

# Power Electronics Lab.

[www.PWM.PE.kr](http://www.PWM.PE.kr)

*focusing on practical applications  
(High performance at Low cost)*

Servo Control with servo motor  
CNC system  
High Torque Step motor drive  
Signal processing with DSP  
HID Ballast  
Embedded controller

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## Electronic Ballast for HID Lamp('90 ~)

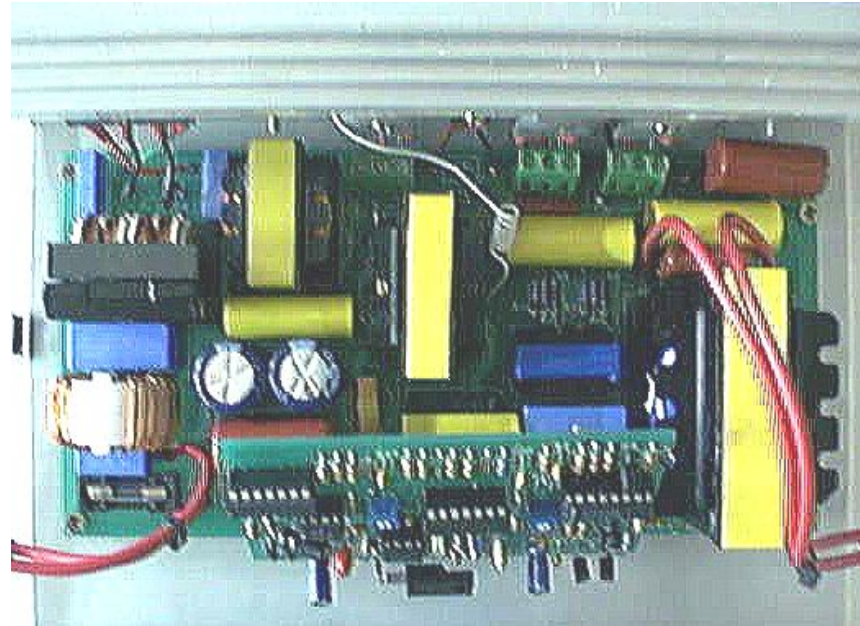
The first Electronic Ballast of HID lamps was developed and produced commercially in 1992. Lamp behaviors at high frequency was also tested.

- Configuration for HPS
- Configuration for MH
- PFC structure for Ballast
- Igniting Circuit
- Fully Analog parts



First E-B for 250W HPS('92)

- E-B for 250W MH ('92)
- E-B for 400W HPS ('98)
- E-B for 35W HPS ('99)
- E-B for 400W MH (low EMI) ('00)
- High efficiency E-B for 250W MH ( $\eta=96\%$ ) ('01)

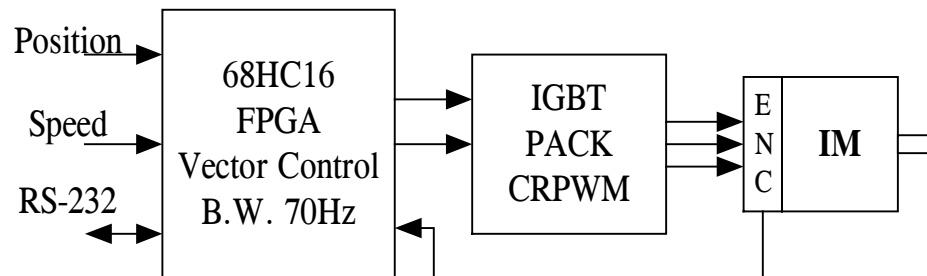


E-B for 400W MH('00)

# Vector Drive of an Induction Motor('94)

The compact servo drive is implemented with vector control technique for an induction motor. Position and speed control are carried out in the drive.

- 68HC16 processor
- 1 FPGA
- 2 hp Output
- General IM + Encoder
- Encoder input for position command
- RS-232 Comm. with PC



## 4-axis CNC controller('95)

Low cost CNC system is set up with vector controlled induction motor. Position control is carried out on drive and interpolated data from G-code file is from PC.

### Motor Drive

- 68HC16 processor
- 1 FPGA
- 1024 Encoder on Motor
- 56Kbaud multi-drop RS-232 Comm.
- Built on Mill('98)
- Too big and heavy!
- Expensive!

