DL205 *Direct*SOFT6
IBox Instructions
PLC User Manual Supplement

Manual Number: DL205-DS6IBOX-S

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Overview

The Ibox Instructions listed in this supplement are in addition to the Standard RLL and IBOX Instructions found in Chapter 5 of the DL205 User Manual. These new instructions are available when using *Direct*SOFT6 to program your DL205 PLC. For more information on *Direct*SOFT6 and to download our Free version, please visit our Web site at: www.automationdirect.com

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Filter Over Time - Binary Double (FILTERBD) (IB-405)

DS6	Used
HPP	N/A

The Filter Over Time - Binary Double IBox performs a first-order filter on the specified 32-bit Raw Binary (decimal) Data value using the specified time interval.

A first order is essentially a lag function, so the FDC (Filter Divisor Constant) represents the amount of desired lag. A Value of 1 represents no lag, a value of 100 represents the maximum amount of lag.

The formula used is:

$$New = Old + \frac{\left[(Raw - Old) + \left(\frac{FDC}{2}\right)\right]}{FDC}$$

FILTERBD Parameters

- Filter Freq Timer: The PLC Timer used to generate the calculation time intervals.
- Filter Freq Time (0.01 sec): The timer preset value in tens of milliseconds (BCD) which specifies the rate at which the calculations take place.
- Raw Data (Binary Double): The first V-Memory of two successive V-Memory locations where the 32-bit Raw Binary (Decimal) input data value is stored.
- Filter Divisor: This value specifies the amount of desired lag (Binary Single).
- Filter Value (Binary Double): The first V-Memory of two successive V-Memory locations where the new 32-bit filtered output value will be stored.

Parameter	DL205 Range
Filter Freq Timer . . . . . T	T0-T377
Filter Freq Time . . . . . V, K	K0-9999, All V Memory
Raw Data V	All V Memory
Filter Divisor . . . . . V, K	K1-100, All V Memory
Filter Value V	All V Memory

FILTERBD Example

In the following example, the FILTERBD instruction is used to filter a double word binary value that is in V3010-V3011. Timer(T2) is set to 0.5 sec, the rate at which the filter calculation will be performed. The filter constant is set to 2. A larger value will increase the smoothing effect of the filter. A value of 1 results in no filtering. The filtered value will be placed in V3012-V3013.

Filter Over Time - BCD Double (FILTERD) (IB-425)

DS6	Used
HPP	N/A

The Filter Over Time - BCD Double IBox performs a first-order filter on the specified 32-bit Raw BCD Data value using the specified time interval.

A first order is essentially a lag function, so the FDC (Filter Divisor Constant) represents the amount of desired lag. A Value of 1 represents no lag, a value of 100 represents the maximum amount of lag.

The formula used is:

$$New = Old + \frac{\left[(Raw - Old) + \left(\frac{FDC}{2}\right)\right]}{FDC}$$

FILTERD Parameters

- Filter Freq Timer: The PLC Timer used to generate the calculation time intervals.
- Filter Freq Time (0.01 sec): The timer preset value in tens of milliseconds (BCD) which specifies the rate at which the calculations take place.
- Raw Data (BCD Double): The first V-Memory of two successive V-Memory locations where the 32-bit BCD input data value is stored.
- Filter Divisor: This value specifies the amount of desired lag (BCD).
- Filter Value (BCD Double): The first V-Memory of two successive V-Memory locations where the new 32-bit filtered output value will be stored.

Parameter	DL205 Range
Filter Freq Timer . . . . . T	T0-T377
Filter Freq Time . . . . . V, K	K0-9999, All V Memory
Raw Data V	All V Memory
Filter Divisor . . . . . V, K	K1-100, All V Memory
Filter Value V	All V Memory

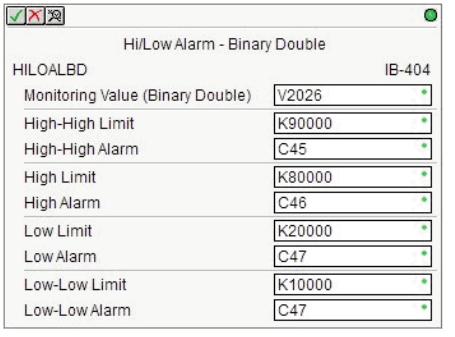
FILTERD Example

In the following example, the FILTERD instruction is used to filter a double word BCD value that is in V2054-V2055. Timer(T1) is set to 0.5 sec, the rate at which the filter calculation will be performed. The filter constant is set to 2. A larger value will increase the smoothing effect of the filter. A value of 1 results in no filtering. The filtered value will be placed in V2056-V2057.

Hi/Lo Alarm - Binary Double (HILOALBD) (IB-404)

DS6	Used
HPP	N/A

The Hi/Lo Alarm - Binary Double IBox monitors the 32-bit binary (decimal) value that is stored in two successive V-Memory locations and sets the appropriate alarm states based on the alarm limit values.



When you enter the alarm limit values you must ensure that the High-High limit ≥ the High limit ≥ the Low limit ≥ the Low-Low limit.

The alarm limits are inclusive. For example, the High and High-High alarm bits will be ON when the Monitoring Value ≥ High-High limit and the Monitoring Value ≥ High limit. The Low and Low-Low alarm bits will be ON when the Monitoring Value ≤ Low limit and the Monitoring Value ≤ Low-Low limit.

HILOALBD Parameters

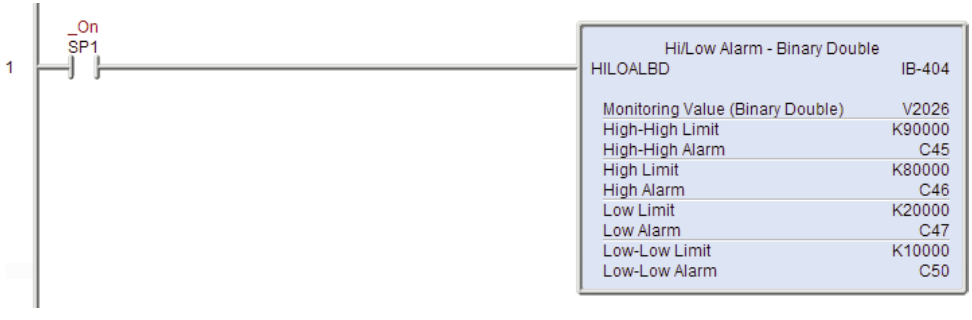
- Monitoring Value (Binary Double): The first V-Memory location of the 32-bit binary (decimal) value to monitor.
- High-High Limit: The High-High alarm limit value (binary double).
- High-High Alarm: The High-High alarm output BIT.
- High Limit: The High alarm limit value (binary double).
- High Alarm: The High alarm output BIT.
- Low Limit: The Low alarm limit value (binary double).
- Low Alarm: The Low alarm output BIT.
- Low-Low Limit: The Low-Low alarm limit value (binary double).
- Low-Low Alarm: The Low-Low alarm output BIT.

Parameter	DL205 Range
Monitoring Value V	All V Memory
High-High Limit . . . . . V, K	K0-4294967295; All V Memory
High-High Alarm . . . . . X, Y, C, GX,GY, B	All Bit Memory
High Limit . . . . . V, K	K0-4294967295; All V Memory
High Alarm . . . . . X, Y, C, GX,GY, B	All Bit Memory
Low Limit . . . . . V, K	K0-4294967295; All V Memory
Low Alarm . . . . . X, Y, C, GX,GY,B	All Bit Memory
Low-Low Limit . . . . . V, K	K0-4294967295; All V Memory
Low-Low Alarm. . . . . X, Y, C, GX,GY, B	All Bit Memory

HILOALBD Example

In the following example, the HILOALBD instruction is used to monitor a double word binary value that is in V2026-V2027. If the value in V2026-V2027 meets/exceeds the high limit of K80000, C46 will turn ON. If the value continues to increase to meet/exceed the high-high limit of K90000, C45 will turn ON. Both bits would be ON in this case. The high and high-high limits and alarms can be set to the same value if one "high" limit or alarm is desired to be used.

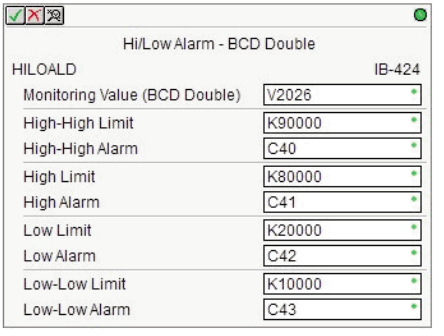
If the value in V2026-V2027 meets or falls below the low limit of K20000, C47 will turn ON. If the value continues to decrease to meet or fall below the low-low limit of K10000, C50 will turn ON. Both bits would be ON in this case. The low and low-low limits and alarms can be set to the same value if one "low" limit or alarm is desired to be used.



Hi/Lo Alarm - BCD Double (HILOALD) (IB-424)

DS6	Used
HPP	N/A

The Hi/Lo Alarm - BCD Double IBox monitors the 32-bit BCD value that is stored in two successive V-Memory locations and sets the appropriate alarm states based on the alarm limit values.



When you enter the alarm limit values you must ensure that the High-High limit ≥ the High limit ≥ the Low limit ≥ the Low-Low limit.

The alarm limits are inclusive. For example, the High and High-High alarm bits will be ON when the Monitoring Value ≥ High-High limit and the Monitoring Value ≥ High limit. The Low and Low-Low alarm bits will be ON when the Monitoring Value ≤ Low limit and the Monitoring Value ≤ Low-Low limit.

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HILOALD Parameters

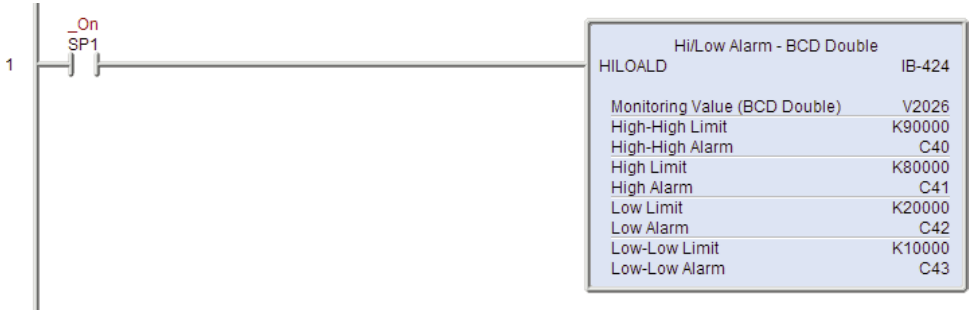
- Monitoring Value (BCD Double): The first V-Memory location of the 32-bit BCD value to monitor.
- High-High Limit: The High-High alarm limit value (BCD double).
- High-High Alarm: The High-High alarm output BIT.
- High Limit: The High alarm limit value (BCD double).
- High Alarm: The High alarm output BIT.
- Low Limit: The Low alarm limit value (BCD double).
- Low Alarm: The Low alarm output BIT.
- Low-Low Limit: The Low-Low alarm limit value (BCD double).
- Low-Low Alarm: The Low-Low alarm output BIT.

Parameter	DL205 Range
Monitoring Value V	All V Memory
High-High Limit . . . . . V, K	K0-99999999; All V Memory
High-High Alarm . . . . . X, Y, C, GX,GY, B	All Bit Memory
High Limit . . . . . V, K	K0-99999999; All V Memory
High Alarm . . . . . X, Y, C, GX,GY, B	All Bit Memory
Low Limit . . . . . V, K	K0-99999999; All V Memory
Low Alarm . . . . . X, Y, C, GX,GY,B	All Bit Memory
Low-Low Limit . . . . . V, K	K0-99999999; All V Memory
Low-Low Alarm. . . . . X, Y, C, GX,GY, B	All Bit Memory

HILOALD Example

In the following example, the HILOALD instruction is used to monitor a double word BCD value that is in V2026-V2027. If the value in V2026-V2027 meets/exceeds the high limit of K80000, C41 will turn ON. If the value continues to increase to meet/exceed the high-high limit of K90000, C40 will turn ON. Both bits would be ON in this case. The high and high-high limits and alarms can be set to the same value if one "high" limit or alarm is desired to be used.

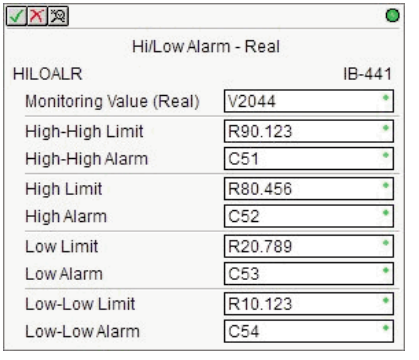
If the value in V2026-V2027 meets or falls below the low limit of K20000, C42 will turn ON. If the value continues to decrease to meet or fall below the low-low limit of K10000, C43 will turn ON. Both bits would be ON in this case. The low and low-low limits and alarms can be set to the same value if one "low" limit or alarm is desired to be used.



Hi/Lo Alarm - Real (HILOALR) (IB-441)

DS6	Used
HPP	N/A

The Hi/Lo Alarm - Real IBox monitors the 32-bit Real (floating point) value that is stored in two successive V-Memory locations and sets the appropriate alarm states based on the alarm limit values.



