



EXPANSION OF HELIUM COMPRESSOR REMOTE CONTROL ACCESSIBILITY

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PROJECT OBJECTIVE

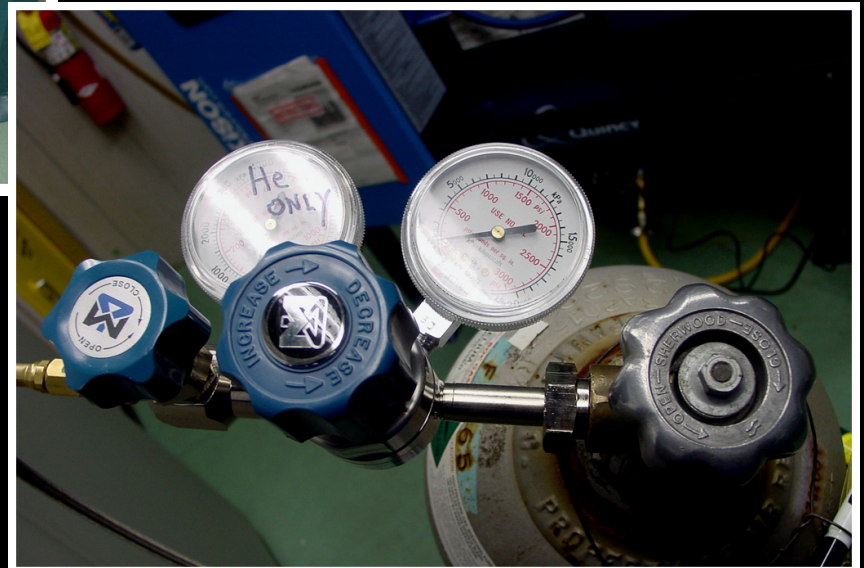
Engineer a system to remotely monitor and control helium compressors used for instrumentation cooling at Subaru Telescope's summit facility, expanding on an existing design.

WHY IS HELIUM IMPORTANT?

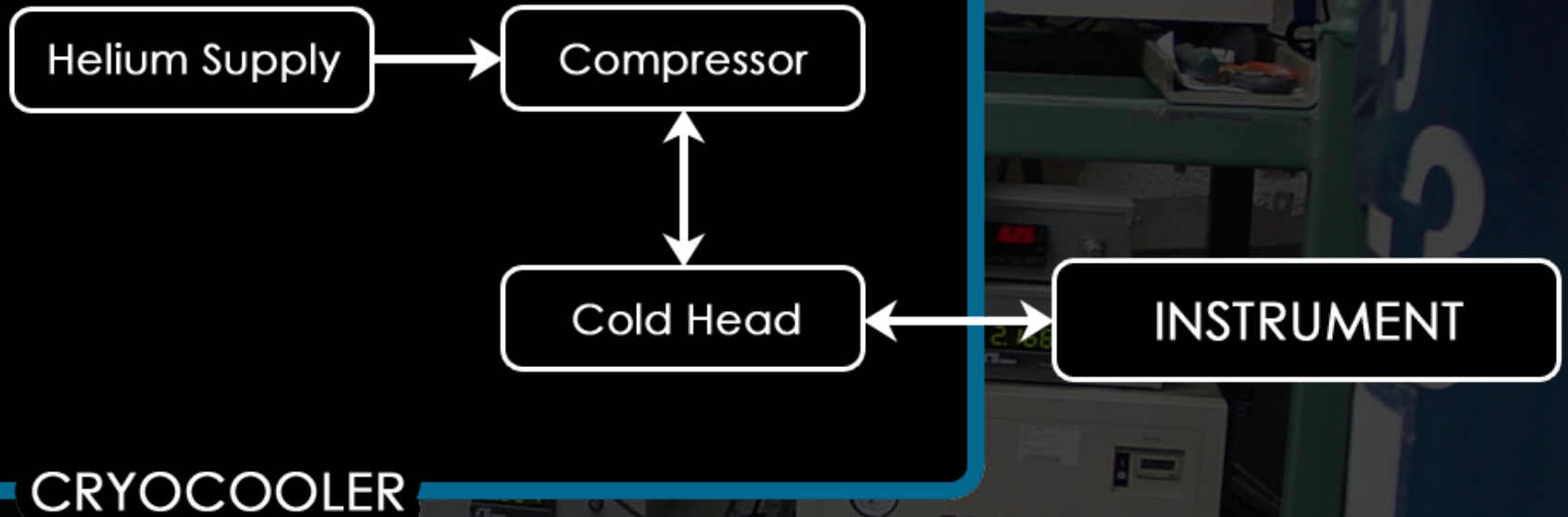


- Used as a cryogen
- Liquid helium is colder than liquid nitrogen (4 Kelvin vs. ~77 Kelvin)

