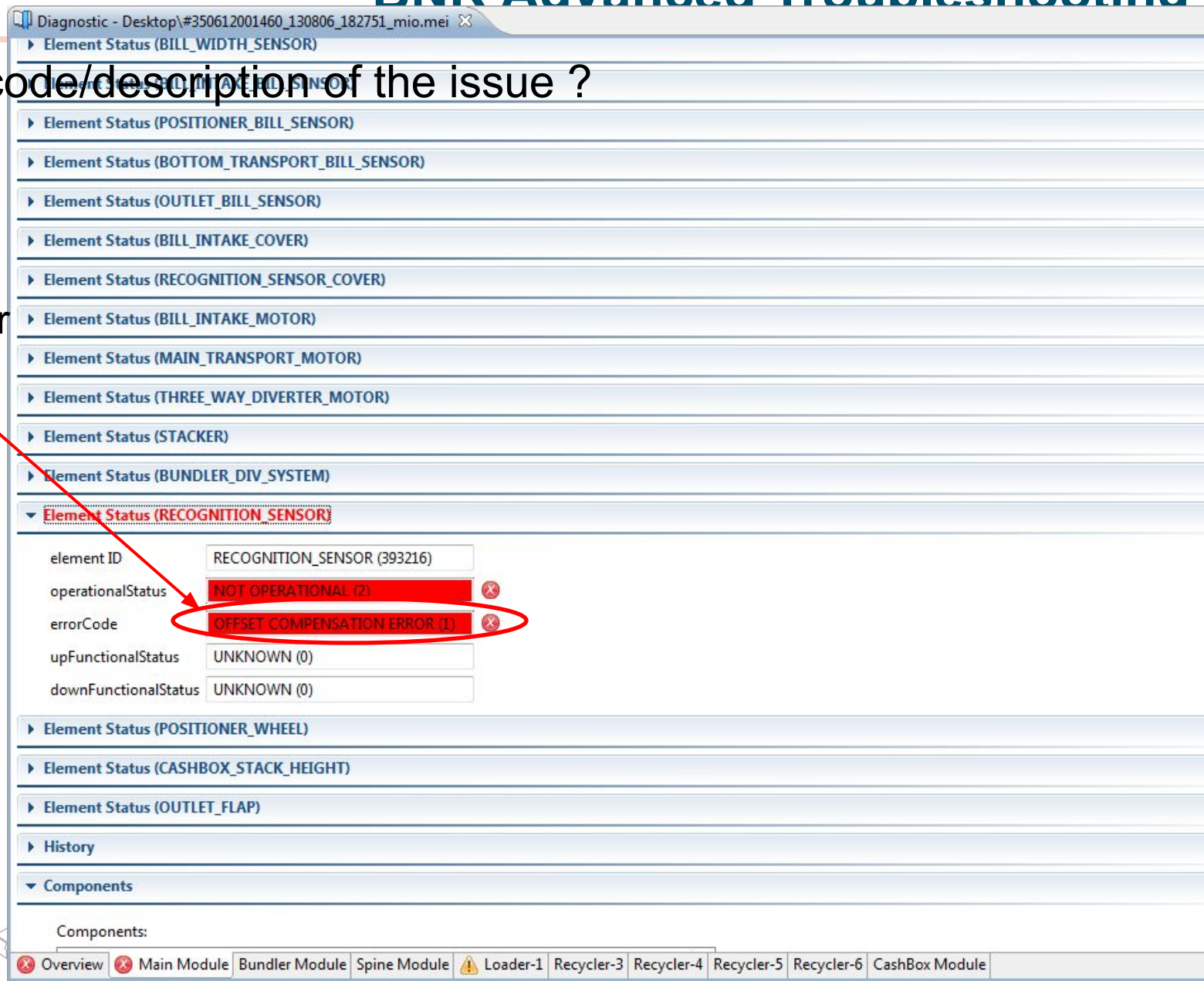
...locate the faulty element inside the Module...



BNR Advanced Troubleshooting

Which is the code/description of the issue ?

...and its error code



BNR Advanced Troubleshooting

Now we take the BNR Troub

Look for the faulty element and ....

- **errorCode:**
  NO_ERROR (0)

  BLOCKED (1): The bundler diverter system motor's speed was null or too low.
  CANNOT_POSITION (2): The bundler diverter system failed to reach the requested position.
  EXTRACTION_POS_NOT_CONFIRMED (3): The bundler diverter system position confirmation sensor (BU.S3) should have been covered on extraction position.
  OUTLET_POS_NOT_CONFIRMED (4): The bundler diverter system position confirmation sensor (BU.S3) should have been covered on outlet position.
  CANNOT_FIND_MARK (5): The bundler diverter system could not find the position mark during initialisation cycle.

  SOLUTION: *1)Advanced Field Operator:* remove cashbox. Remove unexpected object (if any) in the Bundler area. Secure BNR.
  2) Host: send Reset command.
  If problem persists:
  3) Field Service Technician: Main Module needs to be repaired.

