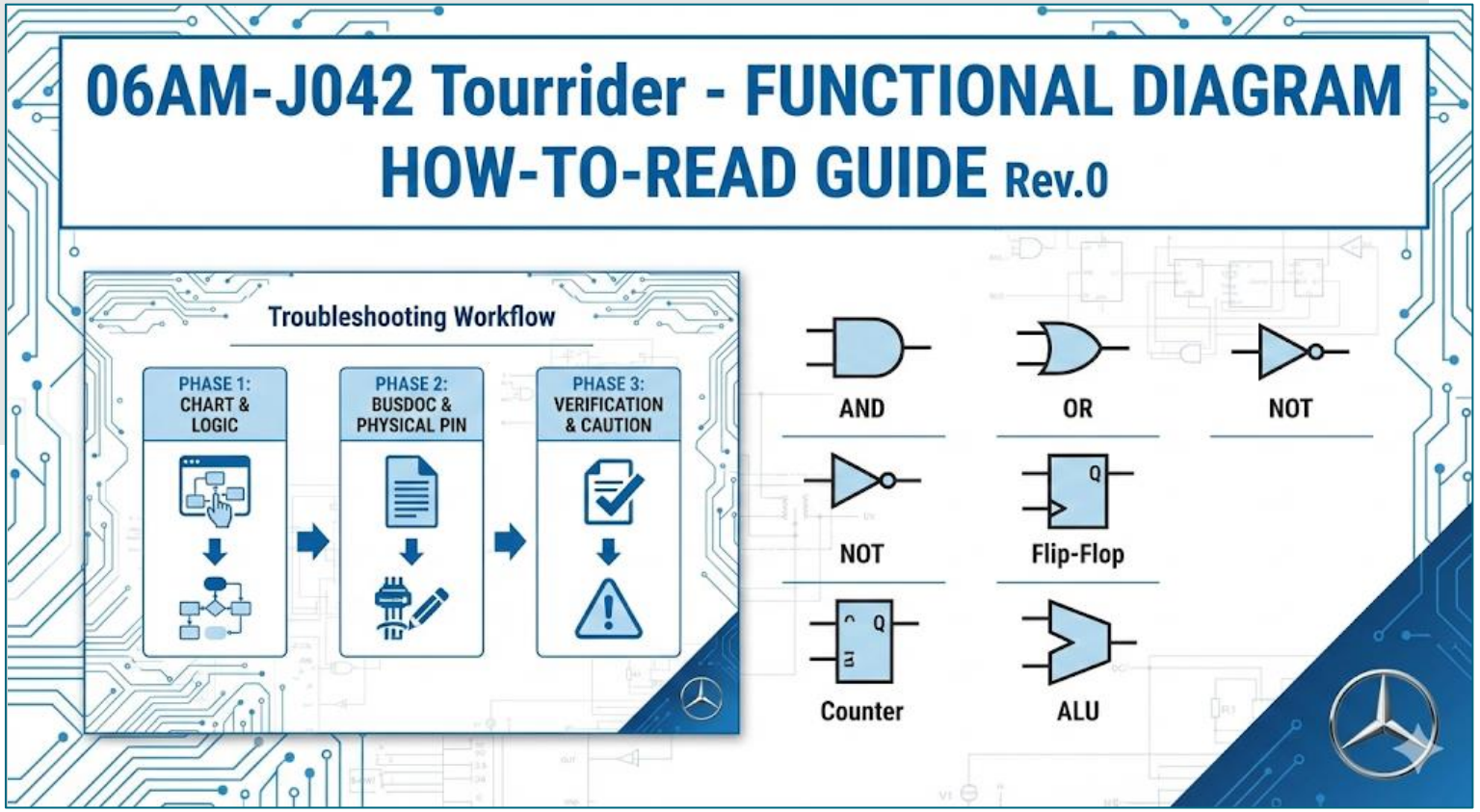
DAIMLER TRUCK

Daimler Buses

Functional Diagram How-to-Read Guide

Daimler Bus Products



Jonathan ‘Jon’ Rasmussen

2026 01 28

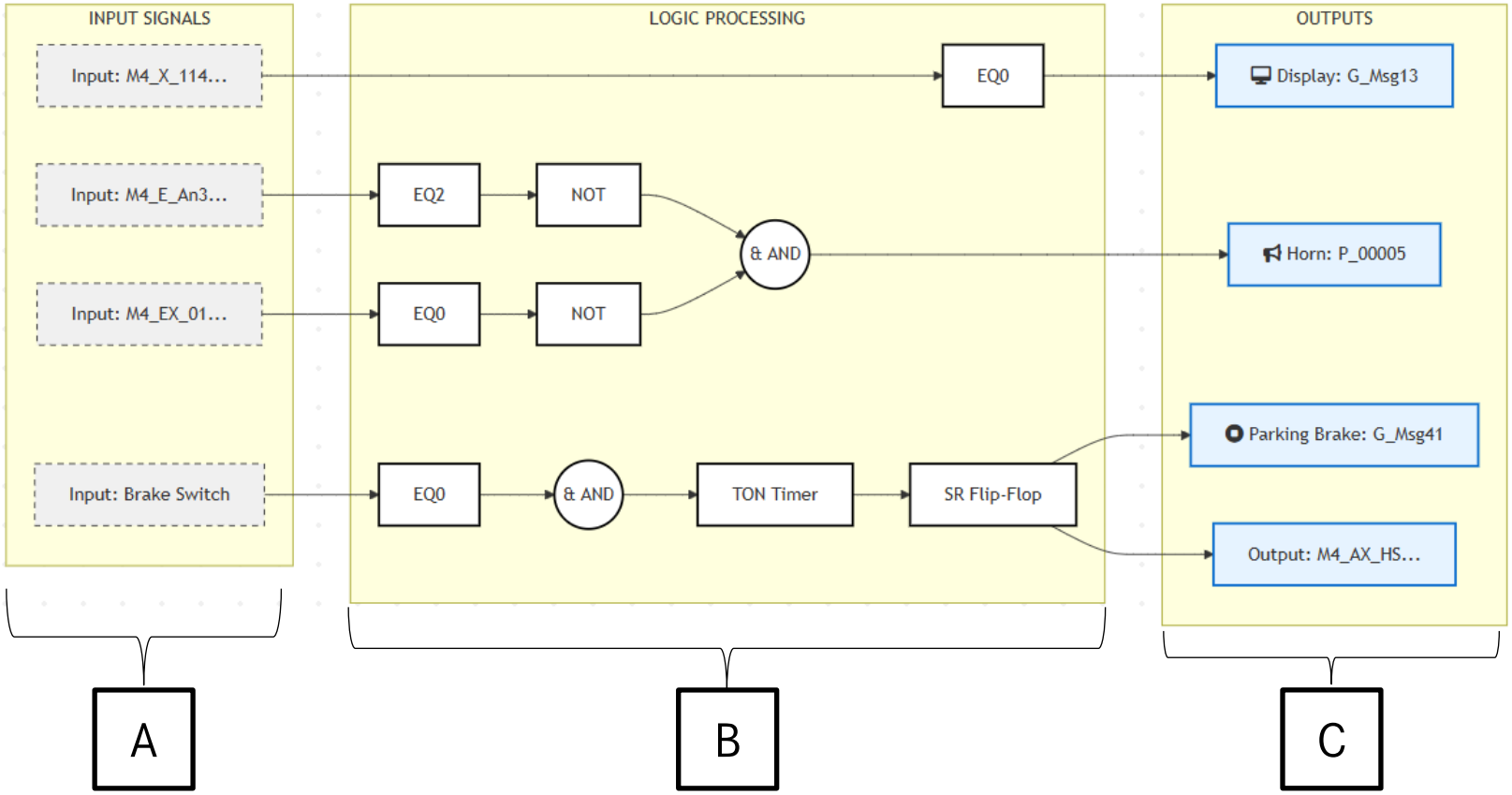
Functional Diagram How-to-Read Guide

The Layout of a Function Chart

Function Chart is a map of the vehicle's software logic. It does not show physical wires; it shows how the computer "thinks."

Structure: The chart is divided into three distinct vertical zones:

- **Left Side (Area A):** Input signals (Sensors, Switches, Data from other modules).
- **Center (Area B):** Logical links and processing (The "Brain" – AND, OR, Timers).
- **Right Side (Area C):** Output signals (Actuators, Lights, Messages to other modules).



