

PowerFlex Drives with TotalFORCE Control

Catalog Numbers: 20G, 20J

PowerFlex 755T Control Block Diagrams

Flow diagrams illustrate the control algorithms used by PowerFlex® 755T products.

- [Line Side Converter Block Diagrams on page 7](#)
- [Motor Side Converter Block Diagrams on page 24](#)

Figure 1 - Diagram Conventions and Definitions

Definitions of the Per Unit system:

1.0 PU Position = Distance traveled / 1 second at Base Velocity

1.0 PU Velocity = Base Velocity of the Motor

1.0 PU Torque = Base Torque of the Motor

Symbol Legend:

Drive Parameters	Option Module Parameters	→ Requires port number.	
			Read Only Parameter
			Read / Write Parameter
			Read Only Parameter with Bit Enumeration
			Read / Write Parameter with Bit Enumeration
			Provides additional information.

() = Enumeration Parameter
 XX[] = Page and Coordinate
 ex. Tst [A2] = pg Tst, Column A, Row 2

= Constant value

'd' = Prefix refers to Diagnostic Item Number
 ex. d33 = Diagnostic Item 33

%:YY = Parameter in PORT X

TP0000 = Software Testpoint (Name and Number)

IMPORTANT These diagrams are for reference only and may not accurately reflect all logical control signals; actual functionality is implied by the approximated diagrams. Accuracy of these diagrams is not guaranteed.

For more information on PowerFlex® 755T product configuration, operation, and troubleshooting, see the following publications.

- The PowerFlex Drives with TotalFORCE Control Programming Manual (firmware revisions 10.xxx and later), publication [750-PM101](#) provides information on startup, control algorithms, and status indicators.
- The PowerFlex Drives with TotalFORCE Control Parameters Reference Data, publication [750-RD101](#) provides information on parameters and programming.
- The PowerFlex Drives with TotalFORCE Control Conditions Reference Data, publication [750-RD102](#) provides information on faults, alarms, events, and troubleshooting.

Addition product support is available on-line at the [PowerFlex 755T Drives Resources](#) Web page.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Reproduction of the contents of this manual, in whole or in part, without written permission of Rockwell Automation, Inc., is prohibited.

Throughout this manual, when necessary, we use notes to make you aware of safety considerations.



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

IMPORTANT: Identifies information that is critical for successful application and understanding of the product.

These labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.



Identifies information that is useful and can help to make a process easier to do or easier to understand.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

Summary of Changes

This manual contains new and updated information as indicated in the following table.

Topic	Page
This publication was modified for improved find text and advanced search results.	Throughout

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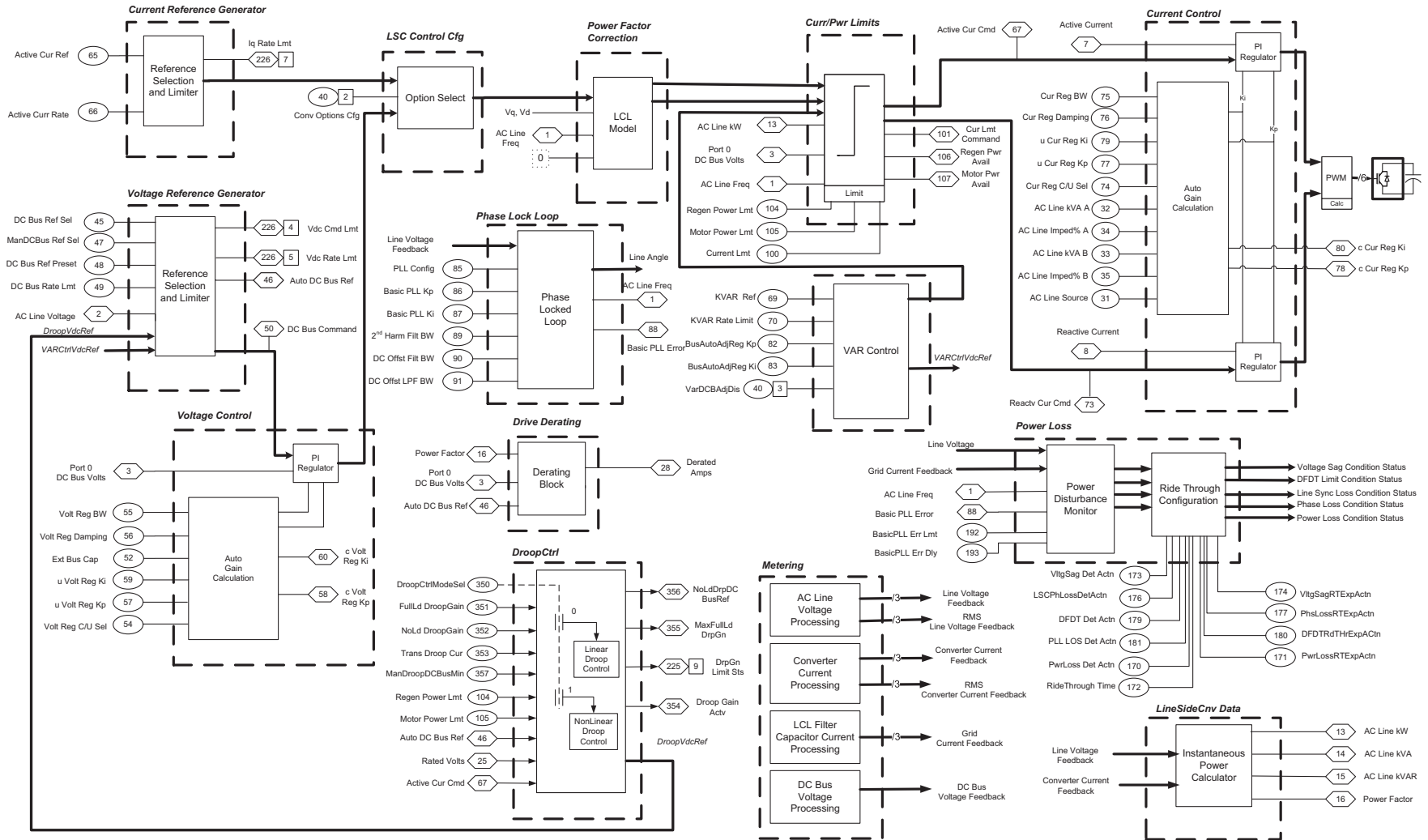
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Line Side Converter Block Diagrams

Figure 2 - PowerFlex 755T Converter - Overview

PowerFlex 755T Converter - Overview



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Figure 3 - Metering (Metering)

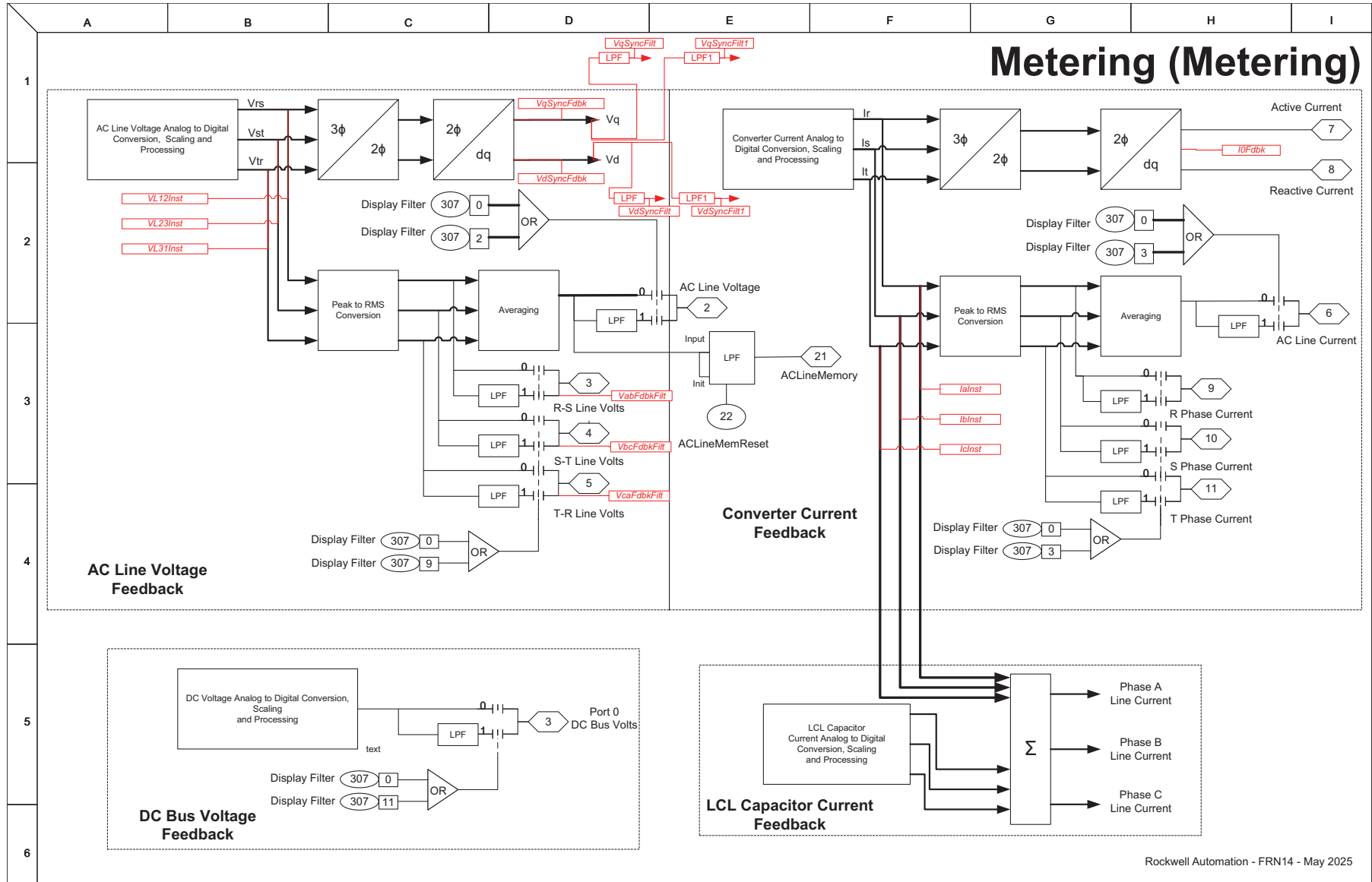


Figure 4 - Phase Locked Loop (PLL)

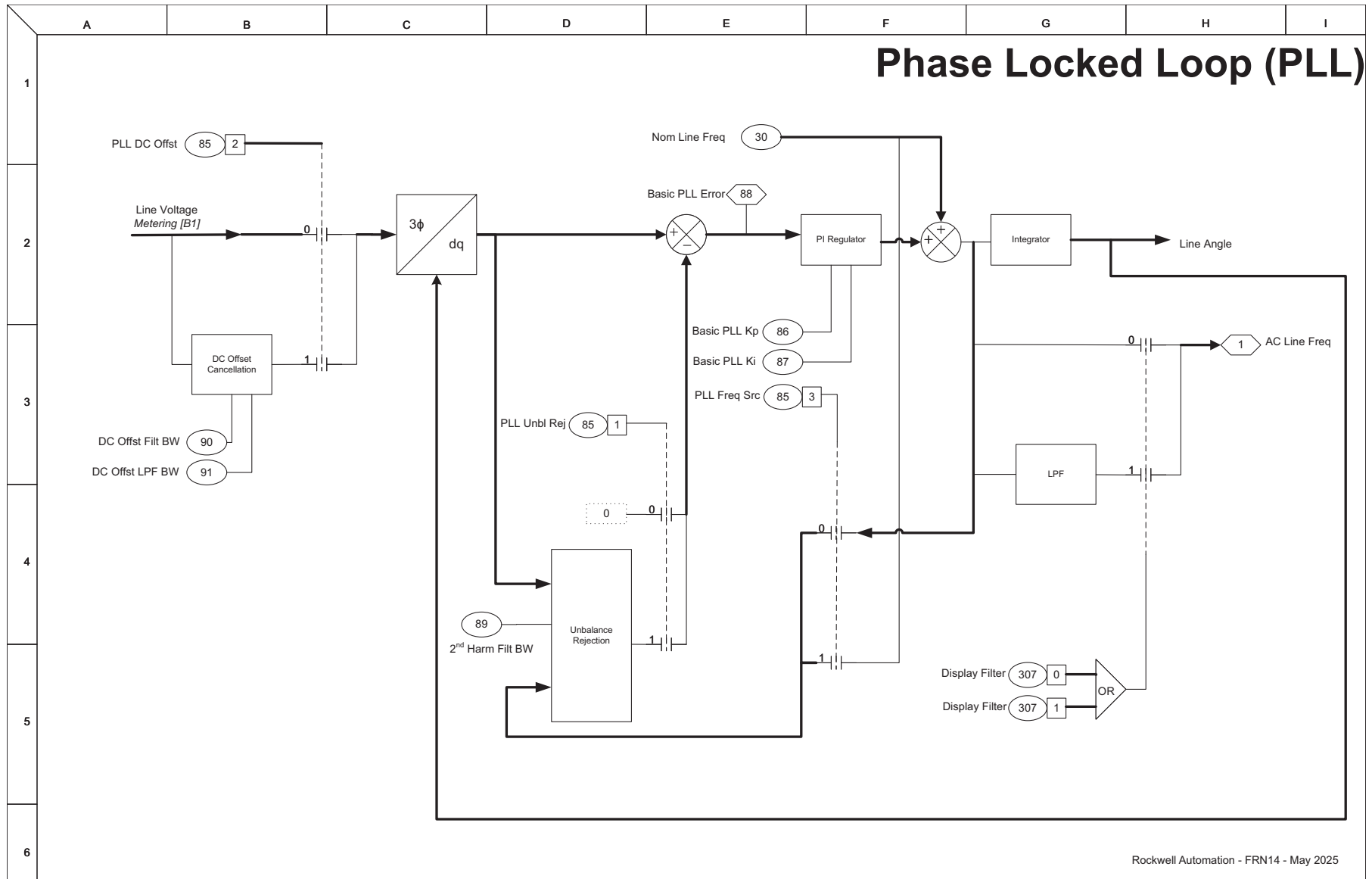


Figure 5 - Power Loss (PwrLoss)

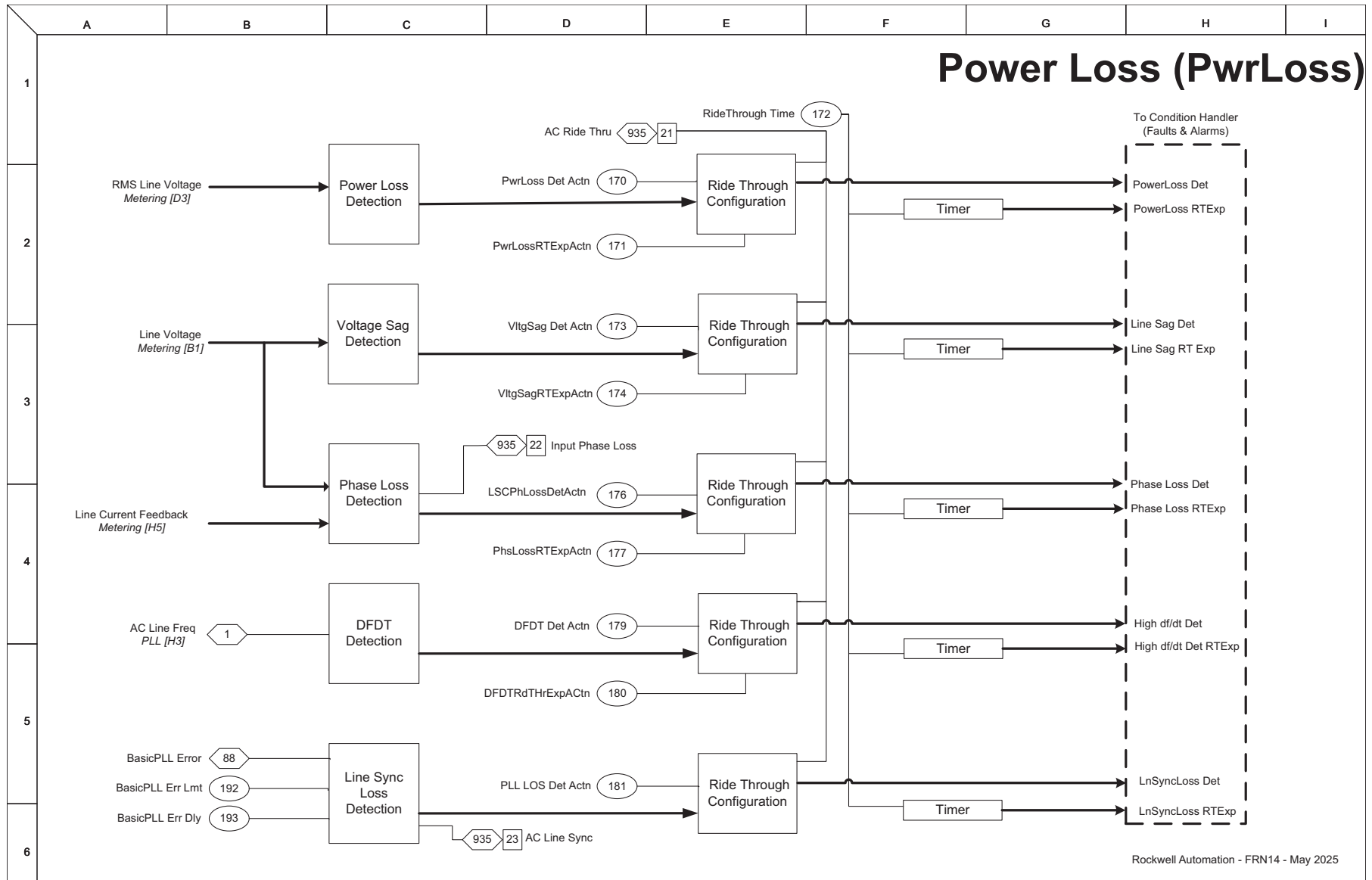
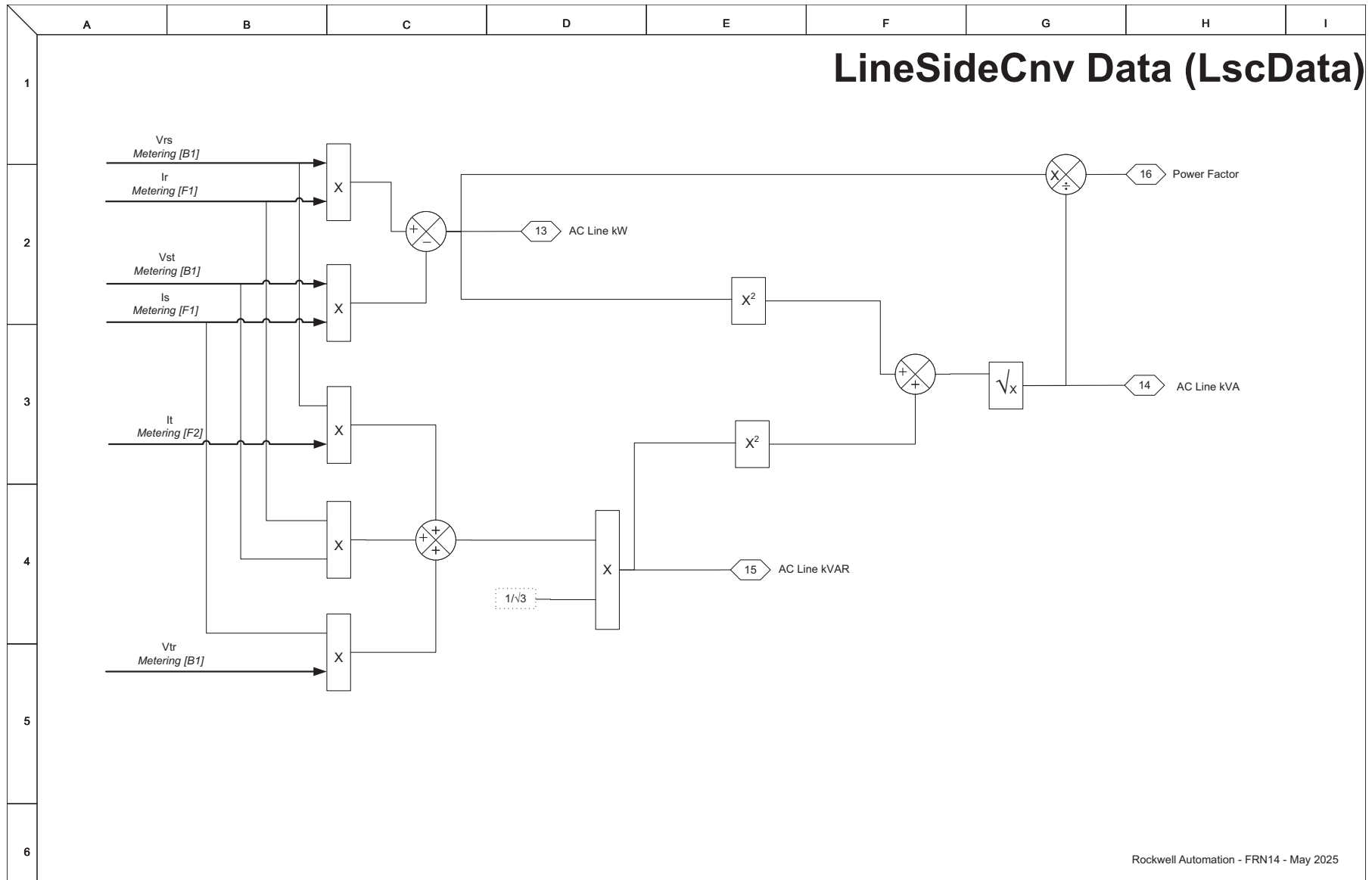


Figure 6 - Line Side Converter Data (LscData)



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Figure 7 - Current Reference Generator (CurRefGen)

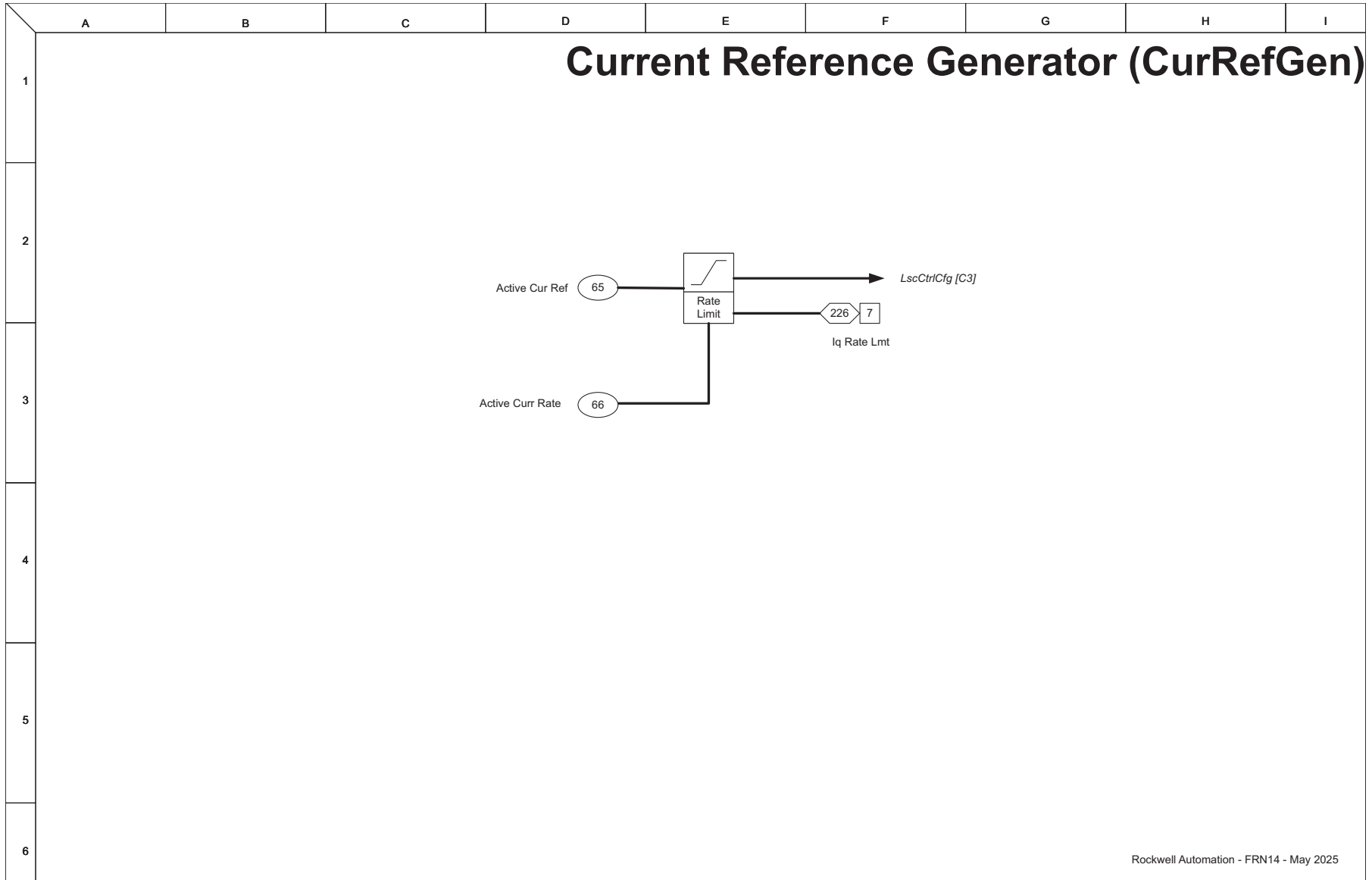


Figure 8 - Reactive Power Control (VarCtrl)

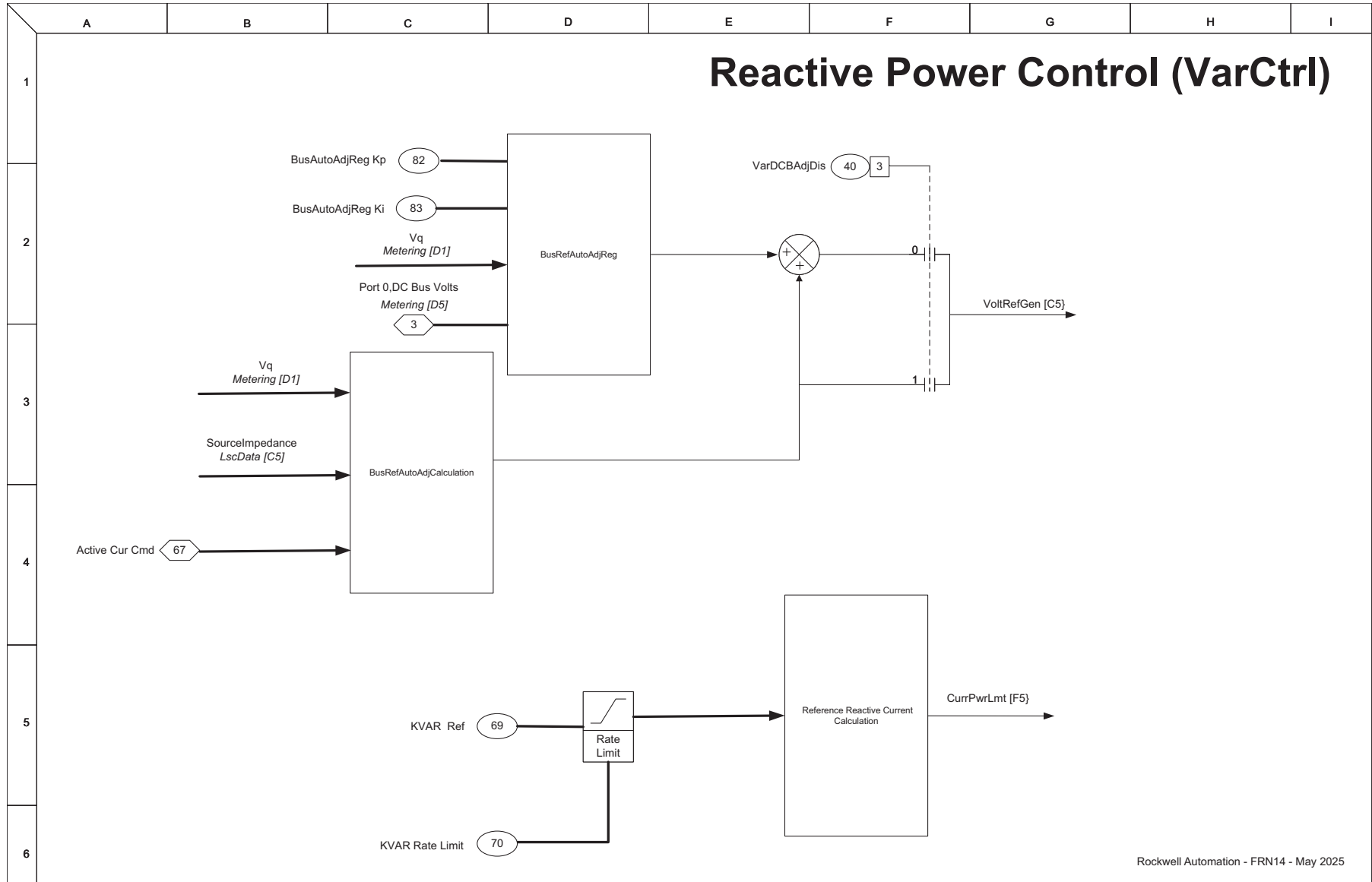


Figure 9 - Droop Control

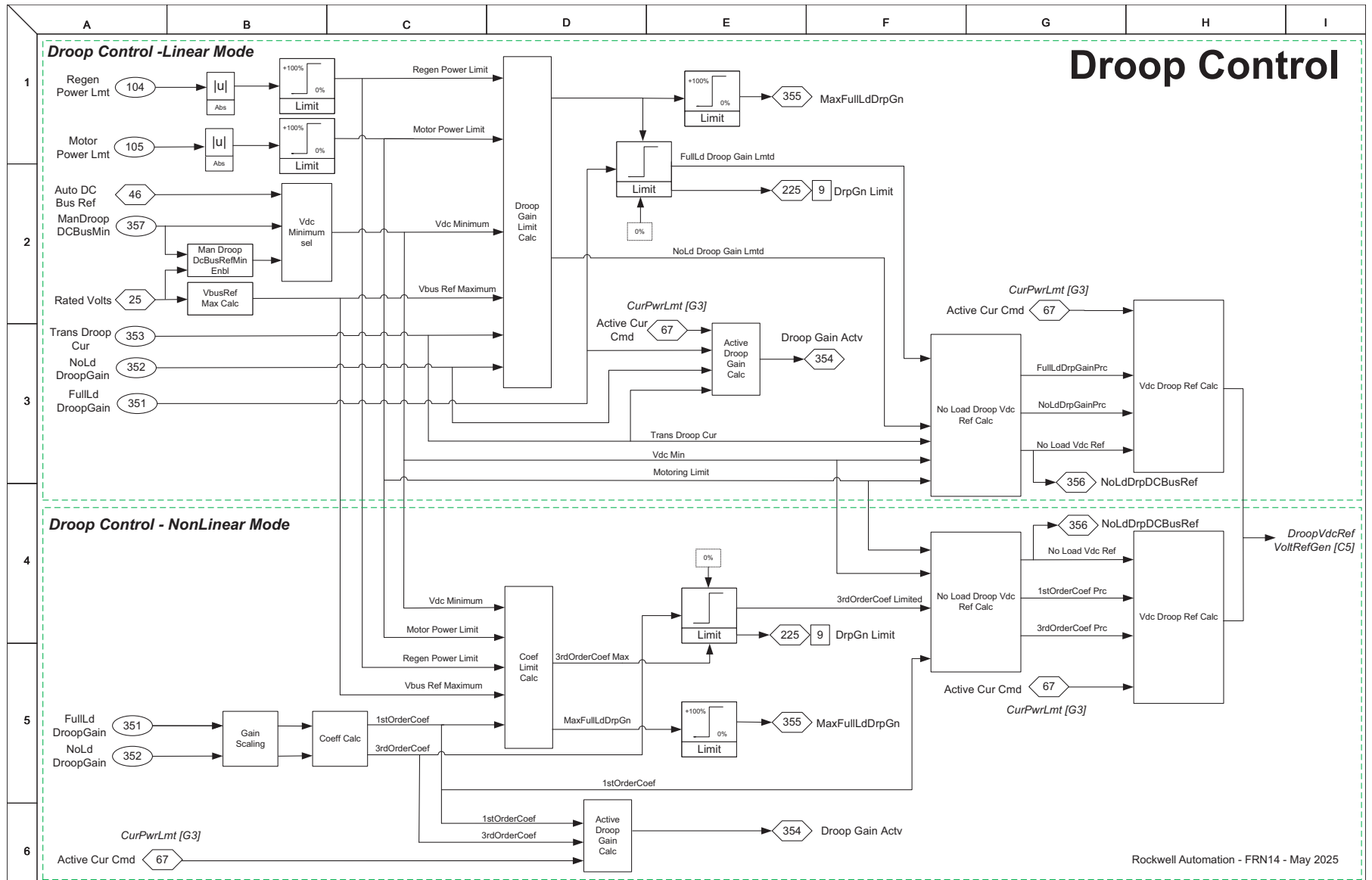


Figure 10 - Dynamic Bus Control (DBC)