When you enter the alarm limit values you must ensure that the High-High limit ≥ the High limit ≥ the Low limit ≥ the Low-Low limit.

The alarm limits are inclusive. For example, the High and High-High alarm bits will be ON when the Monitoring Value ≥ High-High limit and the Monitoring Value ≥ High limit. The Low and Low-Low alarm bits will be ON when the Monitoring Value ≤ Low limit and the Monitoring Value ≤ Low-Low limit.

HILOALR Parameters

- Monitoring Value (Real): The first V-Memory location of the 32-bit Real (floating point) value to monitor.
- High-High Limit: The High-High alarm limit value (real).
- High-High Alarm: The High-High alarm output BIT.
- High Limit: The High alarm limit value (real).
- High Alarm: The High alarm output BIT.
- Low Limit: The Low alarm limit value (real).
- Low Alarm: The Low alarm output BIT.
- Low-Low Limit: The Low-Low alarm limit value (real).
- Low-Low Alarm: The Low-Low alarm output BIT.

Parameter	DL205 Range
Monitoring Value V	All V Memory
High-High Limit . . . . . V, R	R-3.402823E+38 - +3.402823E+38; All V Memory
High-High Alarm . . . . . X, Y, C, GX,GY, B	All Bit Memory
High Limit . . . . . V, R	R-3.402823E+38 - +3.402823E+38; All V Memory
High Alarm. . . . . X, Y, C, GX,GY, B	All Bit Memory
Low Limit . . . . . V, R	R-3.402823E+38 - +3.402823E+38; All V Memory
Low Alarm . . . . . X, Y, C, GX,GY,B	All Bit Memory
Low-Low Limit . . . . . V, R	R-3.402823E+38 - +3.402823E+38; All V Memory
Low-Low Alarm. . . . . X, Y, C, GX,GY, B	All Bit Memory

HILOALR Example

In the following example, the HILOALR instruction is used to monitor a double word Real value that is in V2044-V2045. If the value in V2044-V2045 meets/exceeds the high limit of R80.456, C52 will turn ON. If the value continues to increase to meet/exceed the high-high limit of R90.123, C51 will turn ON. Both bits would be ON in this case. The high and high-high limits and alarms can be set to the same value if one "high" limit or alarm is desired to be used.

If the value in V2044-V2045 meets or falls below the low limit of R20.789, C53 will turn ON. If the value continues to decrease to meet or fall below the low-low limit of R10.123, C54 will turn ON. Both bits would be ON in this case. The low and low-low limits and alarms can be set to the same value if one "low" limit or alarm is desired to be used.

Move Real (MOVER) (IB-202)

DS6	Used
HPP	N/A

The Move Real IBox will copy a 32-bit floating point number that is stored in two consecutive V-Memory locations to the specified location which is also two consecutive V-Memory locations.

MOVER Parameters

- From Real: The first V-Memory location of the source data double-word.
- To Real: The first V-Memory location of the destination double-word.

Parameter	DL205 Range
From Real . . . . . V,R	R-3.402823E+38 - +3.402823E+38; All V Memory
To Real V	All V Memory

MOVER Example

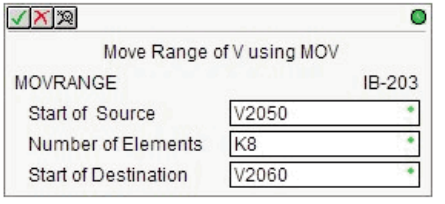
In the following example, the MOVER instruction is used to move 32 bits of data from V2040-V2041 to V2042-V2043.

S

Move Range of V using MOV (MOVRANGE) (IB-203)

DS6	Used
HPP	N/A

The Move Range of V using MOV will use a MOV instruction to copy the values from one range of V-Memory locations to a second range of V-Memory locations. Up to 4095 V-Memory locations can be moved.



MOVRANGE Parameters

- Start of Source: The first V-Memory location of the source range.
- Number of Elements: The number of consecutive V-Memory locations to process (BCD).
- Start of Destination: The first V-Memory location of the destination range.

Parameter	DL205 Range
Start of Source V	All V Memory
Number of Elements . . . . . V,K	K1 - 4095, All V Memory
Start of Destination V	All V Memory

Note: *The Source Range and the Destination Range CAN NOT overlap.*

Note: *If the instruction will be moving double-word values the Number of Elements must be an even number.*

Note: *All of the locations will be moved in the same PLC scan, which will cause an increase in the scan time. Be aware this increase may be large enough to trip with watchdog timer.*

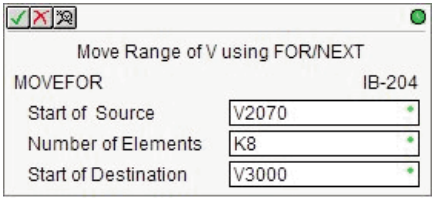
MOVRANGE Example

In the following example, the MOVRANGE instruction is used to move 8 words of data from V2050-V2057 to V2060-V2067.

Move Range of V using FOR/NEXT (MOVEFOR) (IB-204)

DS6	Used
HPP	N/A

The Move Range of V using FOR/NEXT will use a FOR/NEXT loop to copy the values from one range of V-Memory locations to a second range of V-Memory locations. Up to 4095 V-Memory locations can be moved.



MOVEFOR Parameters

- Start of Source: The first V-Memory location of the source range.
- Number of Elements: The number of consecutive V-Memory locations to process (BCD).
- Start of Destination: The first V-Memory location of the destination range.

Parameter	DL205 Range
Start of Source V	All V Memory
Number of Elements . . . . . V,K	K1 - 4095, All V Memory
Start of Destination V	All V Memory

Note: *The Source Range and the Destination Range CAN NOT overlap.*

Note: *If the instruction will be moving double-word values the Number of Elements must be an even number.*

Note: *All of the locations will be moved in the same PLC scan, which will cause an increase in the scan time. Be aware this increase may be large enough to trip with watchdog timer.*

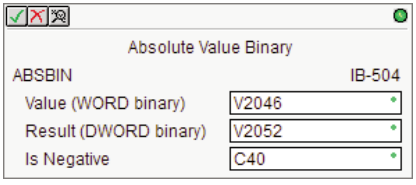
MOVEFOR Example

In the following example, the MOVEFOR instruction is used to move 8 words of data from V2070-V2077 to V3000-V3007.

Absolute Value - Binary (ABSBIN) (IB-504)

DS6	Used
HPP	N/A

The Absolute Value - Binary IBox returns the absolute value of the number Binary (decimal) found in the specified V-Memory location. If the Value is negative, it negates the Value to make it positive and stores it in Result and turns the Is Negative bit ON. Otherwise, it returns the Value unchanged and the Is Negative bit is OFF.



For example:

If V2046 = 31415 the result in V2052/V2053 would be 31415, and the Is Negative bit (C40) would be OFF.
If V2046 = -31415 the result in V2052/V2053 would be 31415, and the Is Negative bit (C40) would be ON.

ABSBIN Parameters

- Value (WORD Binary): The V-Memory location where the 16-bit Binary (decimal) value is located.
- Result (DWORD Binary): The first V-Memory location where the 32-bit Binary (decimal) absolute value will be stored.
- Is Negative: If Value (WORD binary) is negative this bit will be ON. If Value (WORD binary) is not negative (e.g. zero or positive) this bit will be OFF.

Parameter	DL205 Range
Value V	All V Memory
Result V	All V Memory
Is Negative ..... X,Y,C,GX,GY,B	All Bit Memory

ABSBIN Example

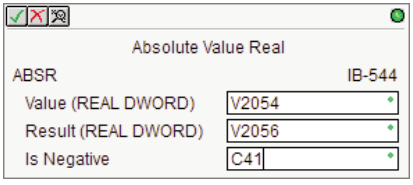
In this example the ABSBIN instruction is used to calculate the absolute value of the binary number stored in V2046. The result is stored in V2052-V2053 and C40 will be set if the value of V2046 was negative.

S

Absolute Value - Real (ABSR) (IB-544)

DS6	Used
HPP	N/A

The Absolute Value - Real IBox returns the absolute value of the Real (floating point) number found in the specified V-Memory locations. If the Value is negative, it negates the Value to make it positive, stores it in Result and turns the Is Negative bit ON. Otherwise, it returns the Value unchanged and the Is Negative bit is OFF.



For example:

If V2054/V2055 = 3.14159 the result in V2056/V2057 would be 3.14159, and the Is Negative bit (C41) would be OFF.
If V2054/V2055 = -3.14159 the result in V2056/V2057 would be 3.14159, and the Is Negative bit (C41) would be ON.

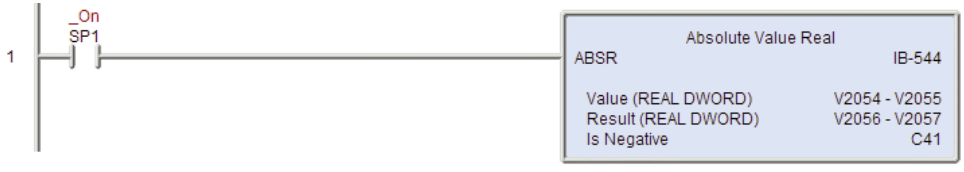
ABSR Parameters

- Value (Real DWORD): The first V-Memory location where the 32-bit Real (floating point) value is located.
- Result (Real DWORD): The first V-Memory location where the 32-bit Real (floating point) absolute value will be stored.
- Is Negative: If Value (REAL DWORD) is negative this bit will be ON. If Value (REAL DWORD) is not negative (e.g. zero or positive) this bit will be OFF.

Parameter	DL205 Range
Value V	All V Memory
Result V	All V Memory
Is Negative ..... X,Y,C,GX,GY,B	All Bit Memory

ABSR Example

In this example the ABSR instruction is used to calculate the absolute value of the real number stored in V2054-V2055. The result is stored in V2056-V2057 and C41 will be set if the value of V2054-V2055 was negative.



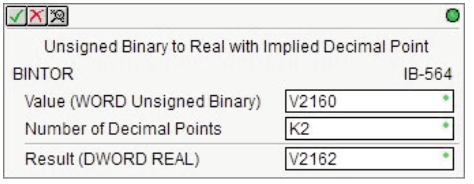
S

Unsigned Binary to Real with Implied Decimal Point (BINTOR) (IB-564)

DS6	Used
HPP	N/A

The Unsigned Binary to Real with Implied Decimal Point IBox converts the given 16-bit Unsigned Binary (decimal) value to a 32-bit real number, given an implied number of decimal points.

Example: K1234 with the Number of Decimal Points set to K1 would yield R123.4.



BINTOR Parameters

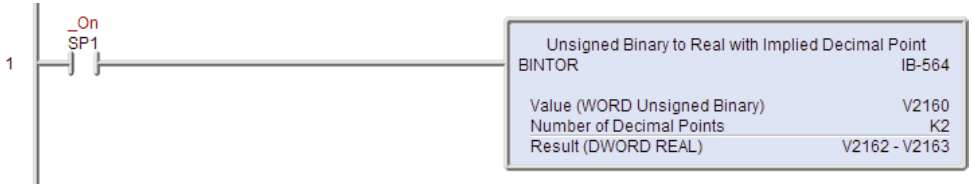
- Value (WORD Unsigned Binary): The V-Memory location where the Unsigned Binary (decimal) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) result will be stored.

Parameter	DL205 Range
Value . . . . . V,K,P	K0 - 65535, All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 5
Result V	All User V Memory

BINTOR Example

In the following example the BINTOR instruction is used to convert the binary value stored in V2160 to a 32 bit real number which is stored in V2162-V2163.

K2 in the decimal points implies that the data will have two digits to the right of the decimal point.

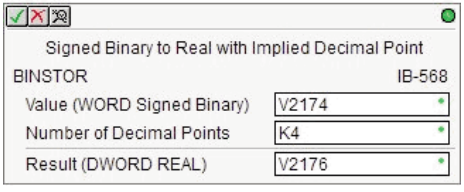


Signed Binary to Real with Implied Decimal Point (BINSTOR) (IB-568)

DS6	Used
HPP	N/A

The Signed Binary to Real with Implied Decimal Point IBox converts the given 16-bit Signed Binary (decimal) value to a 32-bit real number, given an implied number of decimal points.

Example: K1234 with the Number of Decimal Points set to K1 would yield R123.4.



S

BINSTOR Parameters

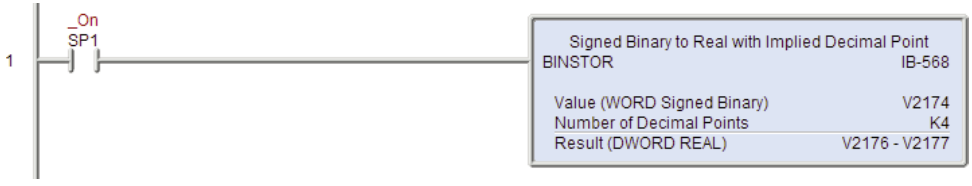
- Value (WORD Signed Binary): The V-Memory location where the Signed Binary (decimal) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) result will be stored.

