TECO Frequency Inverter

PA-PID Card

APPLICATION MANUAL

VER : 01

PA-PID card mainly services in variable frequency constant pressure water supply system. The inverter is widely applied in water supply industry with advantages as built-in PID and simple programmable functions. PA-PID card will substitute the external PLC. The inverter can supply power with variable frequency for pump running at stepless speed and stably control the water pressure in pipe with the built-in PID controller.

PA-PID card classifies into two basic running modes: variable frequency pump fixed mode and cyclic mode.

Variable frequency pump fixed mode:
that is 'inverter drives one certain pump and can controls 8 pumps at max.'

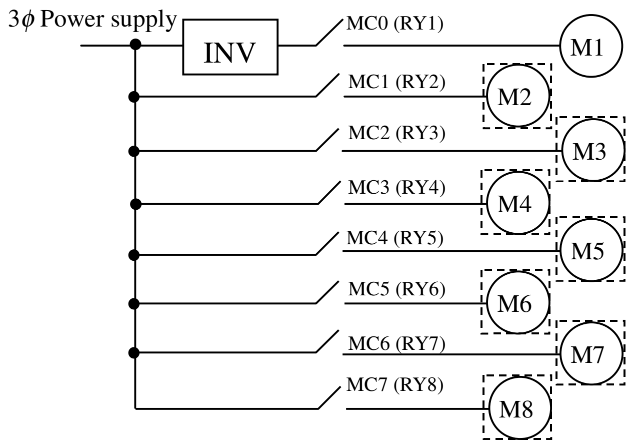


Fig 1 variable frequency pump fixed mode.

Variable frequency pump cyclic mode:
that is 'inverter is not fixed to drive one certain pump and it can control 4 pumps at max.'

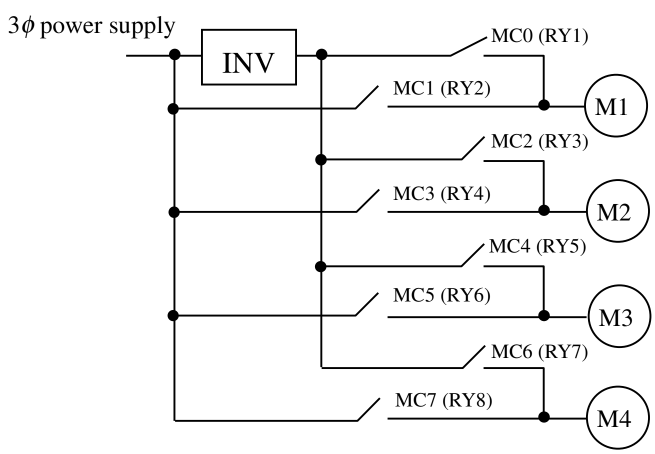


Fig 2 variable frequency pump cyclic mode.

Parameters related to PA-PID card:

Freq. Command Upper-Bound Delay Time (Bn-23):

- That is the time since PID output frequency reaches Frequency. Command Upper Bound (Parameter Cn-14) till PA-PID card controls to increase the serving pump.
- Freq. Command Upper-Bound Delay Time (Bn-23) should be set according to the changing speed of system pressure. The smaller value of Bn-23 would be better, on the basic of no vibration in system pressure.

Freq. Command Lower-Bound Delay Time (Bn-24):

- That is the duration since PID output frequency reaches Frequency. Command Lower Bound (Parameter Cn-15) till PA-PID card controls to reduce the serving pump.
- Freq. Command Lower-Bound Delay Time (Bn-24) should be set according to the changing speed of system pressure. The smaller value of Bn-24 would be better, on the basic of no vibration in system pressure.

MC ON/OFF Delay Time (Bn-25):

- When switching the motor between the inverter and commercial AC power, the parameter Bn-25 is set to prevent short circuit between inverter output and AC power supply for delay of external electro-magnetic switch.
- Bn-25 set value should larger than duration since Relay signal switching of PA-PID card till external electro-magnetic switch acting. Generally, the action time of the electro-magnetic switch: OFF~ON time is longer than ON~OFF time. Please set Bn-25 according to the longer time.