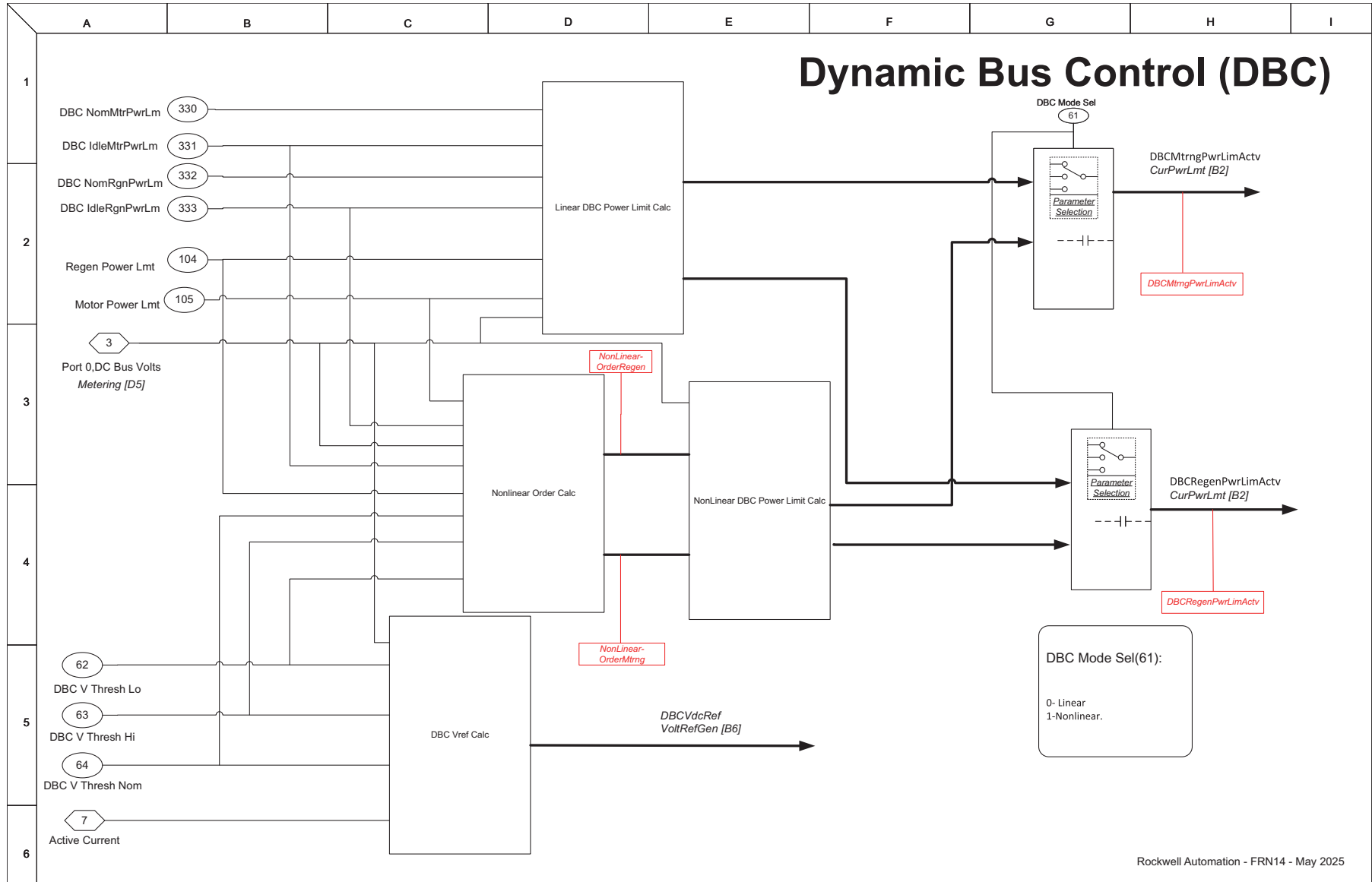


Figure 11 - Voltage Reference Generator (VoltRefGen)

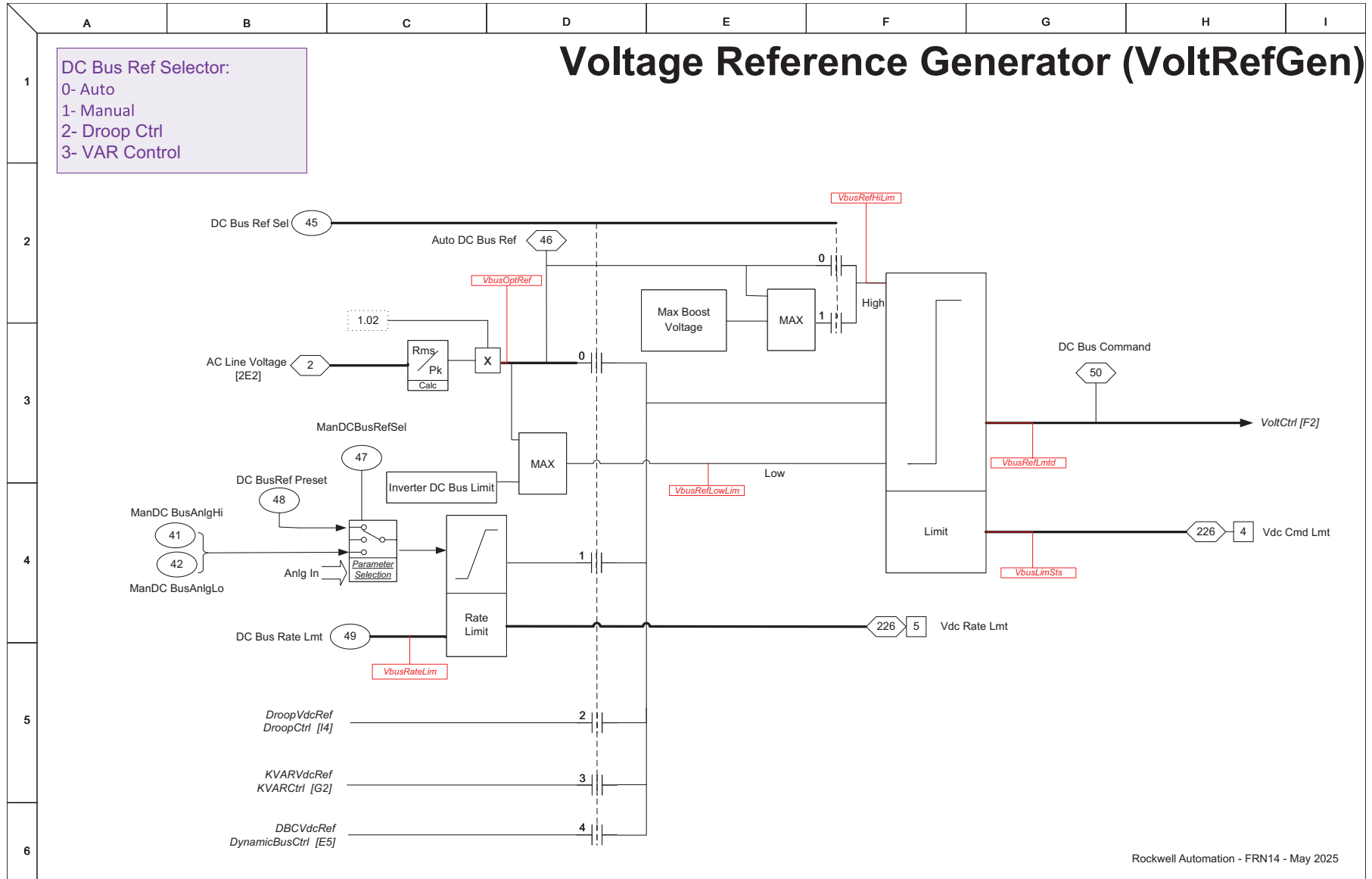
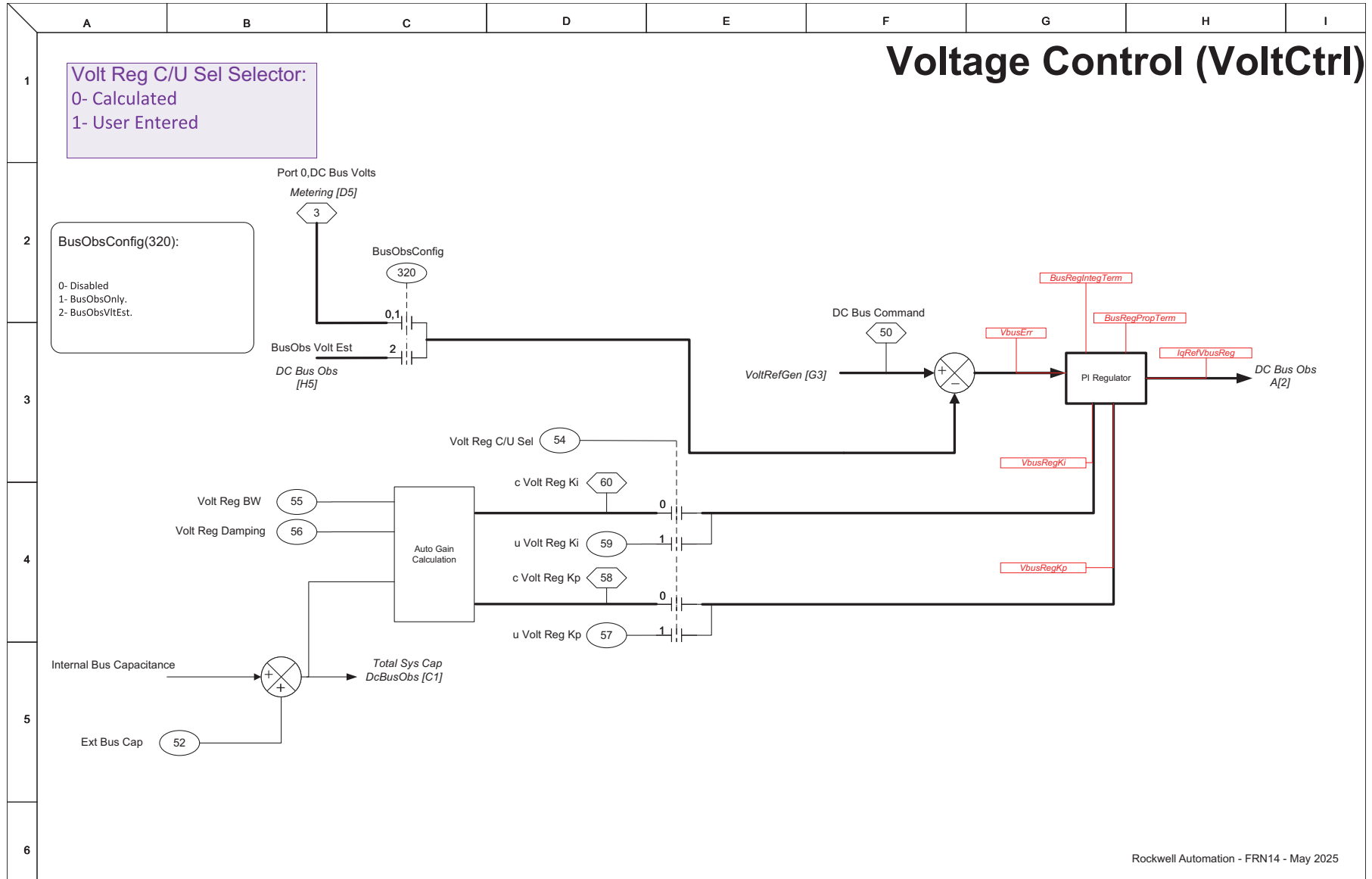


Figure 12 - Voltage Control (VoltCtrl)



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Figure 13 - DC Bus Observer

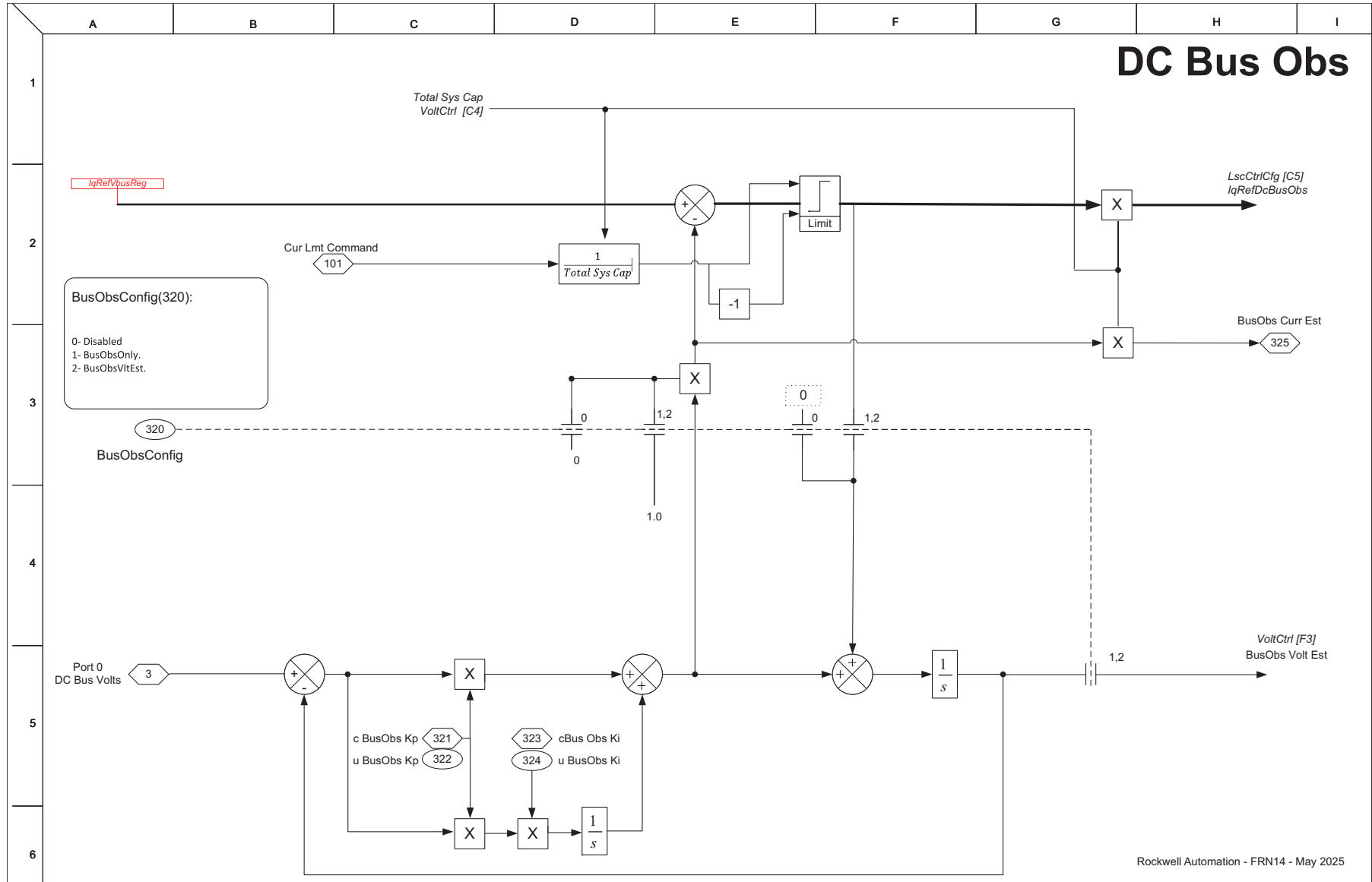


Figure 14 - Power Factor Correction (PFC)

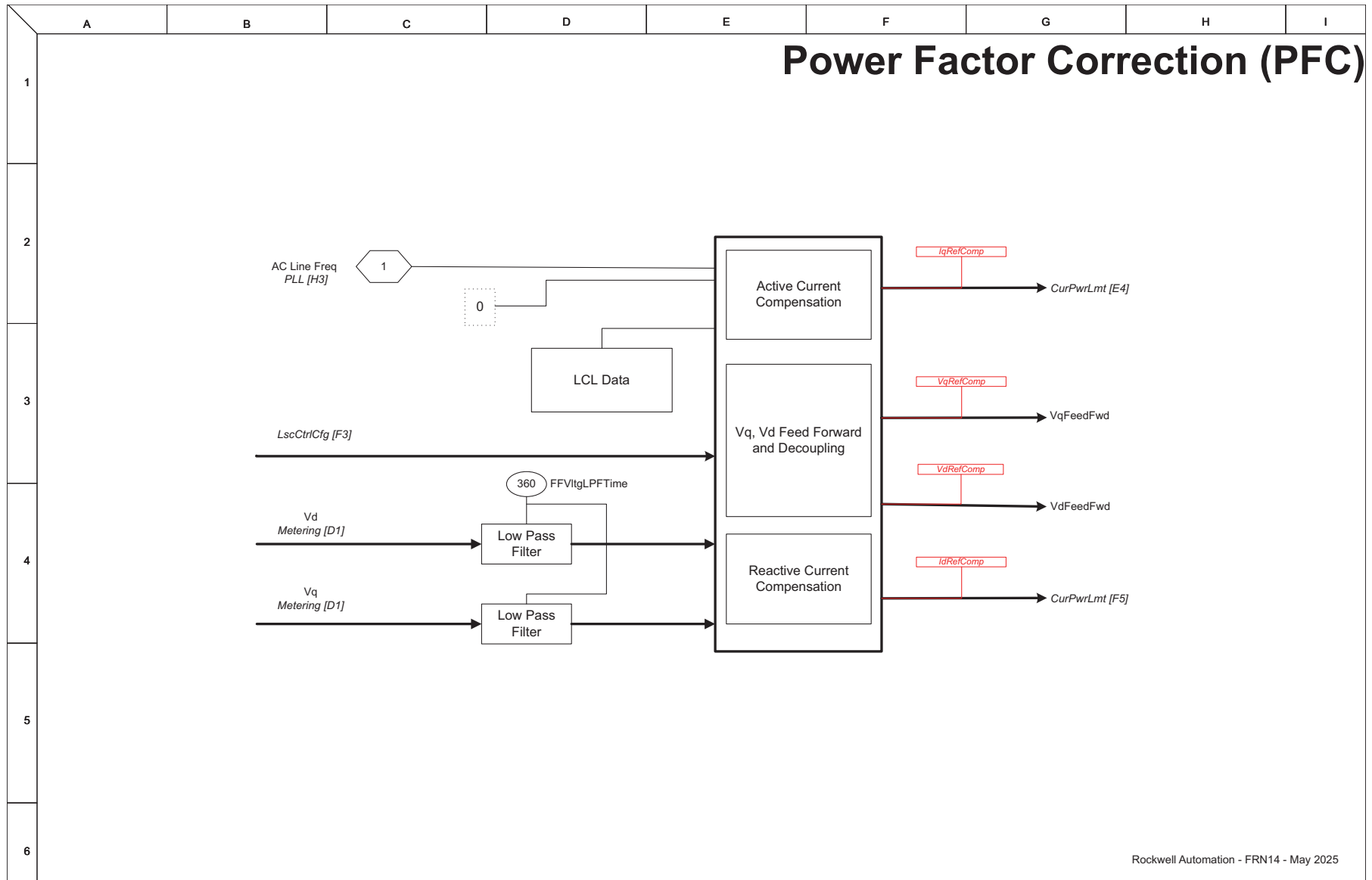


Figure 15 - Current/Power Limits (CurPwrLmt)

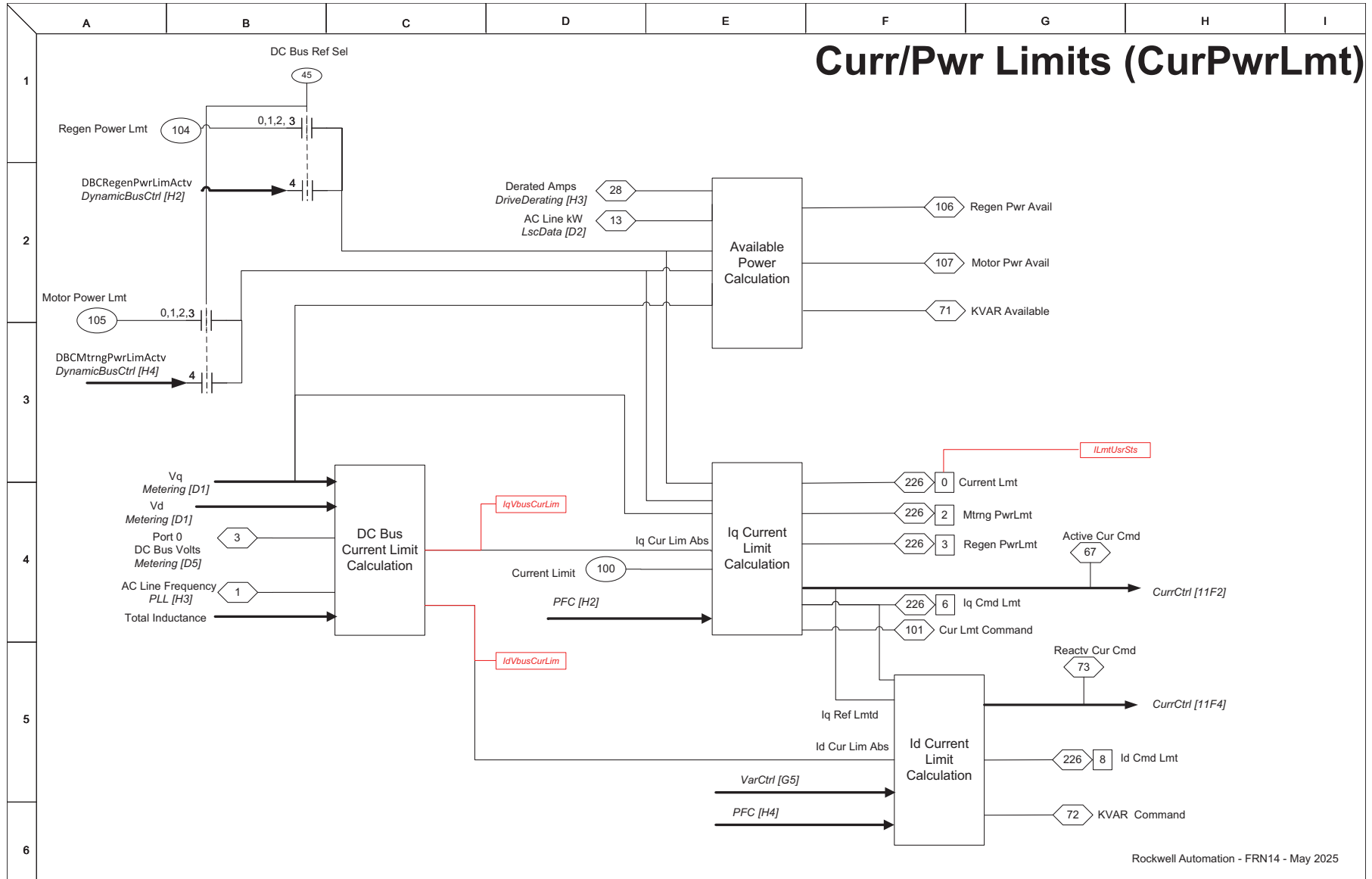


Figure 16 - Current Control (CurrCtrl)