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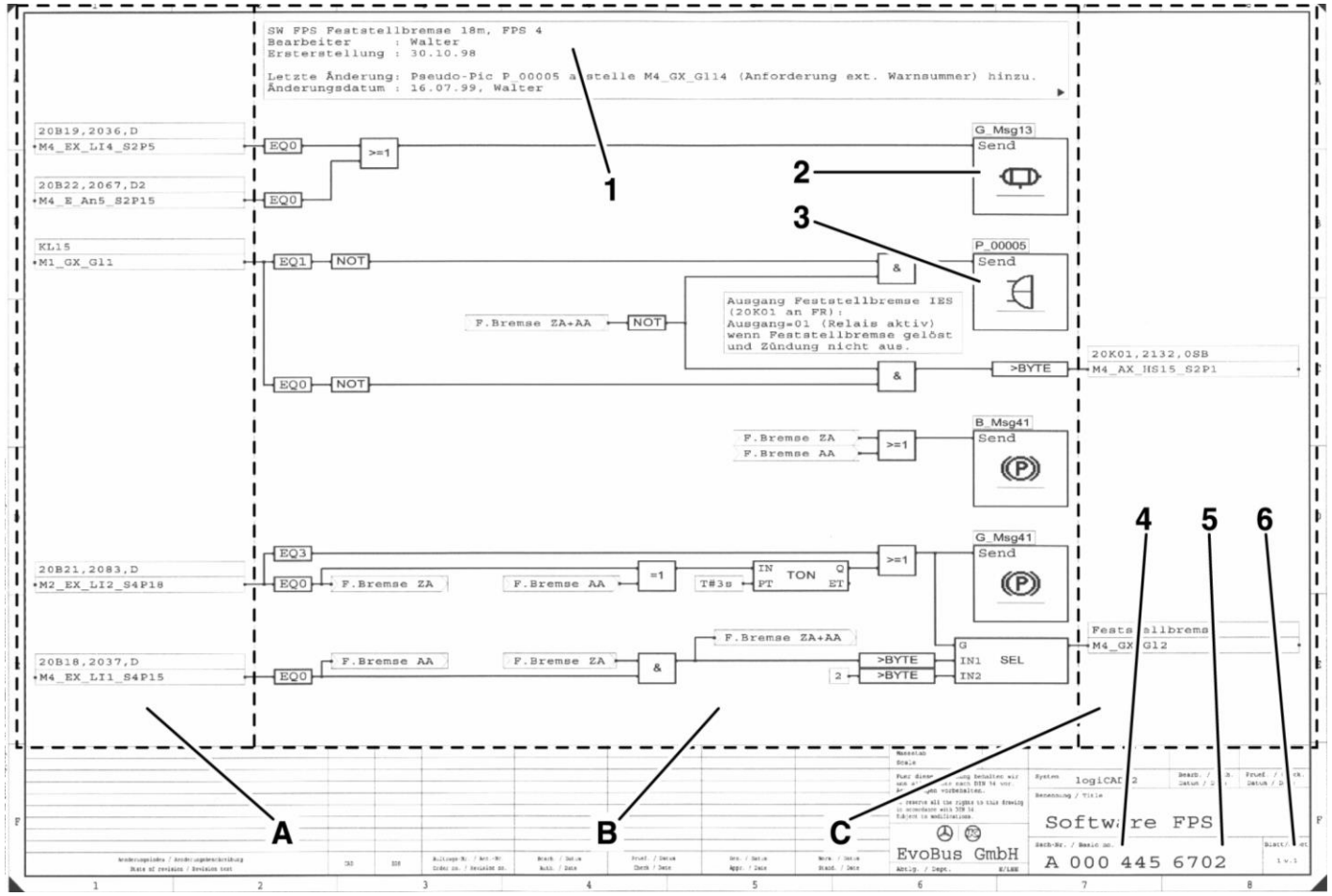

A	Input signals area
B	Logical links (processing) area
C	Output signals area
1	Logic diagram information (designation, author, creation date)
2	Symbol of a display screen notification
3	Symbol of a (pseudo-) icon
4	Item number of the function chart
5	The last digit of the item number corresponds to the first digit (main system) of the electrical system code
6	Sheet number

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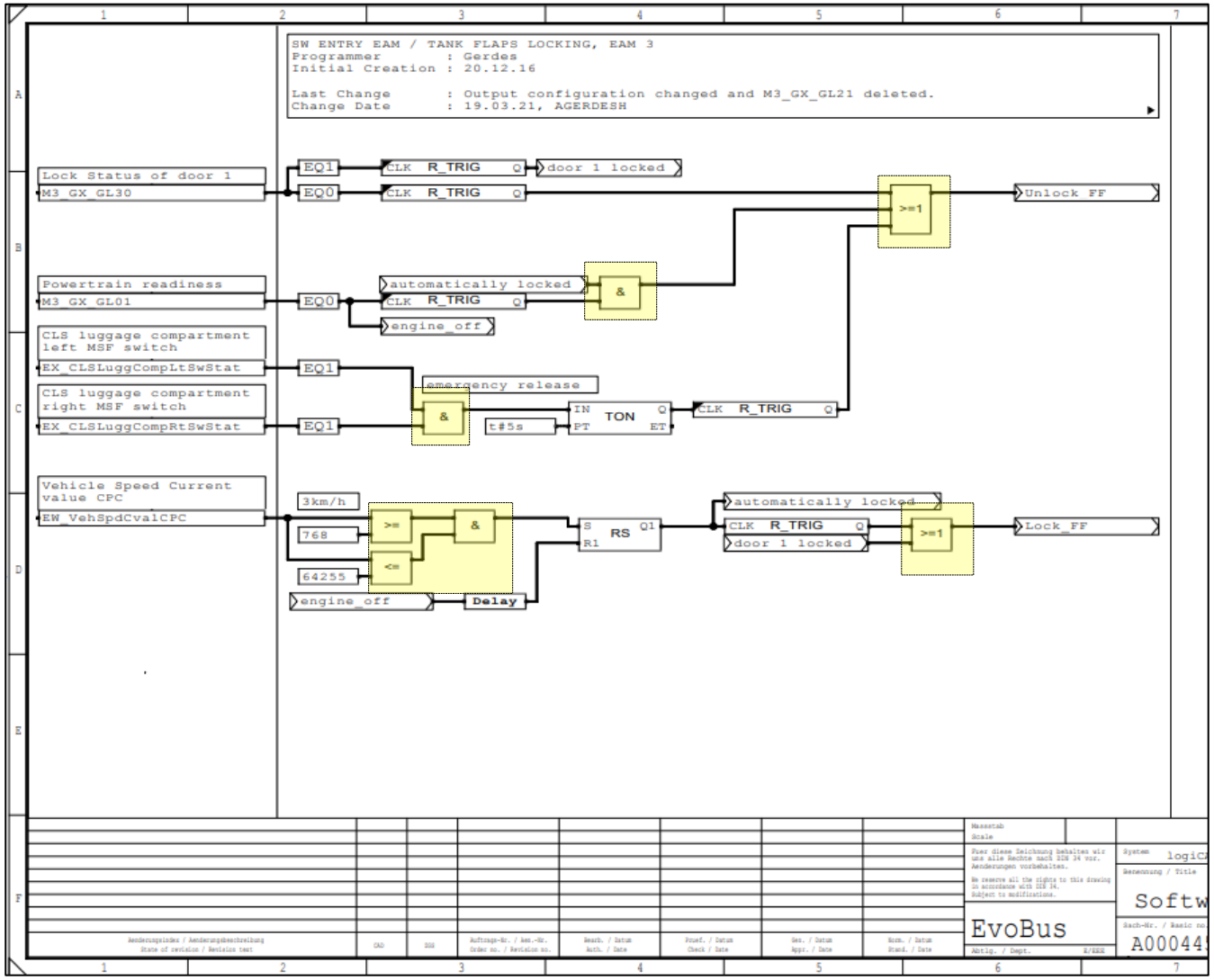
The Building Blocks of Logic Gates