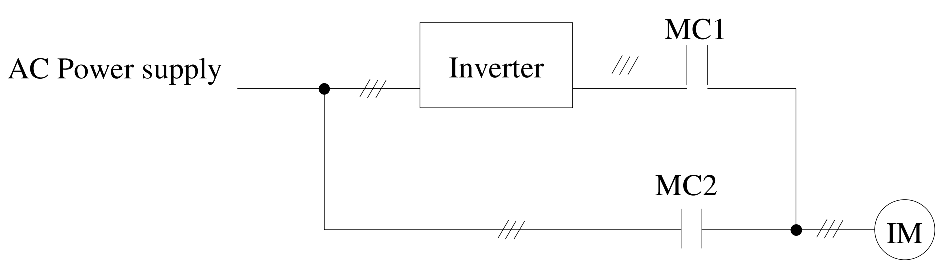


Fig 3 Switching of inverter driving to commercial AC power supply

Pump ON/OFF Detection Level (Bn-26):

- That is allowable tolerance of preset value and detected value when increasing or reducing number of pumps with PID function and PA-PID card. Bn-26 set value is based on the balance of the preset value and detected value to increase to reduce of pumps allowable tolerance according to the inverter output frequency closing to frequency command upper bound (Cn-14) or frequency command lower bound (Cn-15)
- Set unit is 0.1%. If it is set to 0.0%, increasing pumps or reducing pumps will act immediately as long as reaching upper limit frequency or lower limit frequency.

Pump Operation Mode Selection (Sn-30):

- If PA-PID card is not connected to the inverter, it is necessary to set Sn-30=0.
- Sn-30 set PA-PID card enable/ disable and water supply mode.

Sn-30=0: PA-PID card disable

Sn-30=1: Variable frequency pump fixed mode, all stop at first-ON-last-OFF procedure. (The pump (motor) driven by inverter is fixed. When the motors are OFF, sequence is first-ON-last OFF, which is suitable for variable motors capacity)

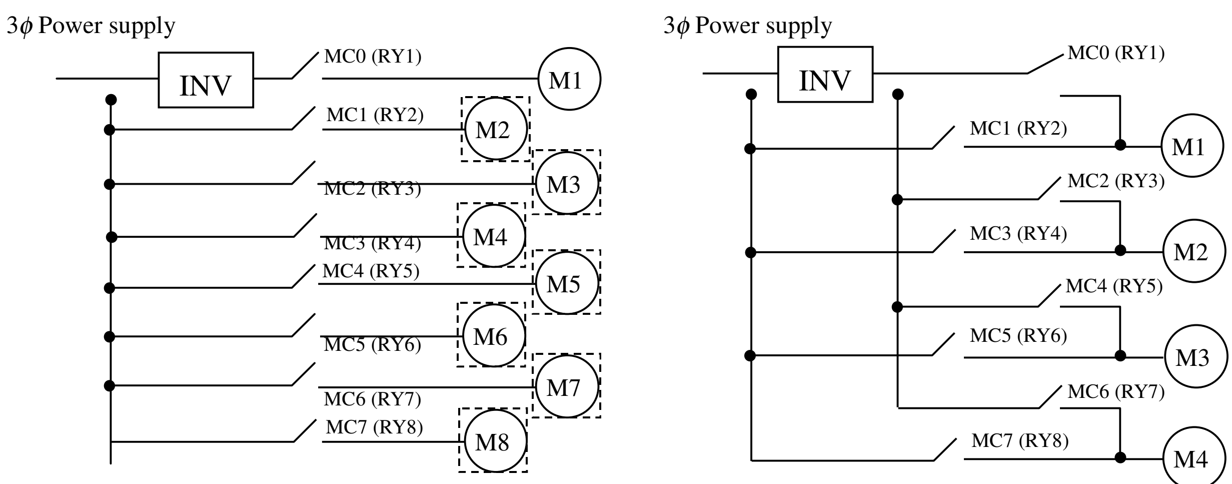
Sn-30=2: Variable frequency pump fixed mode, only variable pump stops.
(The pump (motor) driven by inverter will stop as inverter sends stop instruction.)

Sn-30=3: Variable frequency pump fixed mode, all stop at first-ON-first-OFF procedure.
(The motor which is the first one ON (with the longest running time) will be first OFF in OFF sequence on order to even the service frequency of the motors. The mode is mainly used in motors (pumps) with same capacity.

Sn-30=4: Variable frequency pump cyclic mode, all stop at first-ON-last-OFF procedure. (Inverters drive all motors, all stop at first-ON-first-OFF procedure.)