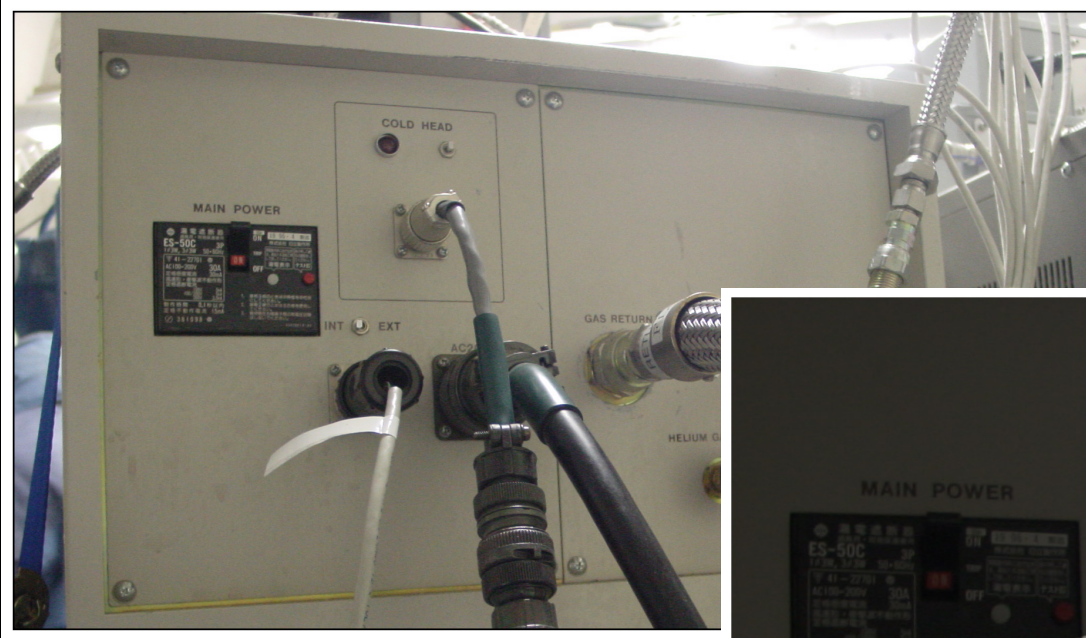
- Part of Cryocooler system
- Keep instrumentation cool
- Reduce thermal/electrical noise in infrared applications



CRYOCOOLER OPERATION



REMOTE CONTROL SIGNALS



- INT Mode - manual
- EXT Mode - remote

SIX REMOTE SIGNALS

- Four output signals
- Two input signals



EXTERNAL MODE

OUTPUT SIGNALS

- Pressure Fault
- Temperature Fault
- Drive Indication
- Control Voltage

INPUT SIGNALS

- Remote Drive (power on/off)
- Remote Reset (for resetting faults)

HELIUM COMPRESSOR CONTROL BOX (HCCB)



- Designed and built by K. Omata in 2003
- Two identical boxes, 8 compressors each
- Remote power on/off capability
- Monitors temperature and pressure faults
- NO REMOTE RESET