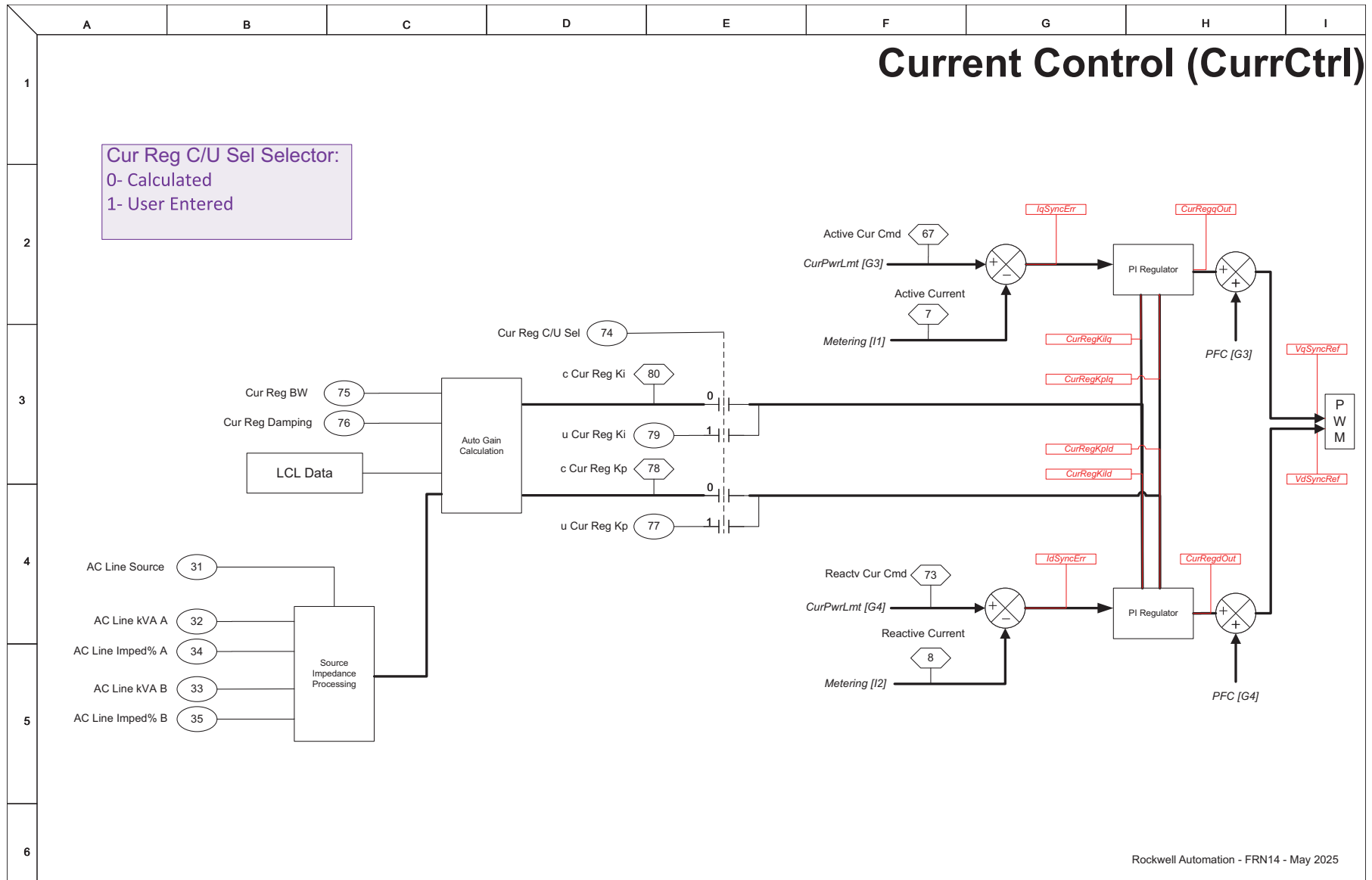
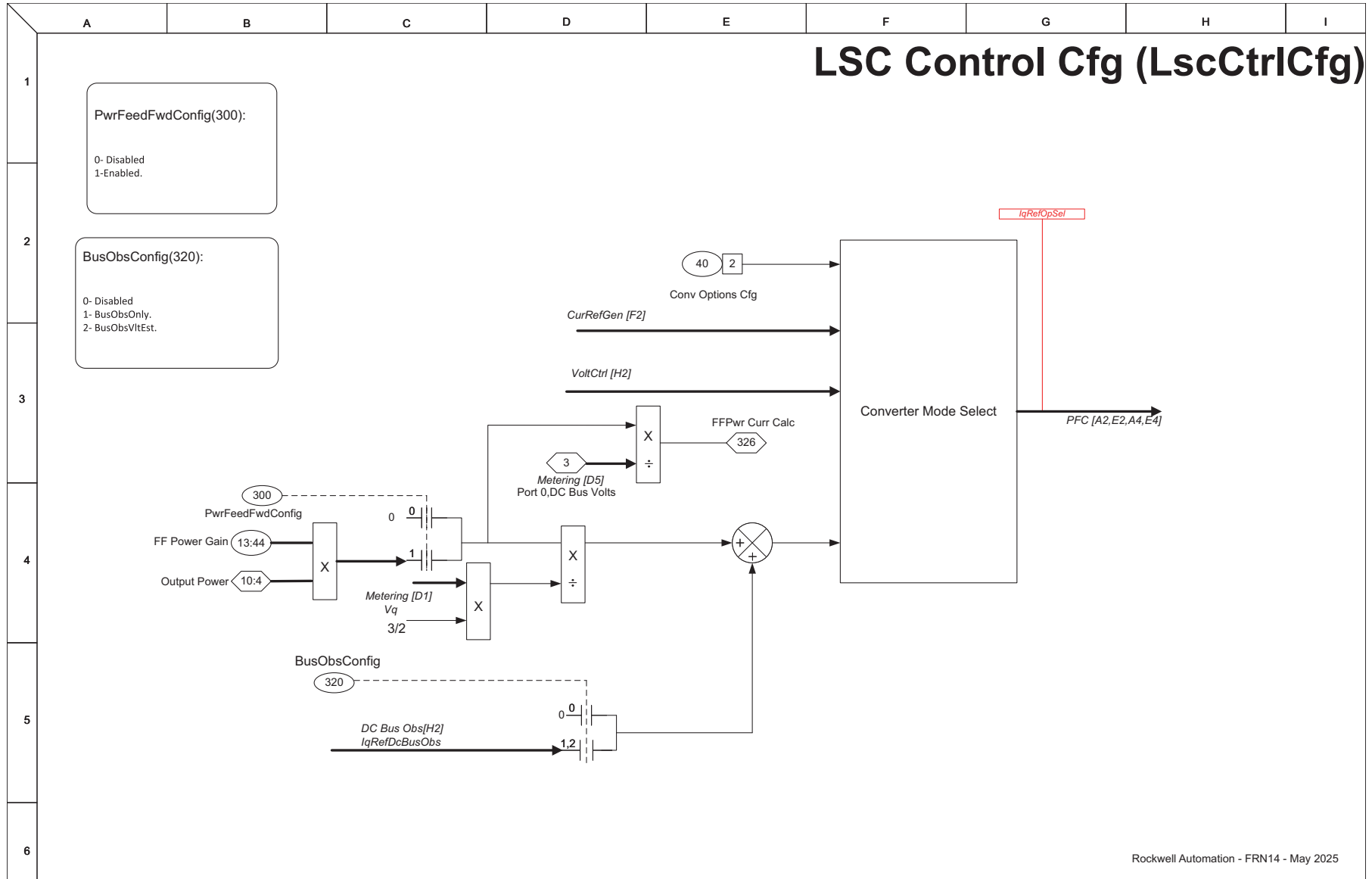
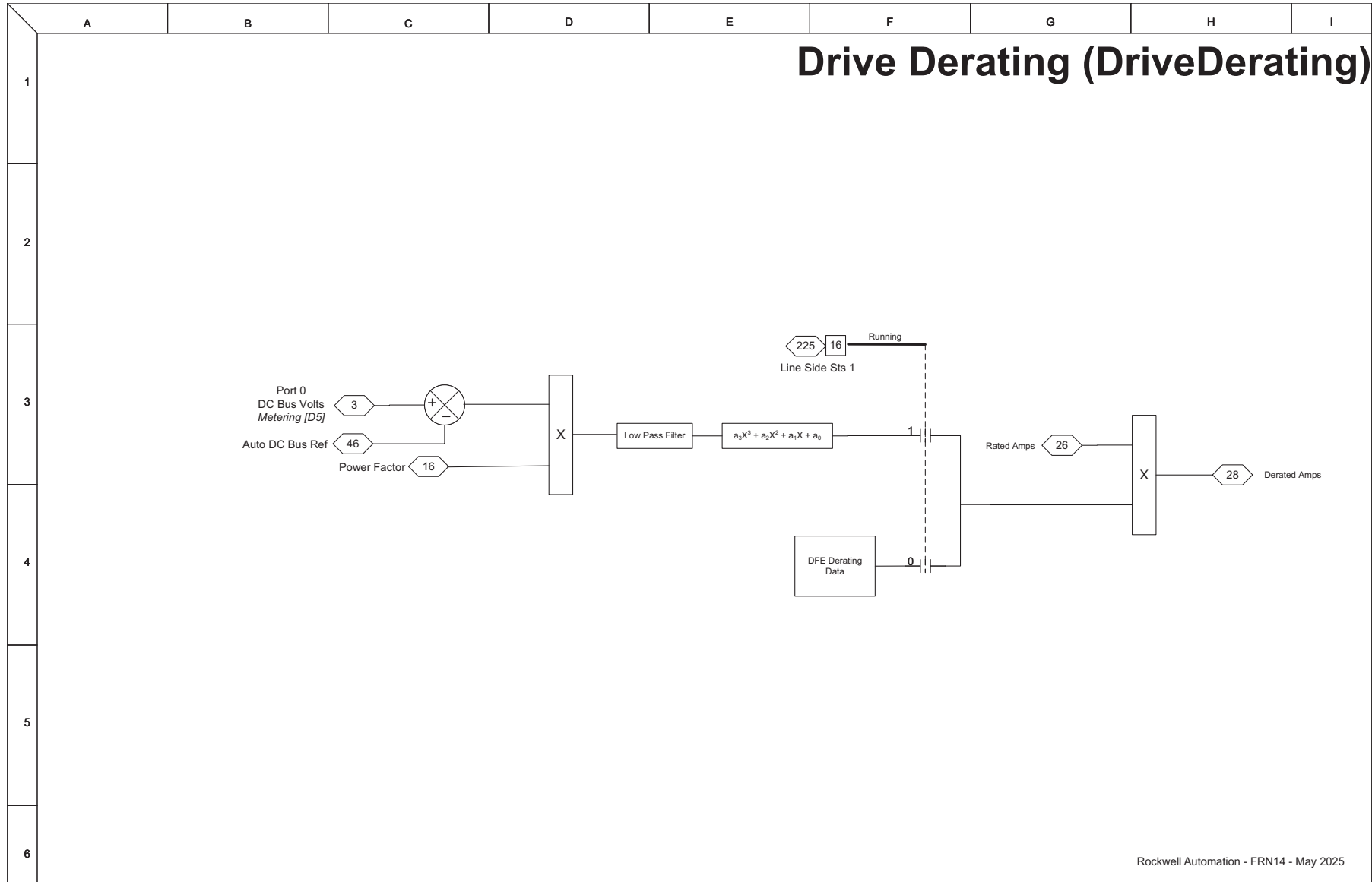


Figure 17 - LSC Control Configuration (LscCtrlCfg)



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Figure 18 - Drive Derating (DriveDerating)



Motor Side Converter Block Diagrams

Figure 19 - Flux Vector Overview (Vector Overview)

Flux Vector Overview (Vector Overview)

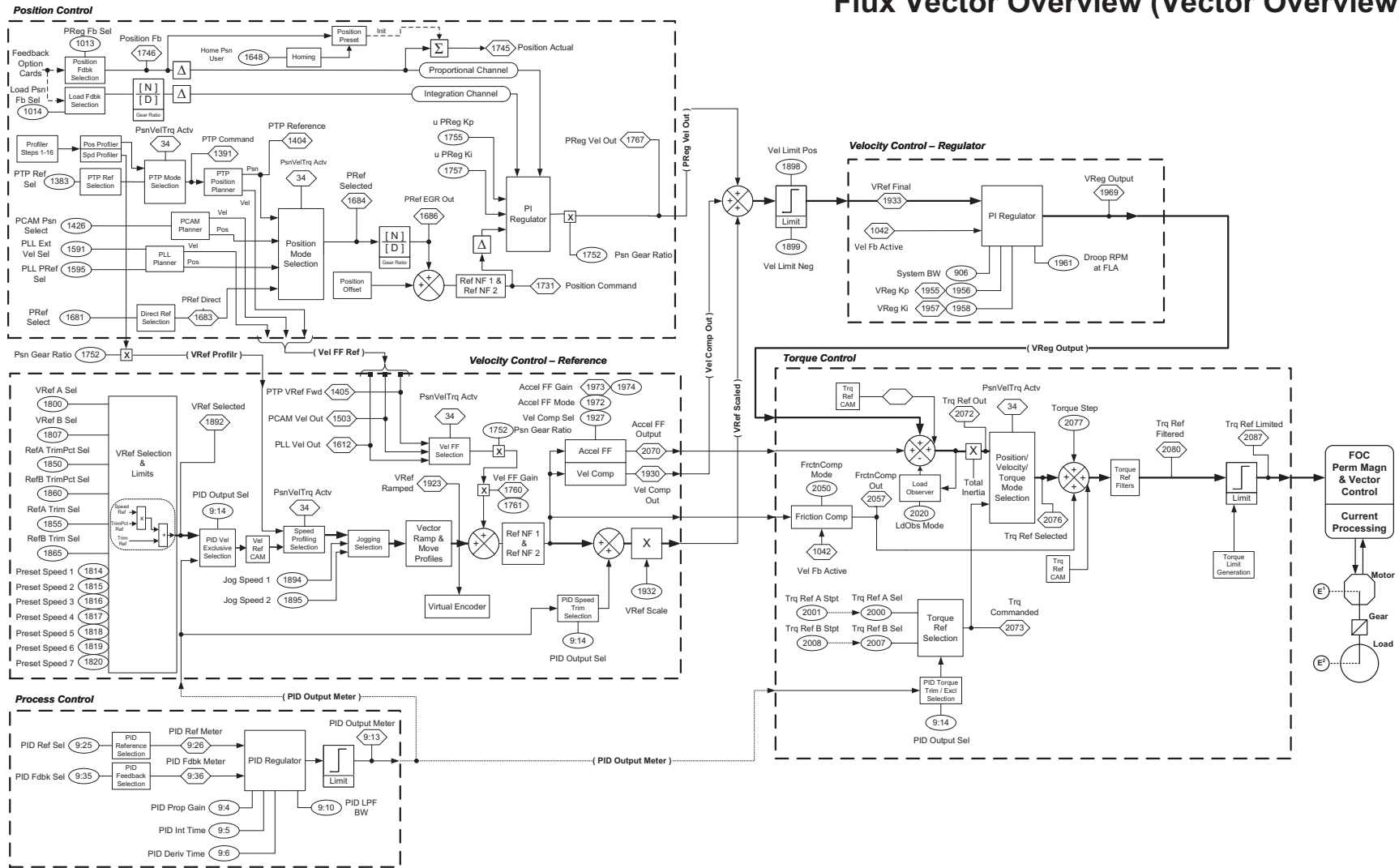
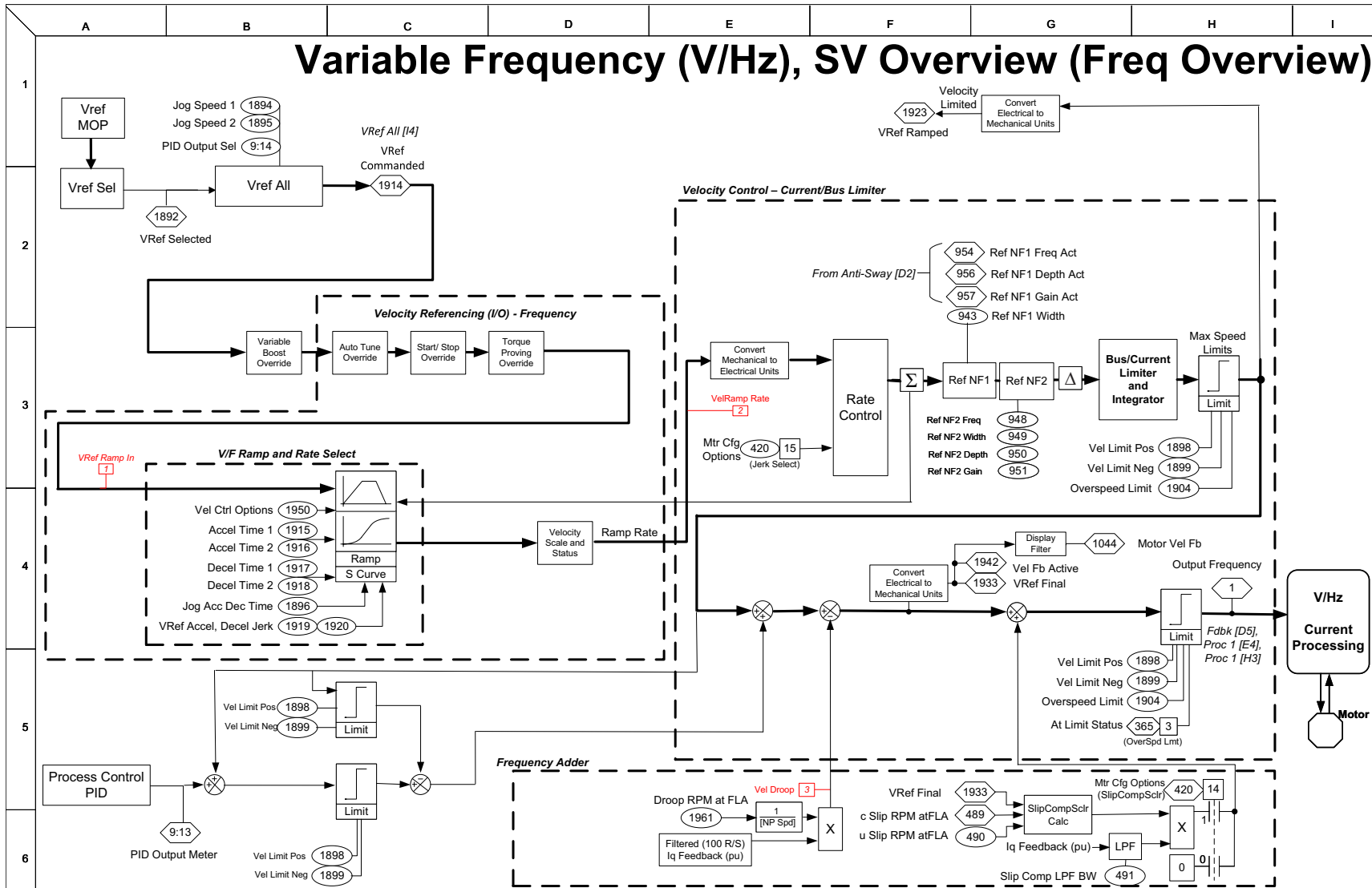


Figure 20 - Variable Frequency (V/Hz), SV Overview (Freq Overview)



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Figure 21 - CBI Metering Signals (CBI Metering)

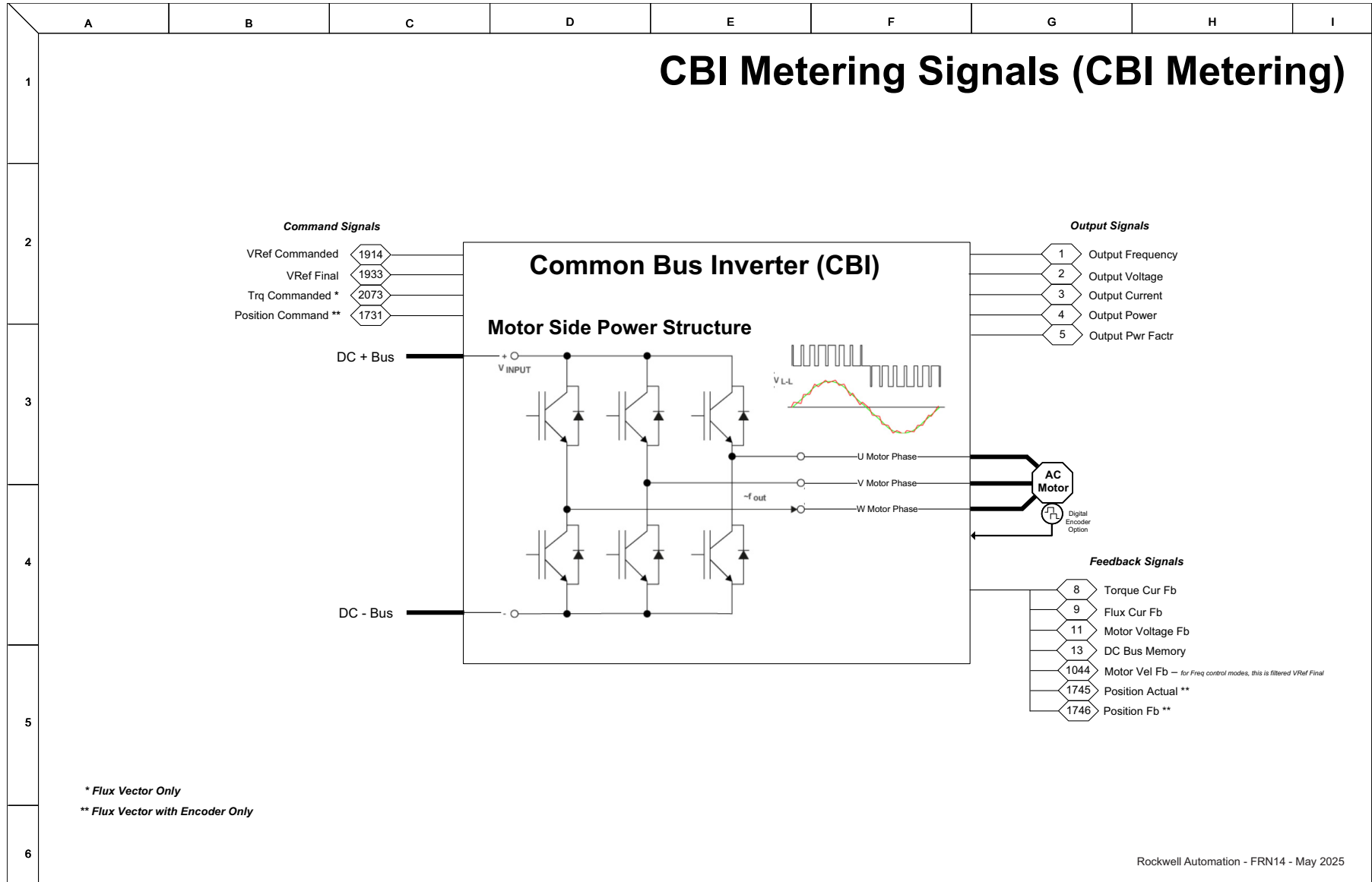


Figure 22 - Feedback Configuration & Status (Fdbk)

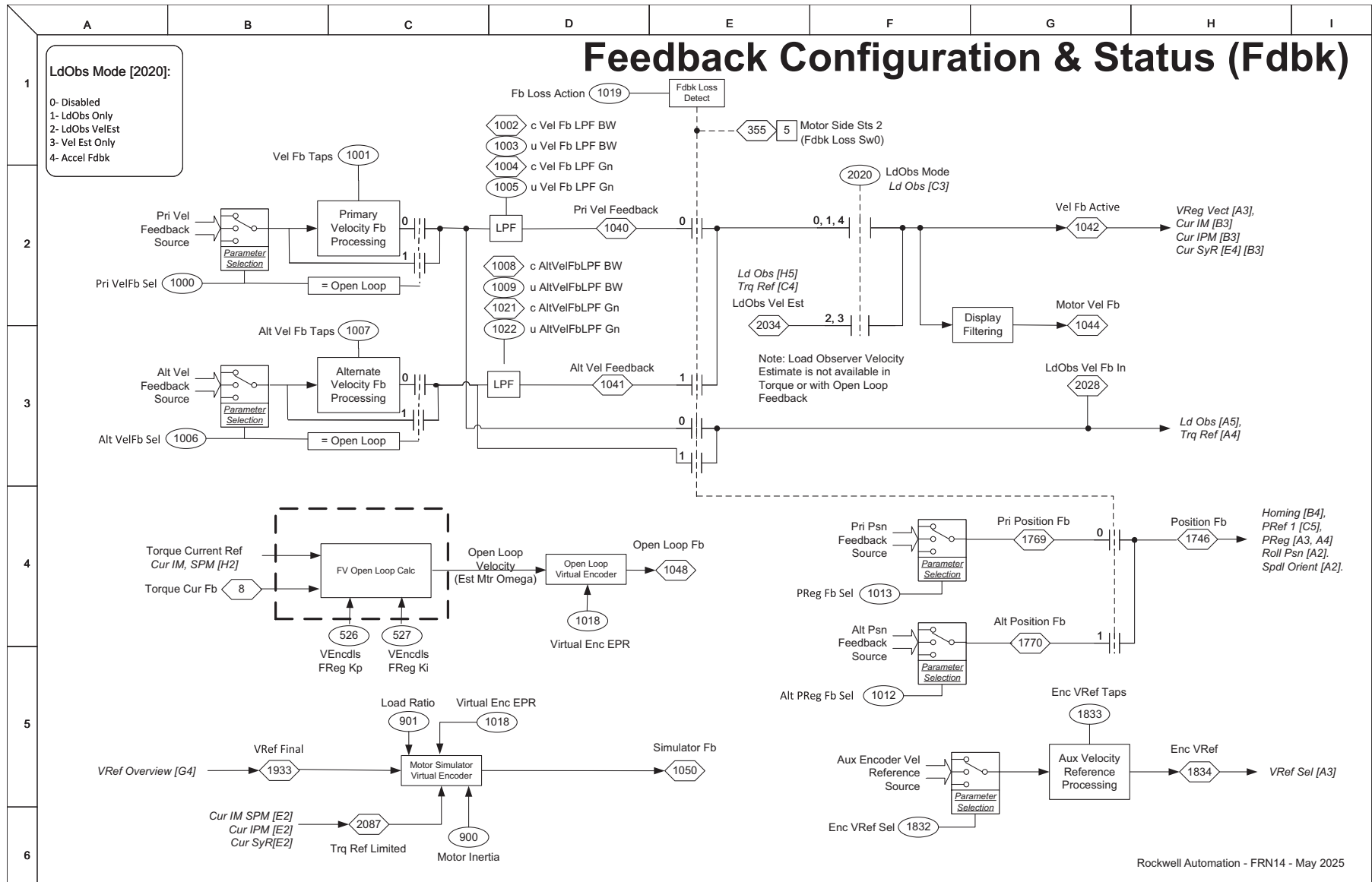


Figure 23 - Position Homing (Homing)

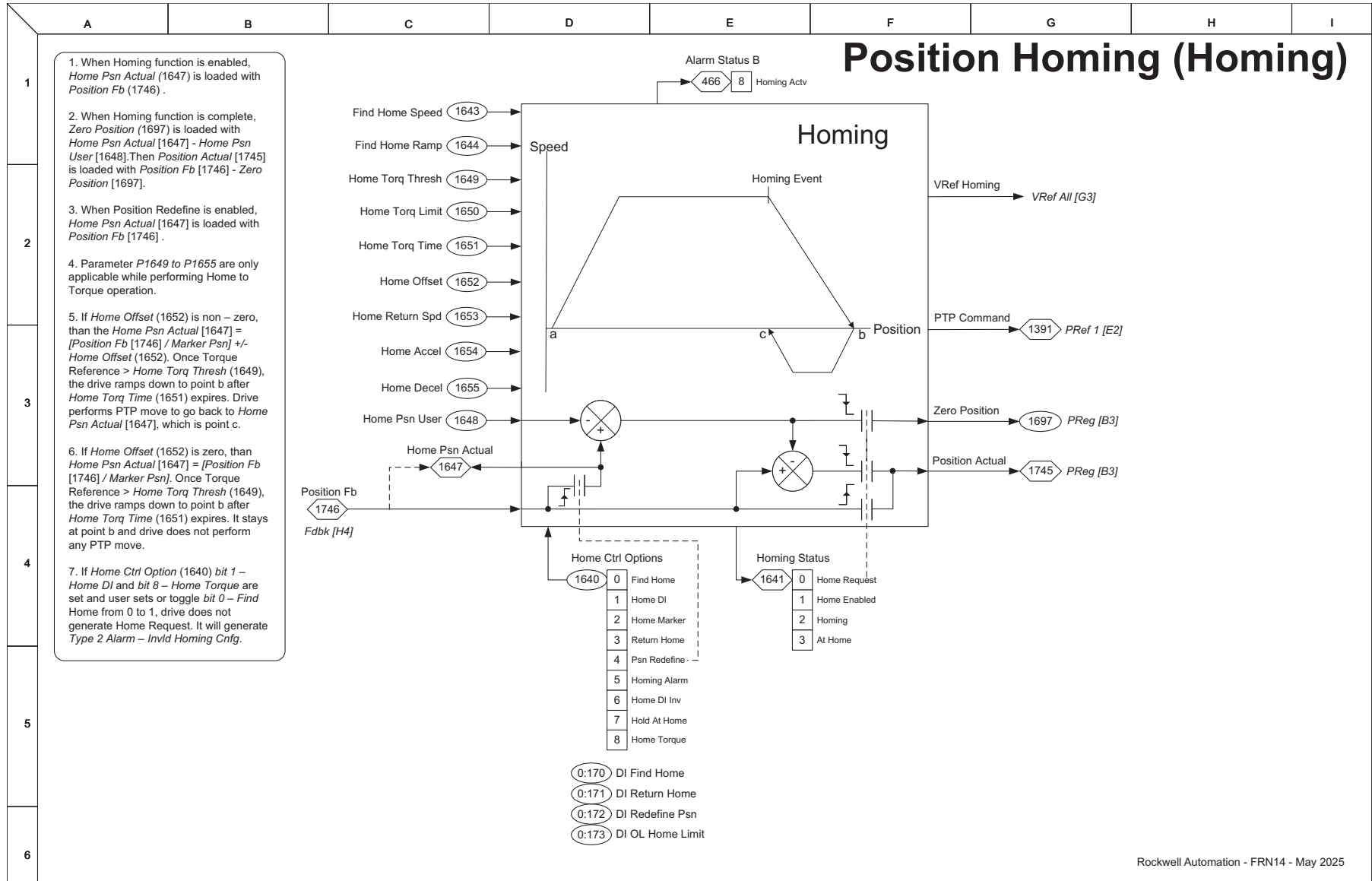
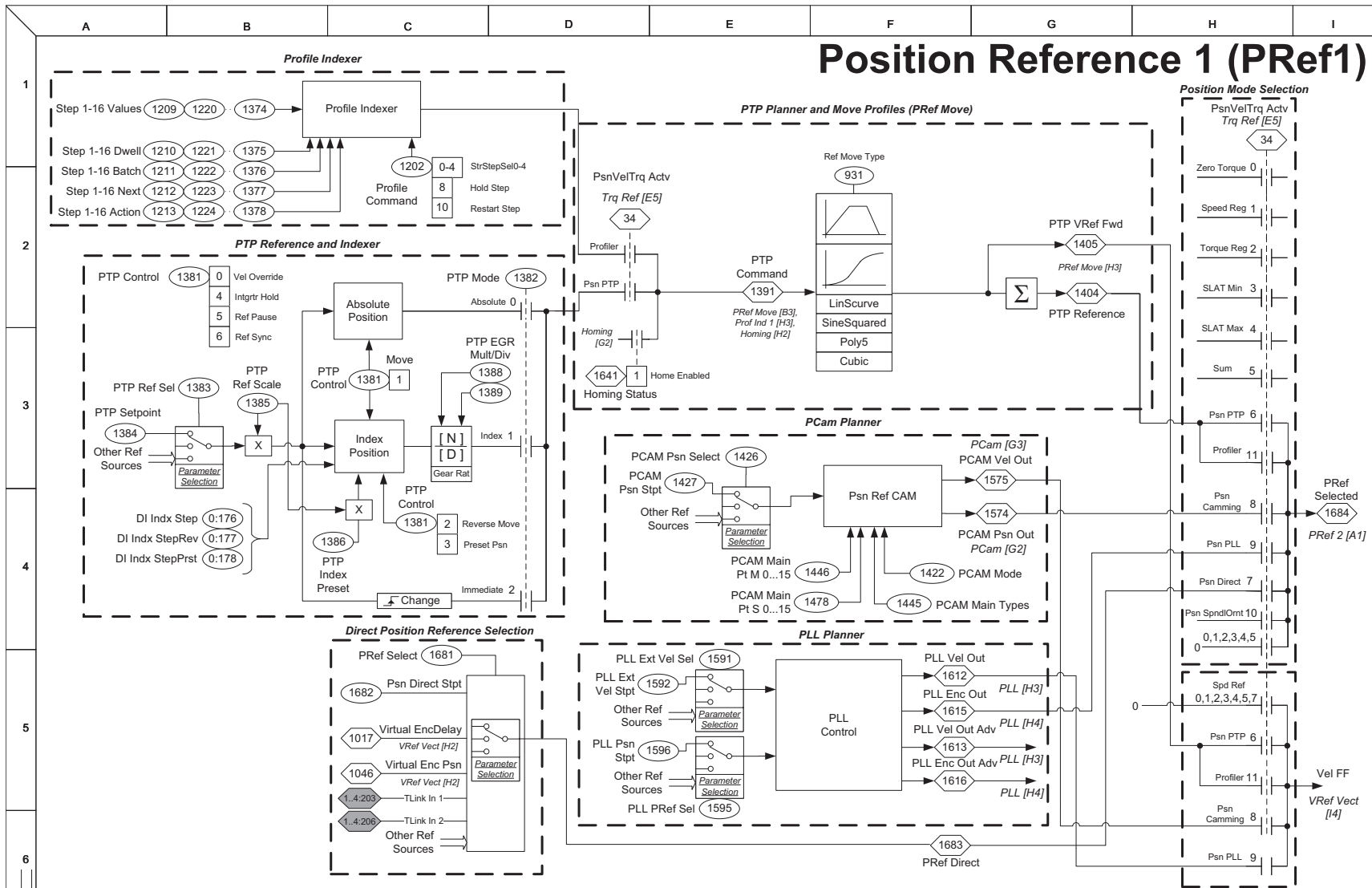


