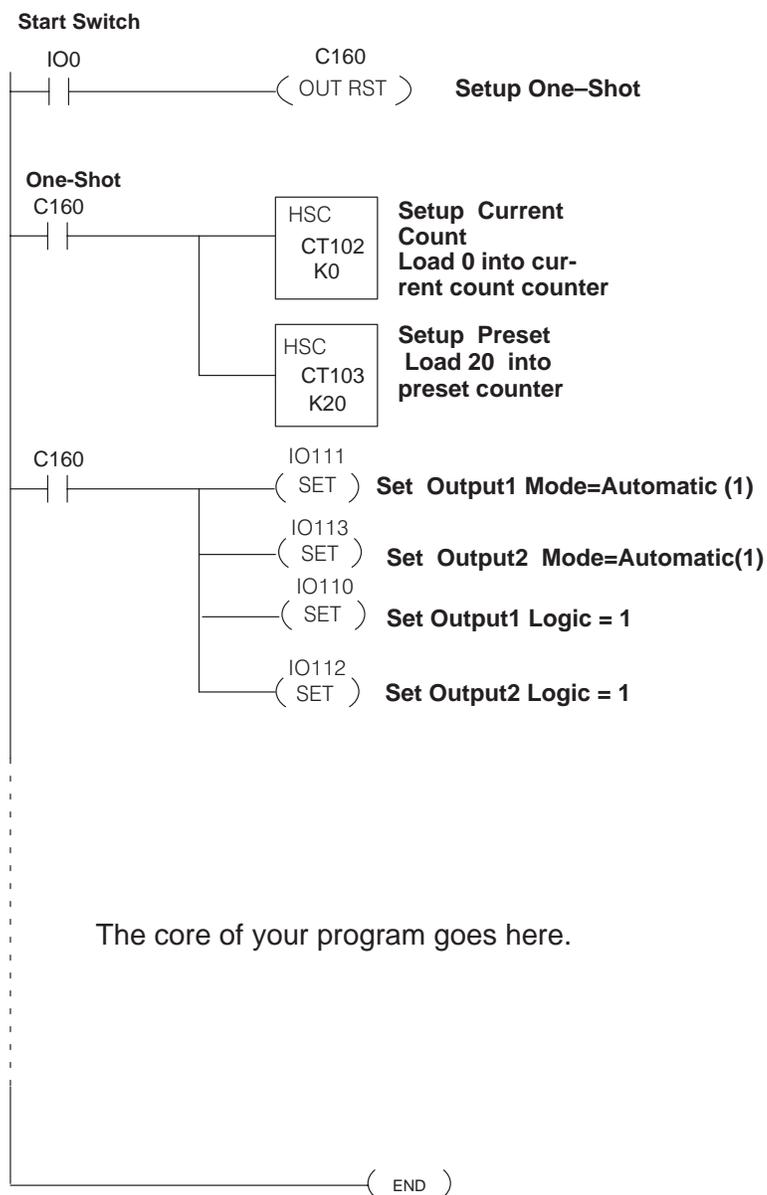# Example 1:
Activating both Outputs Automatically

As you know from reading earlier pages, the HSC module can go in slots 0,1, 2, or 3. In this program, we are assuming that the HSC module has been placed in Slot 1. This means that the counters (HSC boxes) in your program would be designated as CT102 and CT103 (See Page 16). The Output Mode and Output Logic control are assigned I/O points 110 through 113 (See Page 19).

We are using IO0 and C160 as a one-shot to start this setup.The one-shot enables the two HSC boxes, CT102 and CT103 for one scan. This initializes the preset value to 20 and the current count to 0.

C160 also turns ON IO111 and IO113, enabling the Automatic Mode for both outputs. This means when each output will turn ON or OFF is solely dependent on the current count and preset. When C = P, OUTPUT1 and OUTPUT2 will be activated. Whether this means either output turns ON or OFF, depends on how you have set the Output Logic Control in each case. Here you see that we have set the logic of both to 1. So, this means that the output will be ON when C < P and turn OFF when C = P.