These symbols determine when an output happens.

- **AND (&):** All conditions must be met. The output is 1 (Active) only if all inputs are 1 at the same time.
- **OR (>=1):** Any condition will work. The output is 1 if at least one input is 1.
- **XOR (=1):** Exclusive OR. The output is 1 only if the inputs are different (one is ON, one is OFF). If both are ON, the output is OFF.
- **NOT:** Inversion. If the input is 1, the output is 0. If the input is 0, the output is 1.



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Handling Time and Memory

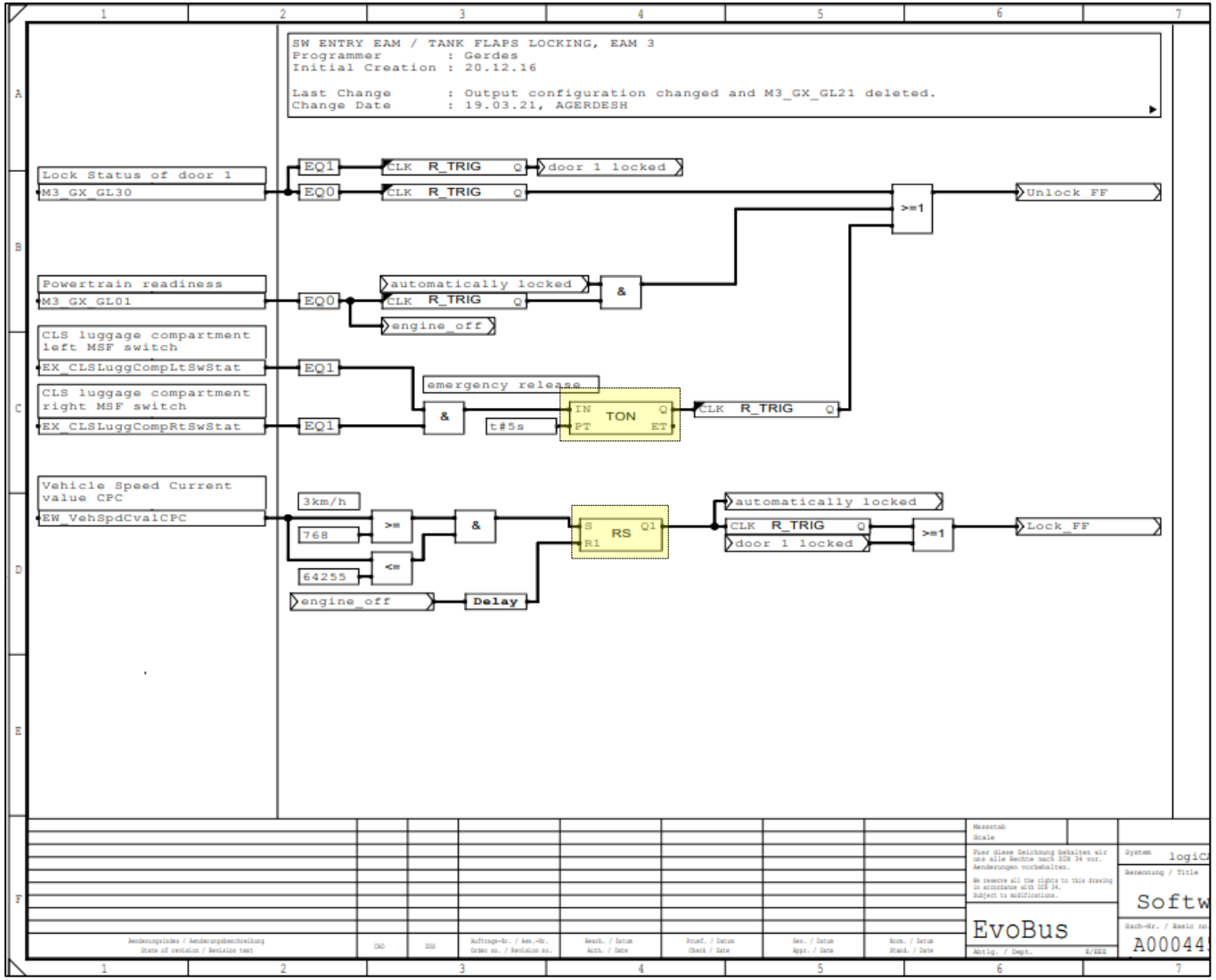
Many vehicle functions rely on timing (e.g., wipers, interior lights) or memory (latching a switch).