Figure 24 - Position Reference 1 (PRef1)



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Figure 25 - PTP Position Reference - Move Profiles (PRef Move)

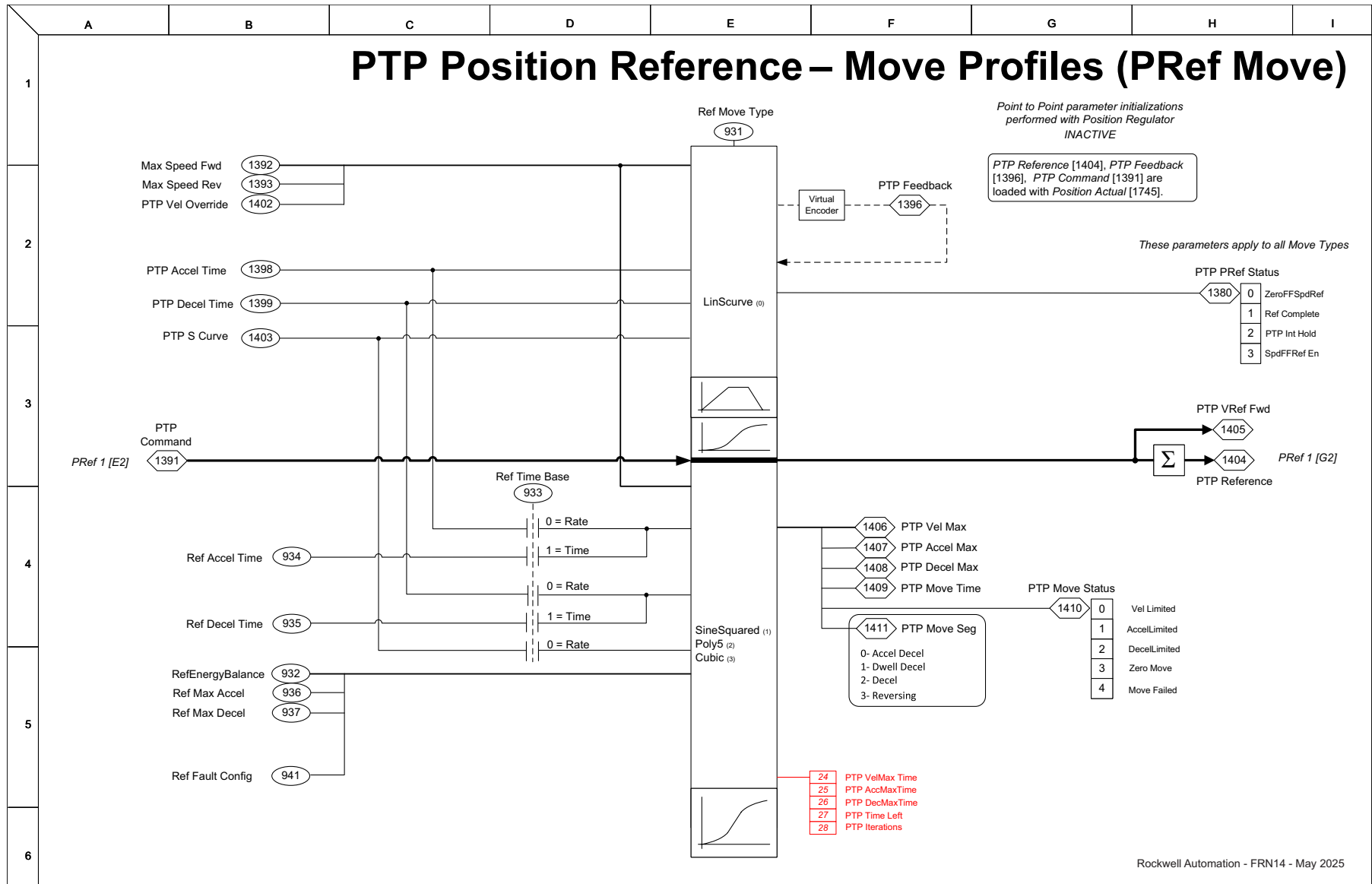
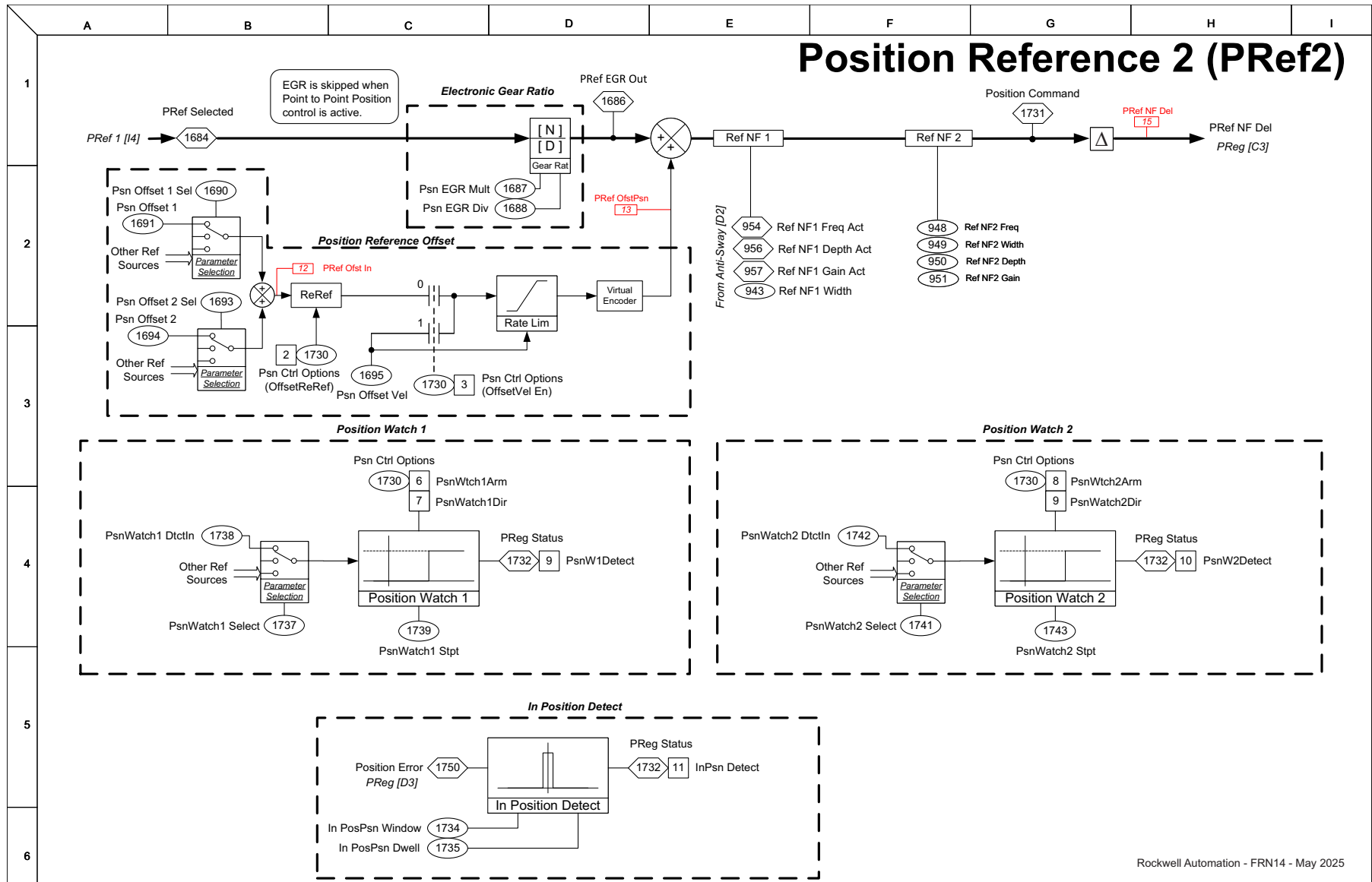
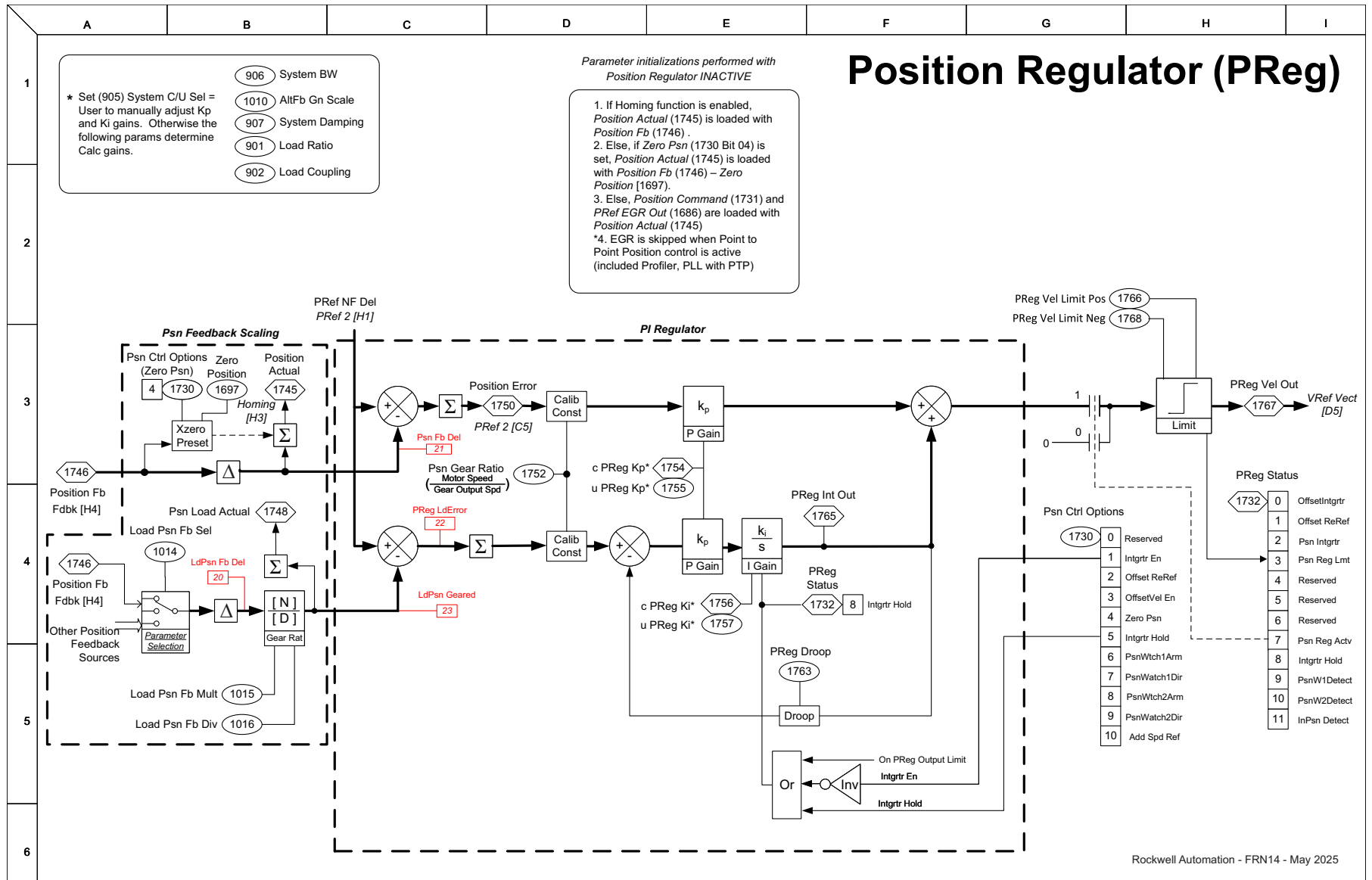


Figure 26 - Position Reference 2 (PRef2)



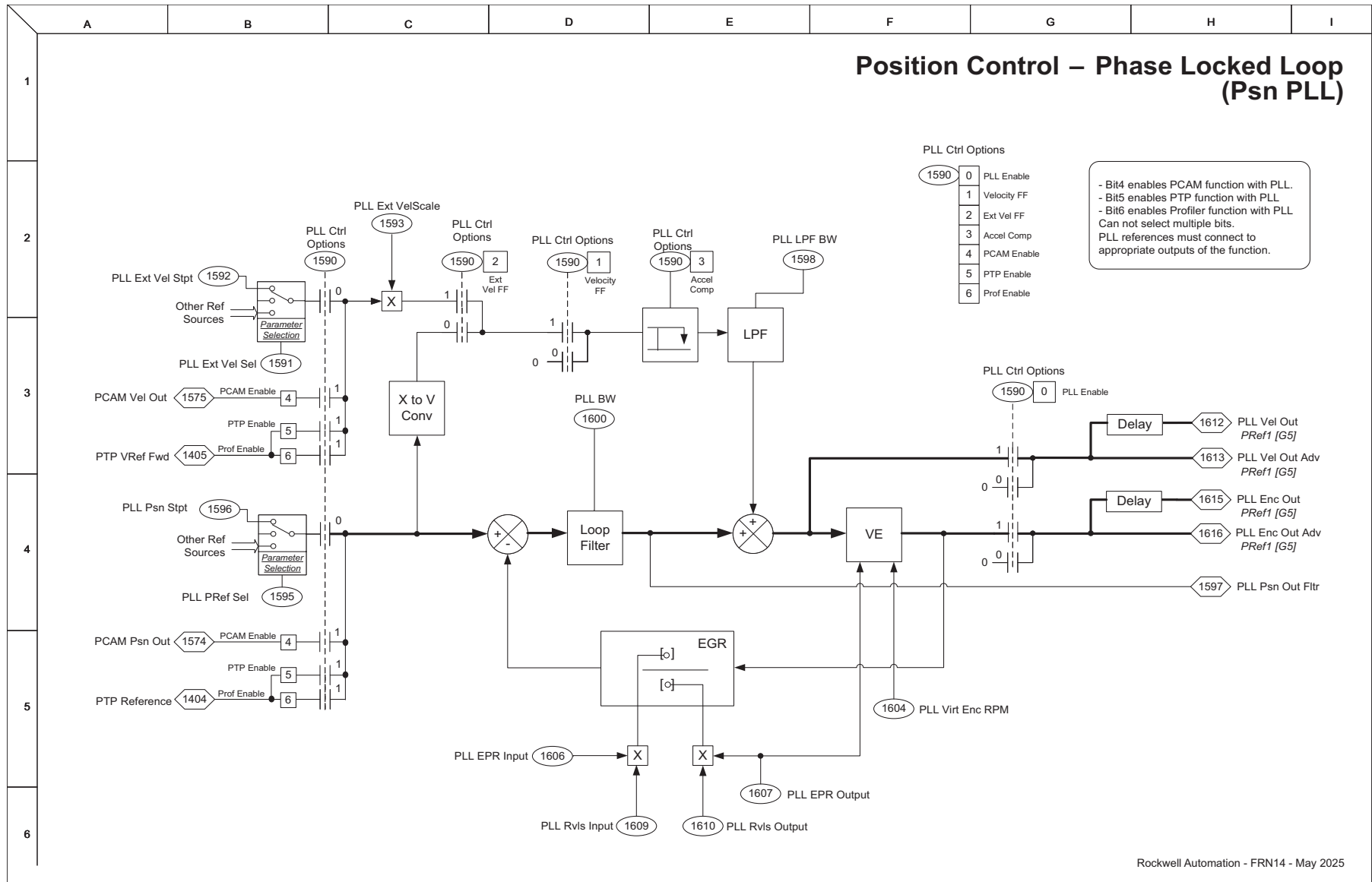
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Figure 27 - Position Regulator (PReg)



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Figure 28 - Position Control - Phase Locked Loop (Psn PLL)



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Figure 29 - Position Control - Position Reference CAM (Psn Ref CAM)

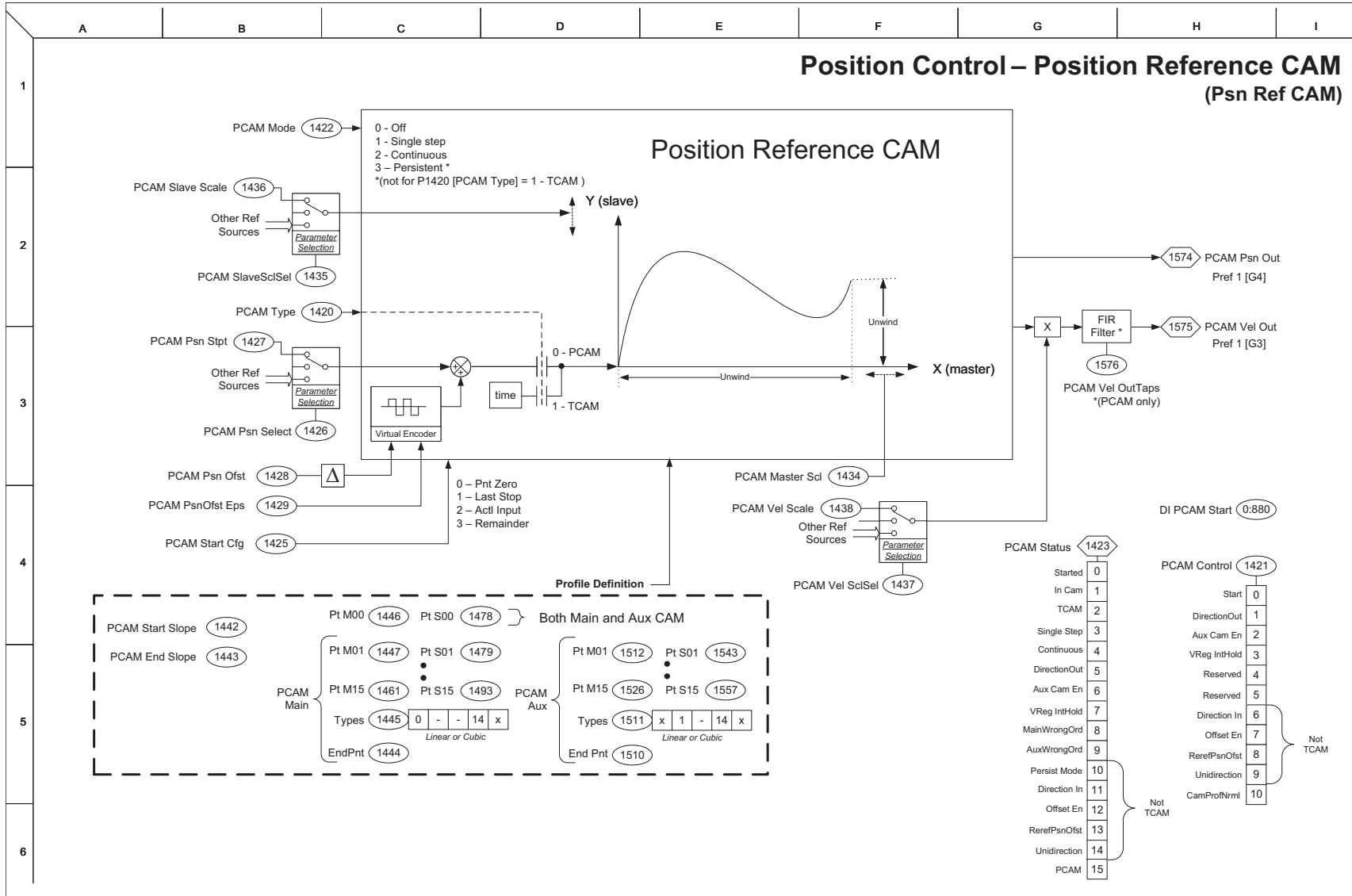


Figure 30 - Position Control - Profiler/Indexer 1 (Prof Ind 1)

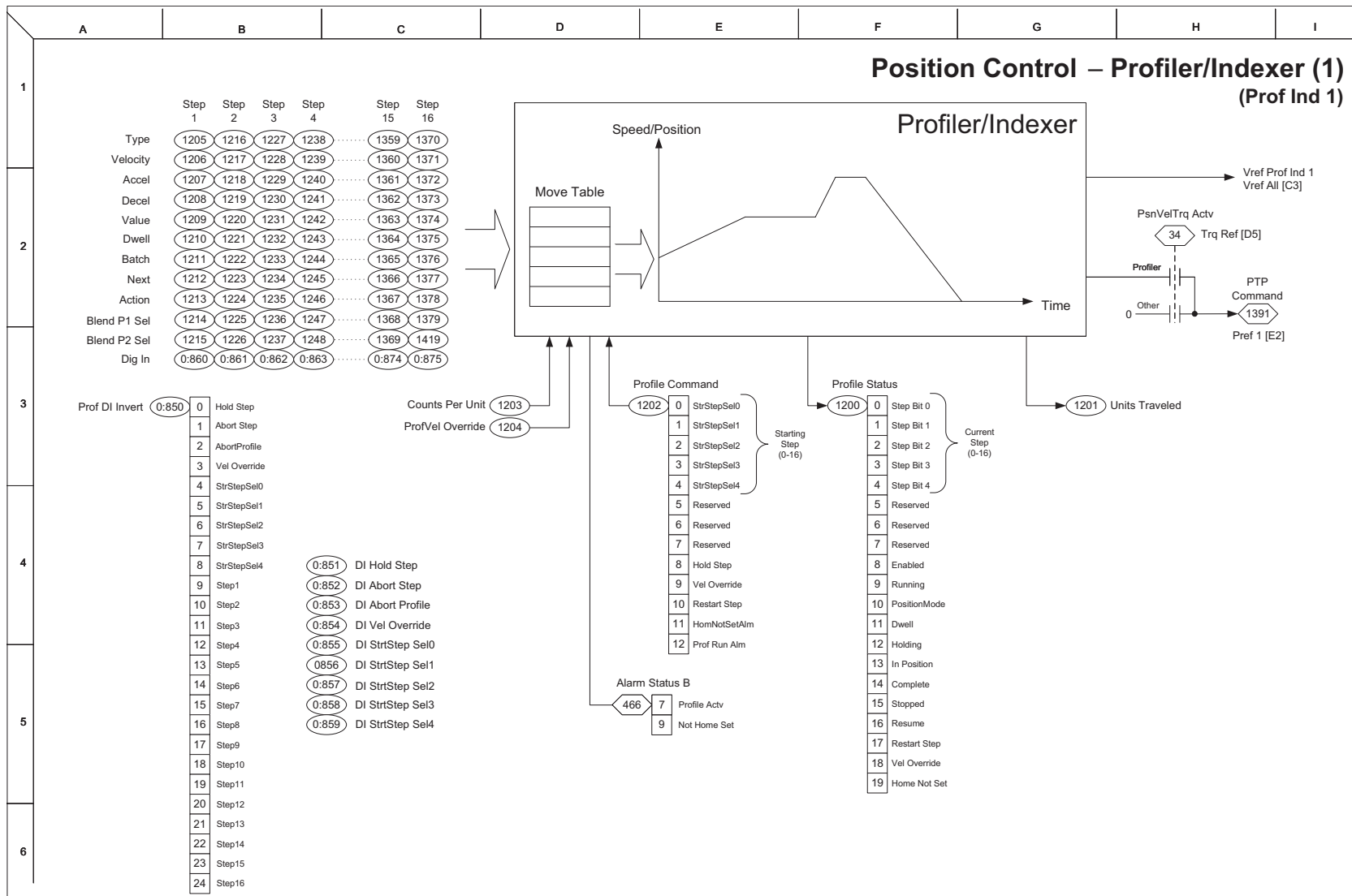


Figure 31 - Position Control - Profiler/Indexer 2 (Prof Ind 2)

	A	B	C	D	E	F	G	H	I
1	Position Control – Profiler/Indexer (2) (Prof Ind 2)								
2	Type = Position Absolute (Posit Abs)								
	Action	Posit Blend	Time Blend	Param Blend	Digin Blend	(+/-) Wait Digin	Step to Next	End	
	Velocity	Move vel	N/A	N/A	N/A	Move vel	Move vel	N/A	
	Accel	Move accel	N/A	N/A	N/A	Move accel	Move accel	N/A	
	Decel	Move decel	N/A	N/A	N/A	Move decel	Move decel	N/A	
	Value	Absolute Target pos	N/A	N/A	N/A	Absolute Target pos	Absolute Target pos	N/A	
	Dwell	N/A	N/A	N/A	N/A	Dwell Time	Dwell Time	Dwell Time	
	Batch	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
	Next	Next Step	N/A	N/A	N/A	Next Step	Next Step	N/A	
	Next Step Condition	Position > Value	N/A	N/A	N/A	Digin transition	Position > Value	Restart Indexer	
	Digin #	N/A	N/A	N/A	N/A	Digin #	N/A	N/A	
3	Type = Position Incremental (Posit Incr)								
	Action	Posit Blend	Time Blend	Param Blend	Digin Blend	(+/-) Wait Digin	Step to Next	End	
	Velocity	Move vel	N/A	N/A	N/A	Move vel	Move vel	N/A	
	Accel	Move accel	N/A	N/A	N/A	Move accel	Move accel	N/A	
	Decel	Move decel	N/A	N/A	N/A	Move decel	Move decel	N/A	
	Value	Incremental Target pos	N/A	N/A	N/A	Incremental Target pos	Incremental Target pos	N/A	
	Dwell	N/A	N/A	N/A	N/A	Dwell Time	Dwell Time	Dwell Time	
	Batch	N/A	N/A	N/A	N/A	Batch #	Batch #	N/A	
	Next	Next Step	N/A	N/A	N/A	Next Step	Next Step	N/A	
	Next Step Condition	Position > Value	N/A	N/A	N/A	Digin transition	Position > Value	Restart Indexer	
	Digin #	N/A	N/A	N/A	N/A	Digin #	N/A	N/A	
4	Type = Speed Profile								
	Action	Posit Blend	Time Blend	Param Blend	Digin Blend	(+/-) Wait Digin	Step to Next	End	
	Velocity	Move vel	Move vel	Move vel	Move Vel	Move vel	Move vel	N/A	
	Accel	Move accel	Move accel	Move accel	Move accel	Move accel	Move accel	N/A	
	Decel	Move decel	Move decel	Move decel	Move decel	Move decel	Move decel	N/A	
	Value	Incremental Target pos	Total Time	Compare Param # (+/-)	N/A	Total Time	Total Time	N/A	
	Dwell	N/A	N/A	Compare Param # (+/-)	Dwell Time	Dwell Time	Dwell Time	Dwell Time	
	Batch	N/A	N/A	N/A	Batch #	Batch #	Batch #	N/A	
	Next	Next Step	Next Step	Next Step	Next Step	Next Step	Next Step	N/A	
	Next Step Condition	Position > Value	Time > Value	Param [Blend P1] Compare to Param [Blend P2]	Digin [Value] transition	Digin transition	Time > Value	Restart Profile	
	Digin #	N/A	N/A	N/A	Digin #	Digin #	N/A	N/A	
5									
6									

Figure 32 - Position Control - Roll Position Indicator (Roll Psn)

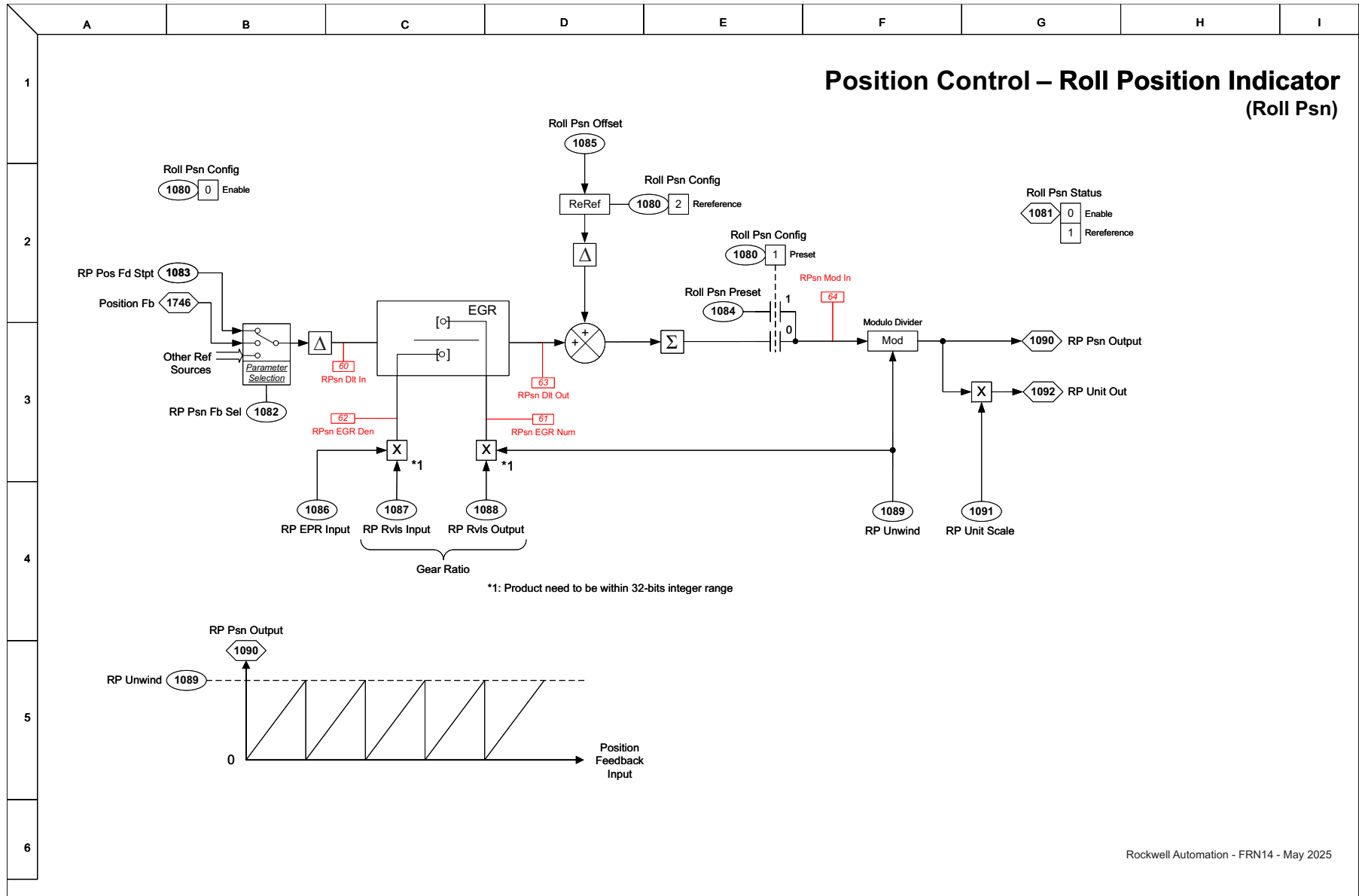


Figure 33 - Position Control - Spindle Orient (Spindle)