Start Switch

IO0   C160
—| |—   (OUT RST)   **Setup One–Shot**

One-Shot

C160
—| |—

| HSC |
| CT102 |
| K0 |

Setup Current Count
Load 0 into current count counter

| HSC |
| CT103 |
| K20 |

Setup Preset
Load 20 into preset counter

C160   IO111
—| |—   (SET)   **Set Output1 Mode=Automatic (1)**

IO113
(SET)   **Set Output2 Mode=Automatic(1)**

IO110
(SET)   **Set Output1 Logic = 1**

IO112
(SET)   **Set Output2 Logic = 1**

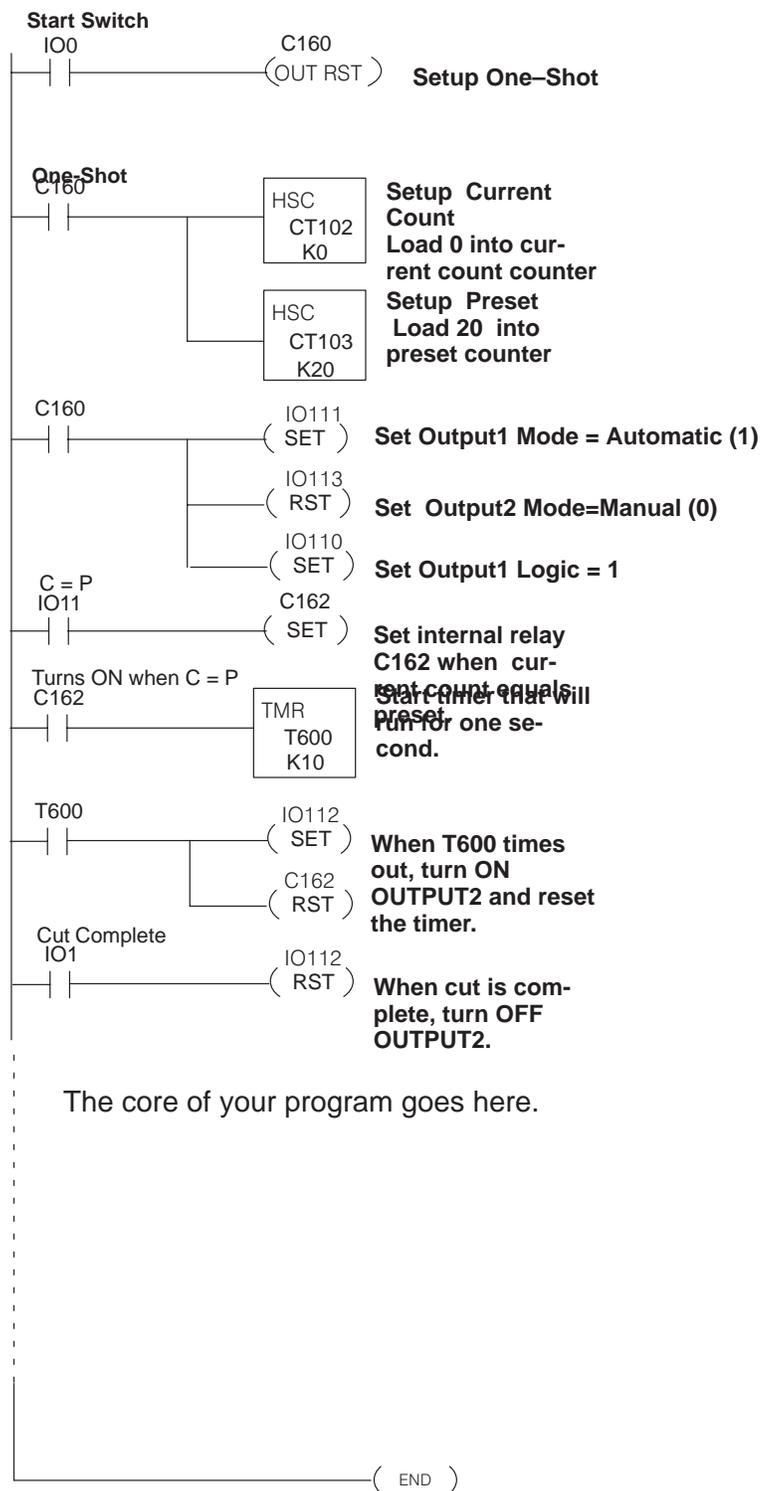The core of your program goes here.

(END)

Example 2:
Mixing Modes of Operation for Outputs

In this example, we are illustrating how you can use the manual and automatic modes for controlling outputs in the same program. We have decided to control OUTPUT1 automatically, and to control OUTPUT2 manually. This could be a cut-to-length application where OUTPUT1 advances a board toward a saw for a preset number of pulses recorded by the HSC. OUT-PUT2 controls the cutting operation. We will assume the HSC module is in Slot 1.

When C = P, OUTPUT1 is turned OFF. At the same time, relay C162 turns on a timer (T600). When T600 times out, we turn ON OUTPUT2 by setting IO112. In our board cutting example, this could mean that a saw is activated by OUTPUT2. The point being made here is that manual control of an output or outputs operates independently from the status of preset and current count.