3.11 Recognition Sensor

Element Status (RECOGNITION_SENSOR)	
element ID	RECOGNITION_SENSOR (393216)
operationalStatus	OPERATIONAL (0)
errorCode	NO ERROR (0)
upFunctionalStatus	UNKNOWN (0)
downFunctionalStatus	UNKNOWN (0)

- **operationalStatus:**
  OPERATIONAL (0): The module or element is operational. No errors

  CHECKING_ERROR (1): Cannot determine operational state of the module. Will be determinate on next test.

  SOLUTION: ***Host :*** Send Reset command

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CashCode CONLI

BNR Advanced Troubleshooting

...the error code

SUGGESTED ACTION

is provided

3.11 Recognition Sensor

Element Status (RECOGNITION_SENSOR)

element ID	RECOGNITION_SENSOR (393216)
operationalStatus	OPERATIONAL (0)
errorCode	NO ERROR (0)
upFunctionalStatus	UNKNOWN (0)
downFunctionalStatus	UNKNOWN (0)

- **operationalStatus:**
  OPERATIONAL (0): The module or element is operational. No errors

  CHECKING_ERROR (1): Cannot determine operational state of the module. Will be determined on next test.
  SOLUTION: ***Host:*** Send Reset command

  NOT_OPERATIONAL (2): Module not operational. Module or sub-module part has an error. Refer to **errorCode**

- **errorCode:**
  NO_ERROR (0)

  OFFSET_COMPENSATION_ERROR (1): Impossible to compensate the offset.
  REMAINING_OFFSET_TOO_LOW (2): The remaining offset is too low.
  C_COEF_DIV_BY_ZERO (5): Divide by zero while calculating C coefficients.
  C_COEF_NEG_VALUE (6): One or more c coefficients are below zero.
  C_COEF_OVERFLOW (7): Overflow on C coefficients.
  C_COEF_OUT_OF_RANGE (8): One or more C coefficients values are out of range.
  SOLUTION: ***Field Service Technician:*** Open Recognition Module. Check if flat cable is correctly connected. If not, **Power off**, insert correctly the flat cable then power on. Close Recognition Module.