Parameter	DL205 Range
Value . . . . . V,K,P	K0 - 32767, All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 5
Result V	All User V Memory

BINSTOR Example

In the following example the BINSTOR instruction is used to convert the signed binary value stored in V2174 to a 32 bit real number which is stored in V2176-V2177.

K4 in the decimal points implies that the data will have four digits to the right of the decimal point.

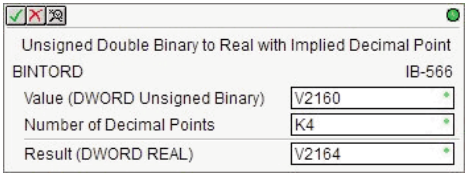


Unsigned Double Binary to Real with Implied Decimal Point (BINTORD) (IB-566)

DS6	Used
HPP	N/A

The Unsigned Double Binary to Real with Implied Decimal Point IBox converts the given 32-bit Unsigned Binary (decimal) value to a 32-bit real number, given an implied number of decimal points.

Example: K12345678 with the Number of Decimal Points set to K5 would yield R123.45678.



S

BINTORD Parameters

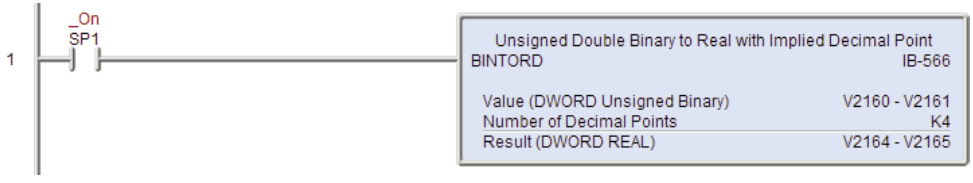
- Value (DWORD Unsigned Binary): The first V-Memory location where the 32-bit Unsigned Binary (decimal) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) result will be stored.

Parameter	DL205 Range
Value . . . . . V,K,P	K0 - 4294967295, All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 10
Result V	All User V Memory

BINTORD Example

In the following example the BINTORD instruction is used to convert the double word binary value stored in V2160-V2161 to a 32 bit real number which is stored in V2164-V2165.

K4 in the decimal points implies that the data will have four digits to the right of the decimal point.

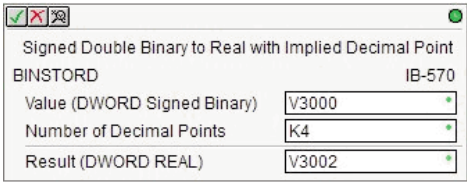


Signed Double Binary to Real with Implied Decimal Point (BINSTORD) (IB-570)

DS6	Used
HPP	N/A

The Signed Double Binary to Real with Implied Decimal Point IBox converts the given 32-bit Signed Binary (decimal) value to a 32-bit real number, given an implied number of decimal points.

Example: K12345678 with the Number of Decimal Points set to K5 would yield R123.45678.



BINSTORD Parameters

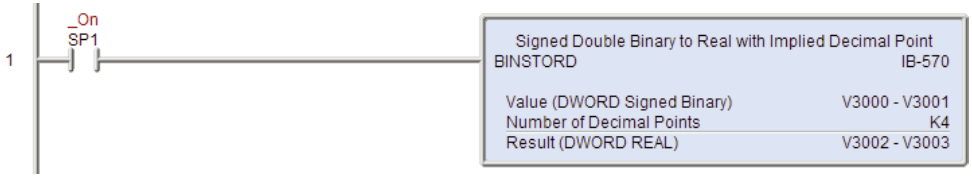
- Value (DWORD Signed Binary): The first V-Memory location where the 32-bit Signed Binary (decimal) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) result will be stored.

Parameter	DL205 Range
Value . . . . . V,K,P	K0 - 2147483647, All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 10
Result V	All User V Memory

BINSTORD Example

In the following example the BINSTORD instruction is used to convert the signed double word binary value stored in V3000-V3001 to a 32 bit real number which is stored in V3002-V3003.

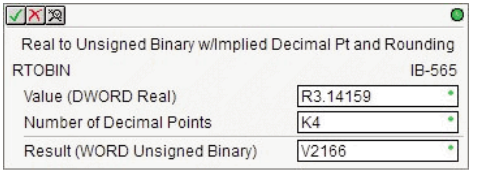
K4 in the decimal points implies that the data will have four digits to the right of the decimal point.



Real to Unsigned Binary with Implied Decimal Point and Rounding (RTOBIN) (IB-565)

DS6	Used
HPP	N/A

The Real to Unsigned Binary with Implied Decimal Point and Rounding IBox converts the 32-bit real number to a 16-bit Unsigned Binary (decimal) value, compensating for an implied number of decimal points, then rounding the number up if needed.



Example: R56.78 with the Number of Decimal Points set to K1 would yield the Binary value 568. If the Number of decimal Points is set to K0, this IBox would yield the Binary value 57 (the 6 is rounded up).

S

RTOBIN Parameters

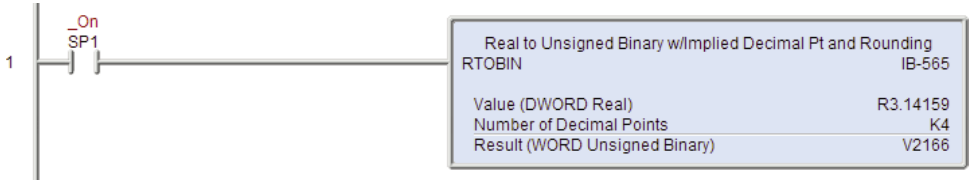
- Value (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point to convert.
- Result (WORD Unsigned Binary): The V-Memory location where the 16-bit Unsigned Binary (decimal) result will be stored.

Parameter	DL205 Range
Value . . . . . V,R,P	R-3.402823E+38 - +3.402823E+38; All P Memory All User V Memory
Number of Decimal Points. . . . . K	K0 - 5
Result V	All User V Memory

RTOBIN Example

In the following example the RTOBIN instruction is used to convert the real value R3.14159 to a binary number which is stored in V2166.

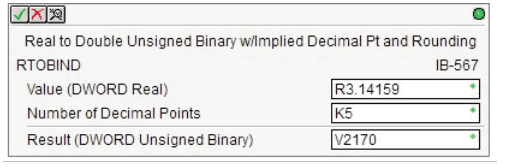
K4 in the decimal points implies that the data will have four digits to the right of the decimal point. The resulting value in V2166 is 31416.



Real to Double Unsigned Binary with Implied Decimal Point and Rounding (RTOBIND) (IB-567)

DS6	Used
HPP	N/A

The Real to Double Unsigned Binary with Implied Decimal Point and Rounding IBox converts the 32-bit real number to a 32-bit Unsigned Binary (decimal) value, compensating for an implied number of decimal points, then rounding the number up if needed.



Example: R123456.78 with the Number of Decimal Points set to K2 would yield the BCD value 12345678. If the Number of decimal Points is set to K0, this IBox would yield the BCD value 123457 (the 6 is rounded up).

RTOBIND Parameters

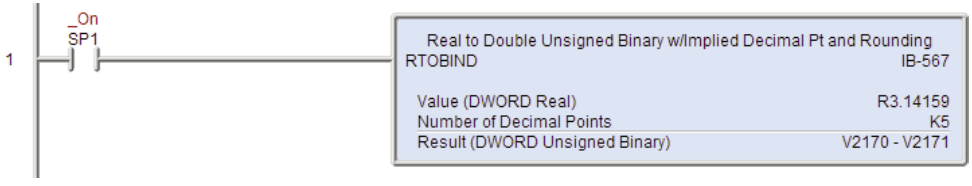
- Value (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Unsigned Binary): The first V-Memory location where the 32-bit Unsigned Binary (decimal) result will be stored.

Parameter	DL205 Range
Value . . . . . V,R,P	R-3.402823E+38 - +3.402823E+38; All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 10
Result V	All User V Memory

RTOBIND Example

In the following example the RTOBIND instruction is used to convert the real value R3.14159 to a double word binary number which is stored in V2170-V2171.

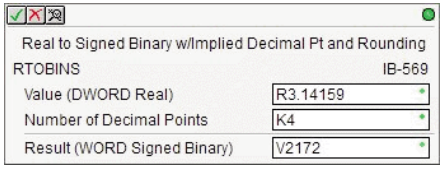
K5 in the decimal points implies that the data will have five digits to the right of the decimal point.The resulting value in V2170-V2171 is 314159.



Real to Signed Binary with Implied Decimal Point and Rounding (RTOBINS) (IB-569)

DS6	Used
HPP	N/A

The Real to Signed Binary with Implied Decimal Point and Rounding IBox converts the 32-bit real number to a 16-bit Signed Binary (decimal) value, compensating for an implied number of decimal points, then rounding the number up if needed.



Example: R56.78 with the Number of Decimal Points set to K1 would yield the Binary value 568. If the Number of decimal Points is set to K0, this IBox would yield the Binary value 57 (the 6 is rounded up).

S

RTOBINS Parameters

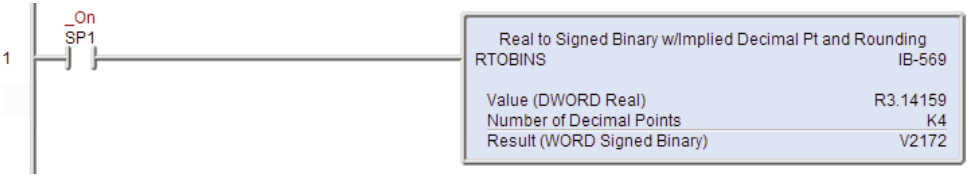
- Value (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (WORD Signed Binary): The V-Memory location where the 16-bit Signed Binary (decimal) result will be stored.

Parameter	DL205 Range
Value . . . . . V,R,P	R-3.402823E+38 - +3.402823E+38; All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 5
Result V	All User V Memory

RTOBINS Example

In the following example the RTOBINS instruction is used to convert the real value R3.14159 to a signed binary number which is stored in V2172.

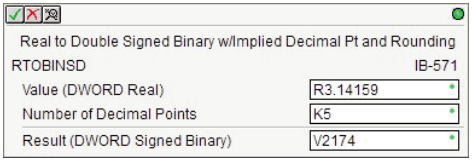
K4 in the decimal points implies that the data will have four digits to the right of the decimal point.The resulting value in V2172 is 31416.



Real to Double Signed Binary with Implied Decimal Point and Rounding (RTOBINSD) (IB-571)

DS6	Used
HPP	N/A

The Real to Double Signed Binary with Implied Decimal Point and Rounding IBox converts the 32-bit real number to a 32-bit Signed Binary (decimal) value, compensating for an implied number of decimal points, then rounding the number up if needed.



Example: R123456.78 with the Number of Decimal Points set to K2 would yield the value 12345678. If the Number of decimal Points is set to K0, this IBox would yield the value 123457 (the 6 is rounded up).

S

RTOBINSD Parameters

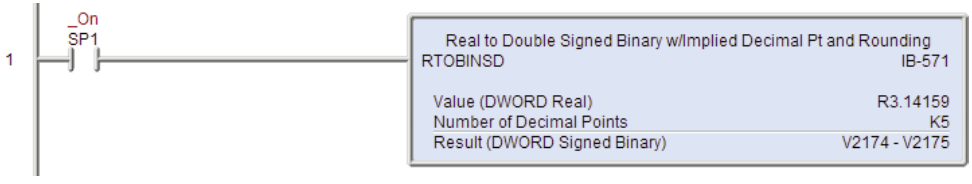
- Value (DWORD Real): The first V-Memory location where the 32-bit Real (floating point) value is located, or the constant value to convert.
- Number of Decimal Points: The desired number of digits to the right of the decimal point in the result.
- Result (DWORD Signed Binary): The first V-Memory location where the 32-bit Signed Binary (decimal) result will be stored.

Parameter	DL205 Range
Value . . . . . V,R,P	R-3.402823E+38 - +3.402823E+38; All P Memory, All User V Memory
Number of Decimal Points. . . . . K	K0 - 10
Result V	All User V Memory

RTOBINSD Example

In the following example the RTOBINSD instruction is used to convert the real value R3.14159 to a signed double word binary number which is stored in V2174-V2175.

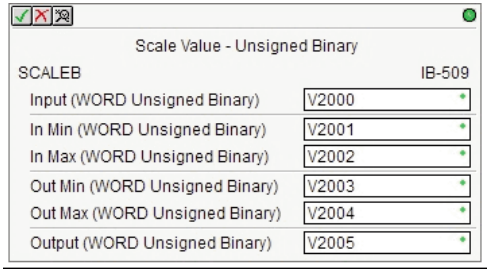
K5 in the decimal points implies that the data will have zero digits to the right of the decimal point.The resulting value in V2174-V2175 is 314159.



Scale Value - Unsigned Binary (SCALEB) (IB-509)

DS6	Used
HPP	N/A

The Scale Value Unsigned Binary IBox will scale an unsigned 16-bit Binary value (0-65535) of a particular range into an unsigned 16-bit Binary value of another particular range.



This IBox only works with unsigned binary values, it DOES NOT work with signed binary or "sign plus magnitude" values.