Timers:

- **TP (Pulse Generator):** Creates a pulse of a specific fixed time (PT) when triggered. It cannot be extended once it starts.
- **TON (Delay ON):** The input must stay ON for a set time before the output turns ON. If the input stops early, the timer resets.
- **TOF (Delay OFF):** When the input turns OFF, the output stays ON for a set time (PT) before finally turning OFF (like headlights fading out).

Flip-Flops (Memory):

- **RS (Reset Dominant):** Sets an output ON or OFF. If both "Set" and "Reset" commands happen at once, Reset wins (Output = 0).
- **SR (Set Dominant):** Similar to RS, but if both commands happen at once, Set wins (Output = 1).



Functional Diagram How-to-Read Guide

Interpreting Signal Names & Connections

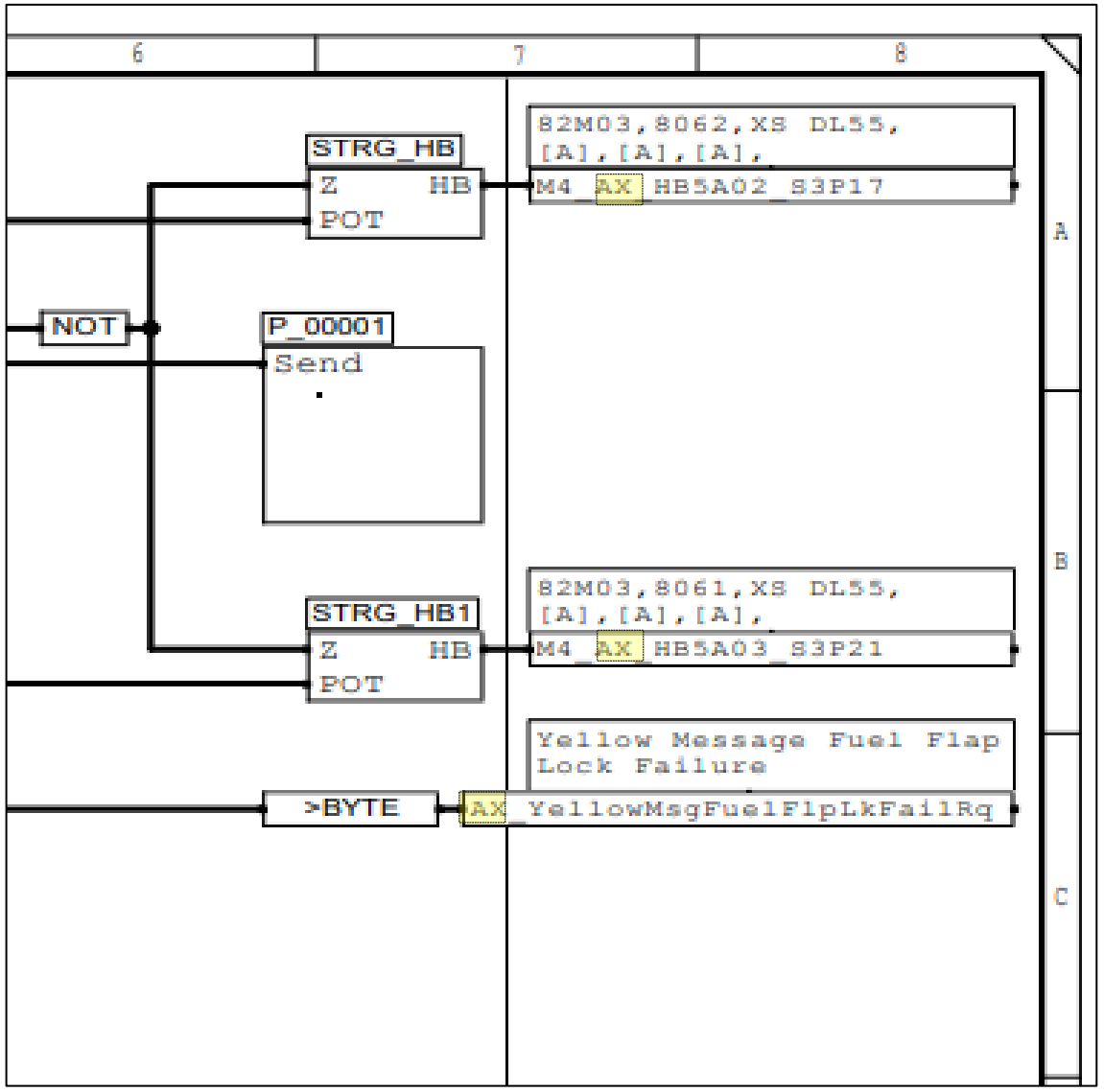
Understanding the acronyms on the input/output lines is critical for locating the correct wire or connector.