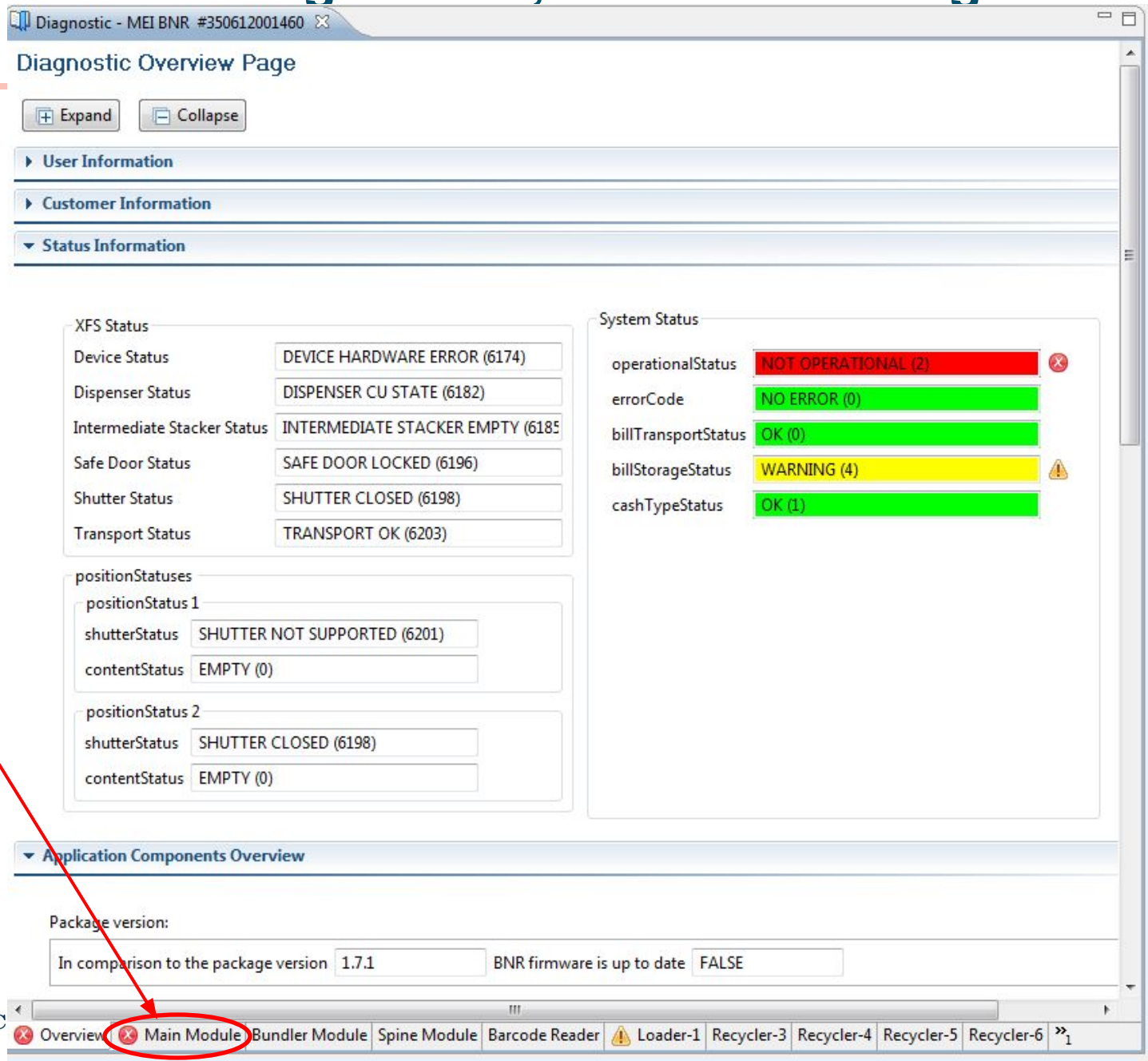
BNR Advanced Troubleshooting

A proper knowledge of the BNR elements functions and sensors position is also required to carry out an effective troubleshooting

Let's see this through another example !

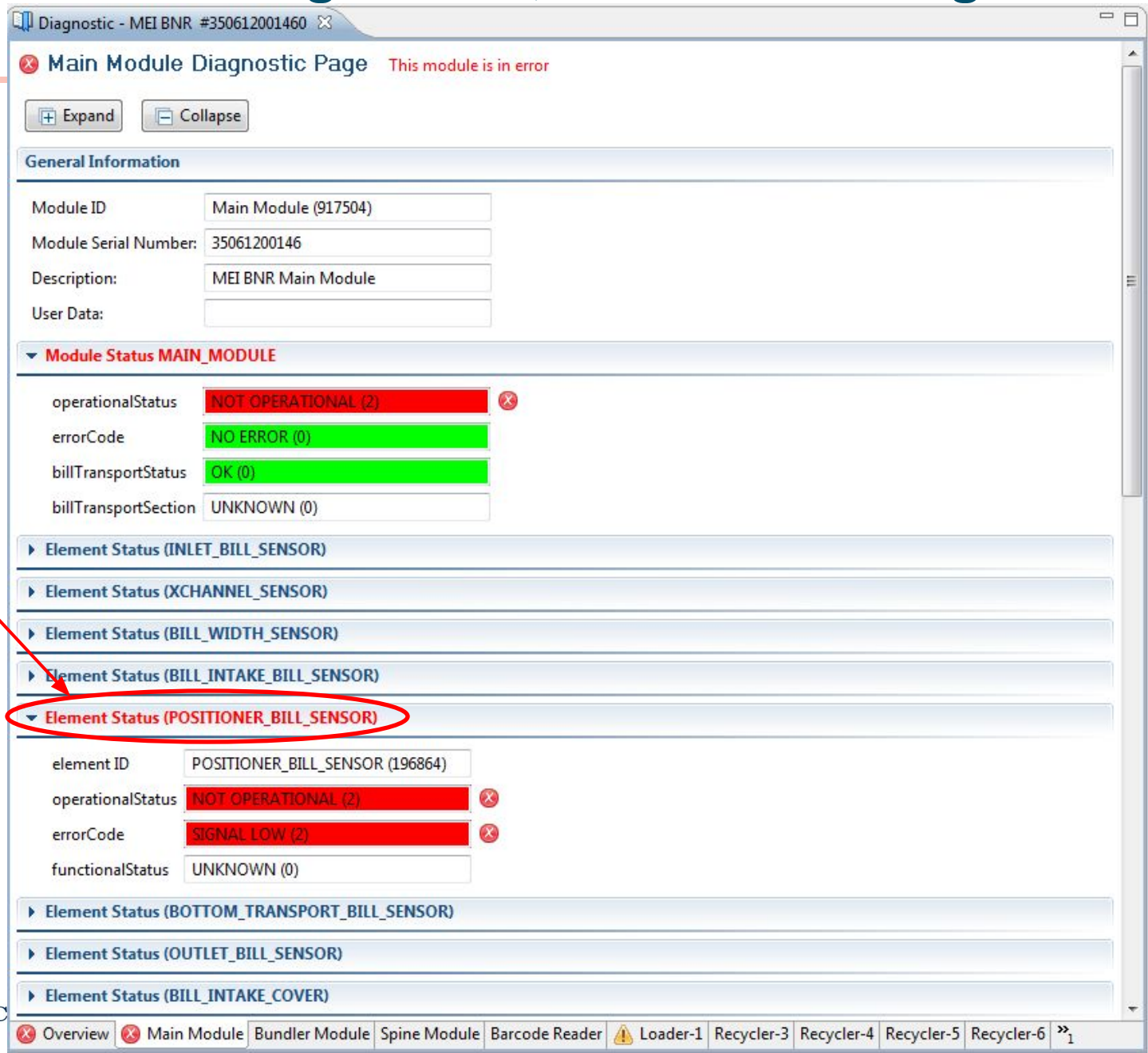
BNR diagnostics, troubleshooting and

Faulty module...



