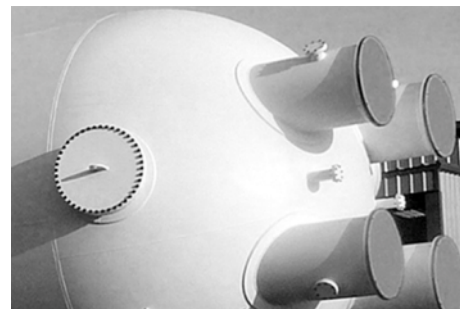


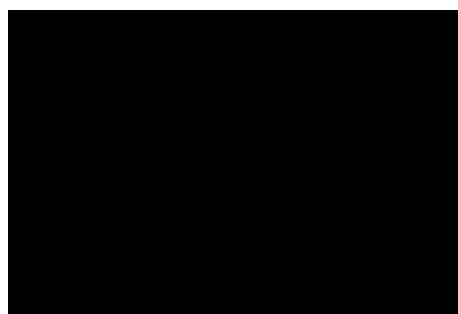
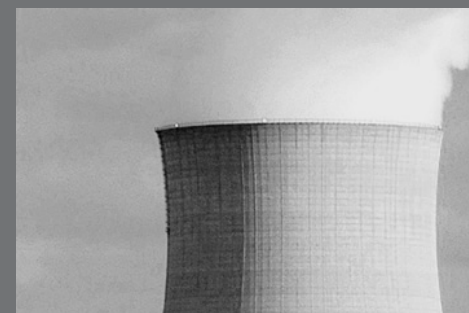


Nuclear Division



# Undeclared Digital Content

## Curtiss Wright Nuclear Program and Status



# Agenda

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## Agenda

- 1. Overview of the CWND Program**
- 2. Review of Components Destructively Evaluated**
- 3. Cost of UDC Program**
- 4. Component Identified with Undeclared Digital Content**
- 5. Conclusion**

# Curtiss Wright Undeclared Digital Content Program

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**What is undeclared digital content (UDC)?**

- **When a basic component that is being dedicated is believed to contain analog devices only contains a digital device.**

**Why is the identification of UDC important during the qualification and dedication process?**

- **UDC introduces failure modes that should be evaluated during the qualification and dedication process. For example,**
  - EMI/RFI
  - Software control

# Curtiss Wright Undeclared Digital Content Program

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## Why did we develop this program?

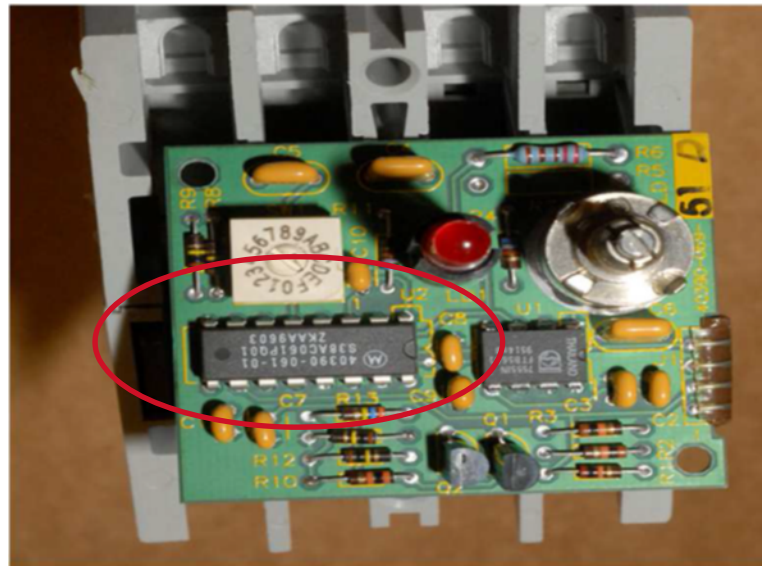
- Commercial manufacturers are constantly updating their products to include digital content to remove cost, improve reliability and increase their competitive advantage.
- The commercial manufacturer may not declare the change in their literature or marketing materials and may not require a part number change, especially when the form, fit and function is the same as seen through the commercial viewpoint.

# Curtiss Wright Undeclared Digital Content Program

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## Industry Example

- The commercial manufacturer (Allen Bradley) originally designed the 700 series timing relay with a digital logic board that had a custom integrated circuit (IC).