In the Manual Mode, the relationship of current count compared to preset does not automatically affect the out-put. In the example shown here, we have used an internal status flag relay IO11 (C=P) to start a timer. When the timer times out(1 second), we turn ON OUTPUT2 by setting IO112. This is done to insure the board has stopped moving before we start the cut.

Start Switch
IO0 — C160 (OUT RST) — **Setup One–Shot**

One-Shot
C160 — HSC CT102 K0 — **Setup Current Count** / **Load 0 into current count counter**

HSC CT103 K20 — **Setup Preset** / **Load 20 into preset counter**

C160 — IO111 (SET) — **Set Output1 Mode = Automatic (1)**

IO113 (RST) — **Set Output2 Mode=Manual (0)**

IO110 (SET) — **Set Output1 Logic = 1**

C = P
IO11 — C162 (SET) — **Set internal relay C162 when current count equals preset.**

Turns ON when C = P
C162 — TMR T600 K10 — **Start timer that will run for one second.**

T600 — IO112 (SET) — **When T600 times out, turn ON OUTPUT2 and reset the timer.**

C162 (RST)

Cut Complete
IO1 — IO112 (RST) — **When cut is complete, turn OFF OUTPUT2.**

The core of your program goes here.

(END)

Example 3: Changing Presets On the Fly

WARNING: The application shown below changes the counter's preset value while the program is executing. Under some conditions (explained in a moment), this causes OUTPUT1 and OUTPUT2 to turn ON for approximately 1 millisecond as soon as preset is changed. This condition occurs only if the external outputs are OFF when the change is initiated, and you are in the **automatic** mode of control. This could result in unsafe or unpredictable results if the field device connected to the outputs sees this momentary ON signal. To prevent this, include a segment in your ladder logic that switches the operating mode of the HSC to **manual** before the preset is changed. The example below illustrates how this is done.

In this example, we are illustrating how you can change the preset value "on the fly". This means you are changing the preset while the program is still running. Although we are only showing the logic for controlling OUTPUT1, the same method could be used to affect both outputs.

We have placed the HSC in Slot 1 for this example. It can, of course, go into any Slot 0 through 3. We will assume at the point in in your program where this logic starts, the process has been running with a Preset that had been entered in earlier ladder logic not shown here. At the point this ladder logic is executed, the counter has already been counting pulses and comparing them against the previous Preset.

This part of the program uses an MCS and MCR instruction to load a new Current Count and Preset value. The logic between MCS and MCR will only execute when the MCS rung has power flow.

With this example, the process is started via IO002. When energized, C161 is latched in the ON state. C161 also enables the MCS. C161 resets IO111, putting the HSC in Manual Mode. The only other rung that executes during this first scan is the rung that causes C161 to turn ON C162.

On the second scan through the logic inside the MCS/MCR, since C162 is now ON, CT102 loads a new Current Count of 0 and CT103 writes a new Preset of 200. C162 will one-shot C165, which puts the HSC back into autmatic mode and resets IO110. It also disables the MCS/MCR.

Ladder diagram:

```
Load New Preset      Disable Load
   IO002                C165           C161
    ┤├─────────────────┤/├──────────( OUT )      Configure  HSC
Configure HSC
   C161
    ┤├

Configure HSC
   C161
    ┤├──────────────────────────────( MCS )

Configure HSC
   C161                               IO111
    ┤├──────────────────────────────( RST )      Set  Output1 Mode =0  (manual)

Load HSC Current  Count
   C162                         ┌──────────┐      Current  Count
    ┤├──────────────────────────│   HSC    │      Value Set to 0
                                │  CT102   │
                                │   K0     │
                                └──────────┘
Load HSC Preset
   C162                         ┌──────────┐      Preset Value Set
    ┤├──────────────────────────│   HSC    │      to 200
                                │  CT103   │
                                │  K200    │
                                └──────────┘
   C162                               C165
    ┤├──────────────────────────────(OUTRST)      Disable Load Using One-shot

Configure HSC
   C161                               C162
    ┤├──────────────────────────────( OUT )       Load HSC Current
                                                  Count and Preset

                                    ( MCR )        End logic under MCS
                                                   and MCR Control
Disable Load
   C165                               IO111
    ┤├──────────────────────────────( SET )       Set  Output1 Mode =1 (automatic)

                                     IO110
                                    ( RST )        Output 1 Logic Control=0

                                    ( END )
```