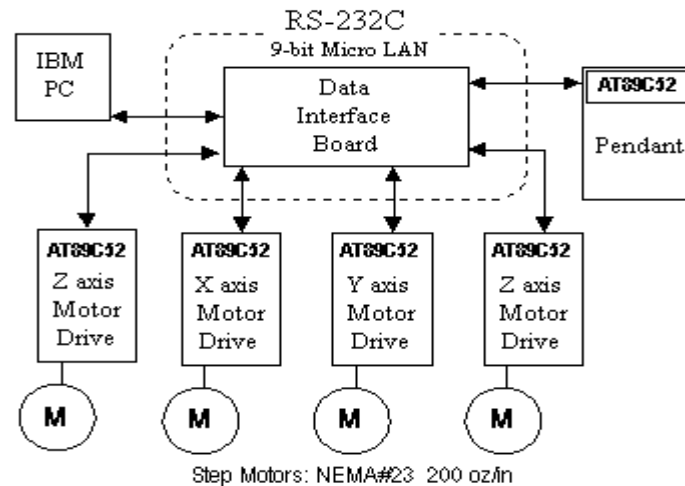




## PC-CNC(4-axis) system('99 ~)

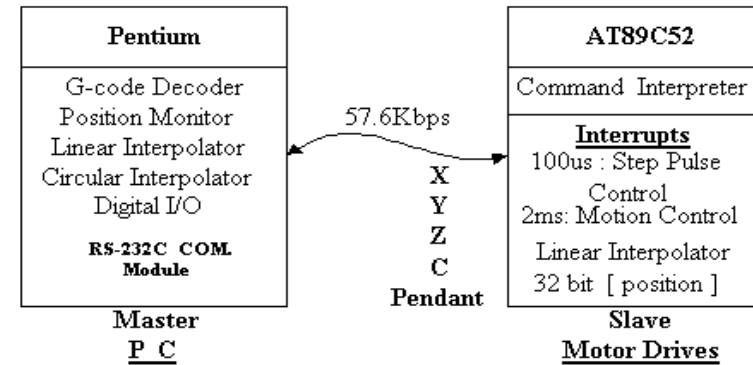
For low cost CNC system, high torque step motor is employed and drives are implemented by using popular ICs.

- Five 89C52s used
- Pendant (feed rate & jog)
- 9-bit Micro-LAN
- 200 oz-in Step motor



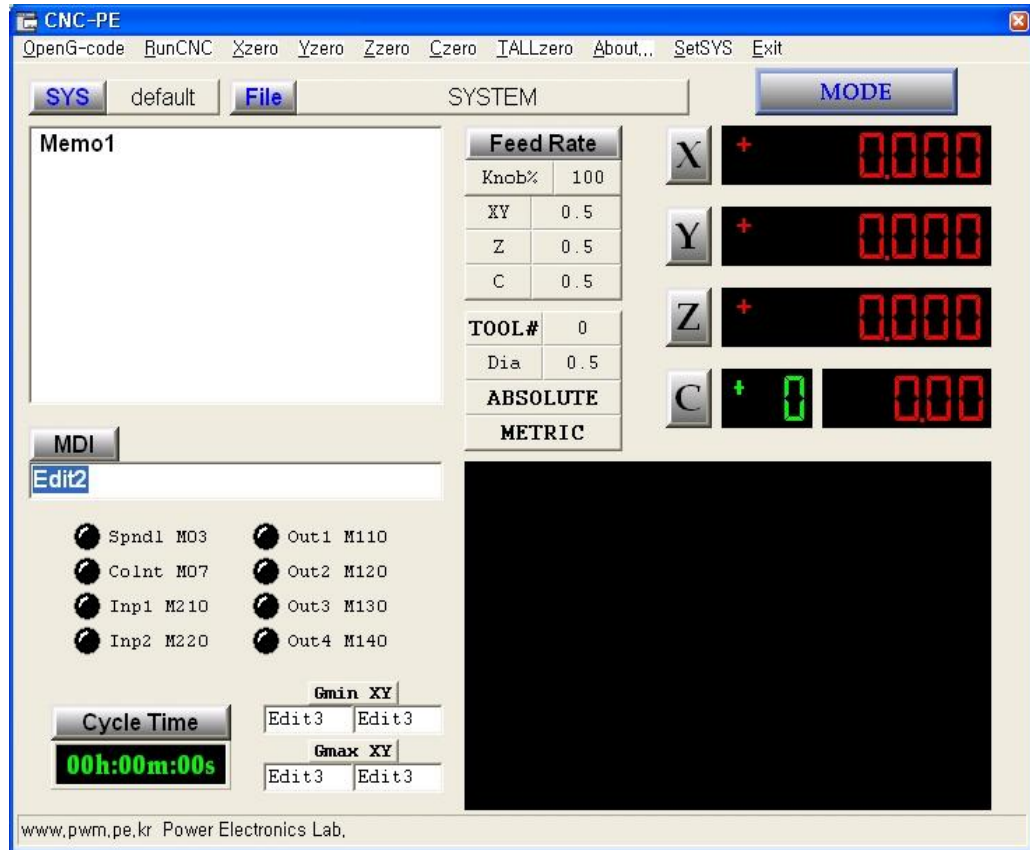
## NEMA#34 high torque motor Drive for CNC