# Curtiss Wright Undeclared Digital Content Program

- As technology improved and became more financially viable, the custom IC was replaced with a CPLD board which contained a “programmable” integrated circuit chip. This chip is programmed at the factory prior to installation in the relay.



- The change in the relay was not discovered since it was not visible during dedication.
- IC chip was susceptible to EMI and failed in the plant.

# Curtiss Wright Undeclared Digital Content Program

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## Industry Response

- In response to this issue, NRC RIS 2016-05 (<http://www.nrc.gov/docs/ML1511/ML15118A015.pdf>) was issued emphasizing the importance of addressing digital content.
- The document states, “The NRC’s intent in issuing this RIS is to heighten awareness that embedded digital devices (EDDs) might exist in procured equipment used in safety-related systems without the devices having been explicitly identified in procurement documentation. Inadequate consideration of these devices in digital technology system upgrades, component replacements, and new equipment applications could lead to an adverse safety consequence. Therefore, addressees should implement early efforts to identify these devices.”

# Curtiss Wright Undeclared Digital Content Program

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## Industry Response

- **EPRI published report 3002008010, “Guideline on Prevention and Detection of Undeclared Digital Content” in 2016.**
- **Provides guidance on how to detect if a component may contain UDC by carefully reviewing product literature for key words or standards reference.**



## Curtiss Wright Undeclared Digital Content Program

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- **To ensure that UDC was incorporated into our qualification and dedication process, Curtiss Wright Nuclear has implemented a program requiring that all items identified as high risk include a destructive test sample that is torn down to inspect for UDC.**
- **Program implemented in June 2016.**
- **Guidelines and training were developed for inspectors and engineers to identify UDC.**

# Curtiss Wright Undeclared Digital Content Program

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## Parts Identified as High Risk

1. Any device with any of the following words in the description, datasheet, manual or catalog literature: programmable, configurable, timer, controller, solid state, wireless, SMART
2. Time delay relay, Relay, Timer
3. Process Switch (Temperature, Pressure, etc.)
4. Breaker
5. Isolator, Delay module
6. Variable frequency drive, Motors and Damper motor
7. Controller, Valve positioner
8. Lighting module, Meter
9. Power Supply and Components with battery backup
10. Signal conditioner
11. Electrical filters
12. Starters
13. Components with the following attributes/features: selector switches, potentiometers, LCD/digital display, external connection (i.e.; USB, Ethernet), JTAG port, BDM port
14. Any item with a DIP switch
15. Inverter/UPS

## Review of Components Destructively Evaluated

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- Curtiss Wright has destructively evaluated 169 components since the start of the program (10 months)**

Component Type	Quantity Evaluated
Actuator	2
Controller	7
MCCB	45
Meter	4
Power Supply	7
Process Switch	9
Relay	71
Signal Conditioner	16
Starter	8

# Components Identified with UDC

November 2016

- Ametek P/N: 07-760010-00  
(Omron Timer P/N: H3CA-A)
- Identified in Omron product literature as a solid state timer; however there is reference to digital in the document

**Solid-state Timer**  
**H3CA**

CSM\_H3CA\_DS\_E\_4\_2

DIN-sized (48 x 48, 45 x 75 mm) Timer with Digital Setting and LCD Display

- Dual power supplies for free AC/DC.
- Eight operation modes selectable with one unit.
- Any desired time can be set digitally within a range from 0.1 seconds to 9,990 hrs.
- Four external signal inputs.
- ON/OFF indicator for control output and bar indicator for remaining time.
- Conforms to UL, CSA, and CE marking.



For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

## Ordering Information

Operation/resetting system	Operation mode	Terminal	Time-limit contact	Instantaneous contact	Mounting	
					Surface mounting/ track mounting	Flush mounting
Time-limit operation/self-resetting (see note 2)	8 operation modes (selectable) (see note 3)	11-pin round socket Front screw	SPDT	—	H3CA-A	H3CA-A
			—	—	H3CA-FA	—
Time-limit operation/self-resetting	ON-delay operation	8-pin round socket	DPDT	—	H3CA-B	H3CA-B
			SPDT	SPDT	H3CA-BH	H3CA-BH

Note: 1. Specify both the model number and supply voltage when ordering for the H3CA-BH and H3CA-B.  
2. The operation/resetting system depends on the selected operation mode. For details, see "Timing Chart".  
3. The 8 operation modes are as follows:  
A: ON-delay operation  
B: Repeat cycle operation  
C: Signal ON/OFF-delay operation (1)  
D: Signal OFF-delay operation (1)  
E: Interval operation  
F: One-shot and flicker operation  
G: Signal ON/OFF-delay operation (2)  
H: Signal OFF-delay operation (2)

## Accessories (Order Separately)

Timer	Track mounted socket (See note.)	Back connecting socket	
		Solder terminal	Screw terminal
H3CA-A	P2CF-11	PL11	P3GA-11
H3CA-BH/H3CA-B	P2CF-08	PL08	P3G-08

Note: Track mounted socket can be used as a front connecting socket.

