



Global Common Controls Hardware Design (GCCH-1) Course

(Revision 6.0, dated 11-6-15)

Course No. GCCH8017, (LMS: 33543)

Duration 3 days

Pre-Requisites Controls Engineer or Designer experience.
Note: (A student who does not have experience with controls design will find it difficult to participate in the course.)

Objectives Upon successful completion of this course, participants will be able to:

- Explain the purpose and benefits of the global standard.
 - Identify architecture components.
 - Utilize standard safeguarding measures.
 - Utilize proper naming conventions
 - Use standard naming conventions.
 - Identify drawing packages at the system, controller/cell, and tool level.
 - Identify the core sections and specifications of a drawing.
 - Identify the robot specifications for robot interface packages.
 - Identify Hardware Generation eTools and be able to locate them.
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GCCH-1 Overview

This course is designed to familiarize participants with the content of the GCCH-1 Standard. This Standard is owned by the GM Vehicle Systems' organization and states the hardware requirements for the controls architecture designed for manufacturing systems installed in GM vehicle assembly and press plants. Participants will complete several student exercises and activities throughout the course and take a certification test on the last day of class.

GCCH-1 Lecture & Exercises – 2-1/2 Day

Module	Content	Delivery Method	Time (Hours)
1 - Overview	<ul style="list-style-type: none">• Define the scope of the GCCH-1 standard.• Explain the purpose of benefits of GCCH-1 standard.• Identify the audience for GCCH-1 standard.• Recognize deviations that supersede the GCCH-1 standard.• Discuss the different Normative References used.• List the GCCH-1 supporting information.• Differentiate the terms regulation, standard, guideline, and specification.• Identify the content and sections of the GCCH-1 standard.• Locate the current version of the GCCH-1 standard.• Interpret Normative References to Correct Supporting Information.• Recognize Normative References to Equipment in the Cell.• Identify GCCH-1 standards within the Global SOR.	Lecture, Exercises	2



<p>2 - Architecture</p>	<ul style="list-style-type: none"> • Define Common Controls Architecture. Identify Architecture Design Criteria (Low, Medium, and High) Automation. • Determine Automation Classifications for Architecture. • Recognize Architecture Key Elements. • Compare Power Architecture with different levels of controls. • Compare Network Architecture with different levels of controls. • Employ Power Architecture to a Cell Layout. • Employ Network Architecture to a Cell Layout. • Recognize Global Common Panels. • Interpret Global Panels used in a Cell Layout. • Determine PLC, PDP, and HMI Span of Control. 	<p>Lecture, Exercises</p>	<p>3</p>
<p>3 - Safety</p>	<ul style="list-style-type: none"> • Define the scope and purpose of the safeguard measures. • Discuss the meaning of Control Reliable. • Define Safety Integrated Levels (SIL). • (SIL) Safety Integrity Levels. • Explain the Safety Categories. • Identify Safe PLC. • Identify Safe PLC and Safe I/O • Identify Smart Guard 600. • Identify Safety IP6X and Safety I/O. • Describe Pulse Test. • Determine E-Stop Span of Control. • Define Monitored Power System (MPS) • Discuss (MPS) Gatebox – Features, Components and Circuitry. • Apply (MPS) Gate Box Procedures. • Discuss Safeguarding – Components and Circuitry. 	<p>Lecture, Exercises</p>	<p>3</p>



