

# Bailey<sup>®</sup> control systems

## Distributed Batch Control Batch Ticket Generation

FRIDAY	BATCH TICKET	15 16 13
BATCH FEATURE 11		
BATCH NUMBER 415		
START TIME 1133		
STOP TIME 1435		
AMOUNT OF A ADDED TO REACTOR K1 224 GAL		
AMOUNT OF B ADDED TO REACTOR K1 135 GAL		
AMOUNT OF C ADDED TO REACTOR K1 440 GAL		
MULTIPLIED PROCESS CONDITIONS		
MAX TEMPERATURE IN PING STEP 3 116.4 F		
MAX TEMPERATURE IN FINISH STEP 4 144 F F		
A9473		

FIGURE 1 Typical Batch Ticket

### Introduction

The Bailey Controls NETWORK 90 microprocessor based distributed control system provides a hierarchical control system for batch processes. NETWORK 90 allows the actual sequential and regulatory control of the batch to be accomplished solely by a microprocessor based controller at the lowest possible level in the control system hierarchy. Operator interface mass storage for on-line historical data and user friendly configuration features are provided by devices at a higher level in the hierarchy (i.e. CRT based operator consoles and/or supervisory computers). However, even with these higher level functions, the distributed nature of the batch

control system can be maintained. The NETWORK 90 Multi-Function Controller (MFC) provides regulatory and sequential control for the batch process, stores/executes batch recipes and collects/stores/transmits batch historical data to the higher level devices in the system.

The standard NETWORK 90 CRT based Operator Interface Unit (OUI) can be used in conjunction with the MFC batch controller to provide a concise historical summary of the

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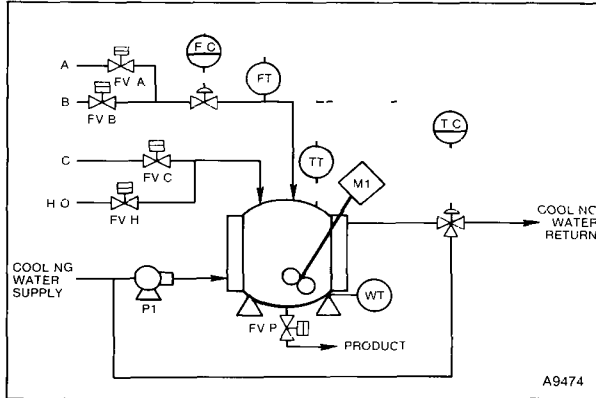


FIGURE 2 Example Batch Process

process conditions during each batch run, without the use of a supervisory computer. A printed batch ticket summary to FIGURE 1 can be quickly defined for NETWORK 90 documentation of each batch. This application guides the user through the example of a simple batch process to demonstrate the steps necessary to configure and automatically generate a batch ticket.

## Example Batch System

A batch chemical reactor with several inlet headers, a discharge valve, and a jacket temperature control system is shown in FIGURE 2. The steps required to process each batch in this reactor are listed in TABLE 1.

## Batch Ticket

A batch ticket that could be generated for this batch process is shown in FIGURE 1. This batch ticket summarizes the ingredients that were added to the reactor, keeps track of the start and stop times for the batch, contains the batch number, and defines key process values (such as temperature extremes during certain steps). It

TABLE 1 Step Descriptions for Example Batch Process

STEP	DESCRIPTION
0	Emergency stop
1	Fill reactor with H <sub>2</sub> O
2	Empty reactor
3	Set jacket temperature
4	Add component A
5	Add component B
6	Add component C
7	Dump product to header
8	Print batch ticket

should be noted that any pertinent information can be included on the batch ticket, such as the material numbers of the specific equipment used. This batch ticket is printed out automatically at the end of the batch run.

## MFC Configuration

To produce a batch ticket, the batch controller (MFC) must be configured to generate the information required for documentation of the batch (e.g., the start/stop times, key analog data integrated flows). The MFC configuration for the example batch ticket is typical of what is generally required and is discussed in detail below.

The logic required to capture batch start times is shown in FIGURE 3. This logic accesses the hour and the minute of current clock time at block address 20 and 21 in the MFC. The hours must be multiplied by 100 and then added to the minute to obtain the military representation of the time. For example, 11:30 AM would become 1130. This time is then captured by a transfer analog function block. The signal that initiates the capture is the Step 1 indicator. Thus, when Step 1 starts, the time is converted into military time, captured, and displayed on the batch ticket. The logic required to capture the batch stop time is identical, except

that the stop time is captured when Step 8 (the last step in the batch sequence) is initiated. This logic can be extended to capture the value of any process parameter at any point in the batch run.

The logic required to integrate the flow of an individual ingredient to the reactor is shown in **FIGURE 4**. The integrator is reset by the Step 1 indicator. The flow integration in this example is computed by the fact that the same flowmeter is used by two different ingredient headers. To accommodate this situation, the signals from the flowmeter are passed to the integrator block only when FVA is open and FVB is closed. If these valves are not in the correct position, a value of zero is passed to the integrator block to hold it at the current value. The logic for integration of component B is identical except that the valve interlocking is reversed.