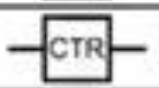
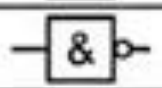
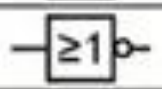
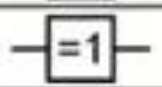
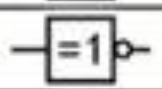
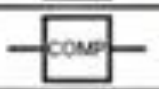
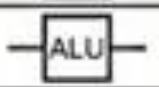
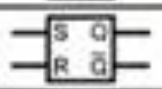
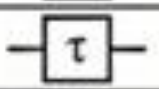
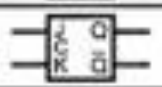
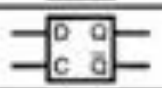
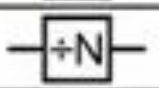
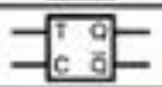
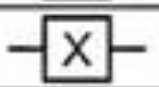
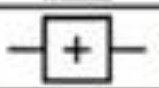
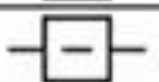
The "AX" and "AD" Mystery Solved:

- **A = Output** (Ausgang) / E = Input (Eingang)
- **X = 2 or 4 bit** (A small group of data)
- **D = Data bit** (1 bit)
  - *Example: **AX** = Output, 2 or 4 bit.*
  - *Example: **AD** = Output data bit.*
  - *Example: **HS** = High Switching output (Power side).*

Pinout Identification: The code on the line tells you exactly where to look on the hardware.

- **Format:** [Module #] [Type] [Connector #] [Pin #]



Symbol	Function	Symbol	Function
	AND gate		Astable Multivibrator (Oscillator)
	OR gate		Counter
	NOT gate		Shift Register
	NAND gate		Decoder
	NOR gate		Encoder
	Exclusive OR (XOR)		Multiplexer
	Exclusive NOR (XNOR)		Demultiplexer
	Buffer (non-inverting)		Comparator
	Schmitt Trigger		Arithmetic Logic Unit (ALU)
	RS Flip-Flop		Delay Element
	JK Flip-Flop		Sample and Hold
	D Flip-Flop		Frequency Divider
	T Flip-Flop		Multiplier
	Monostable Multivibrator (One-Shot)		Adder
	Astable Multivibrator (Oscillator)		Subtractor