- 600 oz-in torque
- Pseudo micro-stepping
- 80V DC bus - 5A driving
- High speed drive (over 1500 rpm)



## G-code Interpreter on Win-XP PC

- Real-time Control on Win-XP
- C Builder + VCL
- RS-232 9-bit Comm.
- Independent Interrupt Service Routine
- Linear interpolation
- Circular interpolation
- Helical interpolation
- I/O control

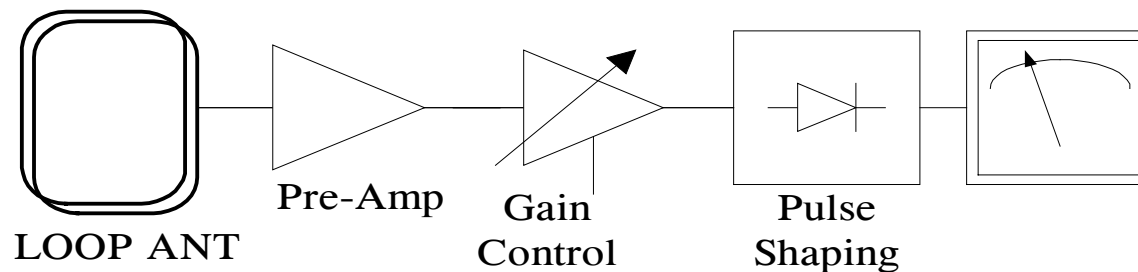
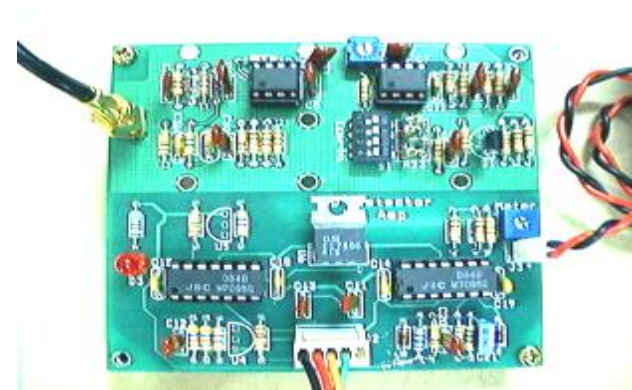




# PD Detector('01)

The partial discharges are tiny electric arcs which occur whenever a flaw appears inside the insulating equipment.