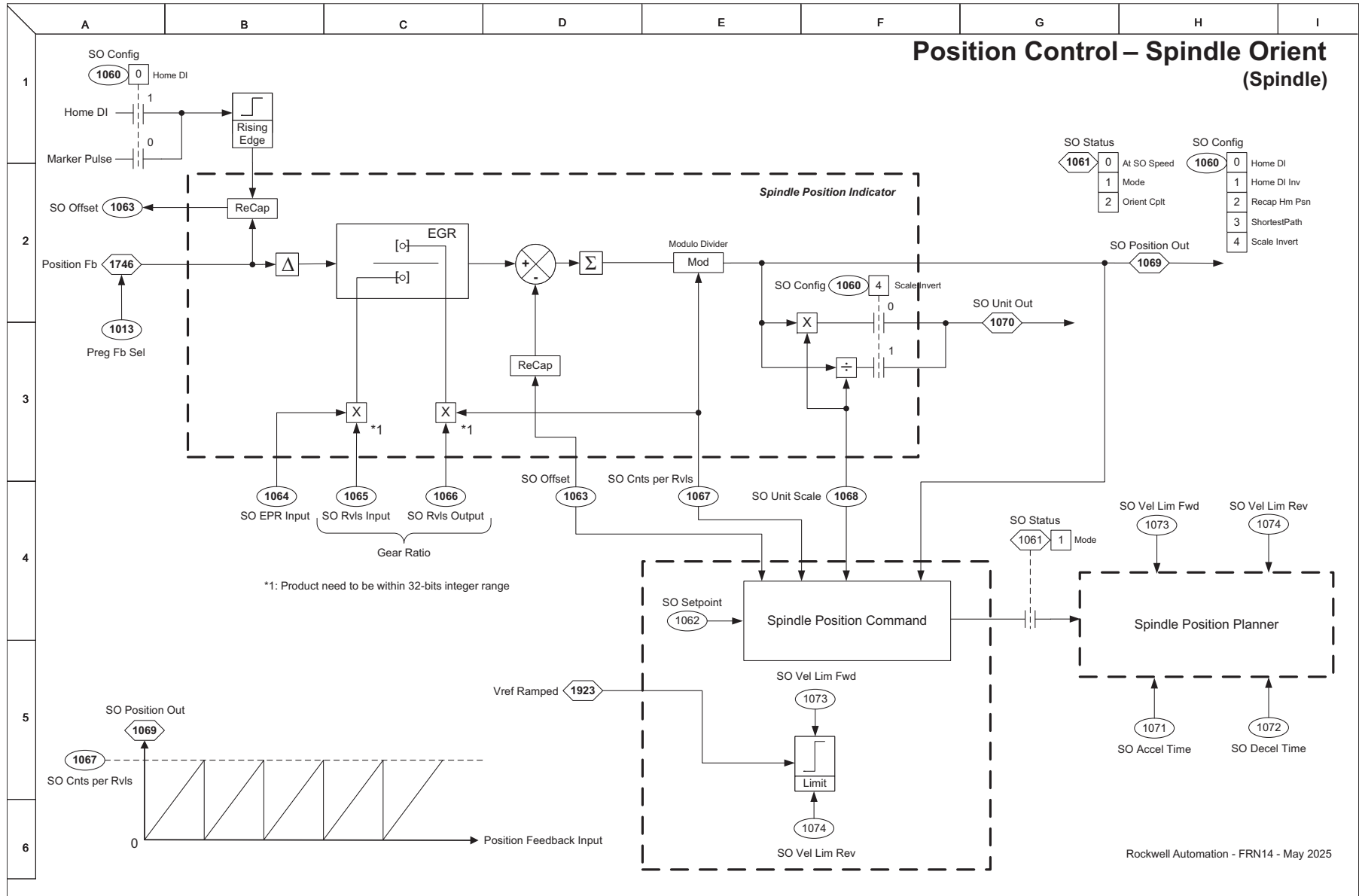


Figure 34 - Velocity Reference Overview (VRef Overview)

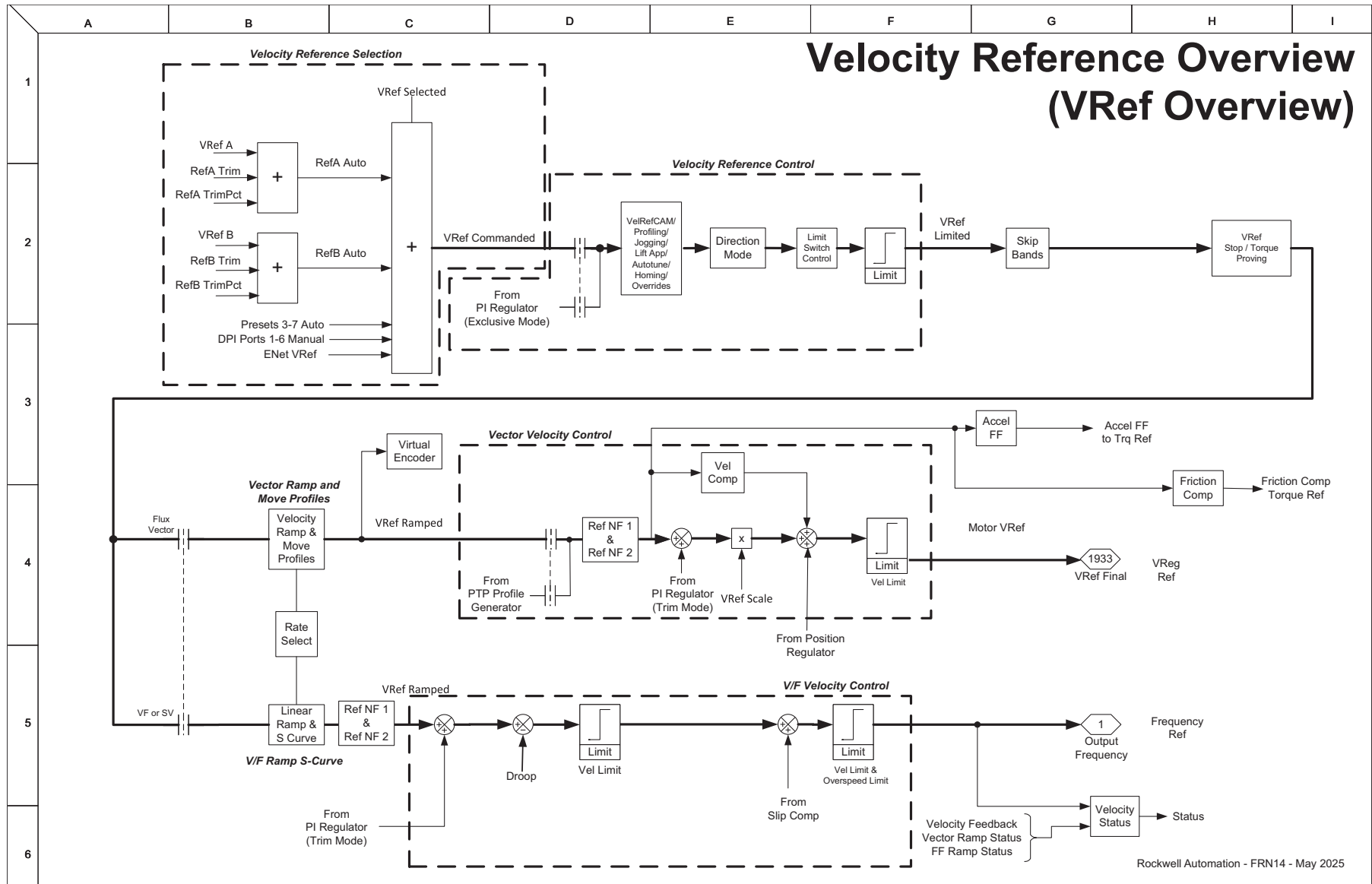


Figure 35 - Velocity Reference Selection (VRef Sel)

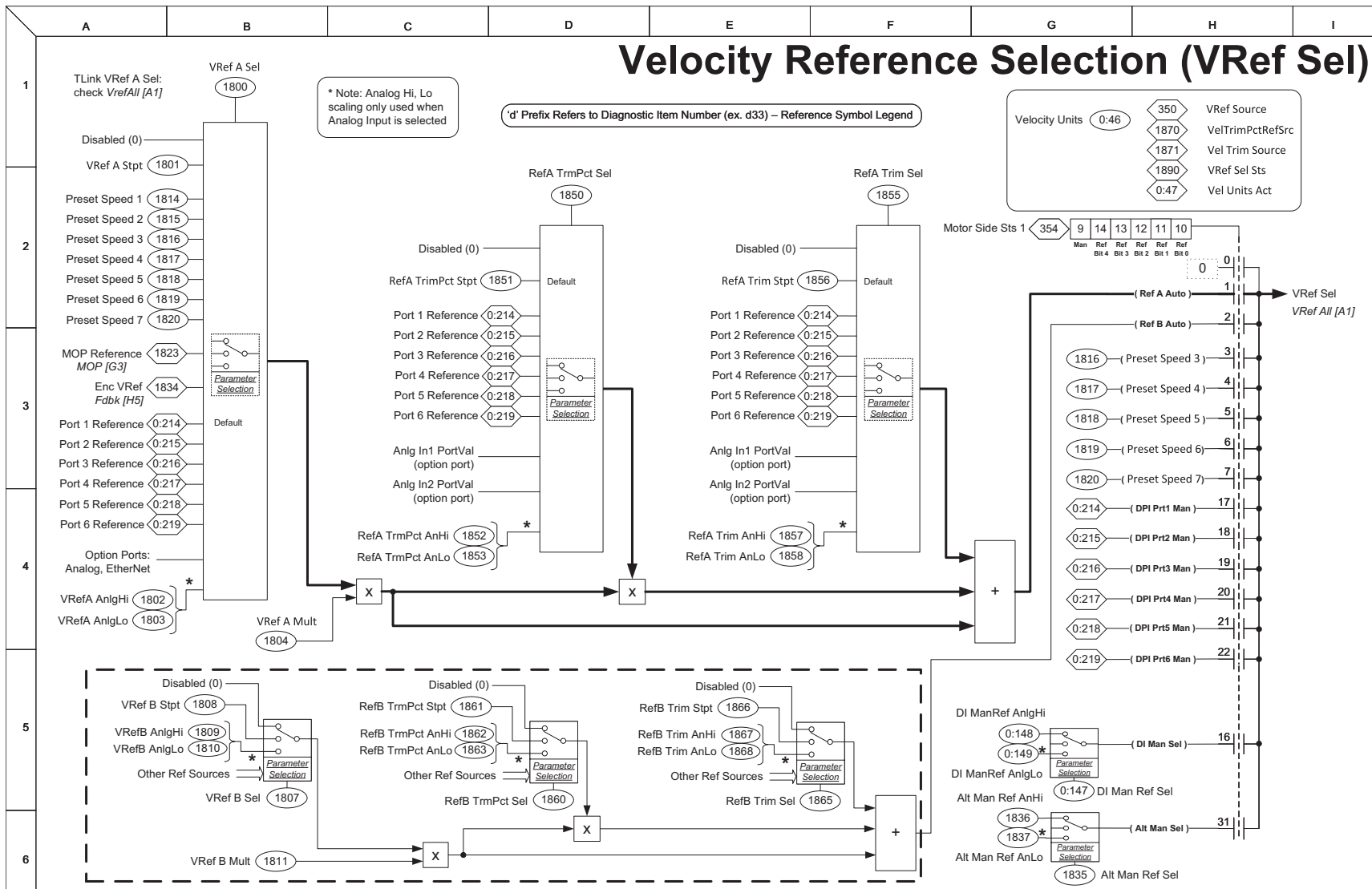
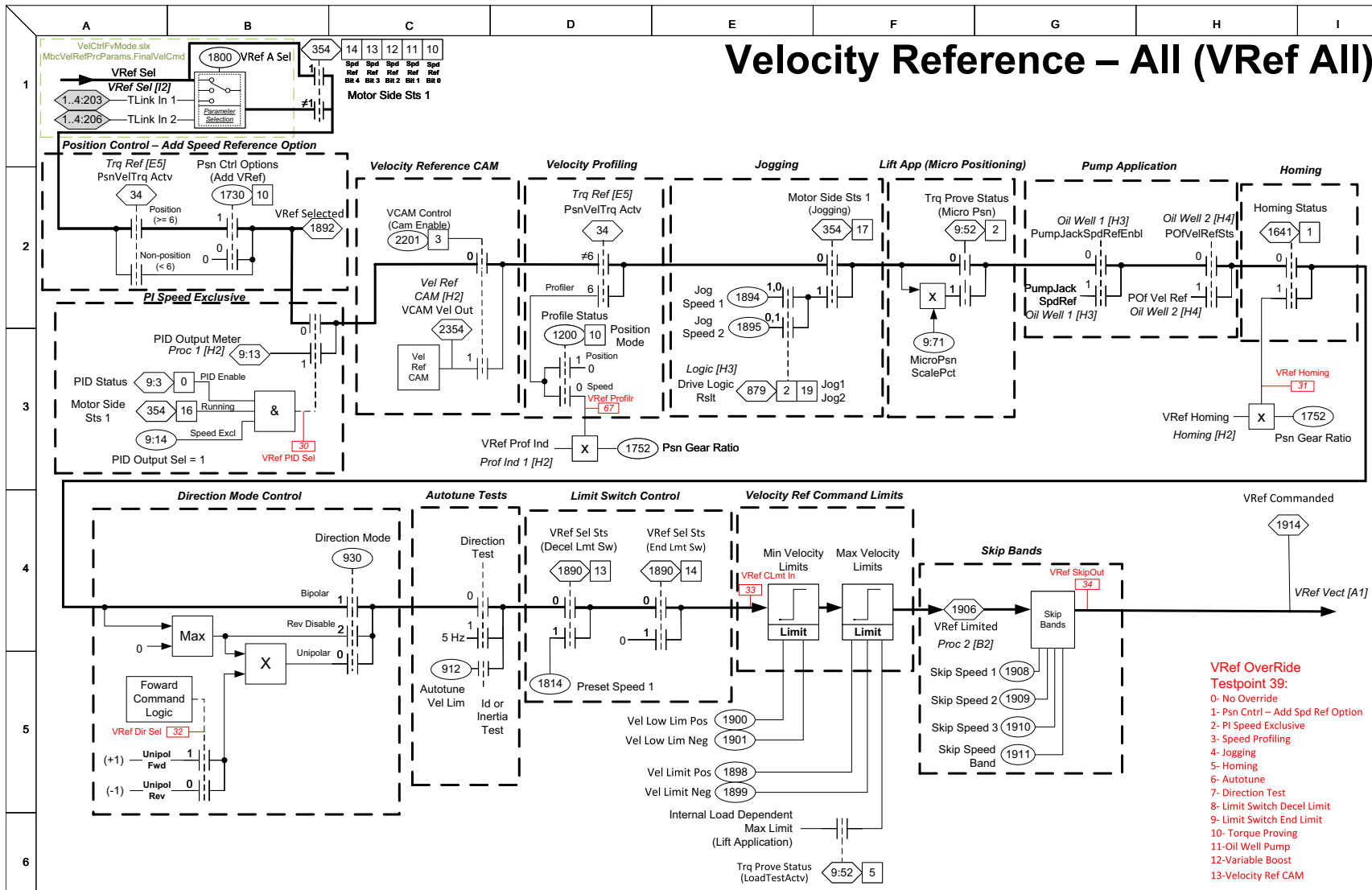
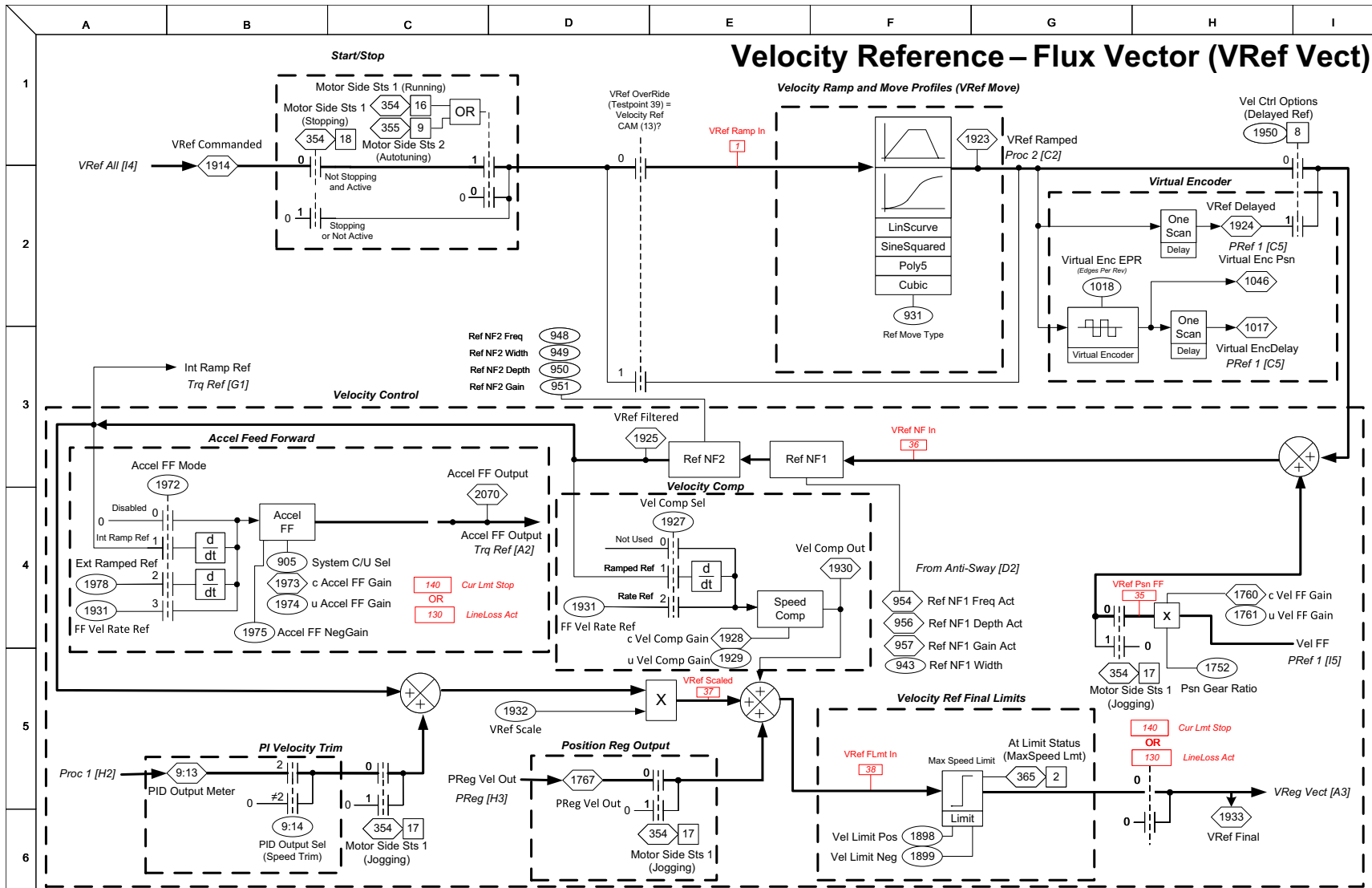


Figure 36 - Velocity Reference - All (VRef All)



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Figure 37 - Velocity Reference - Flux Vector (VRef Vect)



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Figure 38 - Velocity Reference, Flux Vector - Move Profiles (VRef Move)

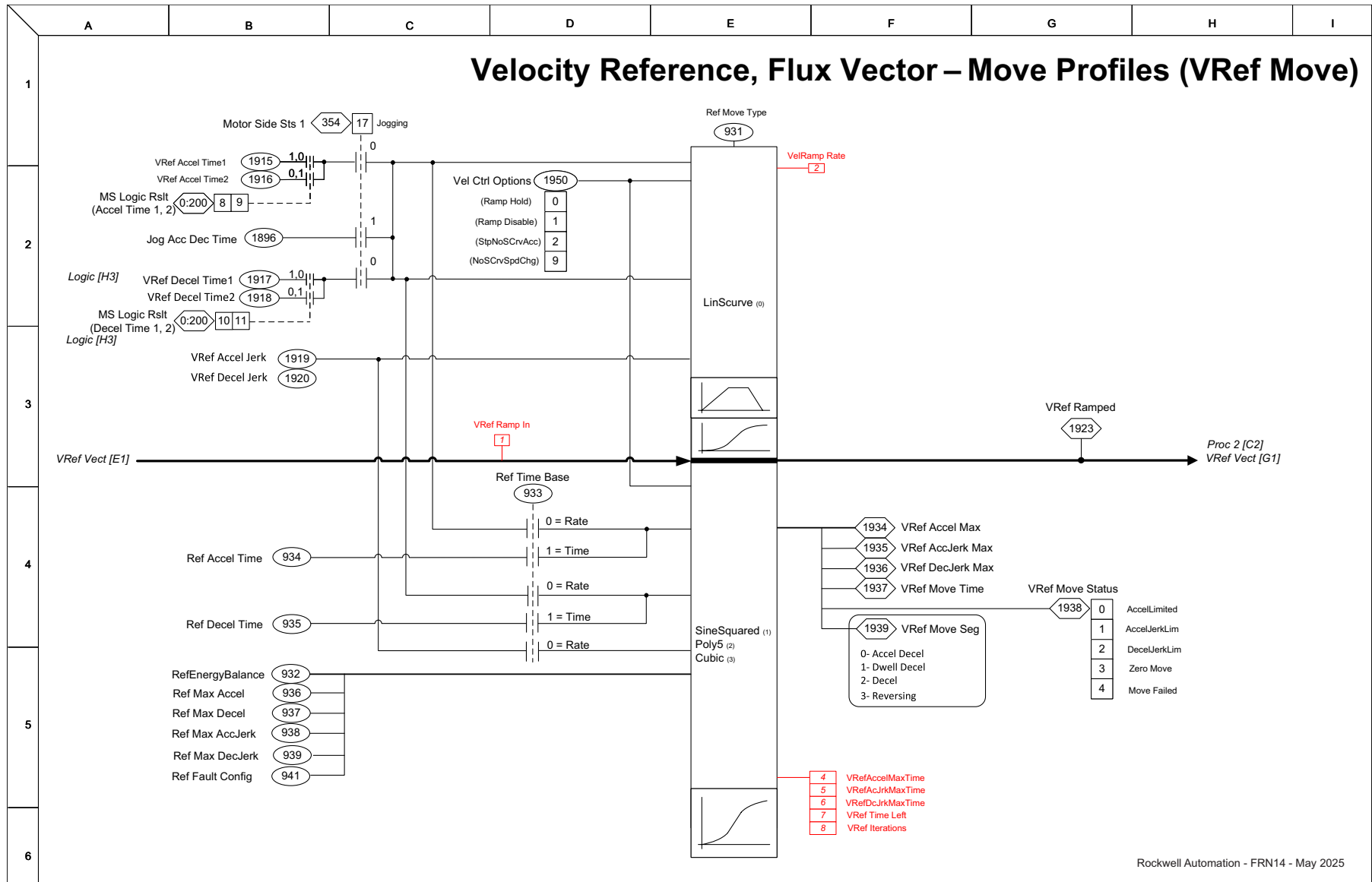


Figure 39 - Velocity Reference CAM (Vel Ref CAM)

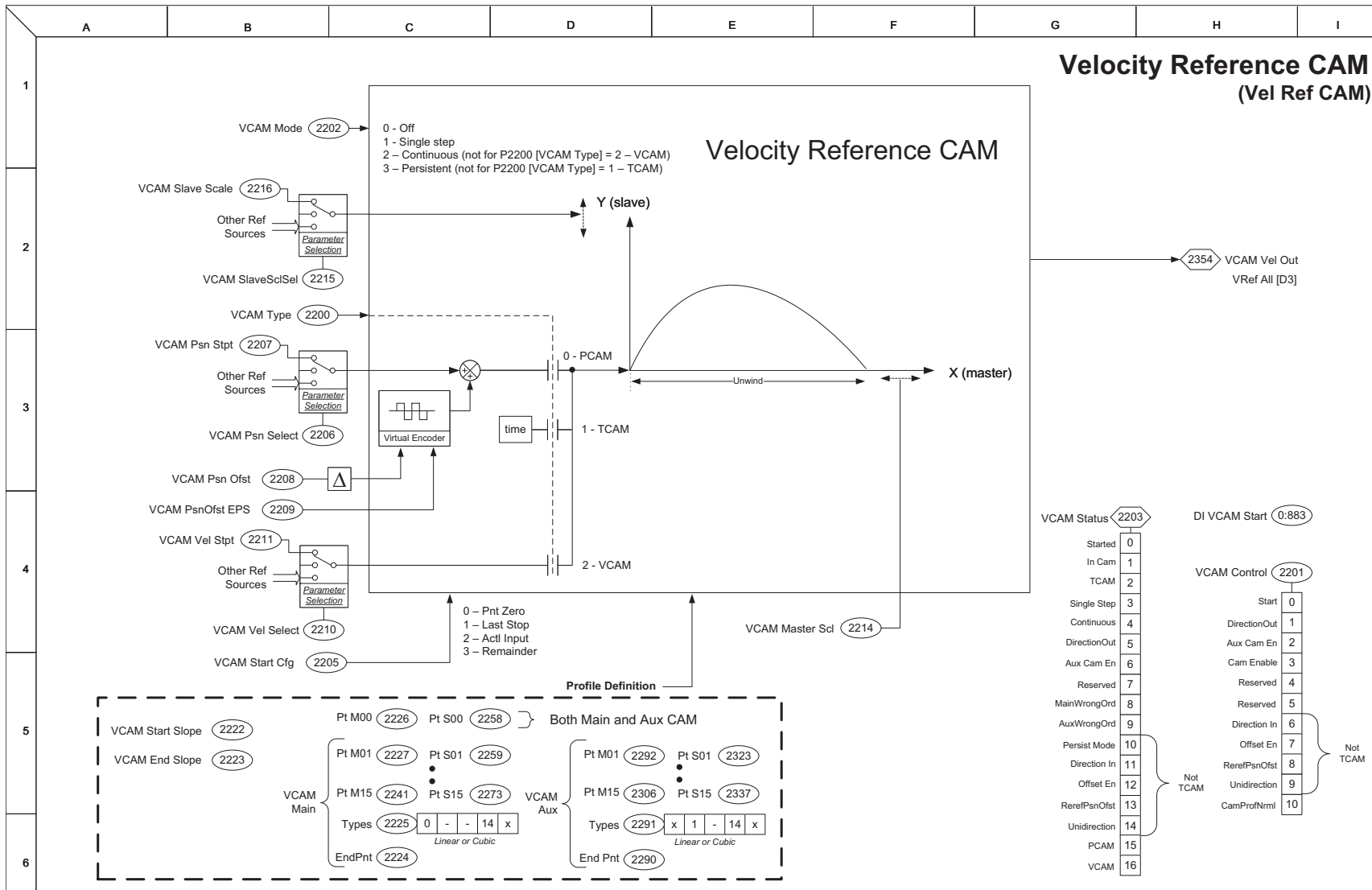
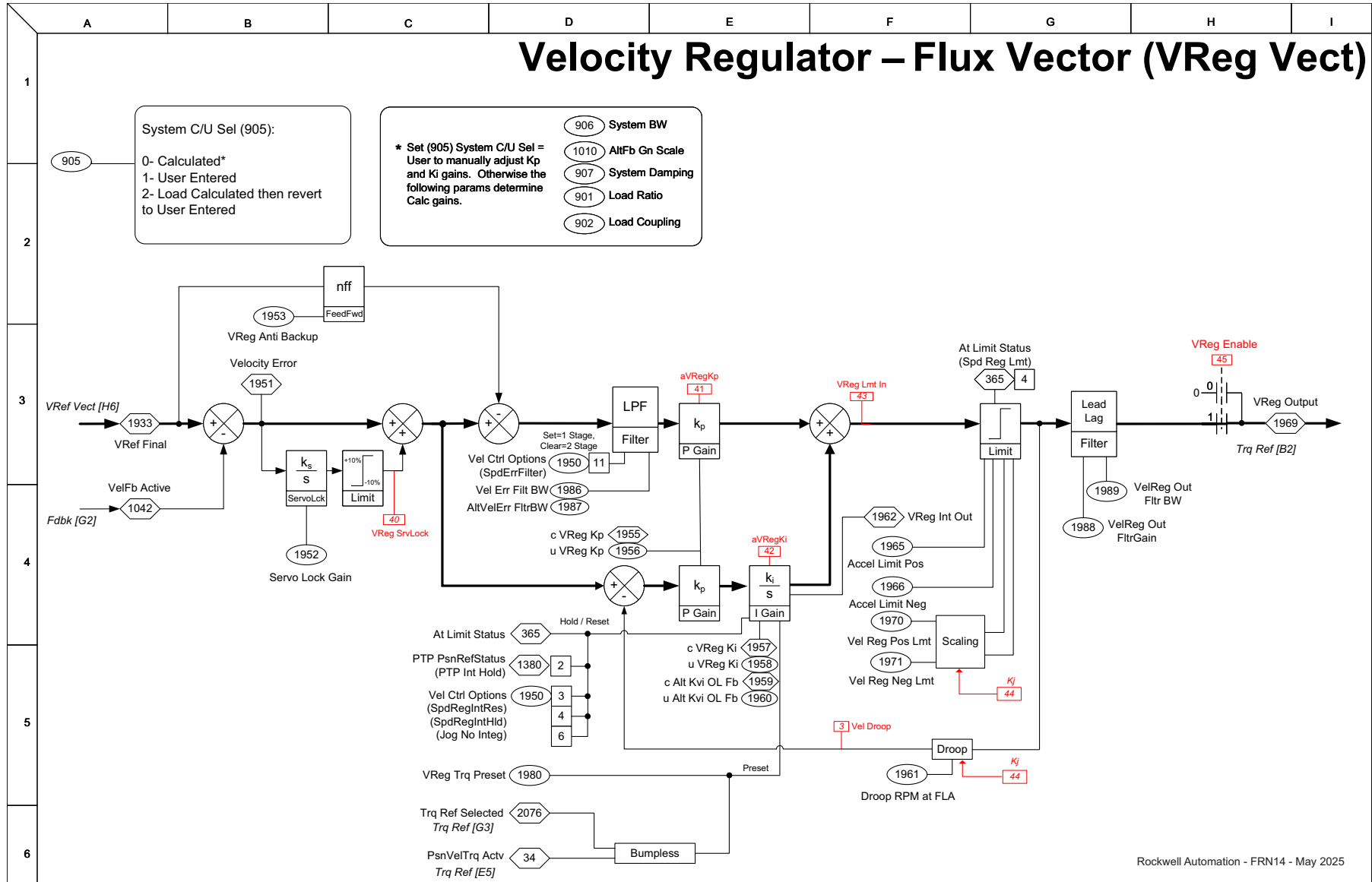