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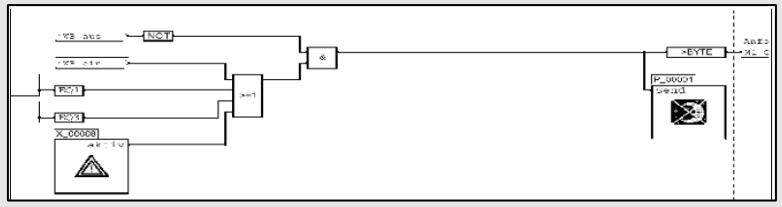
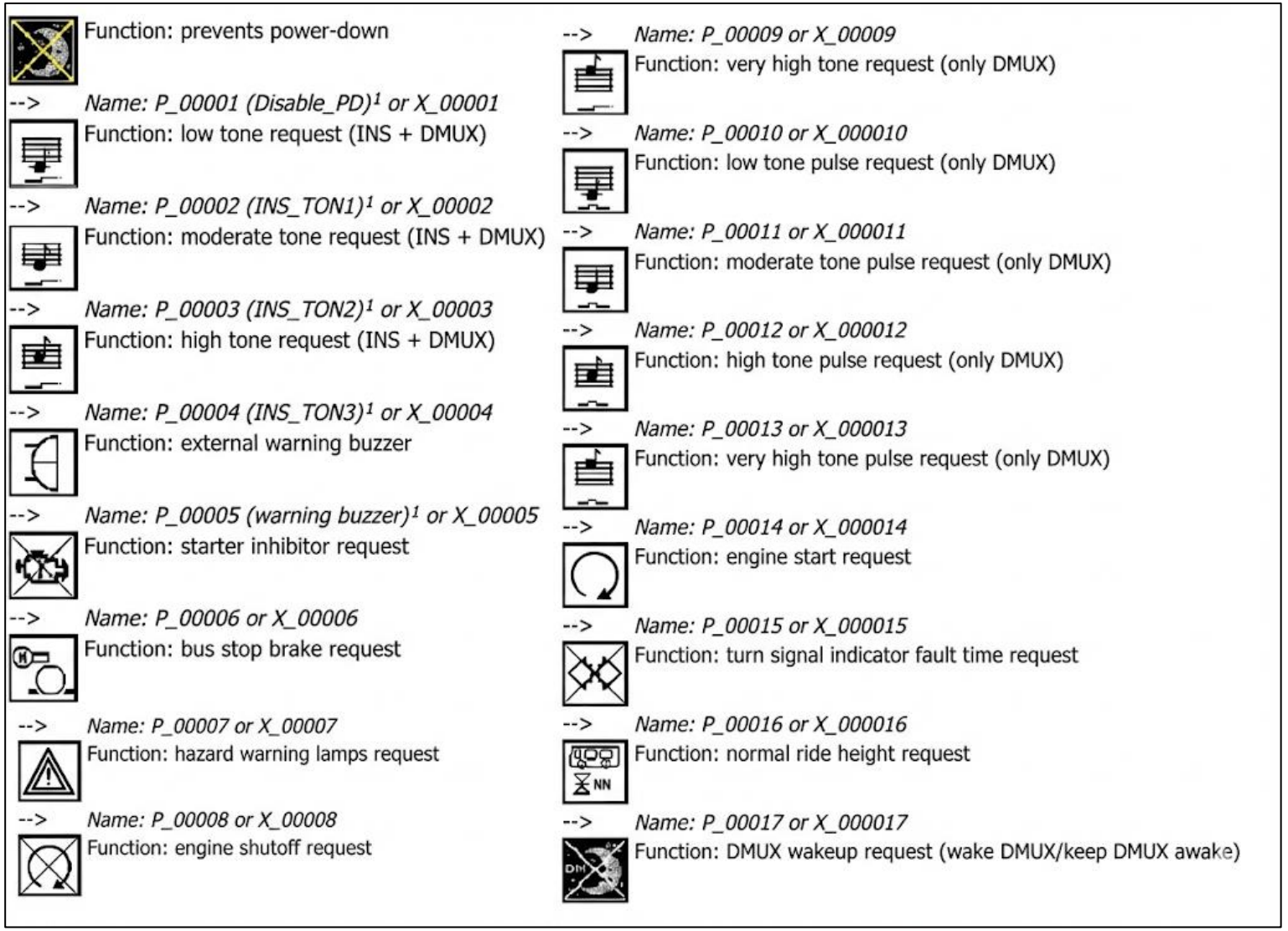
Pseudo-Icons vs. Display Icons

Technicians often confuse internal signals with dashboard warning lights.

- **Display Icons:** These provide information to the driver (e.g., B_MsgXX, R_MsgXX).
- **Pseudo-Icons (P_ or X_):** These are internal software flags only.
  - P_ (Transmitter): Sends a status to another page or module.
  - X_ (Receiver): Receives that status.

Note: These do not light up on the dash; they are "invisible" signals used to trigger other logic.