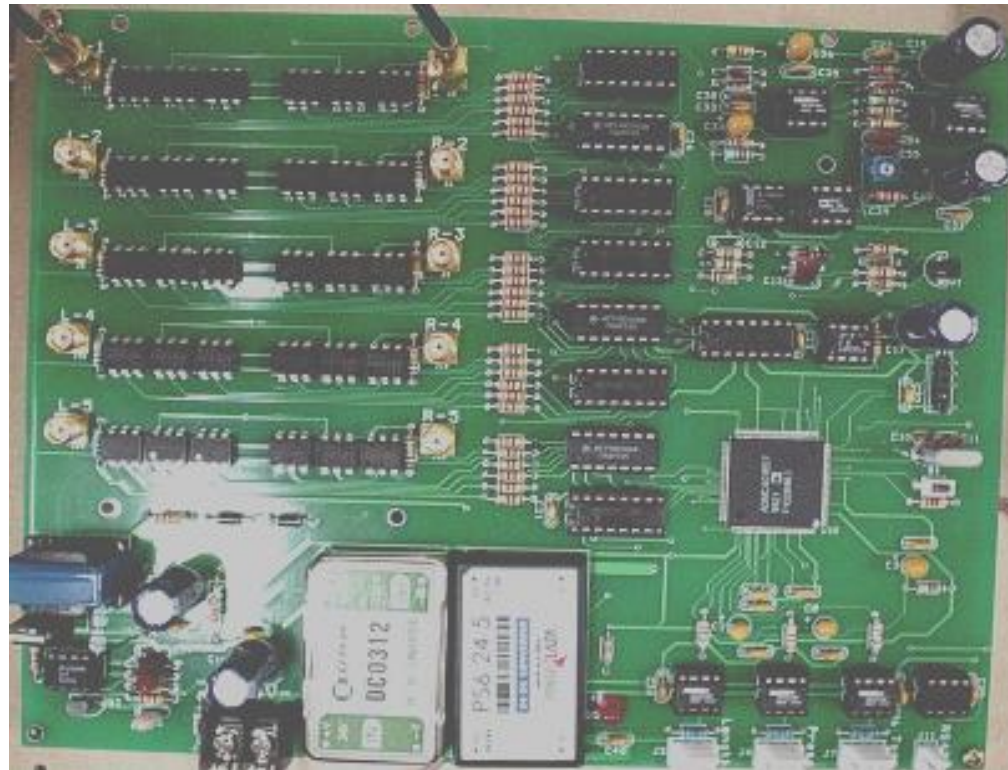
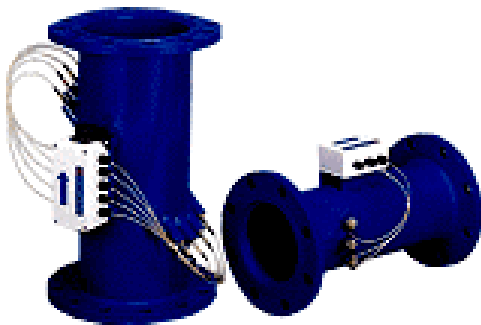
- High gain & Wide bandwidth (80dB, 50MHz)
- Loop-Antenna input
- Detectable from 10pC
- Usable for Diagnostics HV equipment
- Analog & RS-232 Outputs
- For handheld system



## Gas Flow Meter('01)

The multiple ultrasonic senses are used for measuring gas flow and the speed of gas is solved by DSP controller.

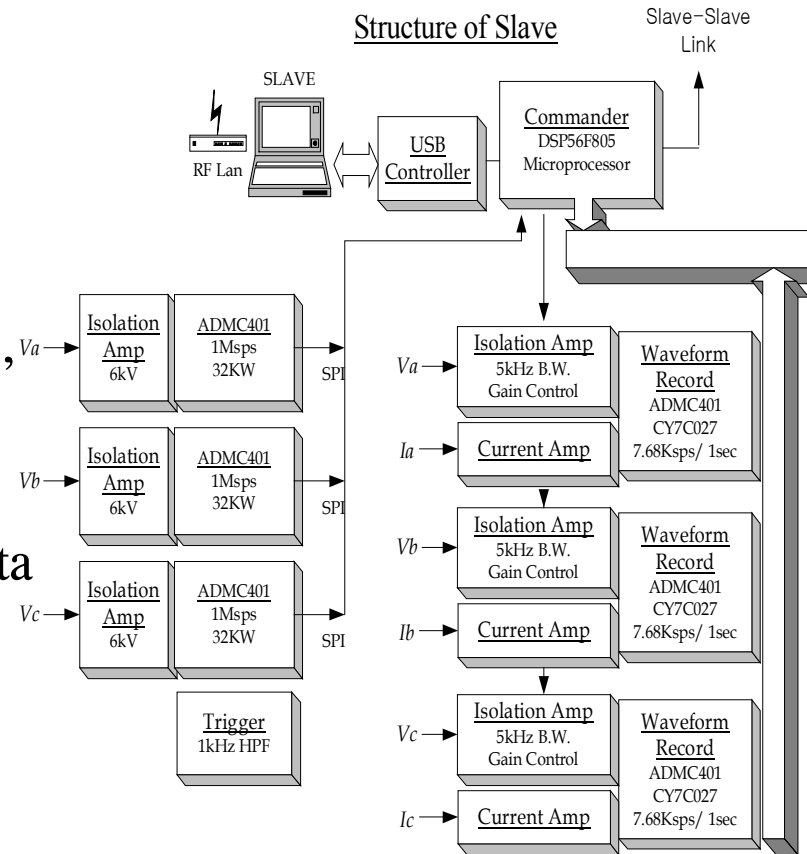
- ADMC401 DSP
- 10 channels I/O
- Digital algorithm for getting time of propagation
- RS-485 Comm.



# Power Quality Analyzer('02)

Real-time capturer for transient voltage, sagging, low PF, low volt, over curr and high THD is implemented with 7 DSPs on one board.