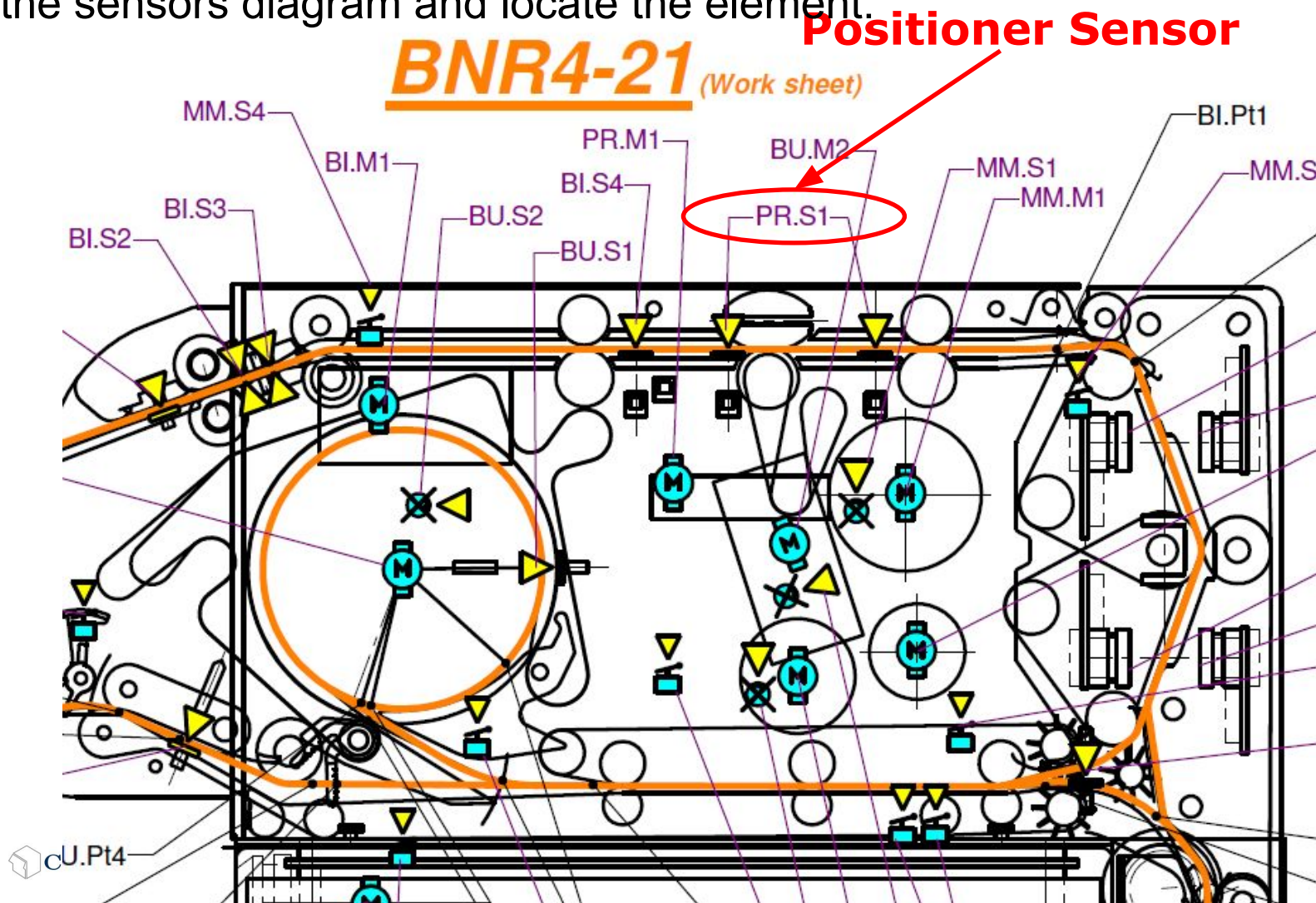
BNR diagnostics, troubleshooting and

...faulty element and error



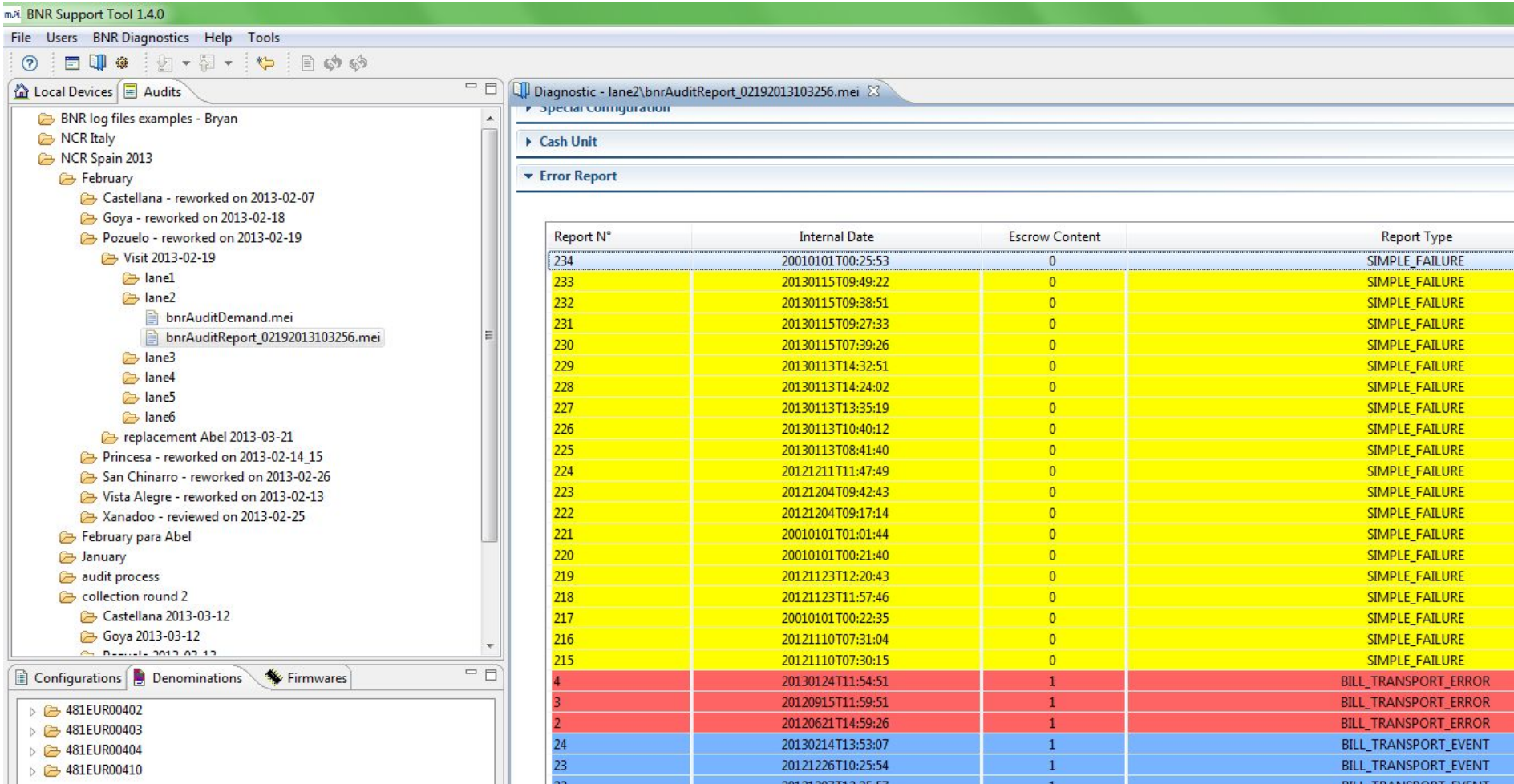
BNR diagnostics, troubleshooting and error reporting

Now we take the sensors diagram and locate the element:



BNR Advanced Troubleshooting

BNR diagnostic file log entries: records all bill events inside the BNR system (motors, sensors, etc.) useful to understand the reason of a problem.



BNR diagnostics, troubleshooting and error reporting

The “Fault code spreadsheet”

Maps the BNR ST error code into the proper SAP code:

Main Module		
Module	Fault Code	Error Description
Main Module	MM01	No Error
Main Module	MM02	Incompatible_SW
Main Module	MM03	Boot_Running
Inlet Sensor	MM04	Signal_High
Inlet Sensor	MM05	Signal_Low
X Channel Sensor	MM06	Signal_High
X Channel Sensor	MM07	Signal_Low
Bill Width Sensor	MM08	Signal_High
Bill Width Sensor	MM09	Signal_Low
Bill Intake Bill Sensor	MM10	Signal_High
Bill Intake Bill Sensor	MM11	Signal_Low
Positioner Bill Sensor	MM12	Signal_High
Positioner Bill Sensor	MM13	Signal_Low
Bottom Transport Bill Senso	MM14	Signal_High
Bottom Transport Bill Senso	MM15	Signal_Low
Outlet Bill Sensor	MM16	Signal_High
Outlet Bill Sensor	MM17	Signal_Low
Main transport Motor	MM18	Speed_To_Low
Stacker	MM19	Cannot_Position
Stacker	MM20	Hardware_Failure
Stacker	MM21	Blocked_At_Home
Stacker	MM22	Blocked_At_Bill_Path
Stacker	MM23	Blocked_At_CB_Entry
Stacker	MM24	Blocked_Around_Home
Stacker	MM25	Stopped_At_Bill_path
Stacker	MM26	Stopped_At_CB_Entry
Stacker	MM27	Cannot_Move_To_TrashBin
Stacker	MM28	Blocked_In_CB
Stacker	MM29	Stopped_In_CB