The logic necessary to capture a peak analog value during Step 3 is shown in **FIGURE 5**. It is designed to capture the highest value that the temperature transmitter reached during Step 3. This type of information is often important to know for a batch. Average values of any process measurement may also be logged using similar logic.

The logic required to print the batch ticket is shown in **FIGURE 6**. This logic also provides the signals to capture the stop time of the batch run and resets a portion of the logic for the next batch ticket.

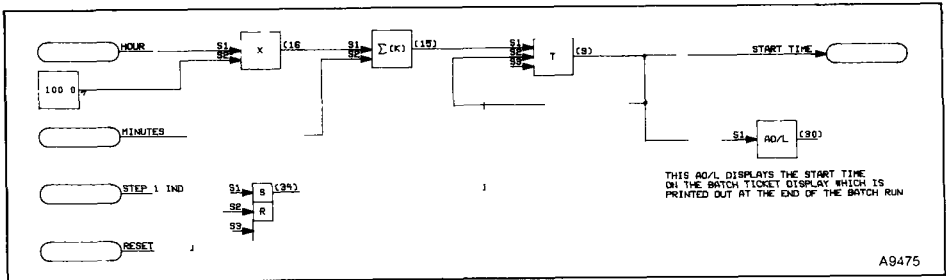


FIGURE 3 Logic to Capture Start Time of a Batch Run

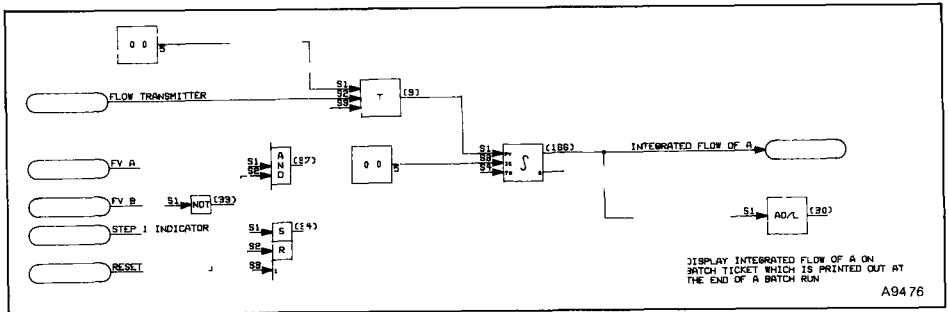


FIGURE 4 Typical Logic for Integrating a Flow

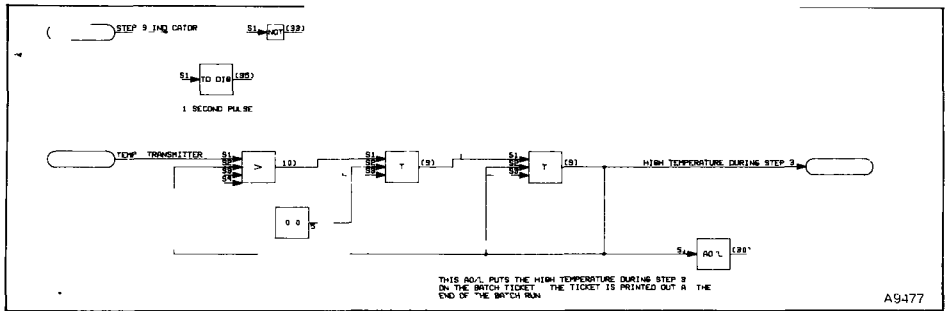


FIGURE 5 Typical Logic for Capturing the High Analog Value During a Step

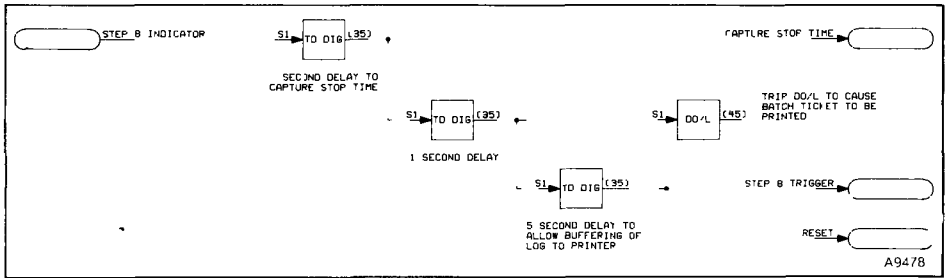


FIGURE 6 Batch Log Trip and Reset Logic

### OIU Configuration

In order to generate a batch ticket on the OUI, the following steps must be completed:

- Using the standard OUI graph editor for a custom graph must be built to establish the format of the batch ticket. All data from the MFC to be displayed on this graph must be transmitted across the plant loop through AO/L blocks (function on code 30), M/A stations (function on code 80), REMSET (function on code 68) or DO/L blocks (function on code 45) which must be defined as tags in the OUI if the graph needs to be actually displayed on the OUI. It must be assigned to a group display for the OUI.

- A trip tag must be defined in the OUI tag list. This can be any discrete tag, but it is normally a DO/L block (function on code 45) that is generated during the last step in the batch sequence.

- The batch ticket must be configured in the OUI as a batch type log (rather than a trend type) referencing the predefined trip tag and custom graph.

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