Figure 40 - Velocity Regulator - Flux Vector (VReg Vect)



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Figure 41 - Torque Overview (Trq Overview)

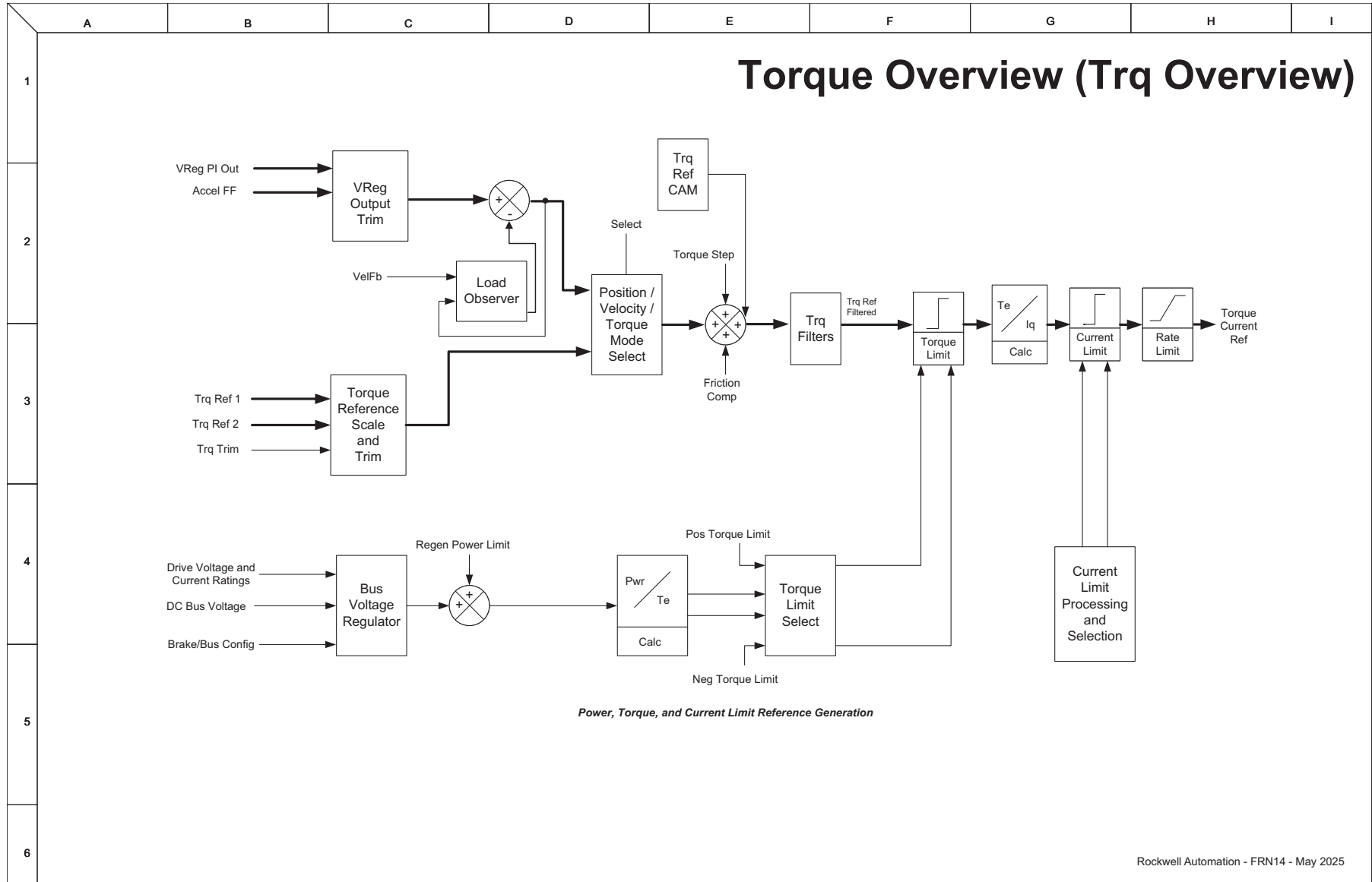
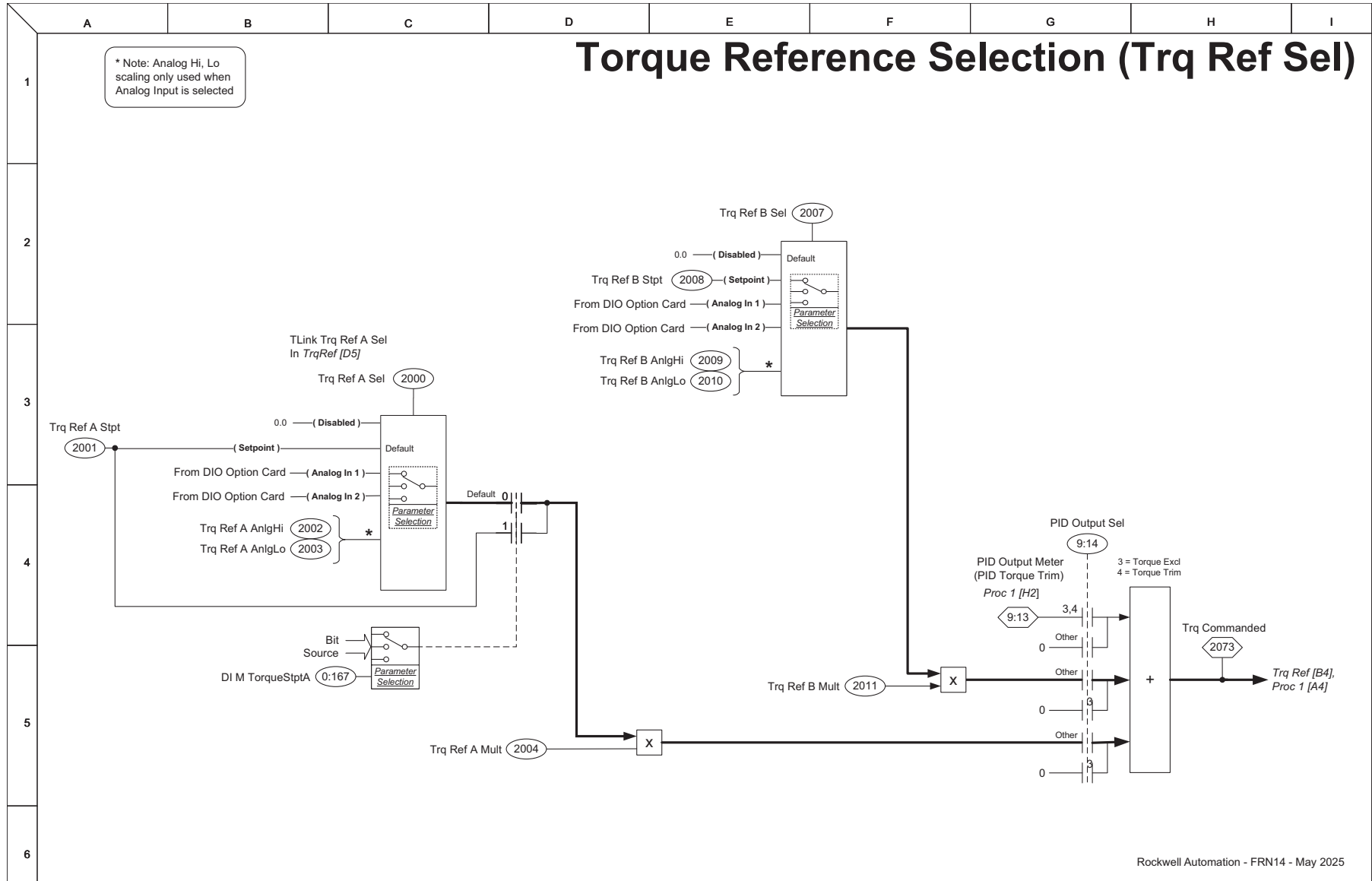
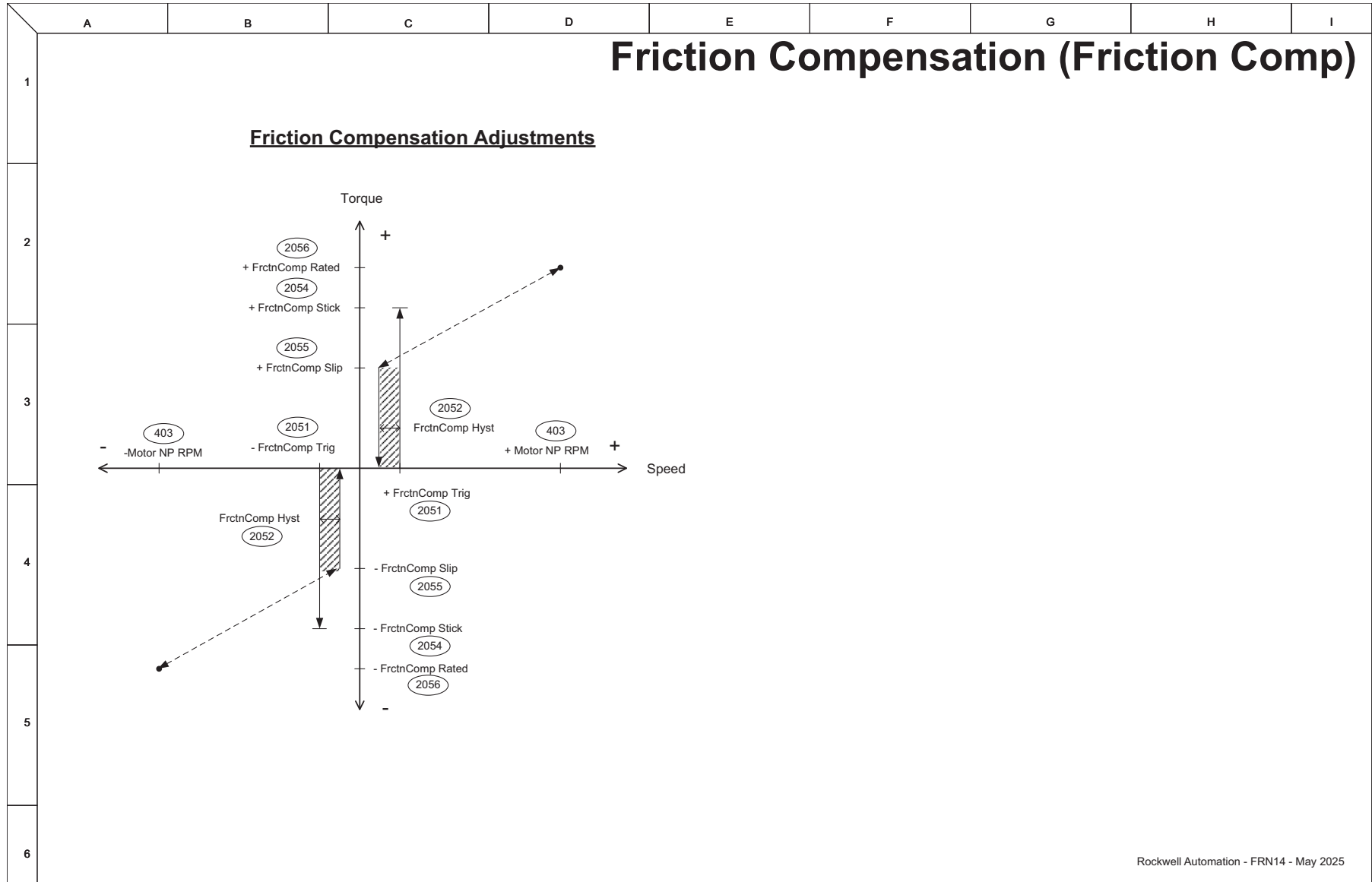


Figure 42 - Torque Reference Selection (Trq Ref Sel)



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Figure 44 - Friction Compensation (Friction Comp)



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Figure 45 - Torque Reference CAM (Trq Ref CAM)

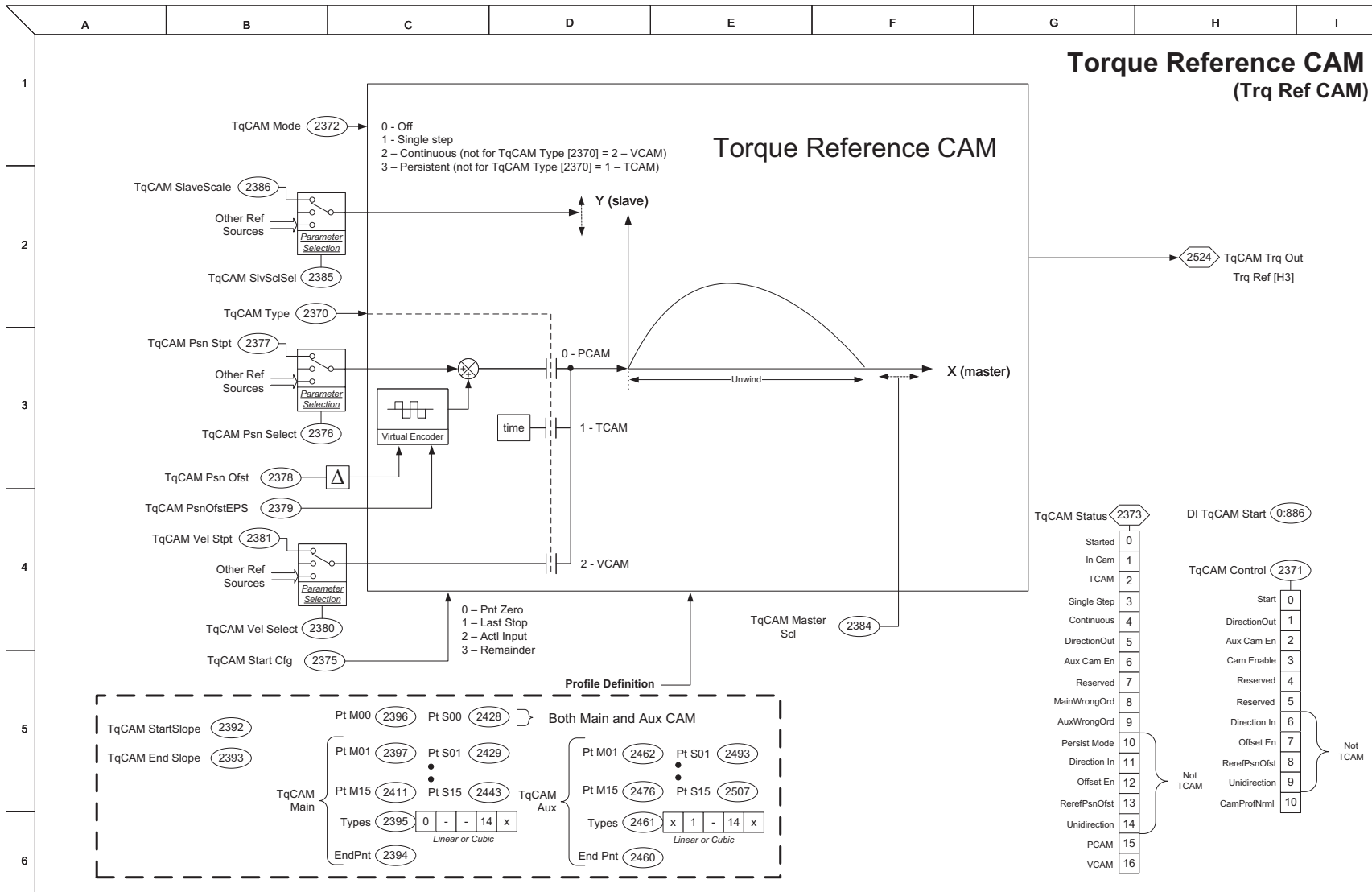


Figure 46 - Torque Reference (Trq Ref)

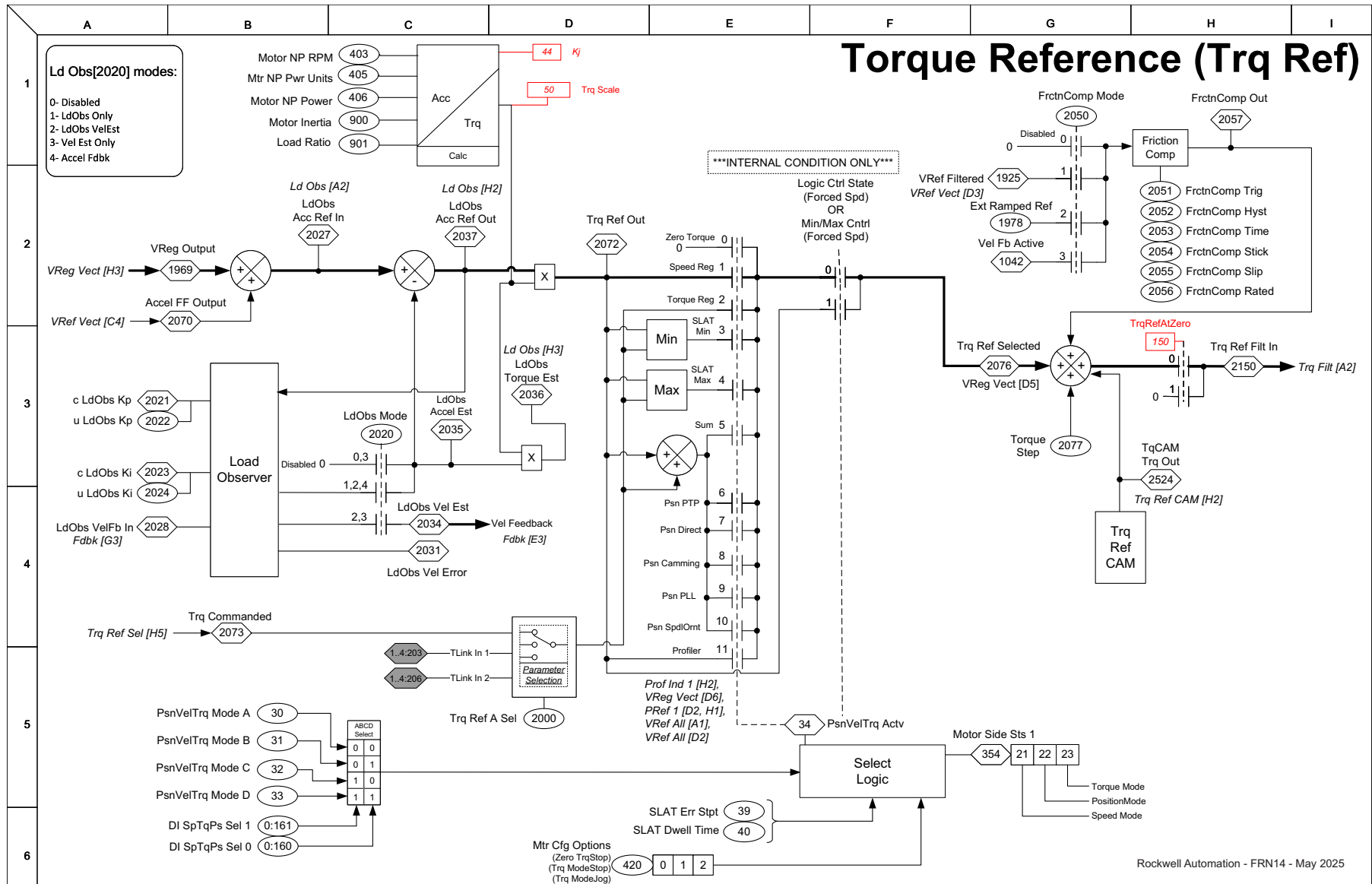


Figure 47 - Torque Filters (Trq Filt)

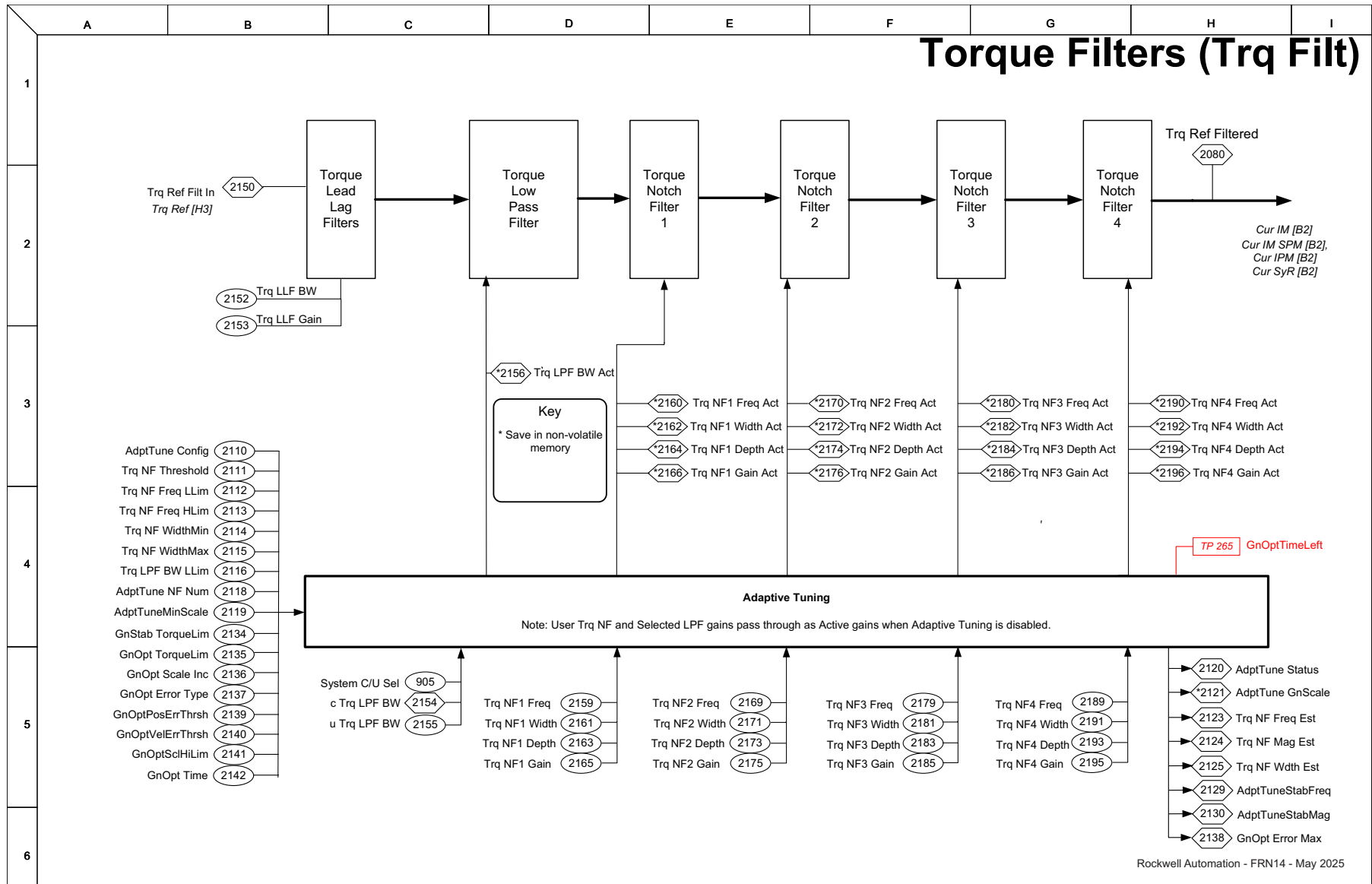
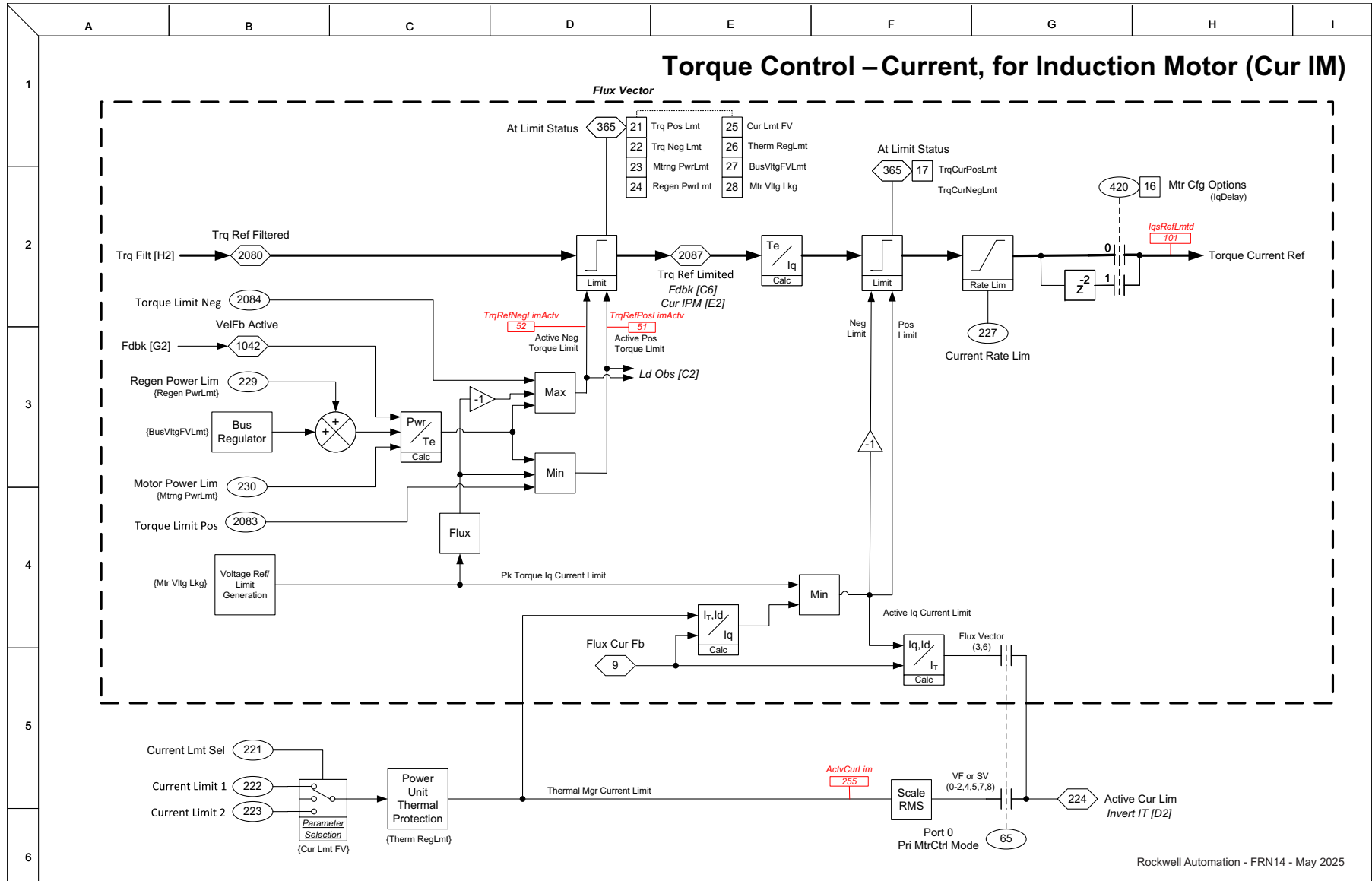


Figure 48 - Torque Control - Current, for Induction Motor (Cur IM)



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Figure 49 - Torque Control - Current, for Permanent Magnet Motor (Cur PM)