SAP code

Loader		
Module	Fault Code	Error Description
Loader	LO01	No_Error
Loader	LO02	Com_Breakdown
Loader	LO03	Incompatible_Module
Loader	LO04	Missing_Module_Type
Loader	LO05	Wrong_Module_Type
Loader	LO06	Boot_Running
Bill Sensor	LO07	Signal_High
Bill Sensor	LO08	Signal_Low
Bill Sensor	LO09	Com_Breakdown
Transport Motor	LO10	Not Started
Transport Motor	LO11	Com_Breakdown
Transport Motor	LO12	Speed_To_Low
Pressure Plate	LO13	Com_Breakdown
Pressure Plate	LO14	Plate_Blocked
Pressure Plate	LO15	Plate_To_Low
Anti Fishing Flap	LO16	Closed
Anti Fishing Flap	LO17	No_Com
Loader	LO18	Replaced_Spare_Part

Spine		
Module	Fault Code	Error Description
Spine	SP01	No_Error
Spine	SP02	Com_Breakdown
Spine	SP03	Incompatible_Module
Spine	SP04	Missing_Module
Spine	SP05	Opened
Spine	SP06	Wrong_Module_Type
Spine	SP07	Boot_Running
Spine Bill Sensor	SP08	Signal_High

BNR diagnostics, troubleshooting and error reporting

Troubleshooting practical exercise !

BNR testing

CRANE PAYMENT INNOVATIONS

BNR testing

- Tests and checks on the BNR:

Makes sense to perform checks on the unit both before we operate on it for repair, and after. Purpose at preliminary stage is get a picture of the overall situation (and possible faults) on the unit. Then, after the repair actions on it, make sure the unit is fully functioning.

BNR testing

- "Pre-repair", to be carried out on a unit incoming for service/repair. Purpose is identify possible issues/weaknesses beyond the ones that have been possibly raised by the customer. This can be done going through an "inspection check-list".

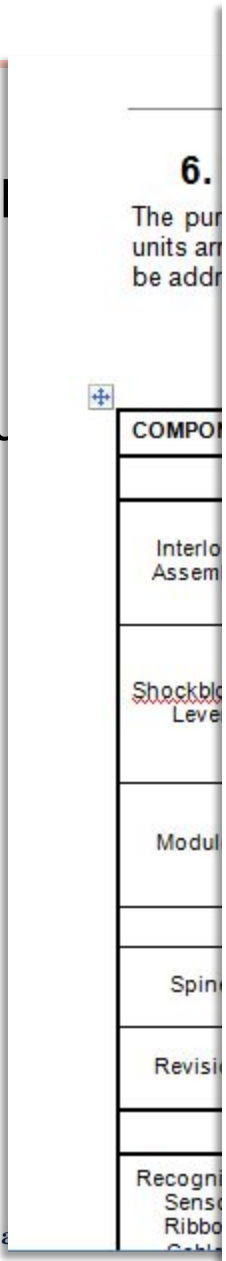
  BNR Repair Guide

- "After-repair", quite obviously, this is aimed to verify that the service/repair operations have been successful, unit is fully functioning and ready to return to the field.

  BNR Bulletin (still unofficial)

  BNR Repair Guide

- Pre-repair: insp
- After-repair: bu



mei | bnr

BNR-SRV-000

Loader:

	Description	Operation
1	Notes Dispense	100 billets dispensed from the loader to the outlet in bundles (6x 15 and 1x 10).
2	Noise	Make sure the loader makes no unusual noise while loading the notes.
3	Diagnostics	Save diagnostics file.

Recyclers:

	Description	Operation
1	Control of the drum capacity: • RE30 28/30 min • RE60 58/60 min	• If variant is USD load the notes in the loader and dispense to the recycler. • If another variant is used insert the notes in the MM inlet. • Check RE30 and RE60 counters.
2	Empty Recyclers	Run empty recyclers to CB macro.
3	Park recyclers	Launch the PARK command to secure the RE tape for transport.
4	Diagnostics	Save diagnostics file.

Spine:

	Description	Operation

BNR servicing and maintenance

CRANE PAYMENT INNOVATIONS

BNR servicing and maintenance

- Recommended **preventive maintenance intervals** are specified in the BNR Service Manual. Actions to be carried out either in the field (OEM technicians), either at A
- Specific cleaning instructions, only...) are also provided in th
- More in depth operations – sp knowledge and high expertise the Repair Workshop !