Sn-30=5: Variable frequency pump cyclic mode, only inverter pump stops

- Variable frequency pump fixed mode/ cyclic mode wiring example:



(a) Variable frequency pump fixed mode (b) Variable frequency pump cyclic mode

Fig 4 Variable pump driven mode

PA-PID Card Relay2 (RY2) Control (Sn-31)
PA-PID Card Relay3 (RY3) Control (Sn-32)
PA-PID Card Relay4 (RY4) Control (Sn-33)
PA-PID Card Relay5 (RY5) Control (Sn-34)
PA-PID Card Relay6 (RY6) Control (Sn-35)
PA-PID Card Relay7 (RY7) Control (Sn-36)
PA-PID Card Relay8 (RY8) Control (Sn-37)

- Motors (pumps) for selection
  Sn-31 – 37=0: Disable
  Sn-31 – 37=1: Enable
  (1) Under fixed mode, RY2~RY8 can be freely enabled or disabled.
  (2) Under cyclic mode, Sn-31 is idle and RY2, RY1 are always in service.
  Others RY3~RY8 are two in one group: RY3/RY4, RY5/RY6, RY7/RY8.
  If any relay in one group is disabled, that group has no function.

Motion description:

(1) Under fixed mode:

In adding (reducing) pumps, the inverter will decelerate (accelerate) to lower (upper) bound frequency, and the PID function will disable. While the frequency reach the lower (upper) bound, the PID function will enable and the inverter will output according to feedback value.

(2) Under cyclic mode:

In adding pumps, the output of the frequency will be cut. When the former motor driven by inverter is switched to driven by commercial AC power supply, it is necessary to let the motor connected to the AC power after the time specified by Bn-25 (MC ON/OFF Delay Time) passed. Then the inverter can drive the next motor. The inverter will output according to feedback value. In reducing pumps, the sequence will be first-ON-first-OFF to equal the service frequency of every motors/pumps.