The formula used is:

$$Output = \frac{(Input - InMin) \times (OutMax - OutMin)}{InMax - InMin} + OutMin$$

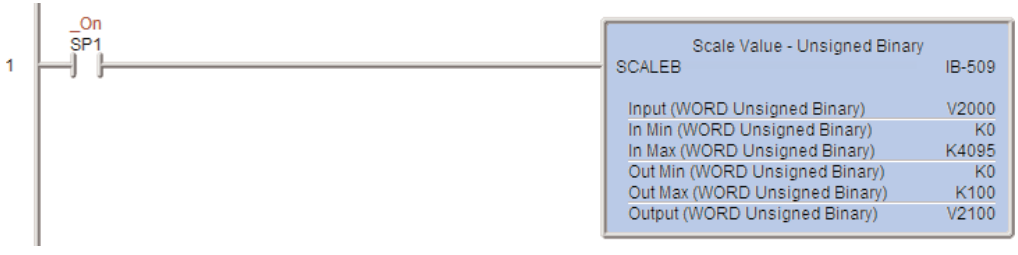
SCALEB Parameters

- Input (WORD Unsigned Binary): The raw 16-bit Unsigned Binary value to be scaled.
- In Min (WORD Unsigned Binary): The low limit (0-65535) of the Input range.
- In Max (WORD Unsigned Binary): The high limit (0-65535) of the Input range.
- Out Min (WORD Unsigned Binary): The low limit (0-65535) of the Output range.
- Out Max (WORD Unsigned Binary): The high limit (0-65535) of the Output range.
- Output (WORD Unsigned Binary): The scaled unsigned 16-bit Binary value (0-65535).

Parameter	DL205 Range
Input V	All V Memory
In Min . . . . . V,K	K0 - 65535, All V Memory
In Max . . . . . V,K	K0 - 65535, All V Memory
Out Min . . . . . V,K	K0 - 65535, All V Memory
Out Max . . . . . V,K	K0 - 65535, All V Memory
Output V	All User V Memory

SCALEB Example

In this SCALEB example a single word unsigned binary value from a 12 bit analog card in V2000 is being scaled from the 0 – 4095 raw value to 0 – 100 engineering units and the result is being stored in V2100 as a single word unsigned binary value. For example, if V2000 has a value of 2048 then the resulting value stored in V2100 is 50.

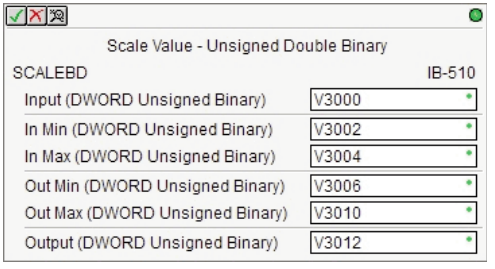


S

Scale Value - Unsigned Double Binary (SCALEBD) (IB-510)

DS6	Used
HPP	N/A

The Scale Value Unsigned Double Binary IBox will scale an unsigned 32-bit Binary value (0-4294967295) of a particular range into an unsigned 32-bit Binary value of another particular range.



This IBox only works with unsigned binary values, it DOES NOT work with signed binary or "sign plus magnitude", or floating-point values.

The formula used is:

$$Output = \frac{(Input - InMin) \times (OutMax - OutMin)}{InMax - InMin} + OutMin$$

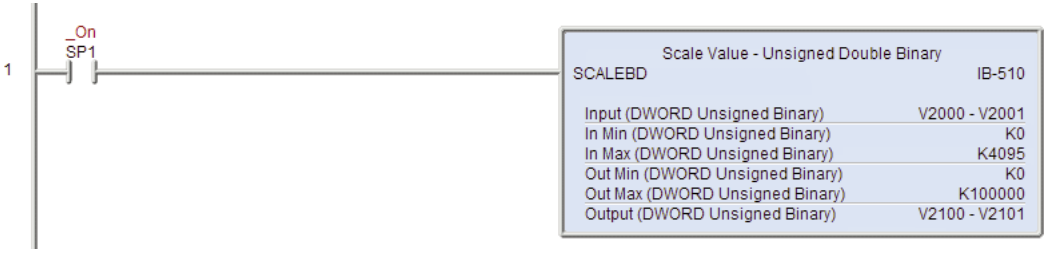
SCALEBD Parameters

- Input (DWORD Unsigned Binary): The raw 32-bit Unsigned Binary value to be scaled.
- In Min (DWORD Unsigned Binary): The low limit (0-4294967295) of the Input range.
- In Max (DWORD Unsigned Binary): The high limit (0-4294967295) of the Input range.
- Out Min (DWORD Unsigned Binary): The low limit (0-4294967295) of the Output range.
- Out Max (DWORD Unsigned Binary): The high limit (0-4294967295) of the Output range.
- Output (DWORD Unsigned Binary): The scaled unsigned 32-bit Binary value (0-4294967295).

Parameter	DL205 Range
Input V	All V Memory
In Min ..... V,K	K0 - 4294967295, All V Memory
In Max ..... V,K	K0 - 4294967295, All V Memory
Out Min ..... V,K	K0 - 4294967295, All V Memory
Out Max ..... V,K	K0 - 4294967295, All V Memory
Output V	All User V Memory

SCALEBD Example

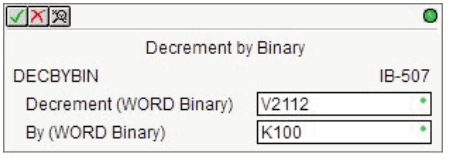
In this SCALEBD example a double word unsigned binary value from a 12 bit analog card in V2000-V2001 is being scaled from the 0 – 4095 raw value to 0 – 100,000 engineering units and the result is being stored in V2100-V2101 as a double word unsigned binary value. For example, if V2000-V2001 has a value of 2048 then the resulting value stored in V2100-V2101 is 50,000.



Decrement By Binary (DECBYBIN) (IB-507)

DS6	Used
HPP	N/A

The Decrement By Binary IBox will subtract the By (WORD Binary) Value from the Decrement (WORD Binary) Value on each scan the instruction is enabled.



DECBYBIN Parameters

- Decrement (WORD Binary): The V-Memory location where the 16-bit Binary (decimal) value is located.
- By (WORD Binary): The WORD Binary (decimal) value to subtract.

Parameter	DL205 Range
Decrement V	All V Memory
By . . . . . V,K	K0 - 65535, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP64	On when the 16- bit subtraction instruction results in a borrow
SP65	On when the 32-bit subtraction instruction results in a borrow
SP70	On anytime the value in the accumulator is negative.

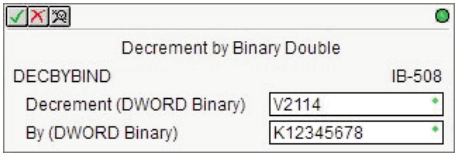
DECBYBIN Example

In this example the DECBYBIN instruction will subtract the value K100 from the binary value in V2112 on every scan that C0 is ON.

Decrement By Binary Double (DECBYBIND) (IB-508)

DS6	Used
HPP	N/A

The Decrement By Binary Double IBox will subtract the By (DWORD Binary) Value from the Decrement (DWORD Binary) Value on each scan the instruction is enabled.



DECBYBIND Parameters

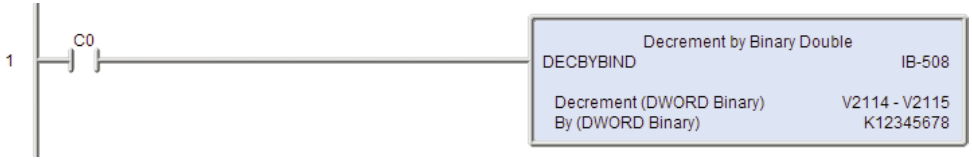
- Decrement (DWORD Binary): The V-Memory location where the 32-bit Binary Double (decimal) value is located.
- By (DWORD Binary): The DWORD Binary (decimal) value to subtract.

Parameter	DL205 Range
Decrement V	All V Memory
By . . . . . V,K	K0 - 4294967295, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP64	On when the 16- bit subtraction instruction results in a borrow
SP65	On when the 32-bit subtraction instruction results in a borrow
SP70	On anytime the value in the accumulator is negative.

DECBYBIND Example

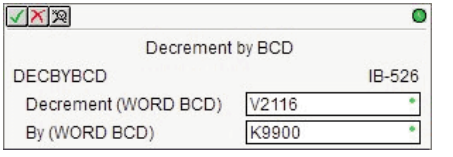
In this example the DECBYBIND instruction will subtract the value K12345678 from the double word binary value in V2114-V2115 on every scan that C0 is ON.



Decrement By BCD (DECBYBCD) (IB-526)

DS6	Used
HPP	N/A

The Decrement By BCD IBox will subtract the By (WORD BCD) Value from the Decrement (WORD BCD) Value on each scan the instruction is enabled.



DECBYBCD Parameters

- Decrement (WORD BCD): The V-Memory location where the 16-bit BCD value is located.
- By (WORD BCD): The WORD BCD value to subtract.

S

Parameter	DL205 Range
Decrement V	All V Memory
By . . . . . V,K	K0 - 9999, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP64	On when the 16- bit subtraction instruction results in a borrow
SP65	On when the 32-bit subtraction instruction results in a borrow
SP70	On anytime the value in the accumulator is negative.
SP75	On when a BCD instruction is executed and a NON–BCD number was encountered.

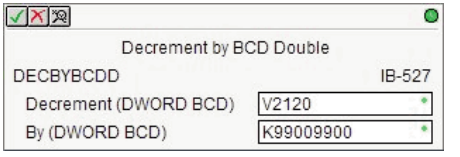
DECBYBCD Example

In this example the DECBYBCD instruction will subtract the BCD value K9900 from the BCD value in V2116 on every scan that C0 is ON.

Decrement By BCD Double (DECBYBCDD) (IB-527)

DS6	Used
HPP	N/A

The Decrement By BCD Double IBox will subtract the By (DWORD BCD) Value from the Decrement (DWORD BCD) Value on each scan the instruction is enabled.



DECBYBCDD Parameters

- Decrement (DWORD BCD): The V-Memory location where the 32-bit BCD value is located.
- By (DWORD BCD): The DWORD BCD value to subtract.

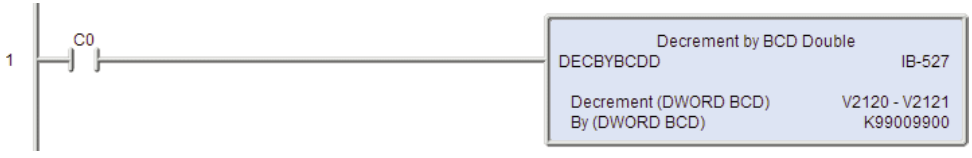
S

Parameter	DL205 Range
Decrement V	All V Memory
By . . . . . V,K	K0 - 99999999, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP64	On when the 16- bit subtraction instruction results in a borrow
SP65	On when the 32-bit subtraction instruction results in a borrow
SP70	On anytime the value in the accumulator is negative.
SP75	On when a BCD instruction is executed and a NON–BCD number was encountered.

DECBYBCDD Example

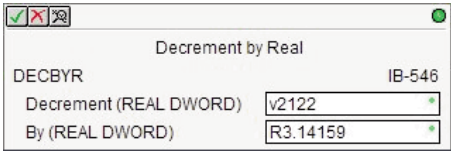
In this example the DECBYBCDD instruction will subtract the BCD value K99009900 from the double word BCD value in V2120-V2121 on every scan that C0 is ON.



Decrement By Real (DECBYR) (IB-546)

DS6	Used
HPP	N/A

The Decrement By Real IBox will subtract the By (REAL DWORD) Value from the Decrement (REAL DWORD) Value on each scan the instruction is enabled.



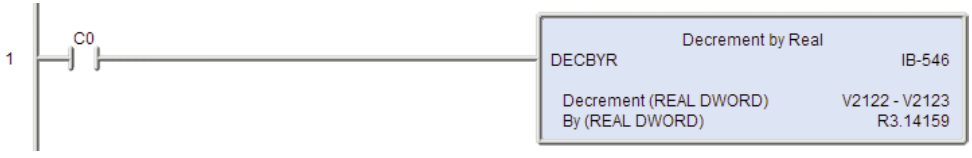
DECBYR Parameters

- Decrement (Real DWORD): The first V-Memory location where the 32-bit Real (floating point) value is located.
- By (Real DWORD): The 32-bit Real (floating point) value to subtract.

Parameter	DL205 Range
Decrement V	All V Memory
By . . . . . V,R	R-3.402823E+38 - +3.402823E+38, All V Memory

DECBYR Example

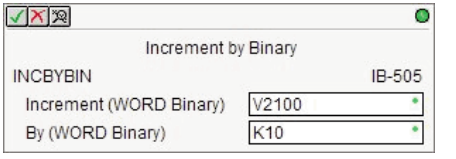
In this example the DECBYR instruction will subtract the real value R3.14159 from the real value in V2122-V2123 on every scan that C0 is ON.



Increment By Binary (INCBYBIN) (IB-505)

DS6	Used
HPP	N/A

The Increment By Binary IBox will add the By (WORD Binary) Value to the Increment (WORD Binary) Value on each scan the instruction is enabled.



INCBYBIN Parameters

- Increment (WORD Binary): The V-Memory location where the 16-bit Binary (decimal) value is located.
- By (WORD Binary): The WORD Binary (decimal) value to add.