BNR Service Manual

BNR maintenance: Indoor environment

Frequency	50k unit cycles,	20k loader cycles,	250k unit cycles	500k unit cycles ,
Type	cleaning	cleaning	Overhaul	Overhaul
Location	Field	Field	Service Center	Service Center
Module				
Main Module	Air jet[2]		Clean BU roller & belt (Only up to MM12 version)	Clean BU roller & belt * Clean all tires , rollers & belts Clean all light pipes (air)
Cash Box	Air jet		-	-
Loader	Air jet	Air jet Cleaning with IPA[3]	-	Clean all light pipes (air)
Recycler	Air jet		Clean RE roller & tape (Only up to RE10 version)	Clean RE tape & roller Clean all light pipes (air)
Spine	Air jet		-	Clean belts & rollers Clean all light pipes (air)
Chassis (Interlock)	Air jet		-	Clean all light pipes (air)

BNR jams clearing (hints)

CRANE PAYMENT INNOVATIONS

BNR jams clearing (hints)

- This topic is not specifically of ASCs interest. For more info about this subject:

  -“Easy“ jam clearing **BNR User Manual**

  -“Advanced” jam clearing **BNR Service Manual**

BNR repair workshop

CRANE PAYMENT INNOVATIONS

BNR repair workshop

BNR Repair: Training sub-units

Training sub-unit	BNR Module	Module element	Type of operations	Level	Resources	Link to available resources
MM-1	**Main Module**	Positioner	Remove-refit/replace	ASC	Official Repair Videos	Removing Positioner WEB.mp4 Reinstalling Positioner WEB.m4v
MM-2	**Main Module**	Positioner O-ring	Remove-refit/replace	ASC	Unofficial video	Replacing the O ring of the positioner V2012.10.2
MM-3	**Main Module**	Bezel Assy	Remove-refit/replace	ASC	Official Repair Videos	Replacing Bezel Assembly WEB.m4v
MM-4	**Main Module**	Oulet Flap	Remove-refit/replace	ASC	Official Repair Videos	Replacing outlet flap WEB.m4v
MM-5	**Main Module**	Inlet sensors	Cleaning	ASC	-	-
MM-6	**Main Module**	Piston	Remove-refit	ASC	Official Repair Videos	Removing Piston WEB.m4v Reinstalling Piston WEB.m4v
MM-7	**Main Module**	Cables	Remove-refit/replace	ASC	Official Repair Videos	Replacing Cable WEB.m4v
MM-8	**Main Module**	Up/Down sensor	Remove-refit/replace	ASC	Official Repair Videos	Replacing Up-sensor WEB.m4v Replacing Down-sensor WEB.m4v
MM-9	**Main Module**	RS Rear Guide	Remove-refit/replace	OEM (?)	Unofficial video, Bulletin	How to replace the HI Roller guide rev 01.mpg FG00711 RearGuide Bulletin.pdf
MM-10	**Main Module**	Bundler	Calculate slippage of the bundler	ASC	Excel macro, Draft doc by JamesC	Calcul glissement Bundler.xlsx Draft - Nettoyage Bundler - BU Cannot find mark -
MM-11	**Main Module**	Bundler	Cleaning	ASC	Unofficial video	BNR CLEANING BUNDLER 2011.04.19 V01.mpg

BNR repair workshop

- Repair workshop part 1: Modules disassembly
  - Main Module:
    - Positioner, Positioner O-ring
    - Piston
    - Bezel, inlet, outlet
    - Up sensor, down sensor
    - RS rear guide
  - Loader:
    - Full module disassembly
  - Chassis:
    - Interlock and bar
  - Spine:
    - Gear wheel and Spine door

BNR ASC official videos

BNR repair workshop

- Repair workshop part 2: other service procedures

  - Rotating diverter adjustment
  - Bundler: slippage calculation, cleaning, coding wheel replacement
  - BNR calibration
  - Sensor board replacement
  - Cashbox
  - Loader: cleaning
  - Recycler: tape adjustment, cleaning, green roller

BNR spare parts

CRANE PAYMENT INNOVATIONS

- CPI always keeps ASCs upda
  Spare Parts Catalogue. Curre

- The catalogue has consistent
  continuously adding new part
  for a given part, not yet availa
  your request to CPI Tech Sup

- RETAIN THE PARTS ! In orde
  product and spot possible we
  retain the replaced/broken pa
  Until new indications will be p
  like ASCs to follow.