4 – Documentation and Naming	<ul style="list-style-type: none"> • Locate the GCCH-5 Section A User Manual. • Locate the GCCH-5 Section I Installation Manual. • Define EPLAN P8. • Discuss the GM Configuration for EPLAN P8. • Locate the GM Configuration for EPLAN P8. • Identify GM EPLAN Project Templates. • Define EPLAN P8 deliverable formats. • Recognize Wiring Diagram (WD) Naming Conventions. • Recognize Electrical Cabinet (EC) Naming Conventions. • Define the Proper File Naming Conventions. • Define File Naming and Bill of Materials (BOM). • Discuss Documentation and Deliverables. • Apply proper Naming Conventions. 	Lecture, Exercises	2
5 – Drawing Packages	<ul style="list-style-type: none"> • Identify drawing levels packages. • Identify drawing sections formats • Find items in the different level (WD) drawing package. 	Lecture, Exercises	3
6 – Drawing Sections	<ul style="list-style-type: none"> • Discuss Drawing Sections for the different application levels. • Define Drawing Section C. • Fill in missing cable labeling information in Section C for the different level (WD) drawing packages. • Define Drawing Section E. • Define Drawing Section F. • Define Drawing Section G. • Define Drawing Section X. • Define Drawing Section Y. 	Lecture, Exercises	3
7 – Robot Packages	<ul style="list-style-type: none"> • Identify and locate the GRS-1 Specification. • Identify and locate the GRS-4 Robot Interface. • Identify and locate the GRS-2 Rules of Process. • Recognize the different robot drawing packages. 	Lecture	2



8 – Math Based Tools	<ul style="list-style-type: none">• Define Global Hardware Generation eTools.• Locate Global Hardware Generation eTools.• Identify xRWD2eRWD.• Identify GeRWD• Recognize the purpose and benefits of GeRWD.• Discuss eToolDrawing.• Discuss eCellDrawing.• Identify the Hardware Generation Flowchart process.	Lecture	2
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GCCH-1 Certification – 1/2 Day

Module	Content	Delivery Method	Time (Hours)
1 - Certification	<ul style="list-style-type: none">• Certification	Test	4



Summary of Exercises

Listed below is a summary of the student exercises and activities for the course. Unique equipment and software for completing a particular exercise is shown in the right column that is in addition to the baseline training equipment required for conducting the entire course.

Module	Lab / Section Name (sections noted in bold)	Unique Equipment & Software required
Module 1: Overview	Exercise 1.1 Statement of Requirement Answer Questions	Windows PC or Laptop Microsoft Word Adobe Reader
Module 2: Architecture	Exercise 2.1 Identify Power and Network Architecture Identify Equipment connected to 480VAC, 120VAC, 24VDC, Ethernet, and Devicenet.	Windows PC or Laptop Microsoft Excel Adobe Reader
	Exercise 2.9 PLC Span of Control Identify PLC Span of Control on layout by using pencil/pen.	Exercise 2.9 – PLC Handout
	Exercise 2.10 PDP Span of Control Identify PDP Span of Control on layout by using pencil/pen.	Exercise 2.10 – PDP Handout
	Exercise 2.11 HMI Span of Control Identify HMI Span of Control on layout by using pencil/pen.	Exercise 2.11 – HMI Handout
Module 3: Overview	Exercise 3.1 MPS Selector Switch Determine the correct POS for Selector Sw. Determine the status lights. Determine the Enabling Pendant For the MPS global gatebox.	GM Trainers – (ECS-4009) or greater. Ex: G12, G16 Windows PC or Laptop Microsoft Excel Adobe Reader



Module	Lab / Section Name (sections noted in bold)	Unique Equipment & Software required
	Exercise 3.12 E-Stop Span of Control Identify E-Stop Span of Control on layout by using pencil/pen.	Exercise 3.12 – E-Stop Handout
Module 4: Documentation and Naming	Exercise 4.1 Naming Conventions (HA) Hands-on Activity Determine Naming Convention for examples provided.	Windows PC or Laptop Microsoft Word Adobe Reader
Module 5: Drawing Packages	Exercise 5.1 Drawing Packages Find and Highlight items in the different level (WD) Drawing Packages.	Windows PC or Laptop Microsoft Word Adobe Reader
Module 6: Drawing Sections	Exercise 6.1 Cable Labeling Provide cable labeling information for missing cable tags in the different level (WD) Drawing Packages.	Windows PC or Laptop Microsoft Word Adobe Reader