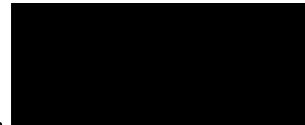


Table of Contents



Chapter 1: Getting Started

Introduction	1-2
Purpose of this manual	1-3
Who should read this manual	1-3
How this manual is organized	1-3
Supplemental Manuals	1-3
DL305 Analog Components	1-4
DL305 Analog I/O	1-4
Thermocouple Input	1-4
Temperature Input	1-4
Physical Characteristics	1-5
Selecting the Appropriate Module	1-6
Analog Input	1-6
Analog Output	1-7
Special Input	1-7
Analog Made Easy – Four Simple Steps	1-8
Analog Input Terminology	1-9
Channels per Module	1-9
Input Ranges	1-9
Resolution	1-9
Input Type	1-9
Input Impedance	1-9
Conversion Method	1-9
Conversion Time	1-9
Linearity Error and Total Tolerance (Relative Accuracy)	1-9
Accuracy vs. Temperature	1-9
LED Display	1-9
I/O Points Required	1-9
External Power Source	1-9
Base Power Required	1-9
Operating Temperature	1-9
Relative Humidity	1-9
Terminal Type	1-9
Weight	1-9
Analog Output Module Terminology	1-10
Channels per Module	1-10
Output Ranges	1-10
Resolution	1-10
Output Current	1-10
Output Impedance	1-10
Load Impedance	1-10
Conversion Time	1-10
Accuracy	1-10
Accuracy vs. Temperature	1-10
LED Display	1-10

External Power Source	1-10
Base Power Required	1-10
Operating Temperature	1-10
Relative Humidity	1-10
Terminal Type	1-10
Weight	1-10
I/O Points Required	1-10

Chapter 2: D3-04AD 4-Channel Analog Input

Module Specifications	2-2
Analog Input Configuration Requirements	2-2
Setting the Module Jumpers	2-3
Connecting the Field Wiring	2-3
Wiring Guidelines	2-3
User Power Supply Requirements	2-3
Custom Input Ranges	2-4
Current Loop Transmitter Impedance	2-5
Removable Connector	2-6
Wiring Diagram	2-6
Module Operation	2-7
Channel Scanning Sequence	2-7
Understanding the I/O Assignments	2-8
All Channel Scan Output	2-8
Single Channel Scan Outputs	2-9
Active Channel Selection Inputs	2-9
Analog Data Bits	2-10
Writing the Control Program	2-11
Identifying the Data Locations	2-11
Single Channel on Every Scan	2-11
Reading Multiple Channels over Alternating Scans	2-12
Single or Multiple Channels	2-13
Scaling the Input Data	2-14
Analog and Digital Value Conversions	2-18

Chapter 3: F3-04ADS 4-Channel Isolated Analog Input

Module Specifications	3-2
Analog Input Configuration Requirements	3-2
Setting the Module Jumpers	3-3
Jumper Locations	3-3
Selecting the Number of Channels	3-4
Selecting Input Signal Ranges	3-4
Connecting the Field Wiring	3-5
Wiring Guidelines	3-5
User Power Supply Requirements	3-5
Custom Input Ranges	3-5
Current Loop Transmitter Impedance	3-6
Removable Connector	3-7
Wiring Diagram	3-7

Module Operation	3-8
Channel Scanning Sequence	3-8
Understanding the I/O Assignments	3-9
Active Channel Selection Inputs	3-9
Analog Data Bits	3-10
Writing the Control Program	3-11
Identifying the Data Locations	3-11
Single Channel on Every Scan	3-11
Reading Multiple Channels over Alternating Scans	3-12
Scaling the Input Data	3-13
Analog and Digital Value Conversions	3-1

Chapter 4: F3-08AD-1 8-Channel Analog Input

Module Specifications	4-2
Analog Input Configuration Requirements	4-2
Setting the Module Jumpers	4-3
Jumper Locations	4-3
Selecting the Number of Channels	4-3
Connecting the Field Wiring	4-4
Wiring Guidelines	4-4
User Power Supply Requirements	4-4
Current Loop Transmitter Impedance	4-4
Removable Connector	4-5
Wiring Diagram	4-5
Module Operation	4-6
Channel Scanning Sequence	4-6
Understanding the I/O Assignments	4-7
Active Channel Indication Inputs	4-7
Analog Data Bits	4-8
Writing the Control Program	4-9
Identifying the Data Locations	4-9
Single Channel on Every Scan	4-9
Reading Multiple Channels over Alternating Scans	4-10
Reading Multiple Channels over Alternating Scans on a DL350	4-11
Scaling the Input Data	4-13
Scaling the Input Data on a DL350	4-17
Analog and Digital Value Conversions	4-18

Chapter 5: F3-16AD 16-Channel Analog Input

Module Specifications	5-2
Analog Input Configuration Requirements	5-2
Setting the Module Jumpers	5-3
Jumper Locations	5-3
Selecting the Number of Channels	5-3
Selecting Input Signal Ranges	5-4
Gain Jumpers	5-5
Variable Gain Adjustment	5-5

Connecting the Field Wiring	5-6
Wiring Guidelines	5-6
User Power Supply Requirements	5-6
Custom Input Ranges	5-7
Current Loop Transmitter Impedance	5-8
Removable Connector	5-9
Wiring Diagram	5-9
Module Operation	5-10
Channel Scanning Sequence	5-10
Understanding the I/O Assignments	5-11
Active Channel Indicator Inputs	5-12
Analog Data Bits	5-13
Writing the Control Program	5-14
Identifying the Data Locations	5-14
Example Program	5-15
Example Program for a DL350 with a Conventional Base	5-16
Example Program for a DL350 with a D3-XX-1 Base	5-17
Scaling the Input Data	5-20
Scaling the Input Data on a DL350 with a Conventional Base	5-24
Broken Transmitter Detection	5-25
Analog and Digital Value Conversions	5-26