S

Parameter	DL205 Range
Increment V	All V Memory
By . . . . . V,K	K0 - 65535, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP66	On when the 16-bit addition instruction results in a carry.
SP67	On when the 32-bit addition instruction results in a carry.
SP70	On anytime the value in the accumulator is negative.
SP73	On when a signed addition or subtraction results in an incorrect sign bit.

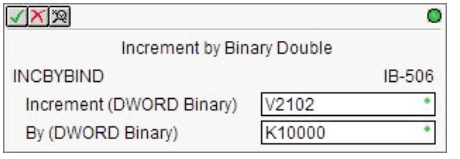
INCBYBIN Example

In this example the INCBYBIN instruction will add the value K10 to the binary value in V2100 on every scan that C0 is ON.

Increment By Binary Double (INCBYBIND) (IB-506)

DS6	Used
HPP	N/A

The Increment By Binary Double IBox will add the By (DWORD Binary) Value to the Increment (DWORD Binary) Value on each scan the instruction is enabled.



INCBYBIND Parameters

- Increment (DWORD Binary): The V-Memory location where the 32-bit Binary Double (decimal) value is located.
- By (DWORD Binary): The DWORD Binary (decimal) value to add.

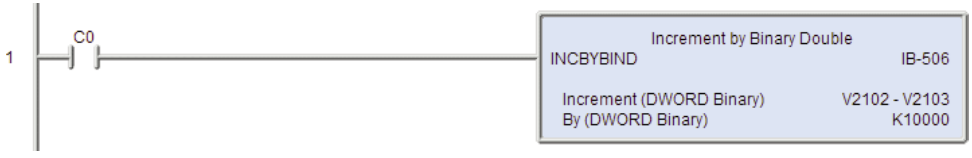
S

Parameter	DL205 Range
Increment V	All V Memory
By . . . . . V,K	K0 - 4294967295, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP66	On when the 16-bit addition instruction results in a carry.
SP67	On when the 32-bit addition instruction results in a carry.
SP70	On anytime the value in the accumulator is negative.
SP73	On when a signed addition or subtraction results in an incorrect sign bit.

INCBYBIND Example

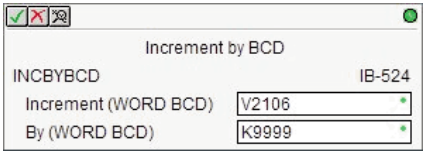
In this example the INCBYBIND instruction will add the value K10000 to the double word binary value in V2102-V2103 on every scan that C0 is ON.



Increment By BCD (INCBYBCD) (IB-524)

DS6	Used
HPP	N/A

The Increment By BCD IBox will add the By (WORD BCD) Value to the Increment (WORD BCD) Value on each scan the instruction is enabled.



INCBYBCD Parameters

- Increment (WORD BCD): The V-Memory location where the 16-bit BCD value is located.
- By (WORD BCD): The WORD BCD value to add.

S

Parameter	DL205 Range
Increment V	All V Memory
By . . . . . V,K	K0 - 9999, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP66	On when the 16-bit addition instruction results in a carry.
SP67	On when the 32-bit addition instruction results in a carry.
SP70	On anytime the value in the accumulator is negative.
SP73	On when a signed addition or subtraction results in an incorrect sign bit.
SP75	On when a BCD instruction is executed and a NON–BCD number was encountered.

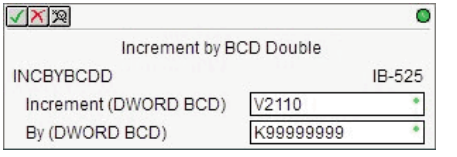
INCBYBCD Example

In this example the INCBYBCD instruction will add the BCD value K9999 to the binary value in V2106 on every scan that C0 is ON.

Increment By BCD Double (INCBYBCDD) (IB-525)

DS6	Used
HPP	N/A

The Increment By BCD Double IBox will add the By (DWORD BCD) Value to the Increment (DWORD BCD) Value on each scan the instruction is enabled.



INCBYBCDD Parameters

- Increment (DWORD BCD): The V-Memory location where the 32-bit BCD value is located.
- By (DWORD BCD): The DWORD BCD value to add.

S

Parameter	DL205 Range
Increment V	All V Memory
By . . . . . V,K	K0 - 99999999, All V Memory

Discrete Bit Flags	Description
SP63	On when the result of the instruction causes the value in the accumulator to be zero.
SP66	On when the 16-bit addition instruction results in a carry.
SP67	On when the 32-bit addition instruction results in a carry.
SP70	On anytime the value in the accumulator is negative.
SP73	On when a signed addition or subtraction results in an incorrect sign bit.
SP75	On when a BCD instruction is executed and a NON–BCD number was encountered.

INCBYBCDD Example

In this example the INCBYBCDD instruction will add the BCD value K99999999 to the BCD value in V2110-V2111 on every scan that C0 is ON.

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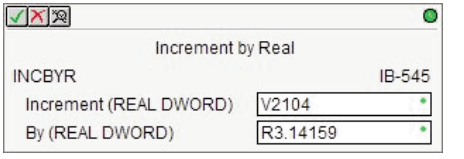
Increment By Real (INCBYR) (IB-545)

DS6	Used
HPP	N/A

The Increment By Real IBox will add the By (REAL DWORD) Value to the Increment (REAL DWORD) Value on each scan the instruction is enabled.



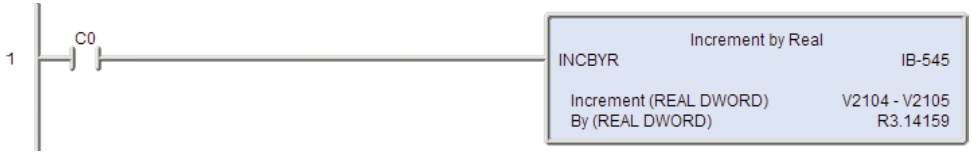
INCBYR Parameters

- Increment (Real DWORD): The first V-Memory location where the 32-bit Real (floating point) value is located.
- By (Real DWORD): The 32-bit Real (floating point) value to add.

Parameter	DL205 Range
Increment V	All V Memory
By . . . . . V,R	R-3.402823E+38 - +3.402823E+38, All V Memory

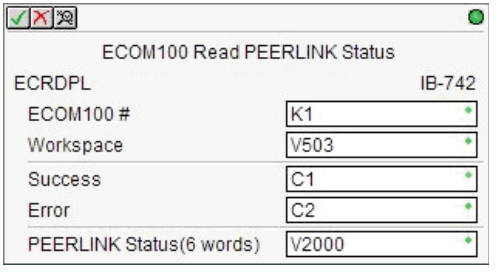
INCBYR Example

In this example the INCBYR instruction will add the real value R3.14159 to the real value in V2104-V2105 on every scan that C0 is ON.



ECOM100 Read PEERLINK Status (ECRDPL) (IB-742)

DS6	Used
HPP	N/A



The ECOM100 Read PEERLINK Status IBox will read the PEERLINK operation's runtime status information from an ECOM100 that is configured to be part of a PEERLINK network. This IBox will return 6 registers that contain information about current PEERLINK status and configuration.

It references the ECOM100 # of the ECOM100 Config IBox that is controlling the ECOM100 module in a specific slot. The ECOM100 Config contains built-in interlocking logic that is used to synchronize the processing of this IBox with all of the other IBoxes in the ladder program that are being processed by the same ECOM100.

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A PEERLINK network is a data sharing network that consists of any number of DirectLOGIC PLC and/or Do-more PLC systems using ECOM100 modules and/or the Do-more PLC's onboard Ethernet port. Each member of the data sharing network can receive data from the other members on the data sharing network by "subscribing to" them, or send data to the other members of the network by electing to "publish" one or more blocks of PEERLINK memory.

When PEERLINK is configured in an ECOM100 the user specifies a section of V-Memory that is allocated for exclusive use by the PEERLINK operation. This memory contains 256 locations. These 256 locations are divided into 16 blocks. Each of these 16 data blocks consists of 16-Bit registers. Theses blocks provide the local storage for the data that is sent and received over the data-sharing network.

PEERLINK uses the verbs 'publishing' and 'subscribing' to describe how data is exchanged with ECOM100s on the data sharing network. Publishing is analogous to sending data, and is done only if the PEERLINK configuration is set to 'publish' one or more of its own data blocks. If so configured, the ECOM100 will broadcast a packet that contains all of the data from the V-Memory blocks. There are sixteen unique data blocks, and each data block can only be published by one ECOM100 or Do-more PLC. This means there can be a maximum of sixteen unique ECOMs configured to publish blocks of data. A single ECOM100 can be configured so that it publishes none of the blocks, one block, some of the blocks, or even all 16 of the blocks.

Subscribing is analogous to receiving data, and is accomplished by 'subscribing to' the data blocks of all the other controllers on the data sharing network. Once PEERLINK is enabled, it listens to the network for PEERLINK broadcasts messages from other ECOM100s or Do-more PLCs. When it receives one, it examines the data from that packet, and for blocks that are configured as "Subscribe To", it stores that data in the controller's local V-Memory in the appropriate block.

The PEERLINK network uses TCP/IP broadcast packets to publish the blocks of data to the network. One caveat with the use of broadcast packets is that it limits the scope of the shared data network to the local broadcast domain.

The ECOM100 Read PEERLINK Status IBox retrieves 6 status values from the ECOM100 and places those values in 6 consecutive V-Memory locations. The definitions of those 6 status values follows:

Number	Name	Description
Word 1	Paused	1 = PEERLINK processing is Paused in this ECOM100 0 = PEERLINK processing is Active
Word 2	PEERLINK Enabled	1 = PEERLINK is Enabled in this ECOM100 0 = PEERLINK is NOT Enabled in this ECOM100
Word 3	PEERLINK Address	The first of the 256 V-Memory locations that the PEERLINK operation uses for storing the data that is sent and received through the Publish and Subscribe operations
Word 4	Ignored Blocks	Indicates which of the 16 PEERLINK blocks are being ignored by this ECOM100. If the bit is ON the block is being ignored, if the bit is OFF the block is NOT ignored. Each of the 16 bits in this Word corresponds to a PEERLINK block as follows: Bit 0 = Block 0 Bit 1 = Block 1 ... Bit 14 = Block 14 Bit 15 = Block 15
Word 5	Published Blocks	Indicates which of the 16 PEERLINK blocks are being published by this ECOM100. If the bit is ON the block is being published, if the bit is OFF the block is NOT being published. Each of the 16 bits in this Word corresponds to a PEERLINK block as follows: Bit 0 = Block 0 Bit 1 = Block 1 ... Bit 14 = Block 14 Bit 15 = Block 15
Word 6	Subscribed Blocks	Indicates which of the 16 PEERLINK blocks this ECOM100 is subscribing to. If the bit is ON the block is being subscribed to, if the bit is OFF the block is NOT being subscribed to. Each of the 16 bits in this Word corresponds to a PEERLINK block as follows: Bit 0 = Block 0 Bit 1 = Block 1 ... Bit 14 = Block 14 Bit 15 = Block 15

ECRDPL Parameters

- ECOM100#: This is a logical number associated with this specific ECOM100 module in the specified slot. All other ECxxxx IBoxes that need to reference this ECOM100 module must reference this logical number.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the ECRDPL succeeds and OFF if the ECRDPL fails.
- Error: This BIT will be OFF if the ECRDPL succeeds and ON if the ECRDPL fails.
- PEERLINK Status (6 Words): The first of the 6 consecutive V-Memory registers where the PEERLINK Status values will be stored.

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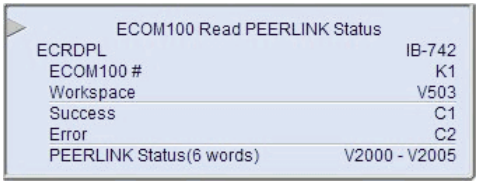
Parameter	DL205 Range
ECOM100# . . . . . K	K0-255
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory
PEERLINK Status V	All User V Memory

Note: *When the ECRDPL IBox is allowed to execute, the Success and Error BITs are both set to OFF. One of these Bits is guaranteed to be ON after the IBox execution is complete. These BITs will retain their ON/OFF value until the IBox is executed again.*

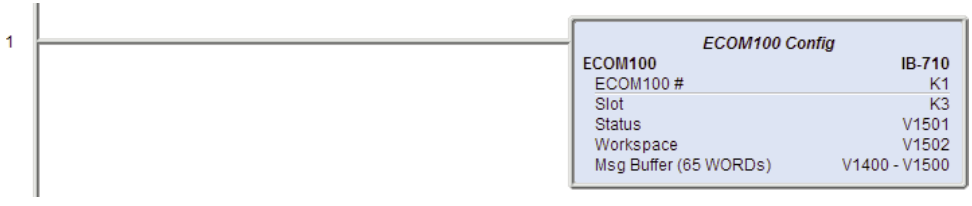
Note: *The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*



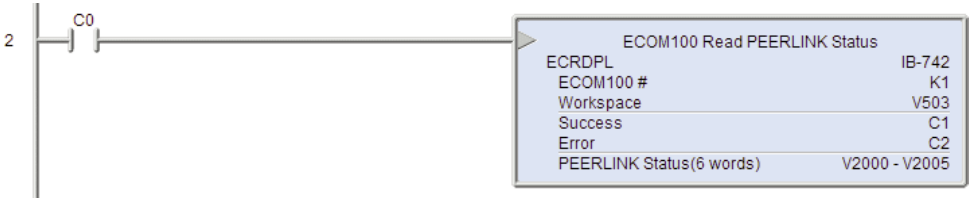
With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

ECRDPL Example

Rung 1: The ECOM100 Config IBox is responsible for coordination/interlocking of all ECOM100 type IBoxes for one specific ECOM100 module. Tag the ECOM100 in slot 3 as ECOM100# K1. All other ECxxxx IBoxes refer to this module # as K1. If you need to move the module in the base to a different slot, then you only need to change this one IBox. V1501 is used as a global result status register for the other ECxxxx IBoxes using this specific ECOM100 module. V1502 is used to coordinate/interlock the logic in all of the other ECxxxx IBoxes using this specific ECOM100 module. V1400-V1500 is a common 130 byte buffer available for use by the other ECxxxx IBoxes using this specific ECOM100 module.