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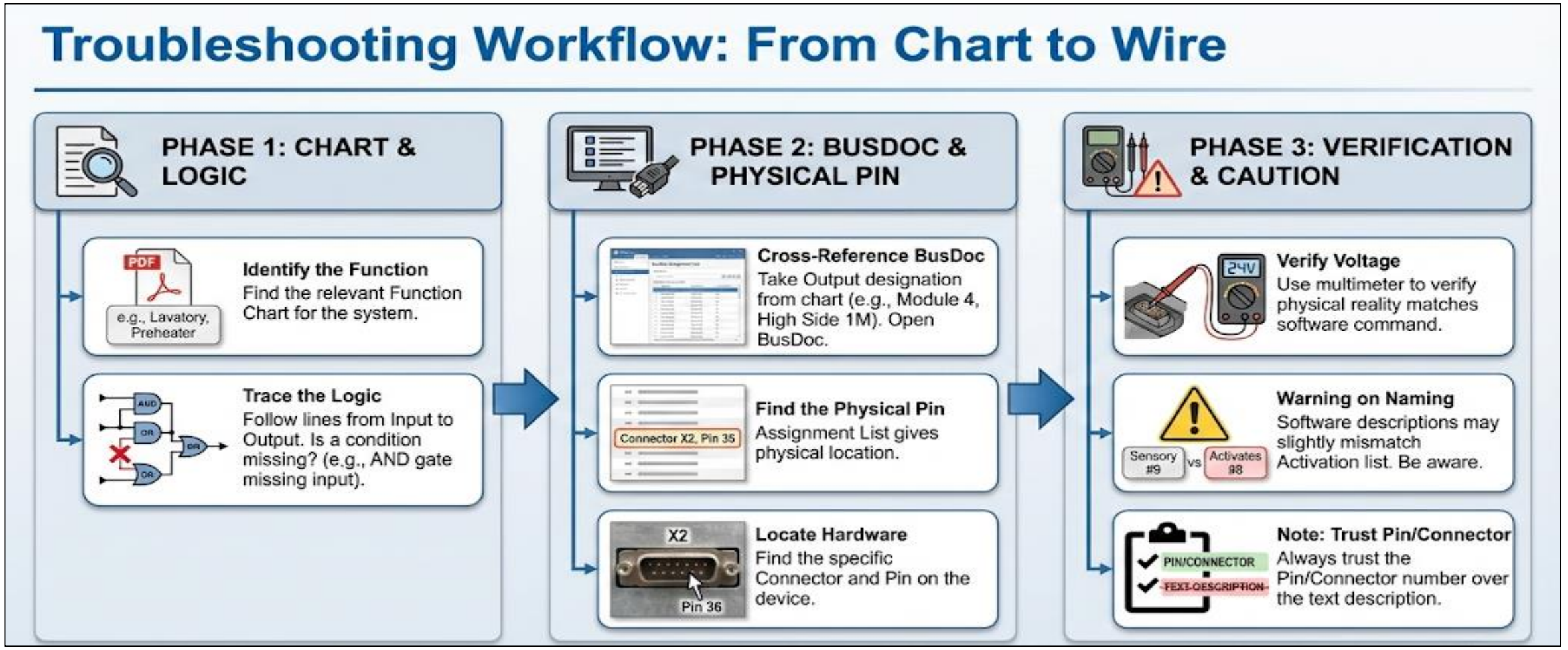

End-to-End Workflow for Successful Troublshooting

TOURRIDER

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Functional Diagram Pocket Guide

Logic Symbols

Symbol	Name	Logic
&	AND	**All** inputs must be ON for output to be ON.
>=1	OR	**Any** one input ON makes the output ON.
=1	XOR	Output is ON only if inputs are **different** (One ON, One OFF).
NOT	NOT	**Inverts** signal (ON becomes OFF, OFF becomes ON).

Timers & Memory

Code	Name	Function
TP	Pulse Gen	Fires a **fixed time pulse** (PT). Cannot be extended once started.
TON	Delay ON	Input must stay ON for time (PT) **before** output turns ON.
TOF	Delay OFF	Output **stays ON** for time (PT) after input turns OFF (e.g., dome lights).
RS	Reset Dom.	Latch. If Set & Reset are both ON, **Reset wins** (OFF).
SR	Set Dom.	Latch. If Set & Reset are both ON, **Set wins** (ON).

Signal Acronym Decoder

Use this to identify what kind of wire or signal you are tracing.

Letter	Meaning	Examples
A	**Output** (Ausgang)	**AX** = Output (2/4 bit).
E	**Input** (Eingang)	**EX** = Input (2/4 bit).
X	**Group** (2 or 4 bit)	**RX** = Readback (2 bit).
D	**Data** (1 bit)	**AD** = Output Data Bit.
HS	**High Side**	**HS** = High Switching Output (Power).
P_	**Pseudo (Send)**	Internal software flag (does **not** light up dash).
Msg	**Message**	**Display Icon** (Lights up on dash for driver).

Symbol	Function	Symbol	Function
&	AND gate	♫	Astable Multivibrator (Oscillator)
≥1	OR gate	CTR	Counter
1	NOT gate	SR	Shift Register
&	NAND gate	DEC	Decoder
≥1	NOR gate	ENC	Encoder
=1	Exclusive OR (XOR)	MUX	Multiplexer
=1	Exclusive NOR (XNOR)	DEMUX	Demultiplexer
1	Buffer (non-inverting)	COMP	Comparator
⎍	Schmitt Trigger	ALU	Arithmetic Logic Unit (ALU)
S Q R Q̄	RS Flip-Flop	τ	Delay Element
J Q C K Q̄	JK Flip-Flop		Sample and Hold
D Q C Q̄	D Flip-Flop	÷N	Frequency Divider
T Q C Q̄	T Flip-Flop	X	Multiplier
1♪	Monostable Multivibrator (One-Shot)	+	Adder
♫	Astable Multivibrator (Oscillator)	−	Subtractor

Troubleshooting Workflow (Chart to Wire)

1. **Goal:** Find the physical pin from the software chart.
2. **Locate Output:** On the Function Chart (Right Side), find the output label (e.g., High side 1M on Module 4)
3. **Check BusDoc:** Open the Assignment List in BusDoc.
4. **Match:** Scroll to the matching Module (e.g., Mod 4) and Output Name
5. **Find Pin:** The list gives you the physical location.
6. **Look for:** Connector X__ Pin __ (e.g., Connector 2, Pin 36)
7. **Verify:** Use a multimeter at that pin to verify voltage/continuity.