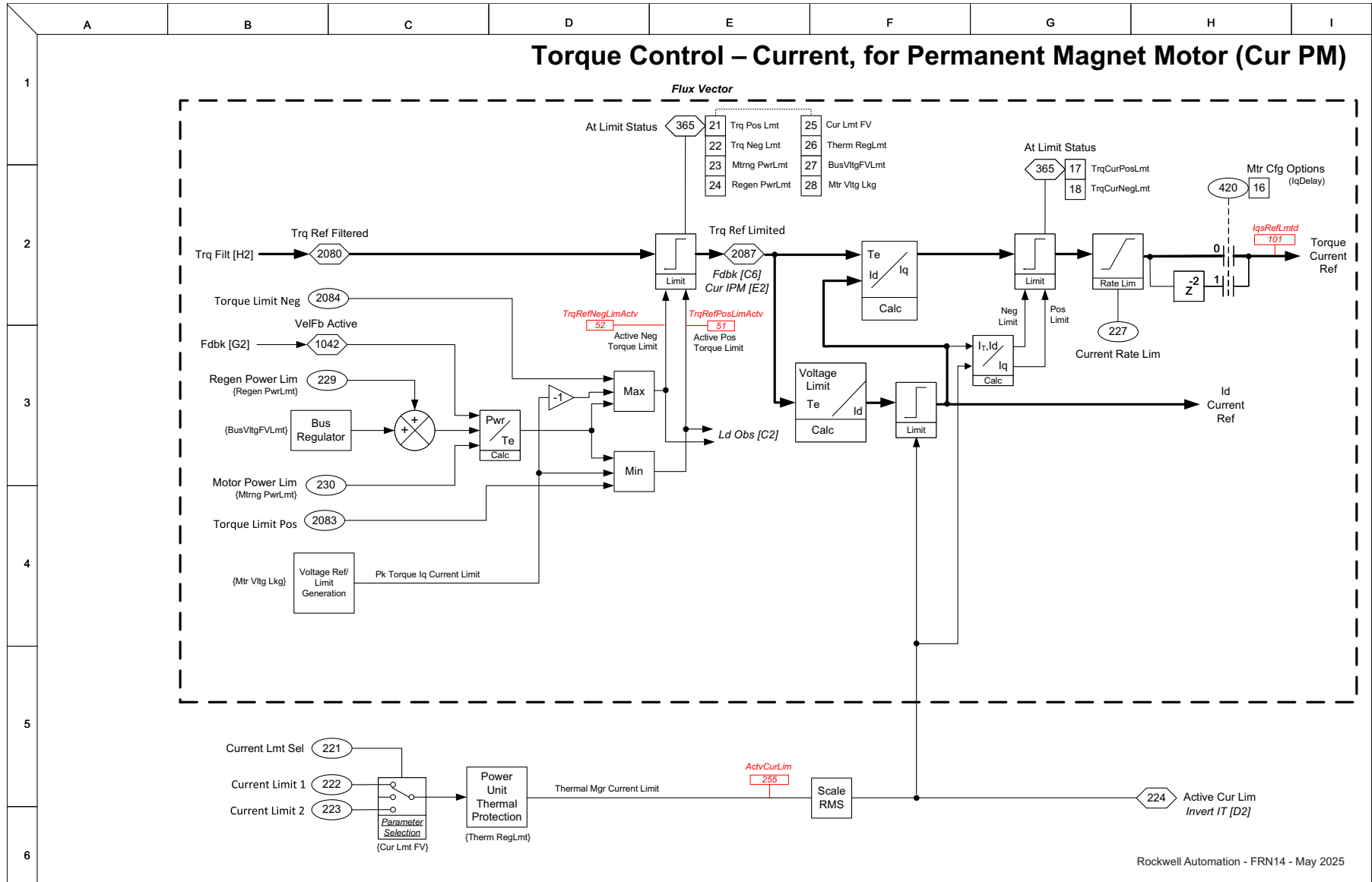


Figure 50 - Torque Control - Current, for Synchronous Reluctance Motor (Cur SyR)

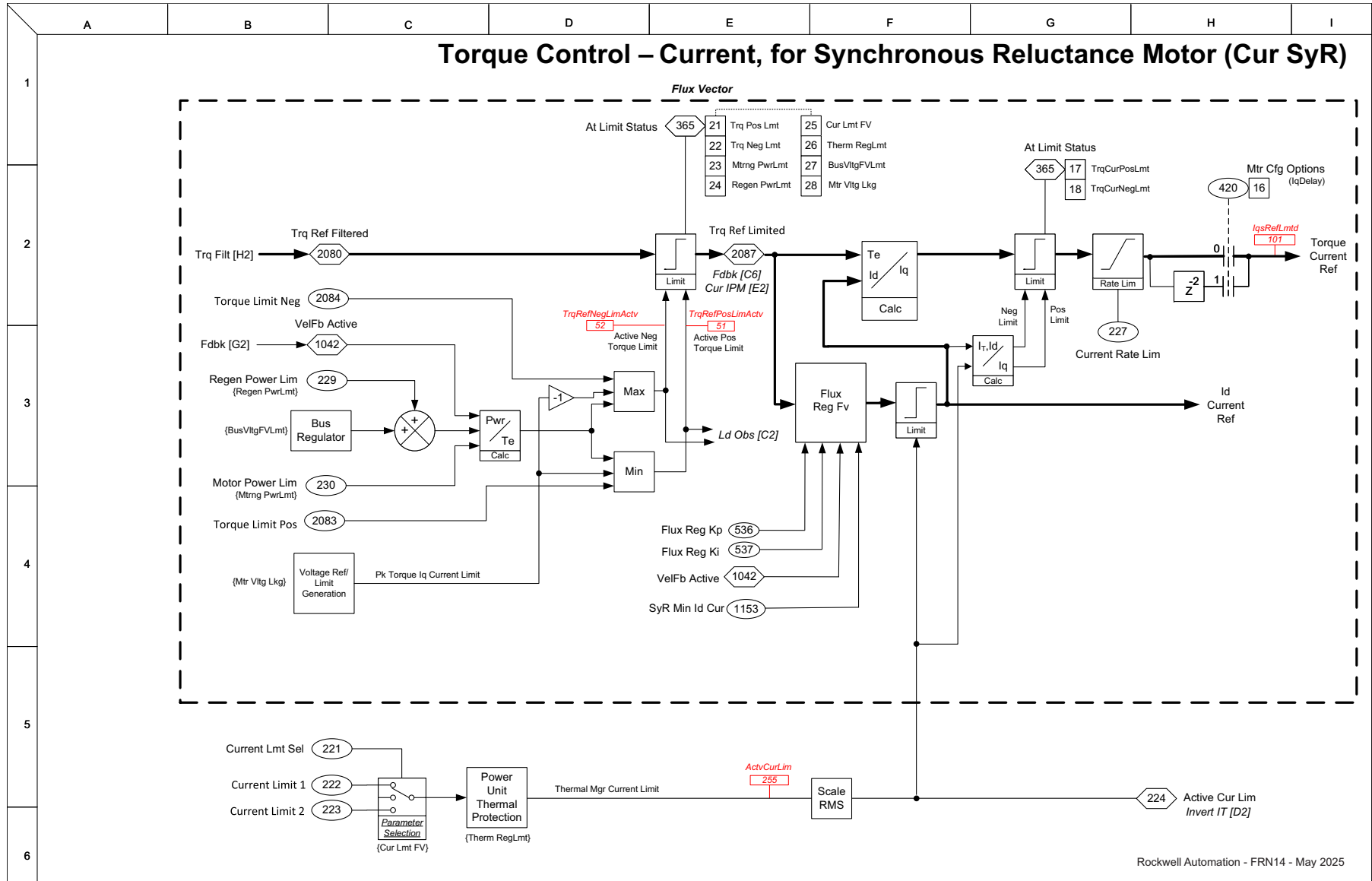
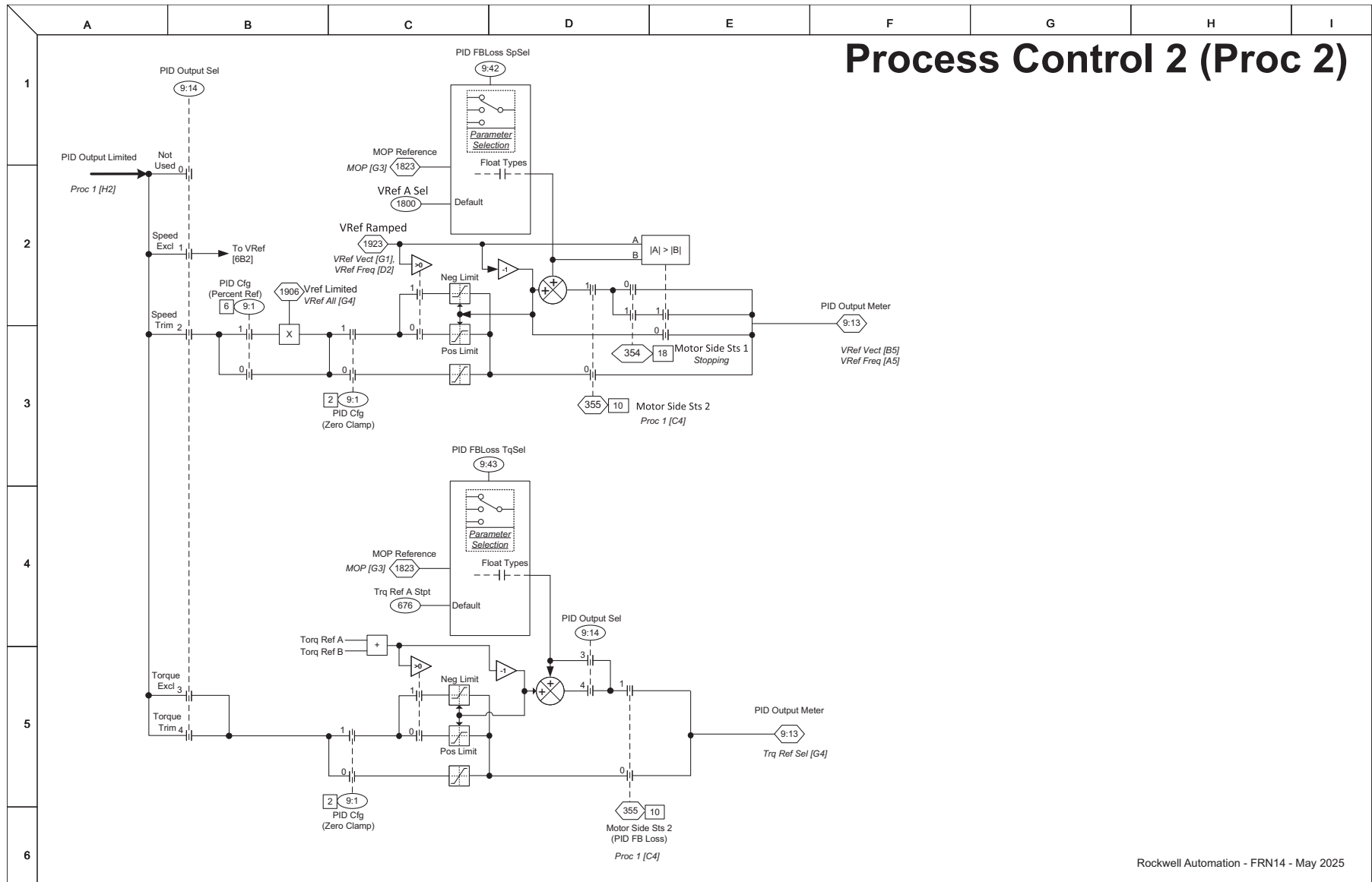


Figure 52 - Process Control 2 (Proc 2)



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Figure 53 - Reference Notch Filter 1 Tuning for Crane Application (Anti-Sway)

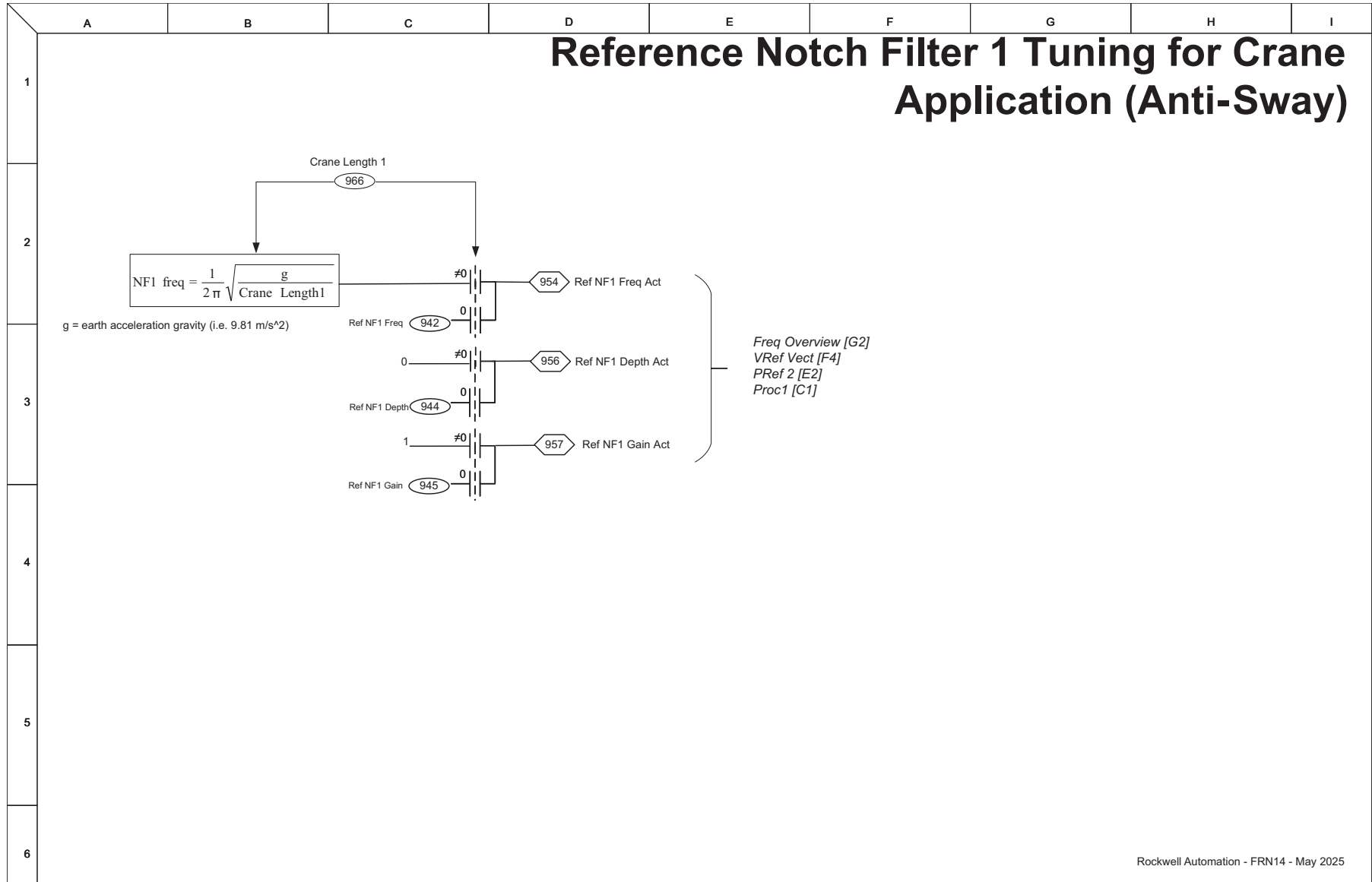


Figure 54 - Pump Jack and Progressive Cavity Pump (Oil Well 1)

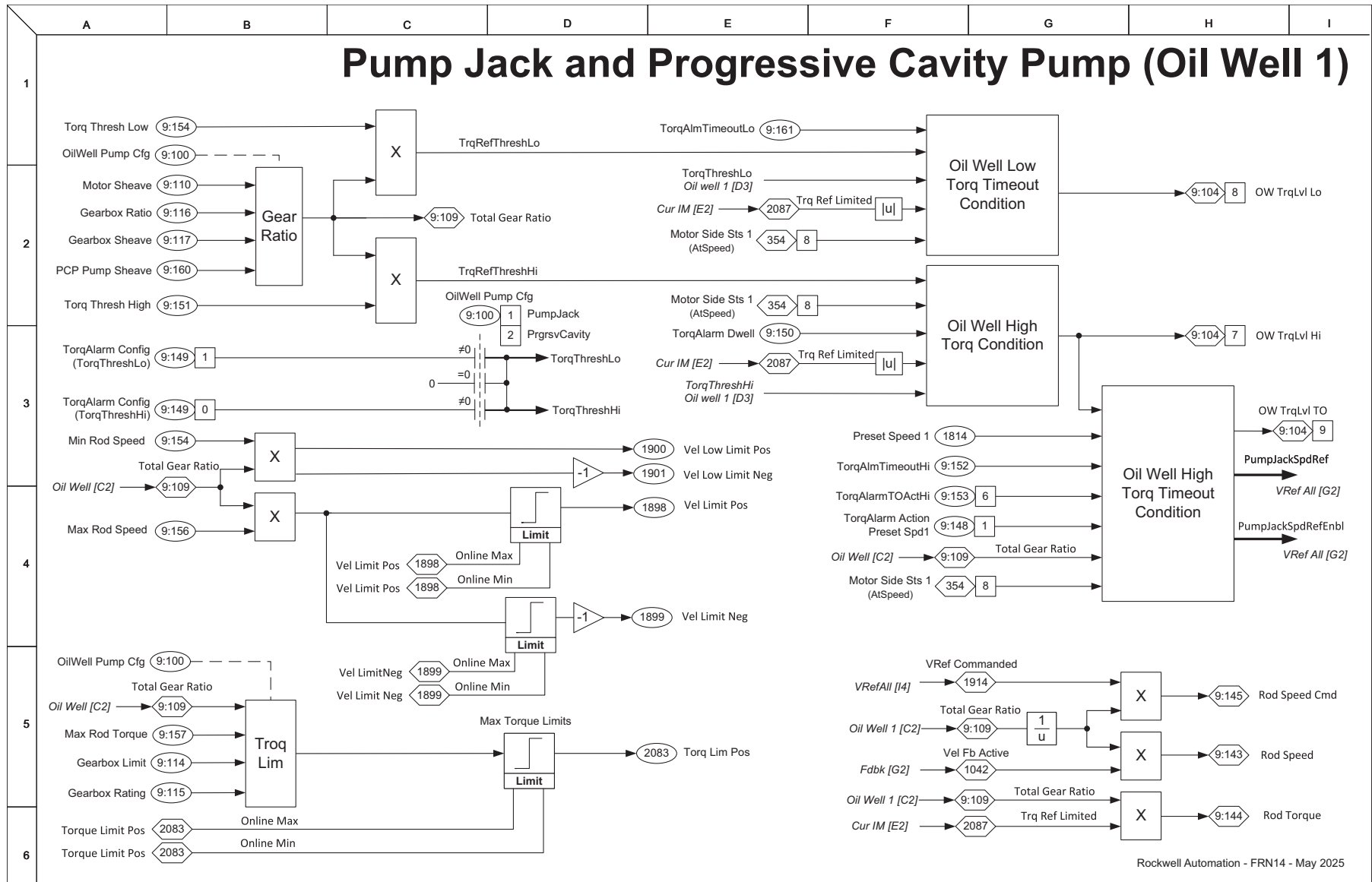


Figure 55 - Pump Off (Oil Well 2)

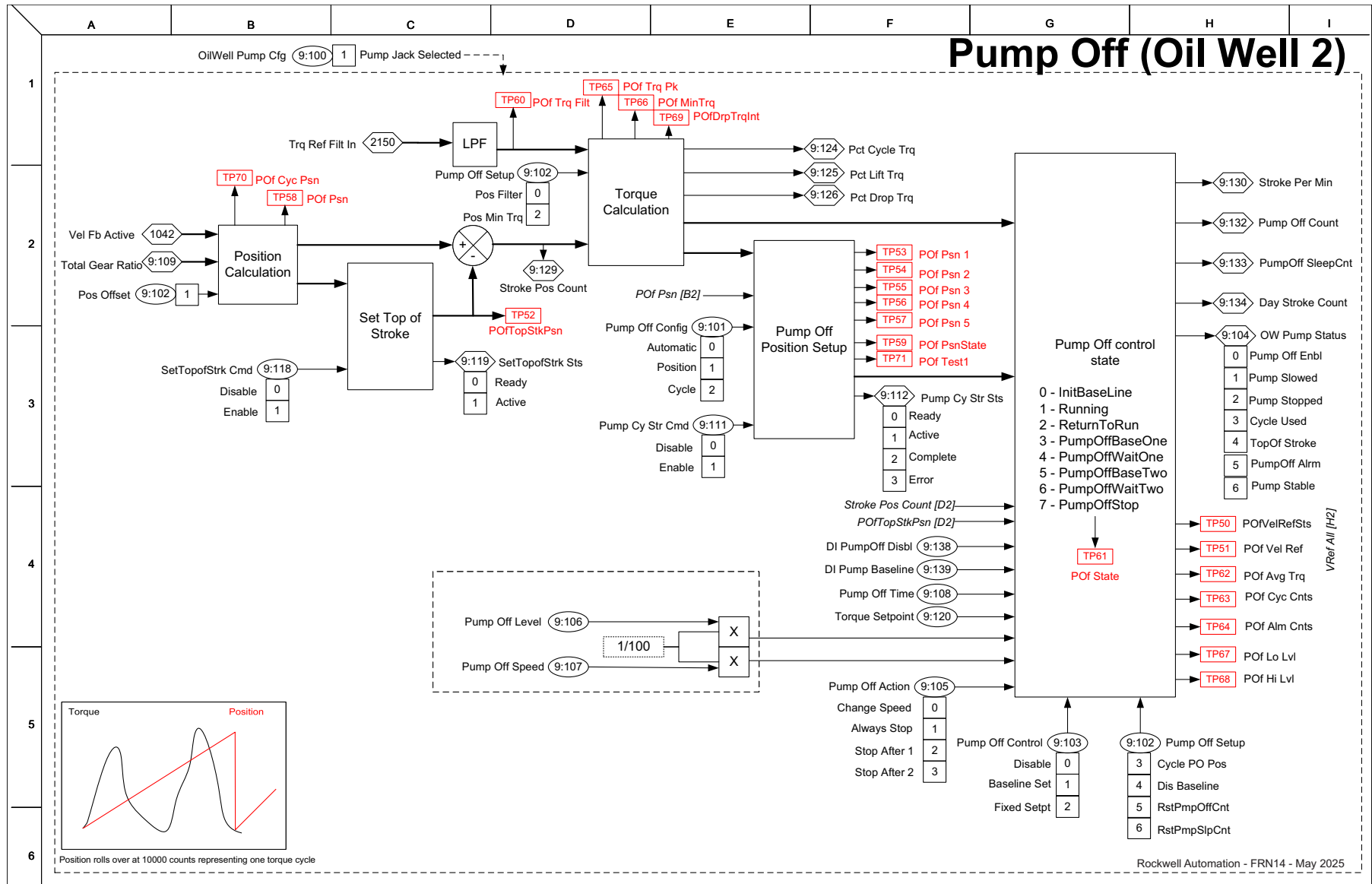
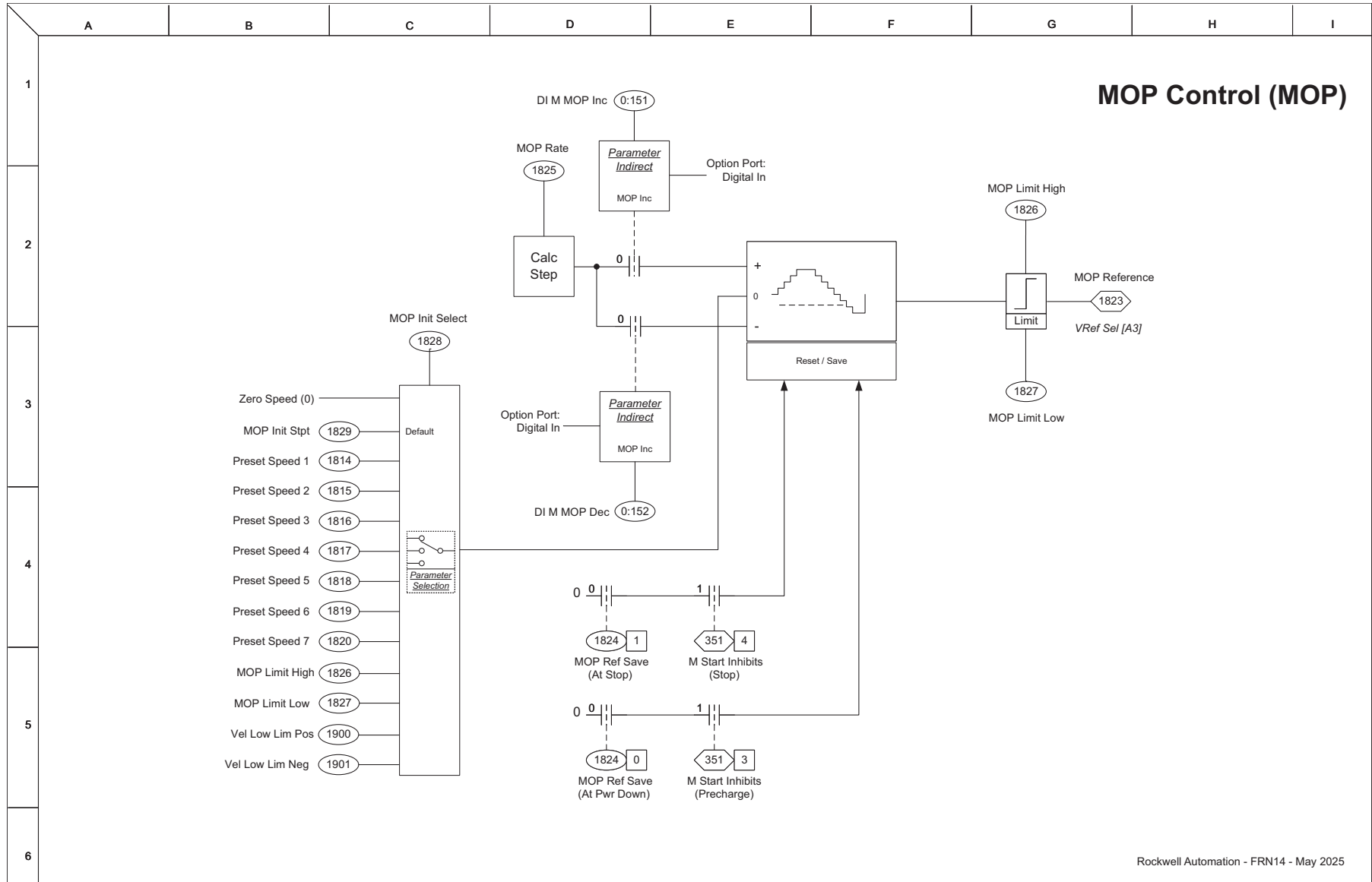


Figure 56 - MOP Control (MOP)



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Figure 57 - 22-Series Inputs & Outputs - Digital (22-Series IO Digital)

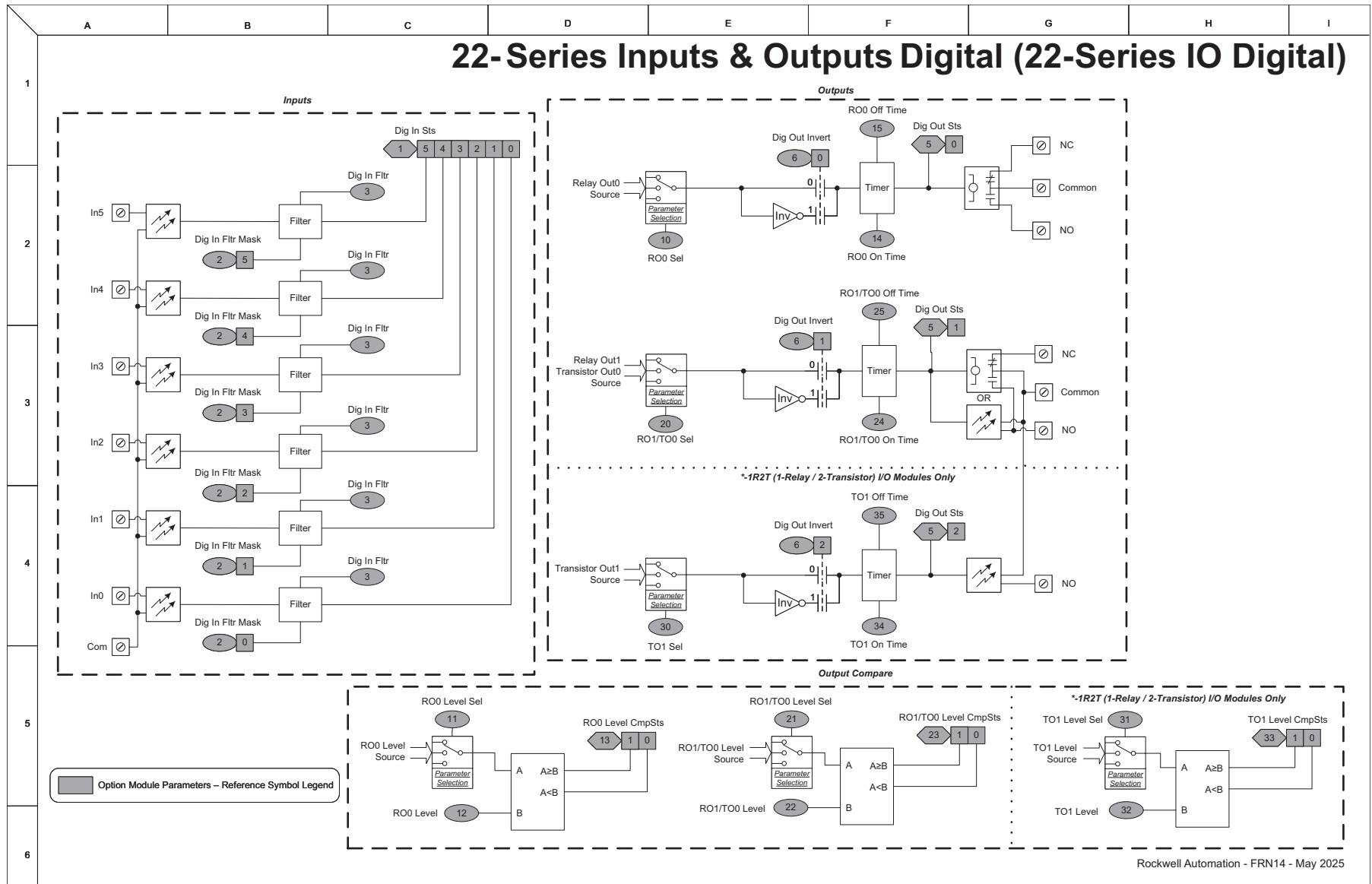
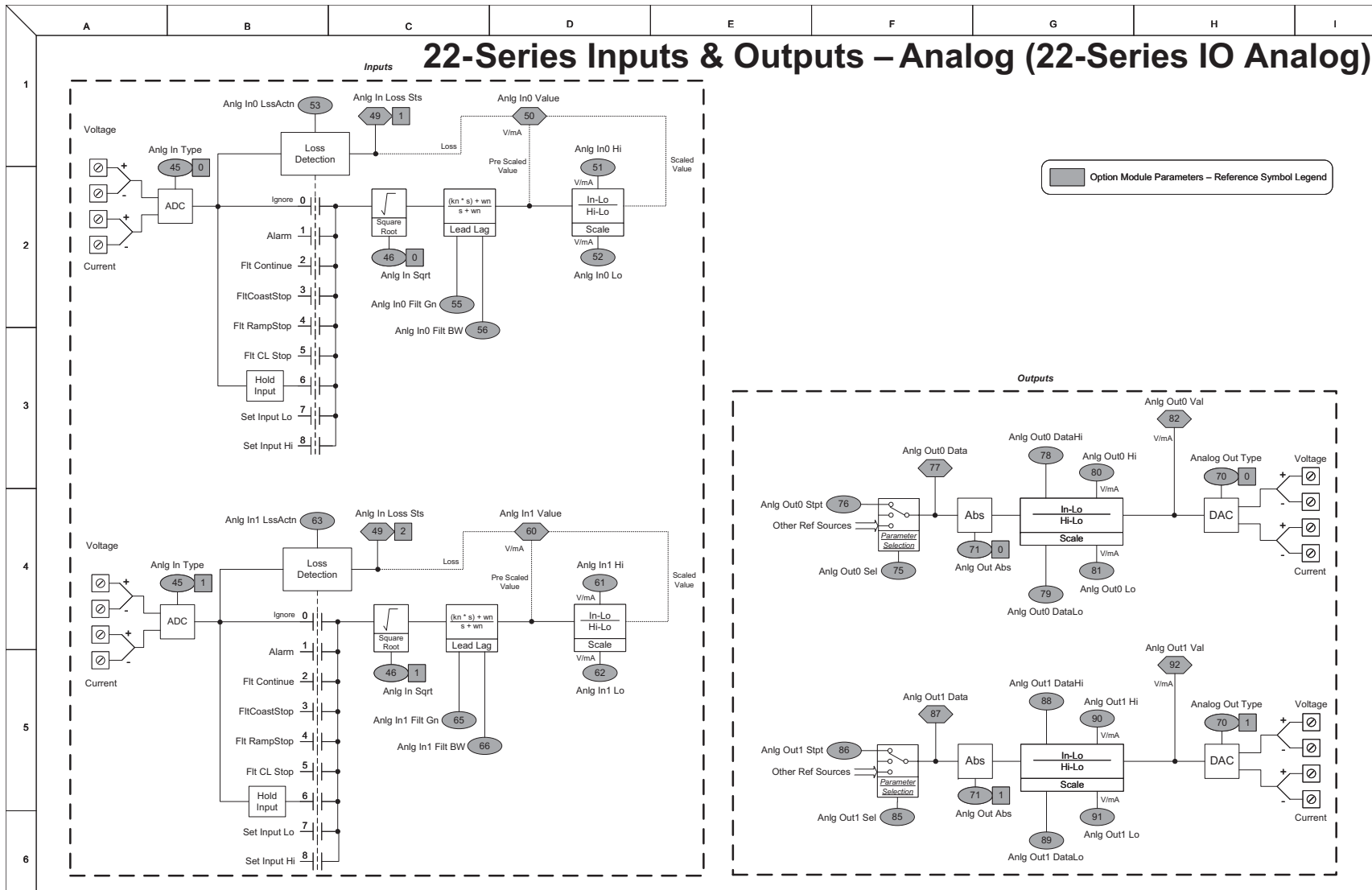