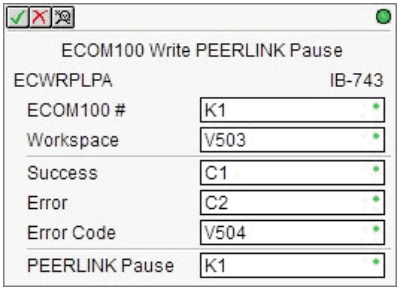
Rung 2: Each time that C0 is enabled, 6 PEERLINK status locations will be read from the ECOM100 and stored in V2000-V2005. C1 will be enabled if the read is a success, C2 will be enabled if the attempted read results in failure.



ECOM100 Write PEERLINK Pause (ECWRPLPA) (IB-743)

DS6	Used
HPP	N/A

The ECOM100 Write PEERLINK Pause IBox will Enable and/or Disable the PEERLINK processing in the specified ECOM100.



It references the ECOM100 # of the ECOM100 Config IBox that is controlling the ECOM100 module in a specific slot. The ECOM100 Config contains built-in interlocking logic that is used to synchronize the processing of this IBox with all of the other IBoxes in the ladder program that are being processed by the same ECOM100.

S

ECWRPLPA Parameters

- ECOM100#: This is a logical number associated with this specific ECOM100 module in the specified slot. All other ECxxxx IBoxes that need to reference this ECOM100 module must reference this logical number.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Write operation succeeds and OFF if the Write operation fails.
- Error: This BIT will be OFF if the Write operation succeeds and ON if the Write operation fails.
- Error Code: A V-Memory register that stores the Return Code from the ECOM100 if the Write operation fails. It must not be used by any other instructions in the PLC.
  The possible Error Return Codes are:
  0 = No Error
  126 = Write Protect Error - the ECOM100 is configured to use DIP Switch 5 to write protect the ECOM100, and DIP 5 is ON
- PEERLINK Pause: The value to write, either a constant or a V-Memory location that contains the following values:
  0 = Allow PEERLINK operation
  1 = Pause PEERLINK operation

Parameter	DL205 Range
ECOM100# ..... K	K0-255
Workspace V	All User V Memory
Success ..... X,Y,C,GX,GY,B	All Bit Memory
Error ..... X,Y,C,GX,GY,B	All Bit Memory
Error Code ..... X,Y,C,GX,GY,B	All Bit Memory
PEERLINK Pause ..... V,K	K0-1, All User V Memory

Note: *When the ECWRPLPA IBox is allowed to execute, the Success and Error BITs are both set to OFF. One of these Bits is guaranteed to be ON after the IBox execution is complete. These BITs will retain their ON/OFF value until the IBox is executed again.*

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

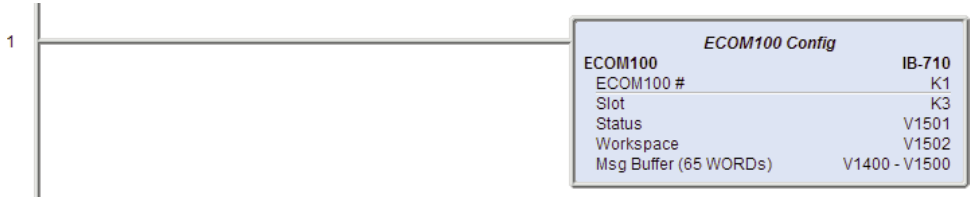
ECOM100 Write PEERLINK Pause	
ECWRPLPA	IB-743
ECOM100 #	K1
Workspace	V503
Success	C1
Error	C2
Error Code	V504
PEERLINK Pause	K1

With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

S

ECWRPLPA Example

Rung 1: The ECOM100 Config IBox is responsible for coordination/interlocking of all ECOM100 type IBoxes for one specific ECOM100 module. Tag the ECOM100 in slot 3 as ECOM100# K1. All other ECxxxx IBoxes refer to this module # as K1. If you need to move the module in the base to a different slot, then you only need to change this one IBox. V1501 is used as a global result status register for the other ECxxxx IBoxes using this specific ECOM100 module. V1502 is used to coordinate/interlock the logic in all of the other ECxxxx IBoxes using this specific ECOM100 module. V1400-V1500 is a common 130 byte buffer available for use by the other ECxxxx IBoxes using this specific ECOM100 module.

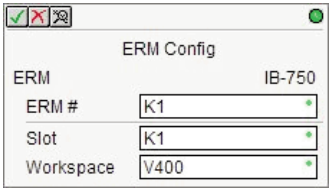


Rung 2: Each time that C0 is enabled, K1 will be sent to the ECOM100 module to pause the PEERLINK feature. A K0 would need to be sent to resume PEERLINK operation. C1 will be enabled if the pause is a success, C2 will be enabled if the attempted pause results in failure.

ERM Config (ERM) (IB-750)

DS6	Used
HPP	N/A

The ERM Config IBox defines all of the information necessary to setup an ERM or ERM100 for use by other ERM-specific IBoxes (ERxxxxx). The ERM Config IBox is the resource manager for the slot or port it is setup to use. It will internally monitor the "Busy" and "Error" SP bits so that it can control all of the other ERM-specific IBoxes in the ladder program.



ERM Config IBox requirements:

- If you wish to use any of the ERM IBoxes, you must have an ERM Config IBox for each ERM and ERM100 module in the system.
- The ERM Config IBox must be located at the top of the ladder or stage program.
- The ERM Config IBox is "always ON", so it can not have any input logic. This IBox must be in a section of the ladder program that is always enabled, so do not place it in a Stage or a subroutine that will ever be disabled.
- The ERM-specific IBoxes require that DIP switch #7 be set ON.

ERM Parameters

- ERM#: A reference number or resource number used to uniquely identify the ERM network.
- Slot: Identifies which slot contains the ERM or ERM100 module.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.

Parameter	DL205 Range
ERM# . . . . . K	K0 - 255
Slot . . . . . K	K0 - 7
Workspace V	All User V Memory

Note: *No input logic is allowed on the rung with this IBox.*

ERM Example

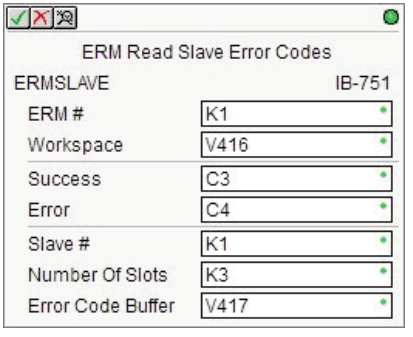
Rung 1: The ERM Config IBox is responsible for coordination/interlocking of all ERM type IBoxes for one specific ERM module. Tag the ERM in slot 1 as ERM# K1. All other ERxxxx IBoxes refer to this module # as K1. If you need to move the module in the base to a different slot, then you only need to change this one IBox.

ERM Read Slave Error Codes (ERMSLAVE) (IB-751)

DS6	Used
HPP	N/A

The ERM Read Slave Error Codes IBox will read the error information from a Slave that is part of an ERM network. Each Slave will return 4 Words of data plus 1 Word for each I/O slot in that slave's base. A maximum of 36 words of error code data can be read from a single slave depending on the number of bases and I/O modules (slots) used per slave.

The program will need a separate ERM Read Slave Error Codes for each slave on the ERM network.



This IBox references the ERM # of the ERM Config IBox that is controlling the ERM or ERM100 module in a specific slot. The ERM Config contains built-in interlocking logic that is used to synchronize the processing of this IBox with all of the other IBoxes in the ladder program that are being processed by the same ERM or ERM100 module.

ERMSLAVE Parameters

- ERM#: A reference number or resource number used to uniquely identify the ERM network.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Read Error Code succeeds and OFF if the Read Error Code fails.
- Error: This BIT will be OFF if the Read Error Code succeeds and ON if the Read Error Code fails.
- Slave#: The number of the ERM Slave to Read the Error Codes from. This number is the order in which they appear in the ERM network configuration in ERM Workbench.
- Number of Slots: The number of Slots in the specified ERM slave.
- Error Code Buffer: The first of the consecutive V-Memory registers where the ERM Error code values will be stored. The status buffer consumes 4 V-Memory locations + one V-Memory location for each Slot as specified above.

Parameter	DL205 Range
ERM# ..... K	K0-255
Workspace V	All User V Memory
Success ..... X,Y,C,GX,GY,B	All Bit Memory
Error ..... X,Y,C,GX,GY,B	All Bit Memory
Slave# ..... K	K1-16
Number of Slots ..... K	K1-32
Error Code Buffer V	All User V Memory

The Error Code Buffer stores error information in the following sequence:

Word Offset	Name	Description
0	Current Error Code	The current error code reported by the Slave Bits 0 - 11: Error Code Bit 12: ON = I/O Error Bit 13: ON = I/O Warning Bit 14: n/a Bit 15: n/a
1	Module Slot (0-15)	For slots 0 - 15, the I/O slot that has a module reporting an error.
2	Module Slot (16-31)	For slots 16 - 31, the I/O slot that has a module reporting an error.
3	Last Error Code	The previous error code reported by the Slave Bits 0 - 11: Error Code Bit 12: ON = I/O Error Bit 13: ON = I/O Warning Bit 14: n/a Bit 15: n/a
4	Ext Error Code Local Base Slot 0	
...	...	
11	Ext Error Code Local Base Slot 7	
12	Ext Error Code Slot 8 or Expansion Base 1 Slot 0	
...	...	
19	Ext Error Code Slot 15 or Expansion Base 1 Slot 7	
20	Ext Error Code Slot 16 Expansion Base 2 Slot 0	
...	...	
27	Ext Error Code Slot 23 or Expansion Base 2 Slot 7	
28	Ext Error Code Slot 24 or Expansion Base 3 Slot 0	
...	...	
35	Ext Error Code Slot 31 or Expansion Base 3 Slot 7	

The following chart has the Slave Error Codes for Word 0 and Word 3 in previous table. These error codes are valid for DL205, DL405, and Terminator I/O slaves.

Code (decimal)	Description
0	No Error
121	Channel Failure
122	Unused Channels Exist - the module has jumpers to disable unused channels
139	Broken Transmitter on one of the analog input channels
142	Multiple Channel Failure
153	Terminator I/O Slave only (Hot-Swap Error): The module which was in this slot is no longer responding, most likely because the user has manually removed an I/O module. If Automatic Reset (default) is enabled for this slave, it will reset itself once the replacement module is inserted. If Manual Reset is enabled for this slave, the user must do the following: 1. SET the slave disable flag for that slave in the first diagnostic output word 2. Wait for bits 8 - 15 in second diagnostic input word to equal 1 3. RESET the slave disable flag in the first diagnostic output word.
154	Terminator I/O Slave only (Hot-Swap Error): I/O configuration has changed, most likely because the user has manually added an I/O module. See 153 above for reset methods.
155	Terminator I/O Slave only (Module Error): One or more of the I/O modules has an error. For more detail check extended errors.
200-216	Unused analog input channels exist at channel xx (1 - 16), where xx = Value - 200. For example: 212 indicates unused analog channel exists at channel 12.

The following chart has the Extended Slave Error Codes for Words 4 through 35 in the Error Code Buffer. These error codes are valid for DL205, DL405, and Terminator I/O slaves.

Code (decimal)	Description	
32 - 63	Bit-wise error where bit 5 is always SET. Look at bit 0 thru bit 4 to get a possible list of errors. For example: 34 decimal = 22 hexadecimal = 0010_0010 (Bit 5 and Bit 1 ON).	
	Bit Number	Description
	0	Terminal block off
	1	External P/S voltage low
	2	Fuse blown
	3	Bus error
	4	Module initialization error (intelligent module)
	5	Fault exists in module
117	Write attempt to an invalid analog channel.	
119	Data not valid. Subnet mask or IP address not allowed. Likely because the data packet is not constructed properly.	
121	Analog input channel error.	
122	Unused analog input channels exist.	
139	Broken Transmitter on one of the analog input channels	
142	Channel Failure	
146	Communications failure. HA-EDRV2 onboard relay has tripped	
153	Terminator I/O Slave only (Hot-Swap): The module which was in this slot is no longer responding, most likely because the user has manually removed an I/O module.	
154	Terminator I/O Slave only (Hot-Swap): I/O configuration has changed, most likely because the user has manually added an I/O module.	
155	Terminator I/O Slave only (Module Error): One or more of the I/O modules has an error.	
200-216	Unused analog input channels exist at channel xx (1 - 16), where xx = Value - 200. For example: 212 indicates unused analog channel exists at channel 12.	