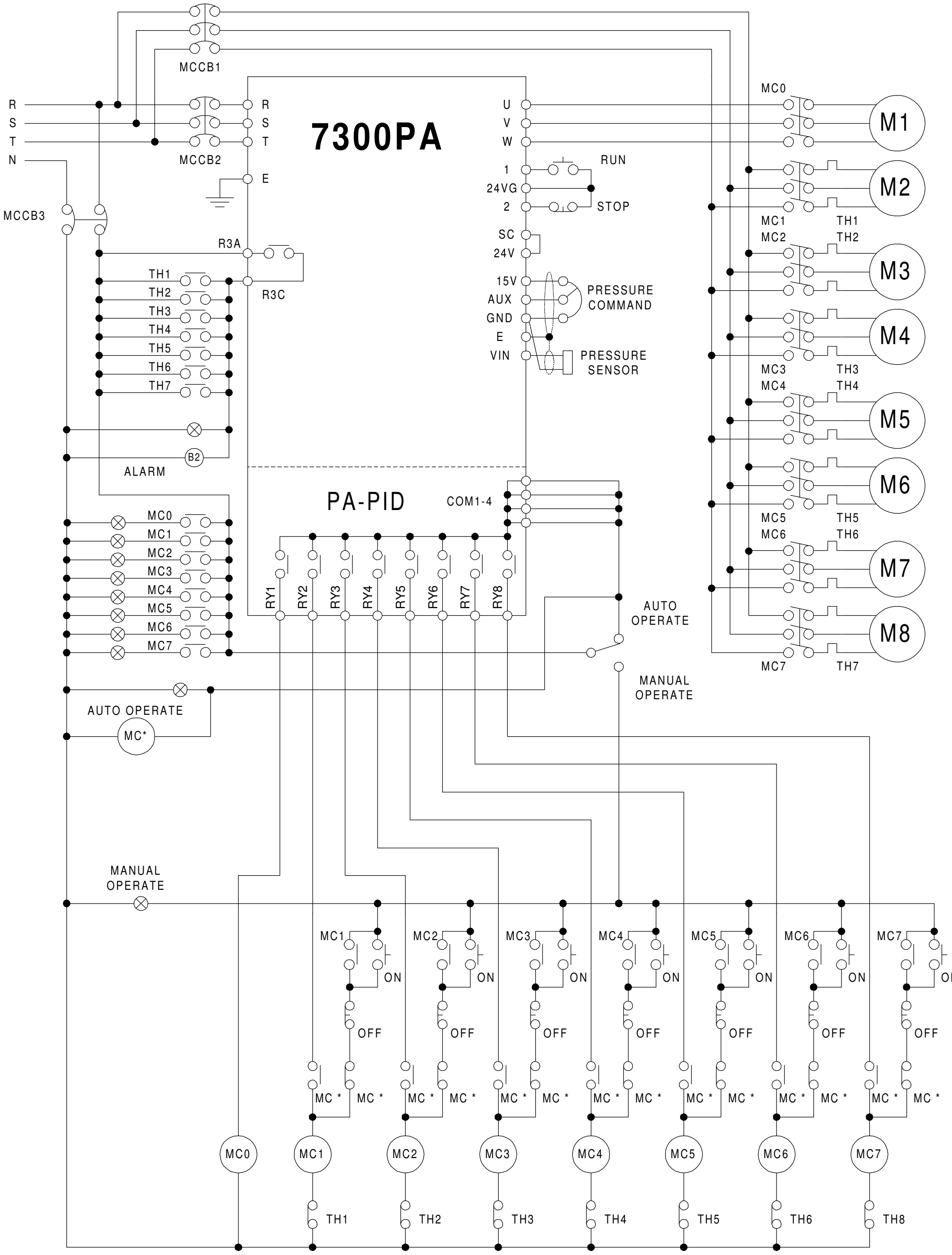


Fig 5 Fixed mode wiring diagram

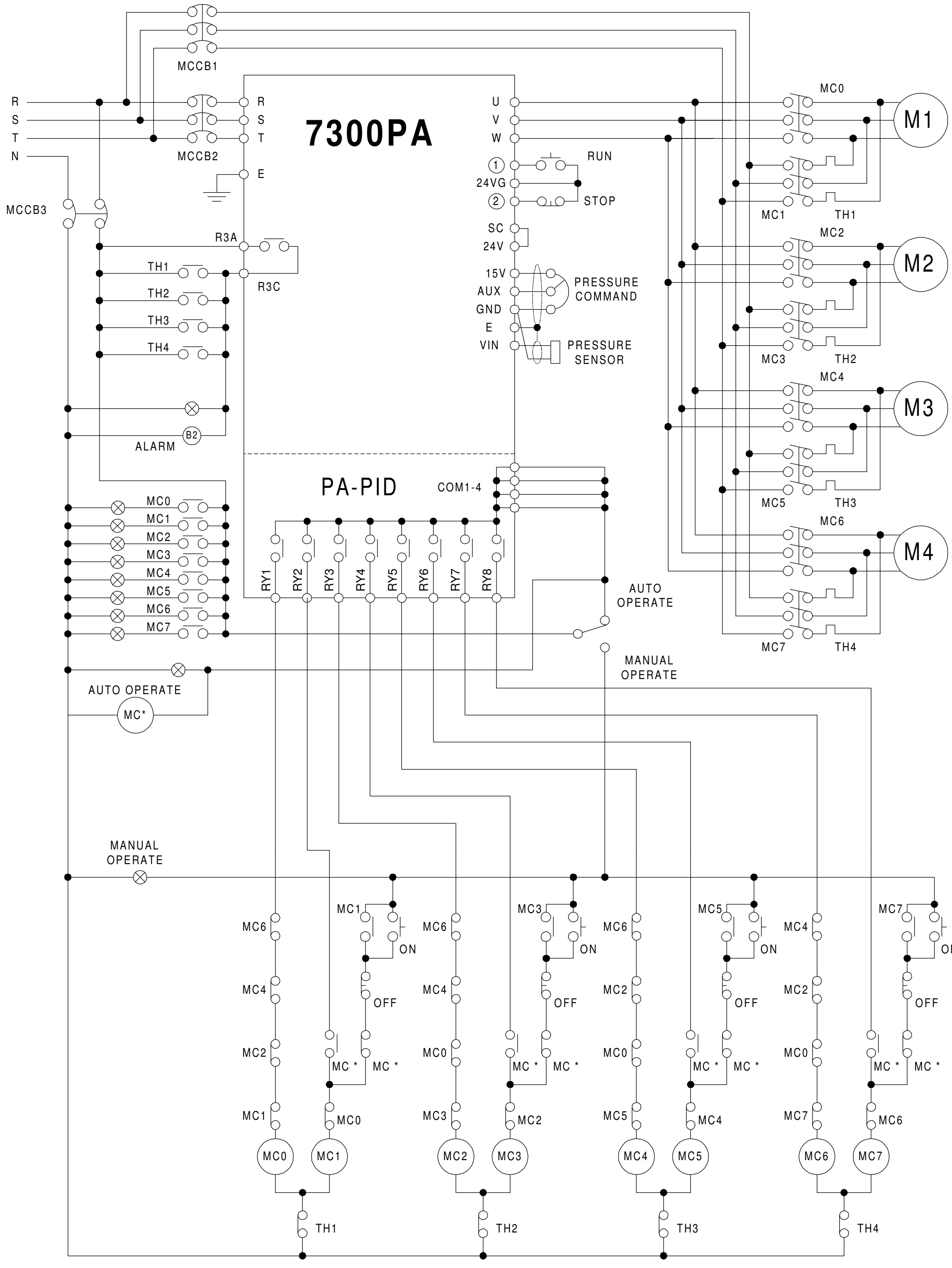


Fig 6 Fixed mode wiring diagram