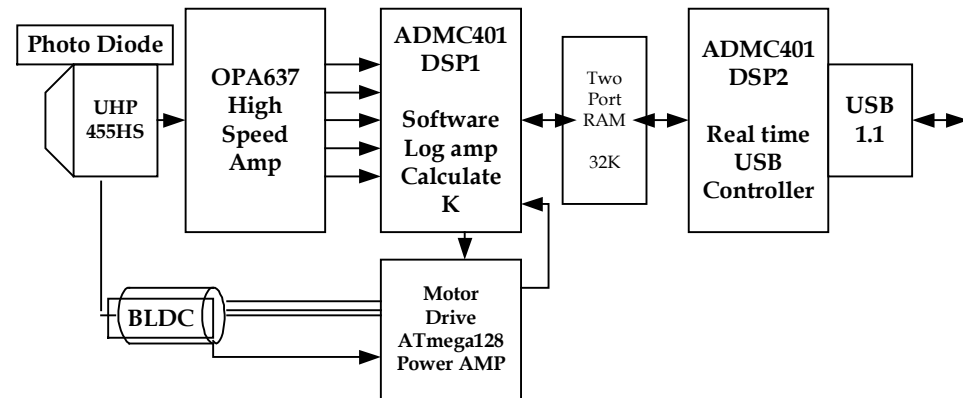
- Seven ADCM401 DSPs + PC
- 1MHz sampling for transient V
- 128 samples/period for V&A (PLL used)
- Real time calculations for RMS, PF, THD(a period)
- USB connection to PC
- Real time saving (waveform data into PC disk)
- Event synchronizing between devices



# Scanning Pyrometer Wireless Strain gauge Amp('03)

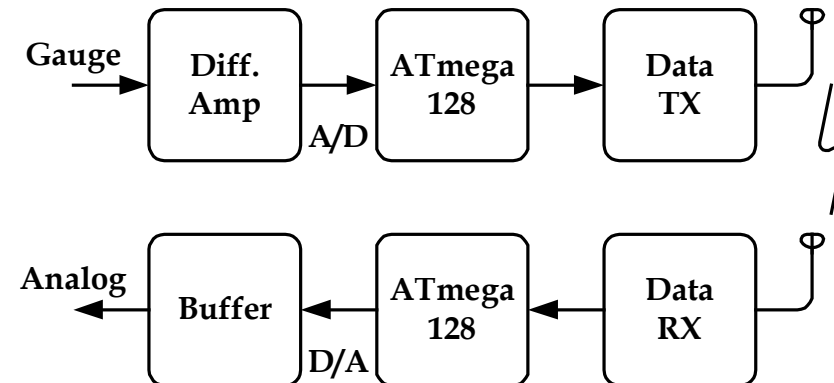
## Scanning Pyrometer

- High speed mirror scanning
- 2usec log conversion on DSP
- 600 ~ 1300[C] temp
- USB connected
- 2D surface scanning



## Strain gauge Amp

- RF modem
- Data communication
- Digital control



# EMAT + Stepping -DRV('04)

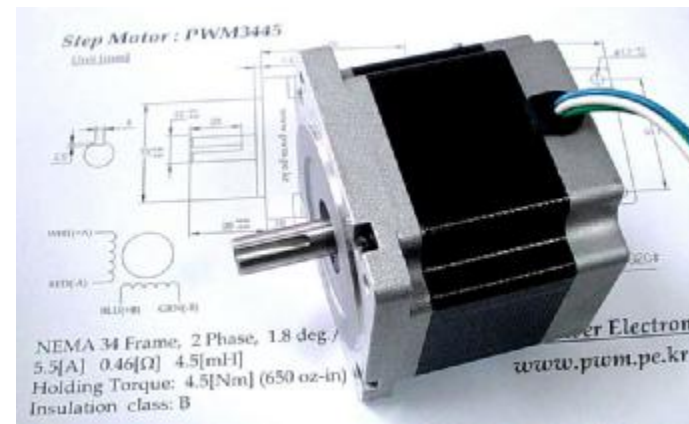
## EMAT

- 1 ~ 5[MHz] MOSFET driving
- 150[V], 20[A] Output
- Pulse number control of TX
- High gain RF preamp



## Stepping motor drive

- Atmega16 cpu
- Micro-stepping
- Anti-resonant algorithm
- Run up to 3000[RPM]





## 7[kV] SCR Tester('05)

- dsPIC30F6010
- USB connection
- Windows-PC Monitor
- 0 ~ 7[kV] continuous output
- Max. 10[mA]
- X-Y curve for leakage current of SCR
- Easy prediction of SCR failure

# Zero Feedback Tube Amp('06)

*The sound can only be described as magnificent, warm and silky, but extremely powerful and live.*