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

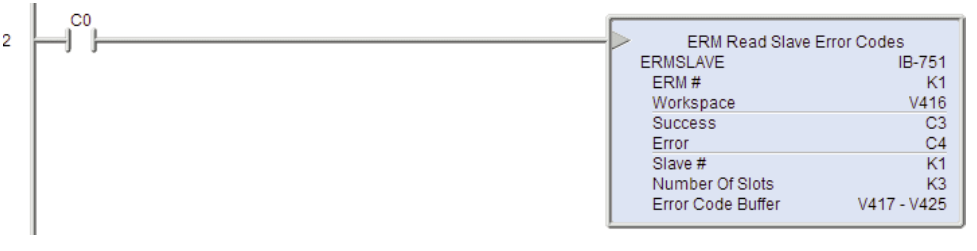
ERM Read Slave Error Codes	
ERMSLAVE	IB-751
ERM #	K1
Workspace	V416
Success	C3
Error	C4
Slave #	K1
Number Of Slots	K3
Error Code Buffer	V417 - V425

With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

ERMSLAVE Example

Rung 1: The ERM Config IBox is responsible for coordination/interlocking of all ERM type IBoxes for one specific ERM module. Tag the ERM in slot 1 as ERM# K1. All other ERxxxx IBoxes refer to this module # as K1. If you need to move the module in the base to a different slot, then you only need to change this one IBox.

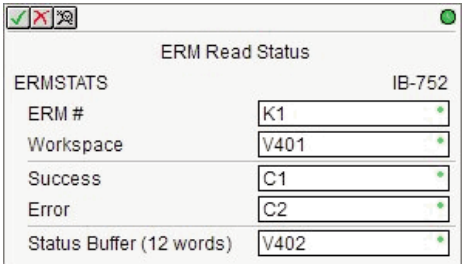
Rung 2: The error information will be read from ERM #1 with the result placed into seven memory locations starting at V417. C3 will be enable if the read is a success, C4 will be enabled if the attempted read results in failure.



ERM Read Status (ERMSTATS) (IB-752)

DS6	Used
HPP	N/A

The ERM Read Status IBox will retrieve runtime status data from the ERM or ERM100.



When the PLC is in Run mode, the ERM or ERM100 module will compute some statistical data describing the ERM network's performance. These status values can be used to monitor the health of the backplane interface between the CPU and the ERM or ERM100 module, and to monitor the health of the Ethernet network connecting the ERM or ERM100 to its slaves.

This IBox references the ERM # of the ERM Config IBox that is controlling the ERM or ERM100 module in a specific slot. The ERM Config contains built-in interlocking logic that is used to synchronize the processing of this IBox with all of the other IBoxes in the ladder program that are being processed by the same ERM or ERM100 module.

The ERM Read Status IBox retrieves 7 status values from the ERM or ERM100 and places those values in consecutive V-Memory locations. The values of these status registers will reset to 0 on each Program mode -to- Run mode change. The definitions of those status values follows:

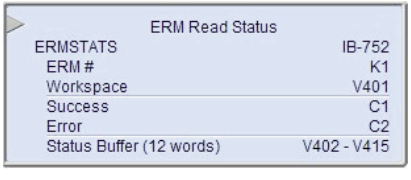
Number	Size	Format	Name	Description
1	Word	Decimal	Minimum I/O Scan	The minimum amount of time (in milliseconds) the ERM or ERM100 module spent updating all of its Ethernet slaves.
2	Word	Decimal	Maximum I/O Scan	The maximum amount of time (in milliseconds) the ERM or ERM100 module spent updating all of its Ethernet slaves.
3	DWord	Decimal	Total Time	The amount of time (in milliseconds) the ERM or ERM100 module has been running.
4	DWord	Decimal	Number of I/O Scans	The total number of I/O scans the ERM or ERM100 has completed.
5	DWord	Decimal	Number of PLC Read Retries	The total number of retries on Read Requests that the ERM or ERM100 module has generated when communicating across the backplane to the CPU.
6	DWord	Decimal	Number of PLC Write Retries	The total number of retries on Write Requests that the ERM or ERM100 module has generated when communicating across the backplane to the CPU.
7	DWord	Decimal	Number of Slave Retries	The total number of retries on Ethernet Read and Write Requests that the ERM or ERM100 module has generated when communicating with its slaves.

ERMSTATS Parameters

- ERM#: A reference number or resource number used to uniquely identify the ERM network.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Read Status succeeds and OFF if the Read Status fails.
- Error: This BIT will be OFF if the Read Status succeeds and ON if the Read Status fails.
- Status Buffer (12 words): The first of the 12 consecutive V-Memory registers where the ERM Status values will be stored.

Parameter	DL205 Range
ERM# . . . . . K	K0-255
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory
Status Buffer V	All User V Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

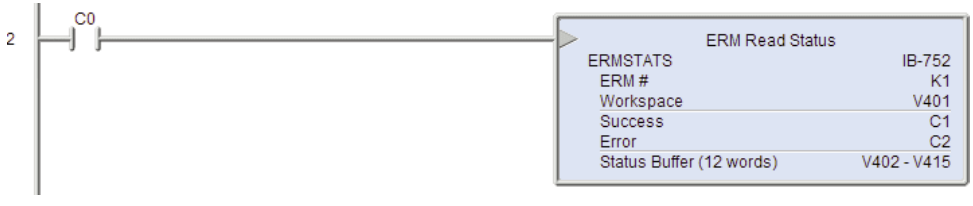


With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

ERMSTATS Example

Rung 1: The ERM Config IBox is responsible for coordination/interlocking of all ERM type IBoxes for one specific ERM module. Tag the ERM in slot 1 as ERM# K1. All other ERxxxx IBoxes refer to this module # as K1. If you need to move the module in the base to a different slot, then you only need to change this one IBox.

Rung 2: The error information will be read from ERM #1 with the result placed into twelve memory locations starting at V402. C1 will be enable if the read is a success, C2 will be enabled if the attempted read results in failure.



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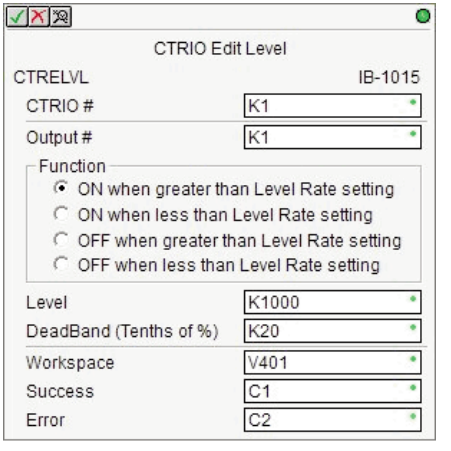
CTRIO Edit Level (CTRELVL) (IB-1015)

DS6	Used
HPP	N/A

The CTRIO Edit Level IBox will configure the Level Mode behavior for a Discrete Output of a CTRIO module.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.

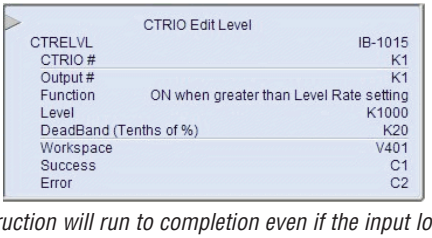


CTRELVL Parameters

- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Output #: Identifies which CTRIO Output to configure.
- Function (selectable option): ON when greater than Level Rate Setting/ON when less than Level Rate Setting/OFF when greater than Level Rate Setting/OFF when less than Level Rate Setting.
- Level: The DWORD count value at which the Function above will be active (decimal).
- Deadband (Tenths of %): The value above and below the Level at which the Function will be active (BCD).
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Edit Level succeeds and OFF if the Edit Level fails.
- Error: This BIT will be OFF if the Edit Level succeeds and ON if the Edit Level fails.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Output# . . . . . K	K0-3
Level . . . . . V,K	K0-2147483647, All User V Memory
Deadband# . . . . . V,K	K0-1000, All User V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

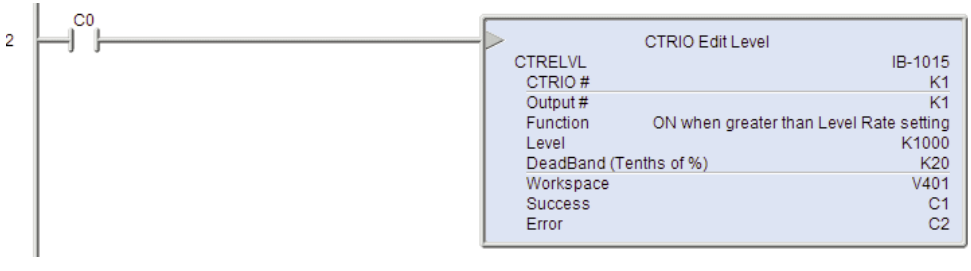


With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

CTRELVL Example

Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This rung is a sample method for configuring the level behavior of a CTRIO output. Turning on C0 will cause the CTRELVL instruction to set the first output of the module to ON when the level setting of K1000 is exceeded. If the level request is successful, C1 will turn ON. If the level request fails, C2 will turn ON.

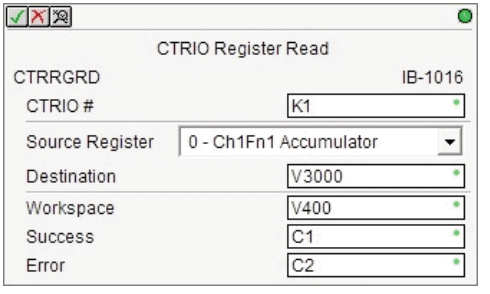


CTRIO Register Read (CTRRGRD) (IB-1016)

DS6	Used
HPP	N/A

The CTRIO Register Read IBox will retrieve the value from the specified register in a CTRIO or CTRIO2 module.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.



CTRRGRD Parameters

- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Source Register (selectable option):

0 - Ch1Fn1 Accumulator	10 - Ch2Fn1 Reset Value
1 - Ch1Fn2 Accumulator	11 - Ch2Fn2 Reset Value
2 - Ch2Fn1 Accumulator	12 - Ch1A Filter Time (CTRIO2)
3 - Ch2Fn2 Accumulator	13 - Ch1B Filter Time (CTRIO2)
4 - Out0 Position	14 - Ch1C Filter Time (CTRIO2)
5 - Out1 Position	15 - Ch1D Filter Time (CTRIO2)
6 - Out2 Position	16 - Ch2A Filter Time (CTRIO2)
7 - Out3 Position	17 - Ch2B Filter Time (CTRIO2)
8 - Ch1Fn1 Reset Value	18 - Ch2C Filter Time (CTRIO2)
9 - Ch1Fn2 Reset Value	19 - Ch2D Filter Time (CTRIO2)

- Destination: A DWORD that is used to store the value read from the specified register.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Register Read succeeds and OFF if the Register Read fails.
- Error: This BIT will be OFF if the Register Read succeeds and ON if the Register Read fails.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Destination V	All User V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

CTRIO Register Read	
CTRRGRD	IB-1016
CTRIO #	K1
Source Register	0 - Ch1Fn1 Accumulator
Destination	V3000
Workspace	V400
Success	C1
Error	C2

With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

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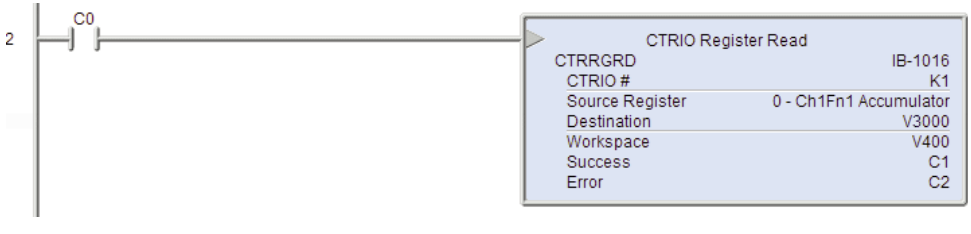
CTRRGRD Example

Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This rung is a sample method for reading a register of a CTRIO module. Turning on C0 will cause the CTRRGRD instruction to read the Channel 1 Function 1 register and store the result in V3000-V3001. If the register read request is successful, C1 will turn ON. If the register read request fails, C2 will turn ON.

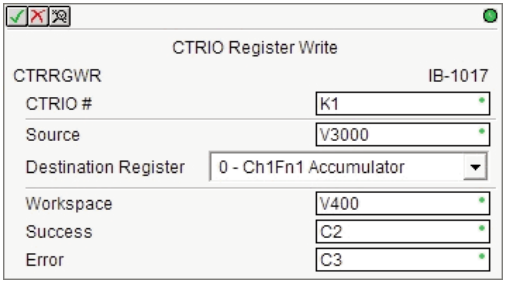


CTRIO Register Write (CTRRGWR) (IB-1017)

DS6	Used
HPP	N/A

The CTRIO Register Write IBox will write the specified value to the selected register in a CTRIO or CTRIO2 module.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.