Figure 58 - 22-Series Inputs & Outputs - Analog (22-Series IO Analog)



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Figure 59 - 11-Series Inputs & Outputs - Digital (11-Series IO Digital)

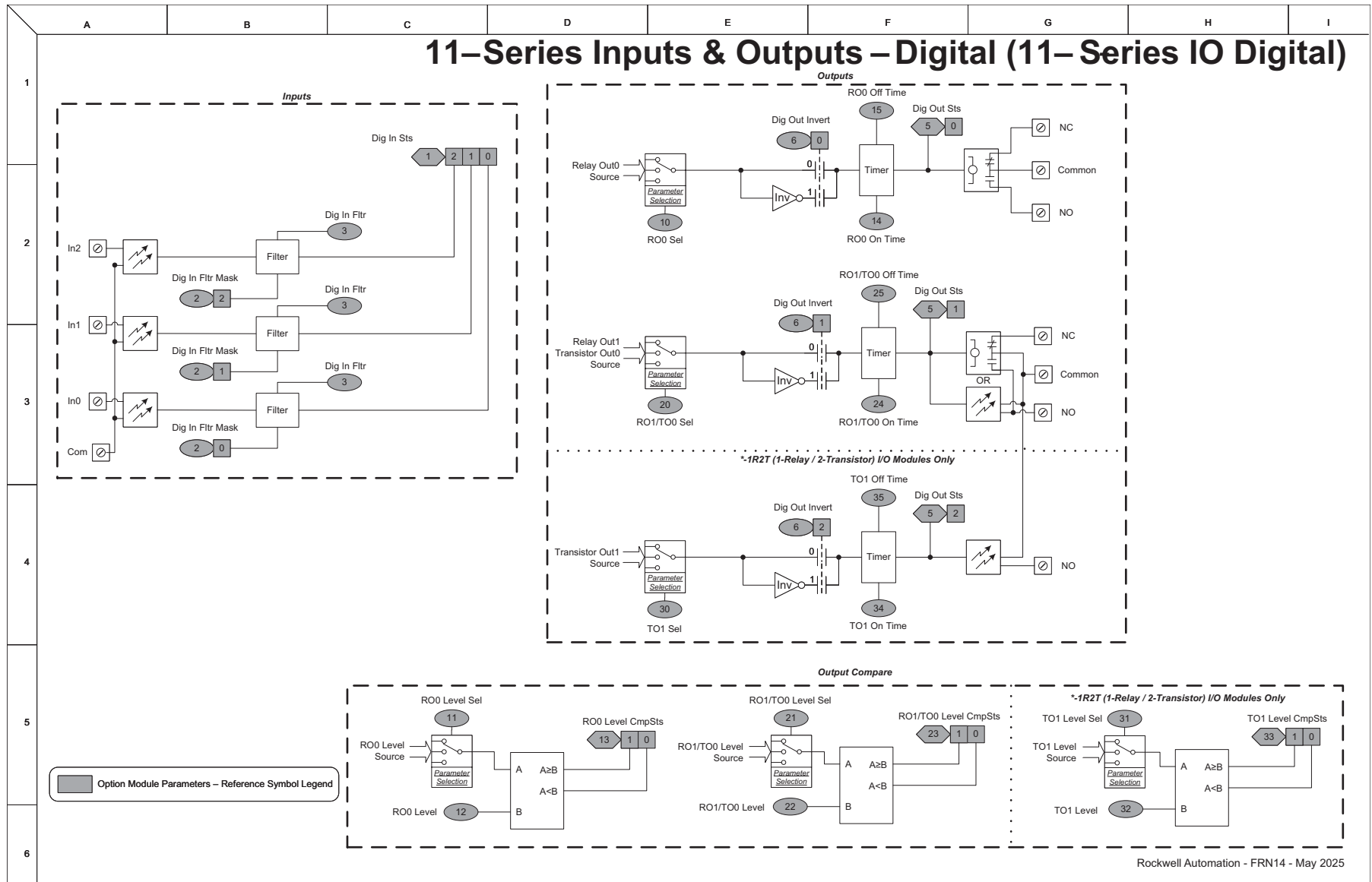
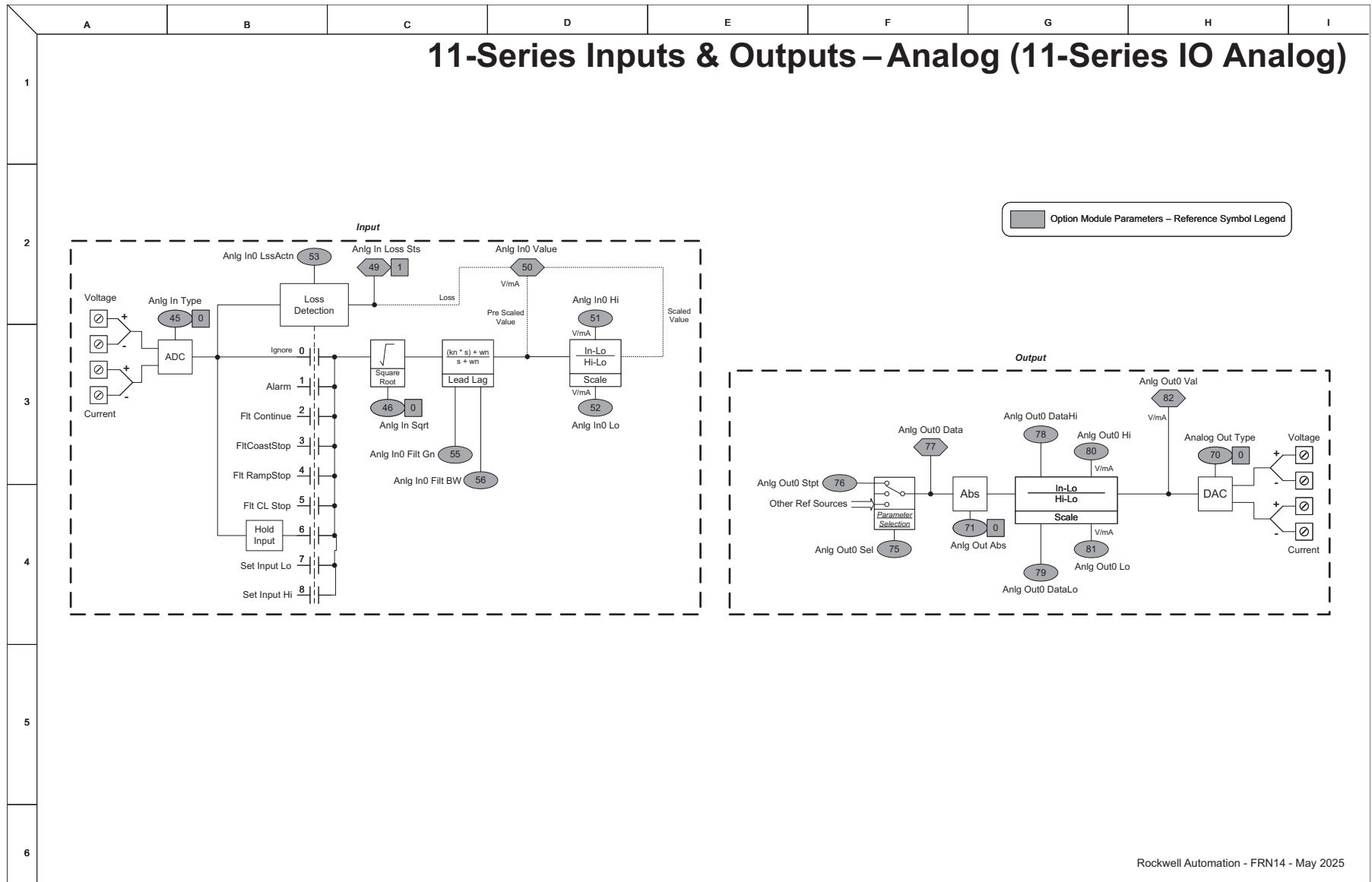
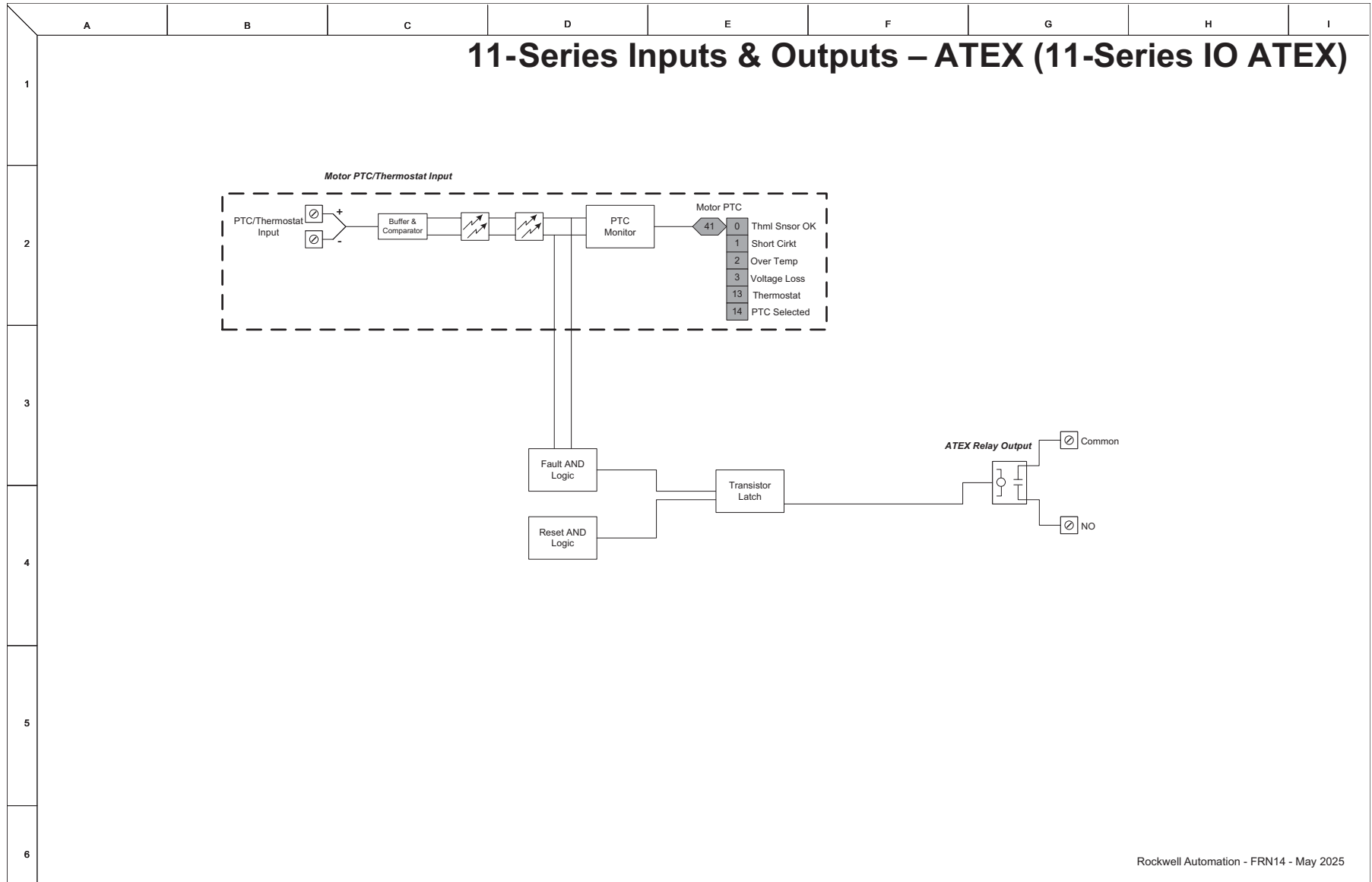


Figure 60 - 11-Series Inputs & Outputs - Analog (11-Series IO Analog)



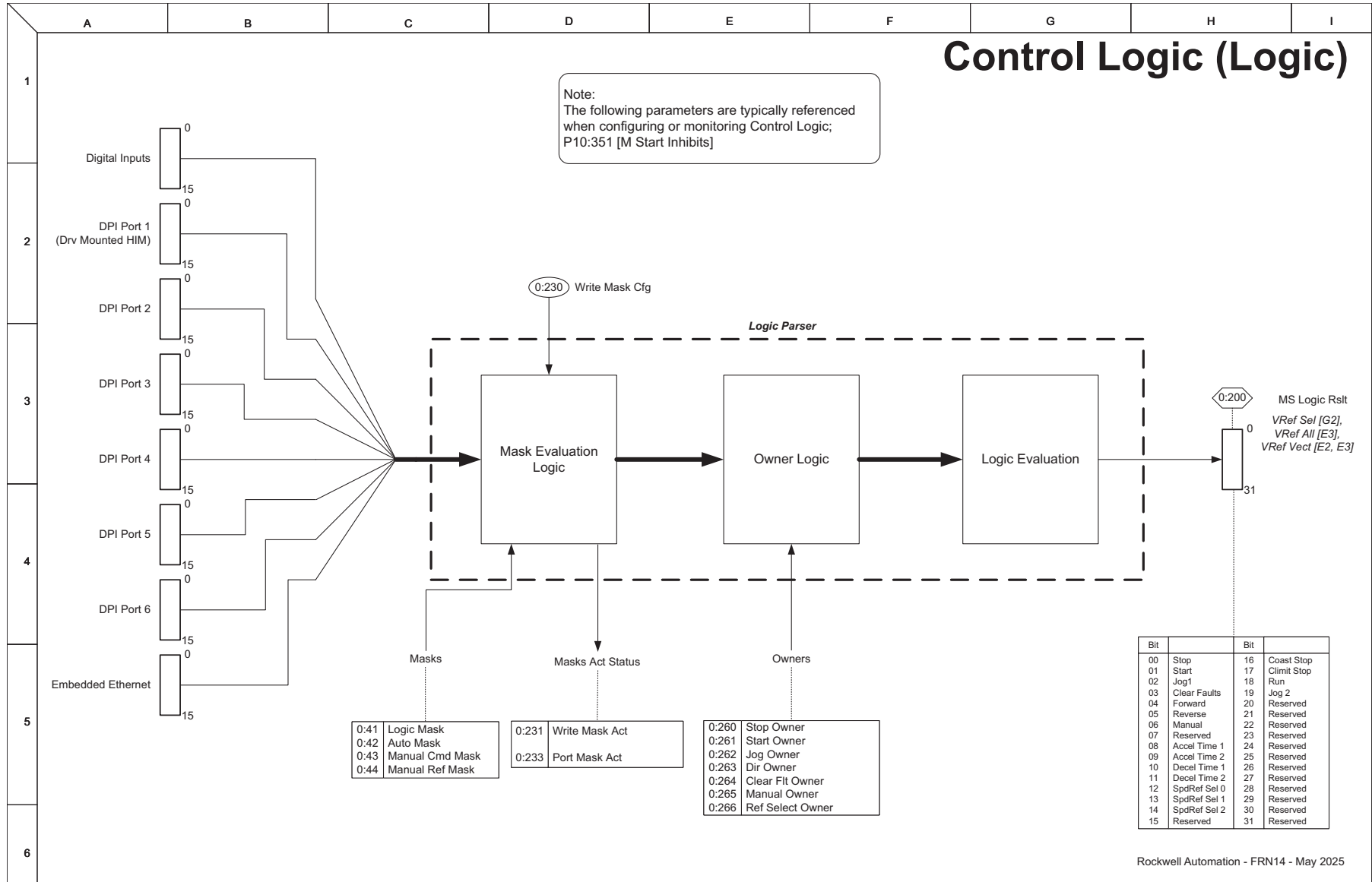
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Figure 61 - 11-Series Inputs & Outputs - ATEX (11-Series IO ATEX)



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Figure 62 - Control Logic (Logic)



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Figure 63 - Inverter Overload IT (Invert IT)

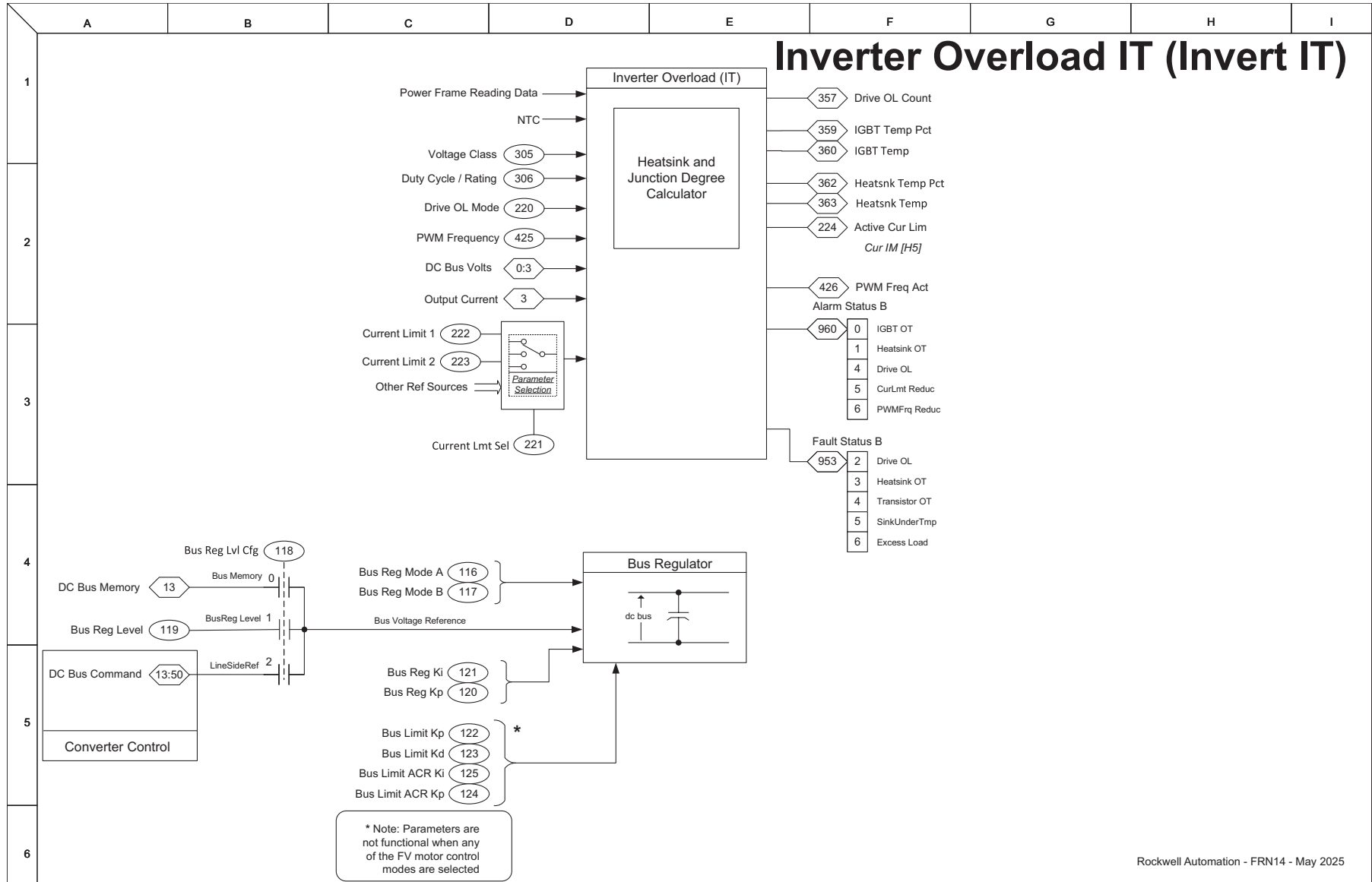
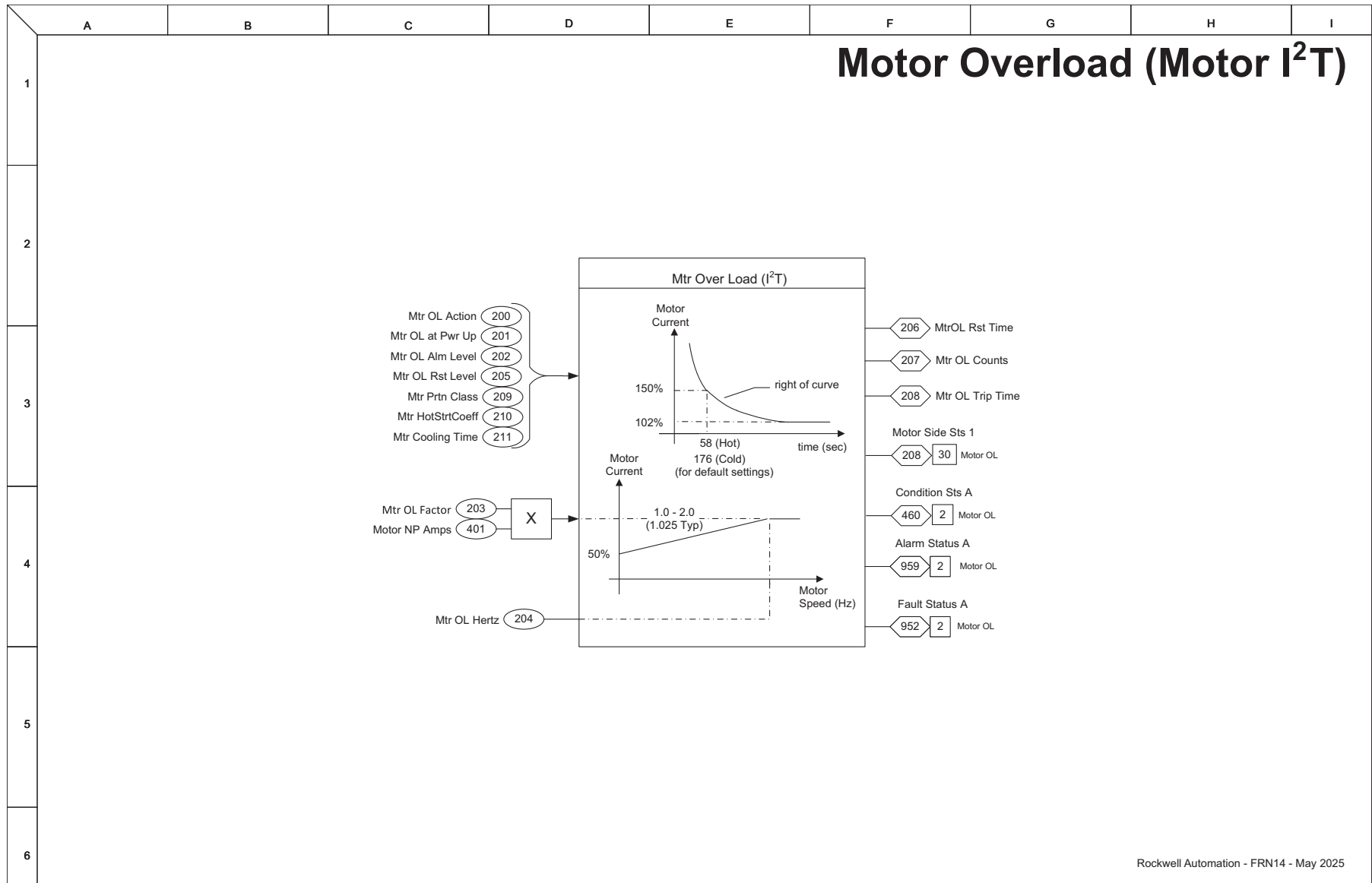
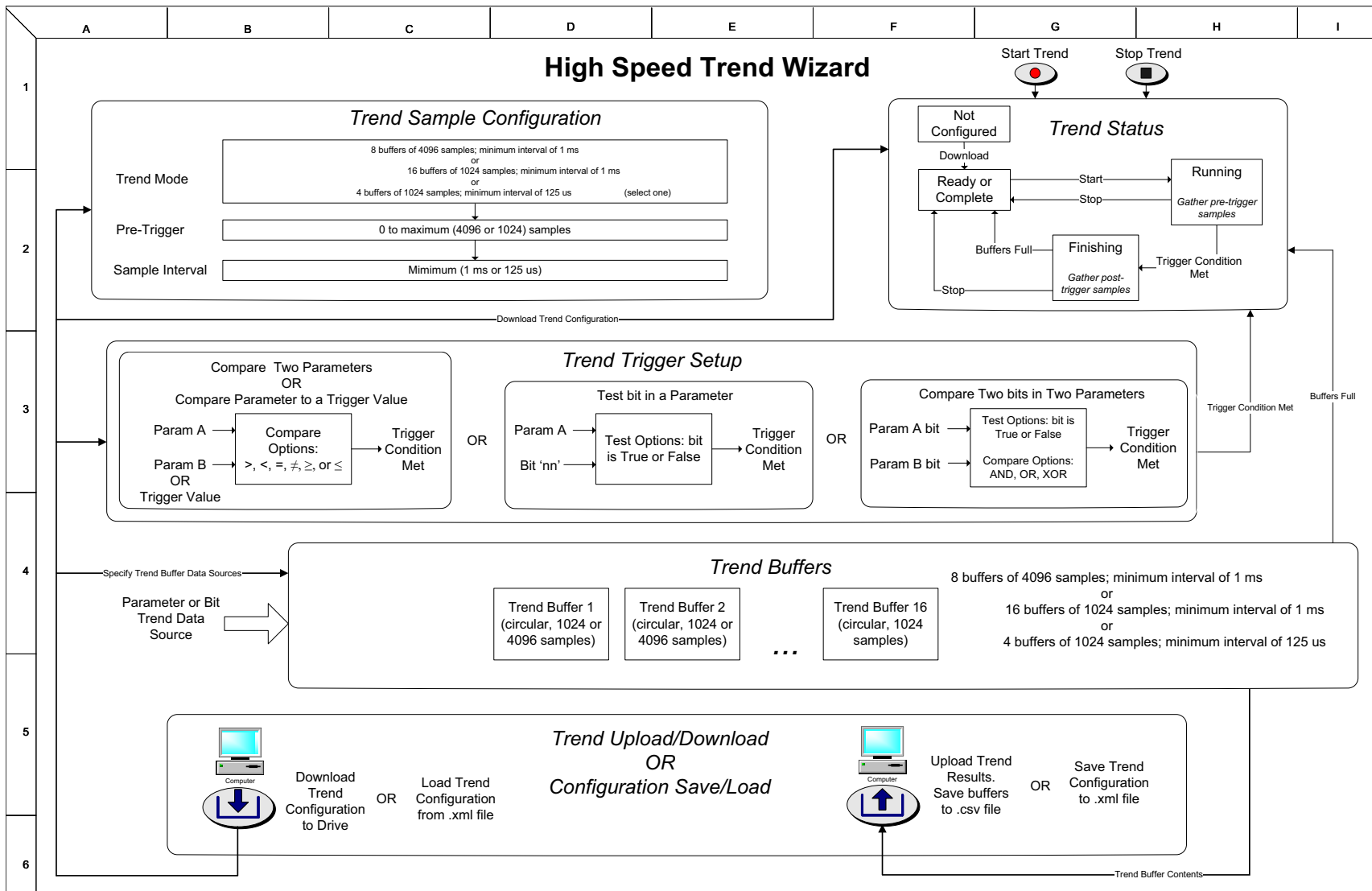


Figure 64 - Motor Overload (Motor I²T)



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Figure 65 - High Speed Trend Wizard



Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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Publication 750-WD100C-EN-P - July 2025 | Supersedes Publication 750-WD100B-EN-P - July 2025

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