MEI BNR Spare parts Catalogue 2013

MAIN MODULE				Price-list
Part Number	Designation	Additional Description		EUR
668508001P1	ST-piston assy spare			100.00

MAIN MODULE				Price-list
Part Number	Designation	Additional Description		EUR
655934001P1	PR-Positionar assy spare			301.00

MAIN MODULE				Price-list
Part Number	Designation	Additional Description		EUR
668006203P100	S BNR,PAN HEAD SCR TORX M4X5,PK100		pack 100	11.50

MAIN MODULE				Price-list
Part Number	Designation	Additional Description		EUR
676591001P100	S BNR,KNURLED HEAD SCREW M3X8,PK100		pack 100	76.50

MAIN MODULE				Price-list
Part Number	Designation	Additional Description		EUR
675707001P1	RS-up-B-sensor-assy spare			151.00

CPI service management

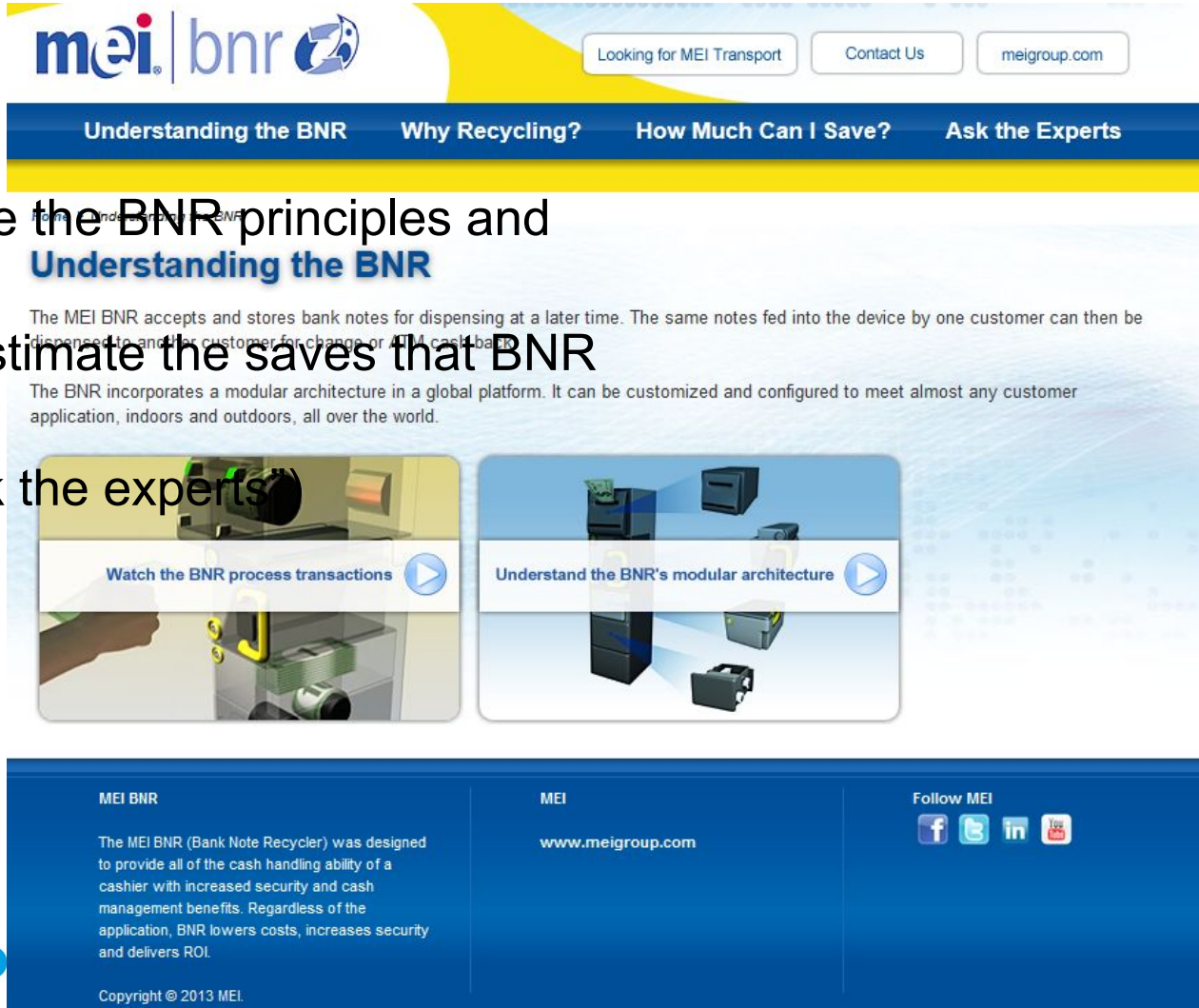
CRANE PAYMENT INNOVATIONS

BNR Web site, FTP site and CPI periodic communications

CRANE PAYMENT INNOVATIONS

BNR repair workshop

- The MEI BNR website
  - Videos that illustrate the BNR principles and advantages
  - ROI calculator to estimate the saves that BNR allows
  - F.A.Q. section (“ask the experts”)
  - More...



CashCode

BNR Resources

- Guides and Bulletins Outlined in this Presentation
- MEI Gaming / Retail Tech Support Website
- BNR Applications Engineers
  - Luis Fuller (luis.fuller@cranePi.com)
  - Fabio Materia (fabio.materia@cranePi.com)
  - Pat Erbe (pat.erbe@cranePi.com)
  - Shane Timmons (shane.timmons@cranePi.com)
  - Abdel Latoui (abdel.latoui@cranePi.com)