CTRRGWR Parameters

- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Source: A DWORD that contains the value or a Hex constant value to write to the specified register.
- Destination Register (selectable option):

0 - Ch1Fn1 Accumulator	10 - Ch2Fn1 Reset Value
1 - Ch1Fn2 Accumulator	11 - Ch2Fn2 Reset Value
2 - Ch2Fn1 Accumulator	12 - Ch1A Filter Time (CTRIO2)
3 - Ch2Fn2 Accumulator	13 - Ch1B Filter Time (CTRIO2)
4 - Out0 Position	14 - Ch1C Filter Time (CTRIO2)
5 - Out1 Position	15 - Ch1D Filter Time (CTRIO2)
6 - Out2 Position	16 - Ch2A Filter Time (CTRIO2)
7 - Out3 Position	17 - Ch2B Filter Time (CTRIO2)
8 - Ch1Fn1 Reset Value	18 - Ch2C Filter Time (CTRIO2)
9 - Ch1Fn2 Reset Value	19 - Ch2D Filter Time (CTRIO2)

- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Register Write succeeds and OFF if the Register Write fails.
- Error: This BIT will be OFF if the Register Write succeeds and ON if the Register Write fails.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Source . . . . . K,V	K0-FFFFFFFF, All V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*

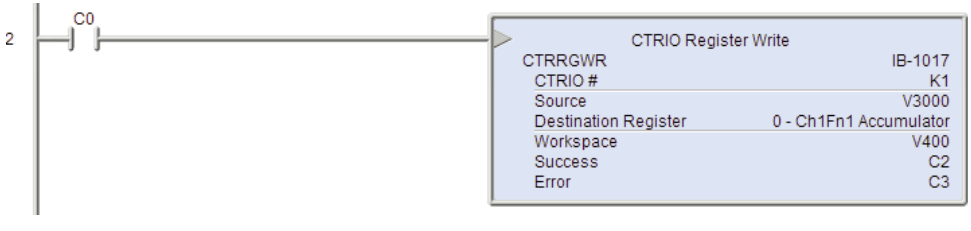
CTRIO Register Write	
CTRRGWR	IB-1017
CTRIO #	K1
Source	V3000
Destination Register	0 - Ch1Fn1 Accumulator
Workspace	V400
Success	C2
Error	C3

With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

CTRRGWR Example

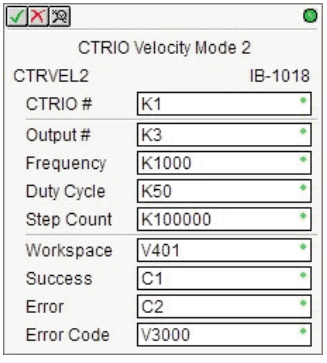
Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This rung is a sample method for writing a register of a CTRIO module. Turning on C0 will cause the CTRRGWR instruction to write the value stored in V3000-V3001 to the Channel 1 Function 1 accumulator register. If the register write request is successful, C2 will turn ON. If the register write request fails, C3 will turn ON.



CTRIO Velocity Mode 2 (CTRVEL2) (IB-1018)

DS6	Used
HPP	N/A



The CTRIO Velocity Mode 2 IBox will setup the CTRIO or CTRIO2 module to perform a Velocity Mode operation on the specified CTRIO output. This runtime function generates the desired number of output pulses as defined by the frequency and duty cycle. A Step Count value of -1 instructs the CTRIO to continuously generate output pulses.

The specified CTRIO output must already be configured as a Pulse Output. This configuration is done via CTRIO Workbench.

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The CTRIO Velocity Mode IBox will take multiple PLC scans to complete. Each time this IBox is triggered it will run to completion exactly one time. It will start running on the rising edge of the input circuit and once triggered, it will run to completion. Any rising edges generated before the IBox completes will be ignored. The IBox is complete when the either the Success bit or Error bit are set ON.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.

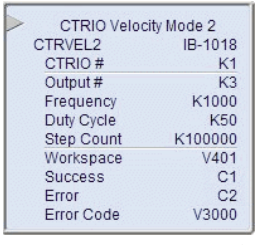
CTRVEL2 Parameters

- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Output#: Identifies which CTRIO Output to configure.
- Frequency: Specifies the pulse output frequency in Hertz.
- Duty Cycle: Specifies the duty cycle of the output pulses (0 = 50%).
- Step Count: This DWORD value specifies the number of pulses to output. A Step Count value of -1 (or 0xFFFFFFFF) causes the CTRIO to output pulses continuously. Negative Step Count values must be V-Memory references.
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Setup Velocity Mode succeeds and OFF if it fails.
- Error: This BIT will be OFF if the Setup Velocity Mode succeeds and ON if it fails.
- Error Code: A V-Memory register that is used to store the Error if the Setup Velocity Mode fails. The following table has a list of the possible Error Code values:

Error Code	Description
0	No Error
2002	Output Enable was already ON when the Instruction was enabled.
2003	The CTRIO module reported an error. Use the CTRIO Read Error (CTRRDER) IBox to read the CTRIO module's error code to determine what went wrong.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Output# . . . . . K	K0-3
Frequency . . . . . V,K	K20-20000, K20-65535 (CTRIO2), All User V Memory
Duty Cycle . . . . . V,K	K0-99, All User V Memory
Step Count . . . . . K,V	K0-2147483647, All User V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error Code V	All V Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*



With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

CTRVEL2 Example

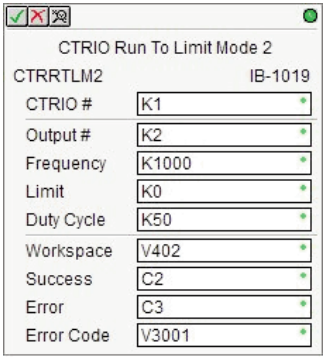
Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This CTRIO Velocity Mode 2 IBox sets up Output #3 in CTRIO #1 to output 100,000 pulses at a Frequency of 1000 Hz with a 50% Duty Cycle.

CTRIO Run to Limit Mode 2 (CTRRTLM2) (IB-1019)

DS6	Used
HPP	N/A

The CTRIO Run to Limit Mode 2 IBox will setup the CTRIO or CTRIO2 module to perform a Run to Limit Mode operation on the specified CTRIO output.



The specified CTRIO Output must already be configured as a Pulse Output and the specified Input must already be configured as a Limit. This configuration is done via CTRIO Workbench.

The CTRIO Run To Limit Mode IBox will take multiple PLC scans to complete. Each time this IBox is triggered it will run to completion exactly one time. It will start running on the rising edge of the input circuit and once triggered, it will run to completion. Any rising edges generated before the IBox completes will be ignored. The IBox is complete when the either the Success bit or Error bit are set ON.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.

CTRRTLM2 Parameters

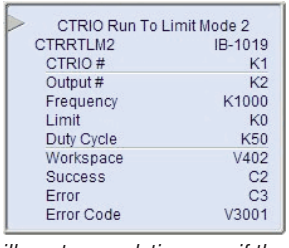
- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Output#: Identifies which CTRIO Output to configure.
- Frequency: Specifies the pulse output frequency in Hertz.
- Limit: Specifies which CTRIO Input resource is the Limit and which level of that Limit to use. See the table on right for a list of the valid Limit values.
- Duty Cycle: Specifies the duty cycle of the output pulses (0 = 50%).
- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Run to Limit succeeds and OFF if it fails.
- Error: This BIT will be OFF if the Run to Limit succeeds and ON if it fails.
- Error Code: A V-Memory register that is used to store the Error if the Run to Limit fails. The following table has a list of the possible Error Code values.

Value	Description
00	Ch1/C High (ON)
10	Ch1/C Low (OFF)
01	Ch1/D High (ON)
11	Ch1/D Low (OFF)
02	Ch2/C High (ON)
12	Ch2/C Low (OFF)
03	Ch2/D High (ON)
13	Ch2/D Low (OFF)

Error Code	Description
0	No Error
2002	Output Enable was already ON when the Instruction was enabled.
2003	The CTRIO module reported an error. Use the CTRIO Read Error (CTRRDER) IBox to read the CTRIO module's error code to determine what went wrong.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Output# . . . . . K	K0-3
Frequency . . . . . V,K	K20-20000, K20-65535 (CTRIO2), All User V Memory
Limit . . . . . V,K	K0-FF, All User V Memory
Duty Cycle . . . . . V,K	K0-99, All User V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error Code V	All V Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*



With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

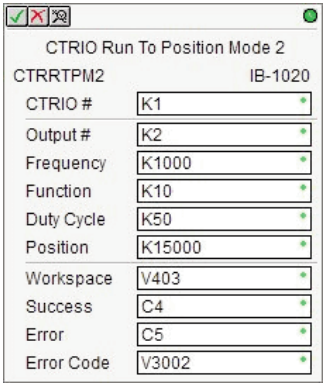
CTRRTLM2 Example

Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This CTRIO Run To Limit Mode 2 IBox sets up Output #2 in CTRIO #1 to output pulses at a Frequency of 1000 Hz with a 50% Duty Cycle until Limit #0 comes ON.

CTRIO Run to Position Mode 2 (CTRRTPM2) (IB-1020)

DS6	Used
HPP	N/A



The CTRIO Run to Position Mode 2 IBox will setup the CTRIO or CTRIO2 module to perform a Run to Position Mode operation on the specified CTRIO output.

The specified CTRIO Output must already be configured as a Pulse Output and the specified Input must already be configured as a Counter or Quad Counter. This configuration is done via CTRIO Workbench.

The CTRIO Run To Position Mode IBox will take multiple PLC scans to complete. Each time this IBox is triggered it will run to completion exactly one time. It will start running on the rising edge of the input circuit and once triggered, it will run to completion. Any rising edges generated before the IBox completes will be ignored. The IBox is complete when the either the Success bit or Error bit are set ON.

It references the CTRIO # in the CTRIO Config IBox that is controlling the CTRIO module.

CTRRTPM2 Parameters

- CTRIO#: This number corresponds to the CTRIO # specified in the CTRIO Config IBox for the CTRIO module being used.
- Output#: Identifies which CTRIO Output to configure.
- Frequency: Specifies the pulse output frequency in Hertz.
- Function: Specifies which CTRIO Input resource and the comparison operator that determines when the target position is reached. The following is a list of the valid resource/comparison operators:

Value	Description
00	Less Than Ch1/Fn1
10	Greater Than Ch1/Fn1
01	Less Than Ch1/Fn2
11	Greater Than Ch1/Fn2
02	Less Than Ch2/Fn1
12	Greater Than Ch2/Fn1
03	Less Than Ch2/Fn2
13	Greater Than Ch2/Fn2

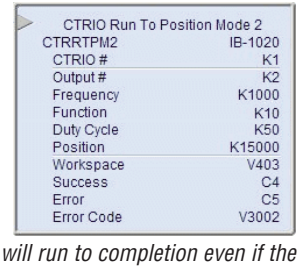
- Duty Cycle: Specifies the duty cycle of the output pulses (0 = 50%).
- Position: This DWORD value specifies the target position. Positive/Negative target position values are used in concert with the Greater-than/Less-than comparison operators to determine when the target position has been reached. Negative target position values must be V-Memory references.

- Workspace: A V-Memory register that is used internally by this IBox. It must not be used by any other instructions in the PLC.
- Success: This BIT will be ON if the Setup Run to Position succeeds and OFF if it fails.
- Error: This BIT will be OFF if the Setup Run To Position succeeds and ON if it fails.
- Error Code: A V-Memory register that is used to store the Error if the Run to Position fails. The following table has a list of the possible Error Code values:

Error Code	Description
0	No Error
2002	Output Enable was already ON when the Instruction was enabled.
2003	The CTRIO module reported an error. Use the CTRIO Read Error (CTRRDER) IBox to read the CTRIO module's error code to determine what went wrong.

Parameter	DL205 Range
CTRIO# . . . . . K	K0-255
Output# . . . . . K	K0-3
Frequency . . . . . V,K	K20-20000, K20-65535 (CTRIO2), All User V Memory
Function . . . . . V,K	See table on previous page, All User V Memory
Duty Cycle . . . . . V,K	K0-99, All User V Memory
Position . . . . . V,K	K0-2147434528, All User V Memory
Workspace V	All User V Memory
Success . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error . . . . . X,Y,C,GX,GY,B	All Bit Memory
Error Code V	All V Memory

Note:*The gray triangle at the right end of an input leg indicates the input is edge triggered. Meaning that each time the input logic transitions from OFF to ON this instruction will execute.*



With each execution, this instruction will run to completion even if the input logic transitions to OFF before the instruction completes.

CTRRTPM2 Example

Rung 1: This sets up the CTRIO module in slot 2 of the base. Each CTRIO module in the system will need a separate CTRIO Config IBox before any CTRxxxx IBoxes can be used. The CTRIO has been configured to use V2000 through V2025 for its input data, and V2100 through V2131 for its output data.

Rung 2: This CTRIO Run To Position Mode 2 IBox sets up Output #2 in CTRIO #1 to output pulses at a Frequency of 1000 Hz with a 50% Duty Cycle, use the 'Greater than Ch1/Fn1' comparison operator, until the input position of 15,000 is reached.