## Specifications

### Time Ranges

A desired time can be set within a range of 0.1 s to 9,990 hrs by combining the three thumbwheel switch modules for time setting and one module for time unit selection.

Time unit	0.1 s	1 s	0.1 min	1 min	0.1 hrs	1 hr	10 hrs
Time range	1 to 999 (3 digits)						
	0 0 1 0.1 S to 9 9 9 10 h						

OMRON

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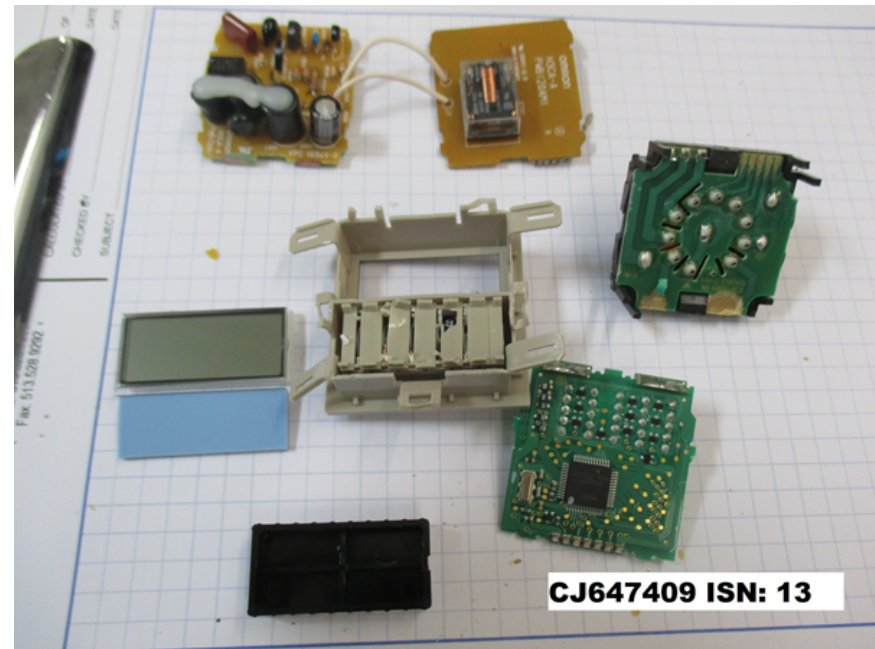
## Components Identified with UDC

- **42 pin chip with markings 789322 559 1505KP201 found**
  - The manufacture of the chip was not identified other than “Japan”. An internet search identified “789322” as a 8-bit single-chip microcontroller made by NEC.



## Components Identified with UDC

- Omron was requested to identify the chip manufacturer, application for chip, and if there was a software version.
  - Omron refused to supply this information
  - Customer decided to cancel the PO and no longer use the part





# Components Identified with UDC

January 2017

- Basler Under Frequency Relay  
P/N: BE1-81 O/U T3G-E1J-A6N2F
- Originally qualified & dedicated in 1993
- 1993 and current literature refer to the relay as “Digital Frequency Relay”
- Not really UDC since the literature stated digital relay