Chapter 6: D3-02DA 2-Channel Analog Output

Module Specifications	6-2
Analog Output Configuration Requirements	6-2
Connecting the Field Wiring	6-3
Wiring Guidelines	6-3
User Power Supply Requirements	6-3
Load Requirements	6-3
Removable Connector	6-4
Wiring Diagram	6-4
Module Operation	6-5
Channel Scanning Sequence	6-5
Understanding the I/O Assignments	6-6
Analog Data Bits	6-7
Writing the Control Program	6-8
Identifying the Data Locations	6-8
Calculating the Digital Value	6-8
Sending the Same Data to Both Channels	6-11
Sending Specific Data to Each Channel	6-12
Analog and Digital Value Conversions	6-13

Chapter 7: F3-04DA-1 4-Channel Analog Output

Module Specifications	7-2
Analog Output Configuration Requirements	7-2
Setting the Module Jumpers	7-3
Jumper Locations	7-3

Selecting Output Signal Ranges	7-3
Connecting the Field Wiring	7-4
Wiring Guidelines	7-4
User Power Supply Requirements	7-4
Load Requirements	7-4
Removable Connector	7-5
Wiring Diagram	7-5
Module Operation	7-6
Channel Scanning Sequence	7-6
Understanding the I/O Assignments	7-7
Channel Selection Inputs	7-7
Analog Data Bits	7-8
Writing the Control Program	7-9
Identifying the Data Locations	7-9
Calculating the Digital Value	7-9
Sending Data to a Single Channel	7-12
Sequencing the Channel Updates	7-13
Sequencing Example	7-13
Analog and Digital Value Conversions	7-14

Chapter 8: F3-04DAS 4-Channel Isolated Analog Output

Module Specifications	8-2
Analog Output Configuration Requirements	8-3
Setting the Module Jumpers	8-4
Jumper Locations	8-4
Selecting Input Signal Ranges	8-5
Special Output Signal Ranges	8-6
Connecting the Field Wiring	8-7
Wiring Guidelines	8-7
User Power Supply Requirements	8-7
Load Requirements	8-7
Removable Connector	8-8
Wiring Diagram	8-8
Combining Voltage Outputs	8-8
Combining Current Outputs	8-9
Module Operation	8-10
Channel Scanning Sequence	8-10
Understanding the I/O Assignments	8-11
Channel Selection Inputs	8-11
Analog Data Bits	8-12
Writing the Control Program	8-13
Identifying the Data Locations	8-13
Calculating the Digital Value	8-13
Sending Data to a Single Channel	8-16
Sequencing the Channel Updates	8-17
Analog and Digital Value Conversions	8-18

Chapter 9: F3–08THM–n 8-Channel Thermocouple Input

Introduction	9–2
Automatic Conversion	9–2
Hardware Features	9–2
Diagnostic Features	9–2
Module Specifications	9–3
Analog Input Configuration Requirements	9–3
Setting the Module Switches	9–4
Jumper Locations	9–4
Selecting °F or °C Operation	9–4
Selecting 0–4095 Operation	9–4
Connecting the Field Wiring	9–5
Wiring Guidelines	9–5
User Power Supply Requirements	9–5
Wiring Diagram	9–5
Module Operation	9–6
Channel Scanning Sequence	9–6
Understanding the I/O Assignments	9–7
Active Channel Indicator Inputs	9–7
Temperature Sign Bit	9–8
Analog Data Bits	9–8
Temperature Input Resolution	9–8
Millivolt Input Resolution	9–8
Writing the Control Program	9–9
Identifying the Data Locations	9–9
Automatic Temperature Conversion	9–9
Using the Sign Bit	9–11
Reading Multiple Channels on a DL350 with a D3–XX–1 Base	9–12
Scaling the Input Data	9–14
Temperature and Digital Value Conversions	9–18
Millivolt and Digital Value Conversions	9–18

Chapter 10: F3–08TEMP 8-Channel Temperature Input

Module Specifications	10–2
Compatible Temperature Probe Specifications	10–3
Analog Input Configuration Requirements	10–3
Setting the Module Jumpers	10–4
Factory Settings	10–4
Selecting the Number of Channels	10–4
Connecting the Field Wiring	10–5
Wiring Guidelines	10–5
User Power Supply Requirements	10–5
Removable Connector	10–5
Wiring Diagram	10–5

Module Operation	10-6
Channel Scanning Sequence	10-6
Understanding the I/O Assignments	10-7
Active Channel Indicator Inputs	10-7
Analog Data Bits	10-8
Temperature Input Resolution	10-8
Writing the Control Program	10-9
Identifying the Data Locations	10-9
Reading the Digital Value	10-9
Converting the Data to Temperature	10-10
Reading Temperatures Below Zero	10-12
Storing the Temperature	10-13
Reading Temperatures on a DL350 with a D3-XX-1 Base	10-14
Temperature and Digital Value Conversions	10-17

Appendix A: DL305 Data Types and Memory Map

DL330 Memory Map	A-2
DL330P Memory Map	A-3
DL340 Memory Map	A-4
I/O Point Bit Map	A-5
Control Relay Bit Map	A-6
Special Relays	A-8
Data Registers	A-9
DL350 System V-Memory	A-11
DL350 Comm Port 2 Control Relays	A-12
DL350 Memory Map	A-13
DL350 X Input/ Y Output Bit Map	A-14
DL350 Control Relay Bit Map	A-15
DL350 Stage™ Control / Status Bit Map	A-17
DL350 Timer and Counter Status Bit Maps	A-19