## Components Identified with UDC

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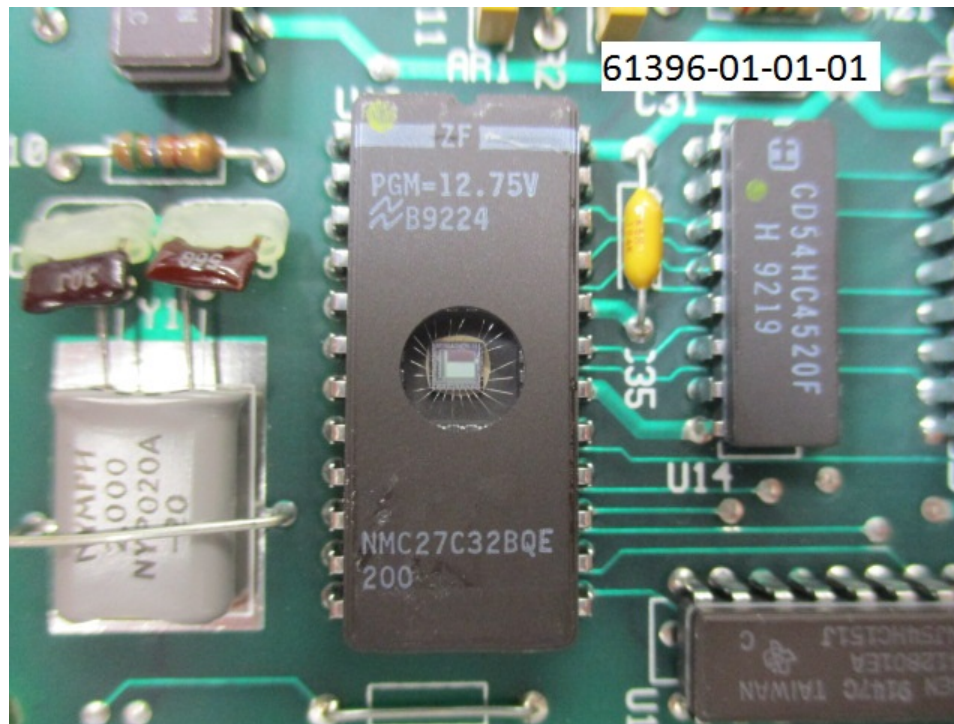
- 1993 chip with markings 9137334005 found
- Unable to identify manufacturer or device type





## Components Identified with UDC

- 1993 chip with markings NMC27C32BQE-200 found
- National Semiconductor EPROM IC Chip



## Components Identified with UDC

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- **2017 Programmable chip with markings AT27C256R 70JU 1531 found**
  - The manufacture of the chip is Amtel. An internet search identified the chip as EPROM IC Chip.



## Components Identified with UDC

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- **Customer was notified of the change in digital chip**
- **On hold until path forward determined**
- **Requires EMI/RFI testing and FMEA evaluation/test program to complete dedication**

## Cost of UDC Program

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- **Curtiss Wright has received some feedback that the additional fee does not comply with “Delivering the Nuclear Promise”**
- **If a component with UDC causes a failure in the plant, the cost is extremely high. It is cheaper by orders of magnitude to do the evaluation up front then to deal with a problem after installation.**
- **Quality and safety should not be comprised as a cost savings measure.**

## Cost of UDC Program

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- **CWND efforts to reduce cost:**
  - For dedication or qualification with a material sample, the fee for an additional sample is reduced since the material sample can be used to investigate UDC.
  - Components with clear or removable covers do not have a test sample fee included.
  - Only charge for one in a product line or family recently evaluated.

## Cost of UDC Program

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- **Can the utility decline UDC Evaluation?**
  - If the answer is yes and we have confidence that a UDC evaluation is needed, we add a limitation to the C of C.
  - We have a policy that we should add a limitation to C of C under this scenario to safeguard the fact that a failure mode is not addressed.

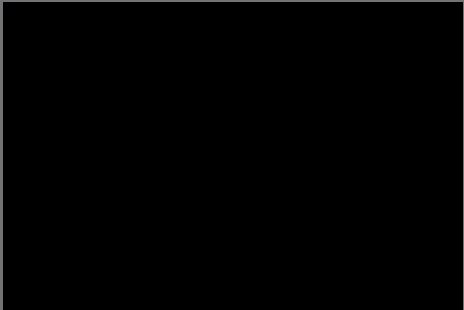
## Conclusion

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- **Components that are identified as solid state may contain UDC**
- **Literature should be carefully reviewed**
- **Components that have been previously qualified and dedicated may contain UDC**
- **Digital content may change over time within a product due to availability and technology**
- **A database should be started to identify components with UDC**



**Marie S. Nemier**  
**Business Segment Director –**  
**CGD/EQ/HVAC**  
**Curtiss Wright Nuclear Division**

A solid black rectangular area used to redact information, likely a photograph of Marie S. Nemier.

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**[www.cwnuclear.com](http://www.cwnuclear.com)**