SUBARU INTERNAL NETWORK

HELIUM COMPRESSOR
CONTROL BOX

Helium Supply

Compressor

Cold Head

CRYOCOOLER

INSTRUMENT

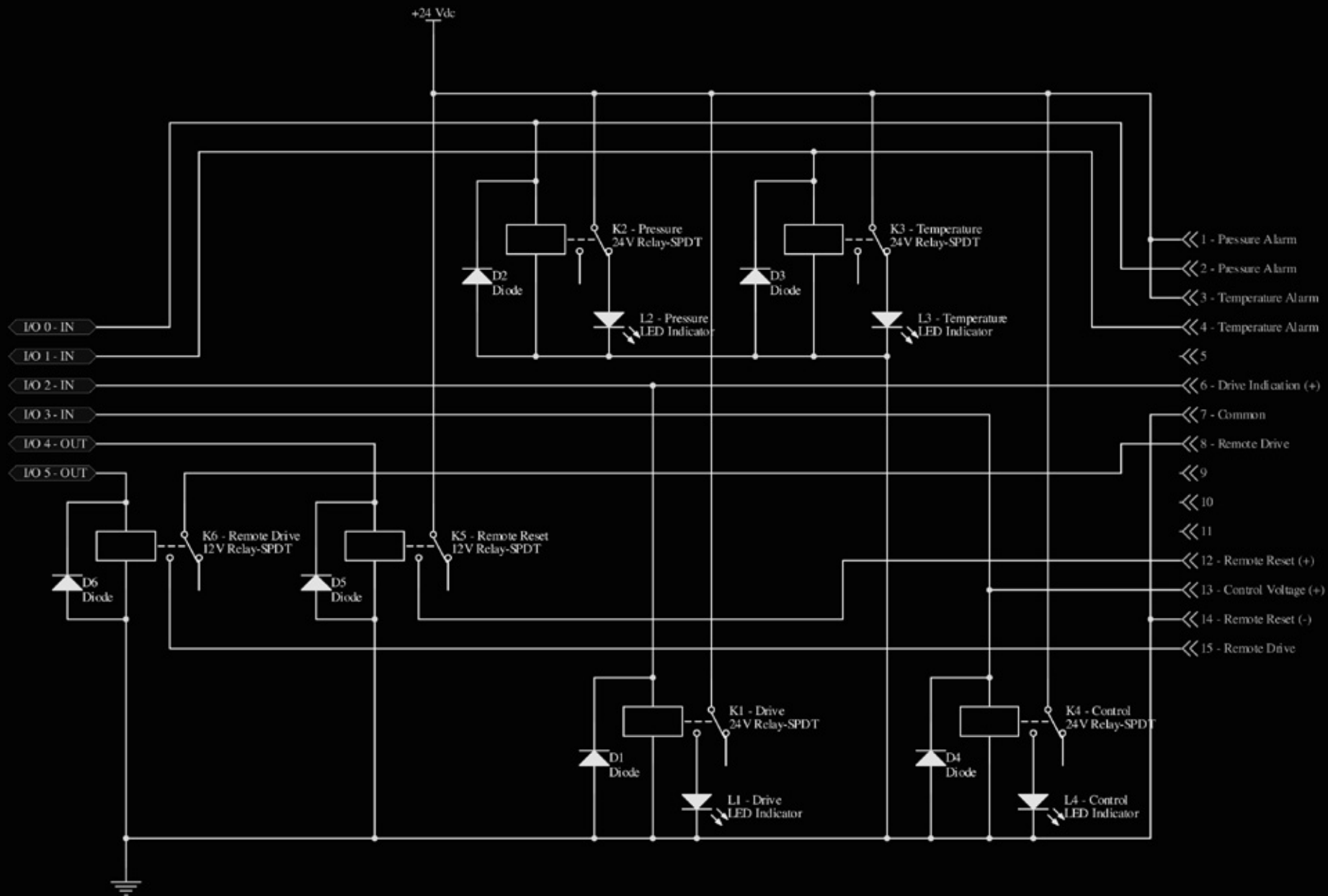
REQUIREMENTS

- Capacity (16 compressors)
- Communication (compressor and network)
- Access to all remote functions
- Smooth transitioning
- Upgradeability
- Expansion

CONSIDERATIONS

- Modify HCCB
- Pre-built data acquisition unit
- Custom build a new remote system

Remote
Helium
Compressor
Controller

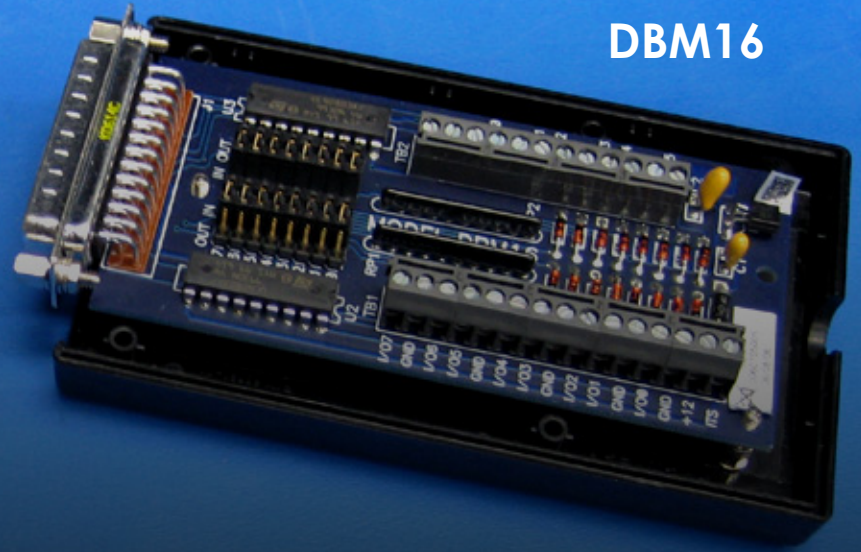


THE HEART OF RHCC

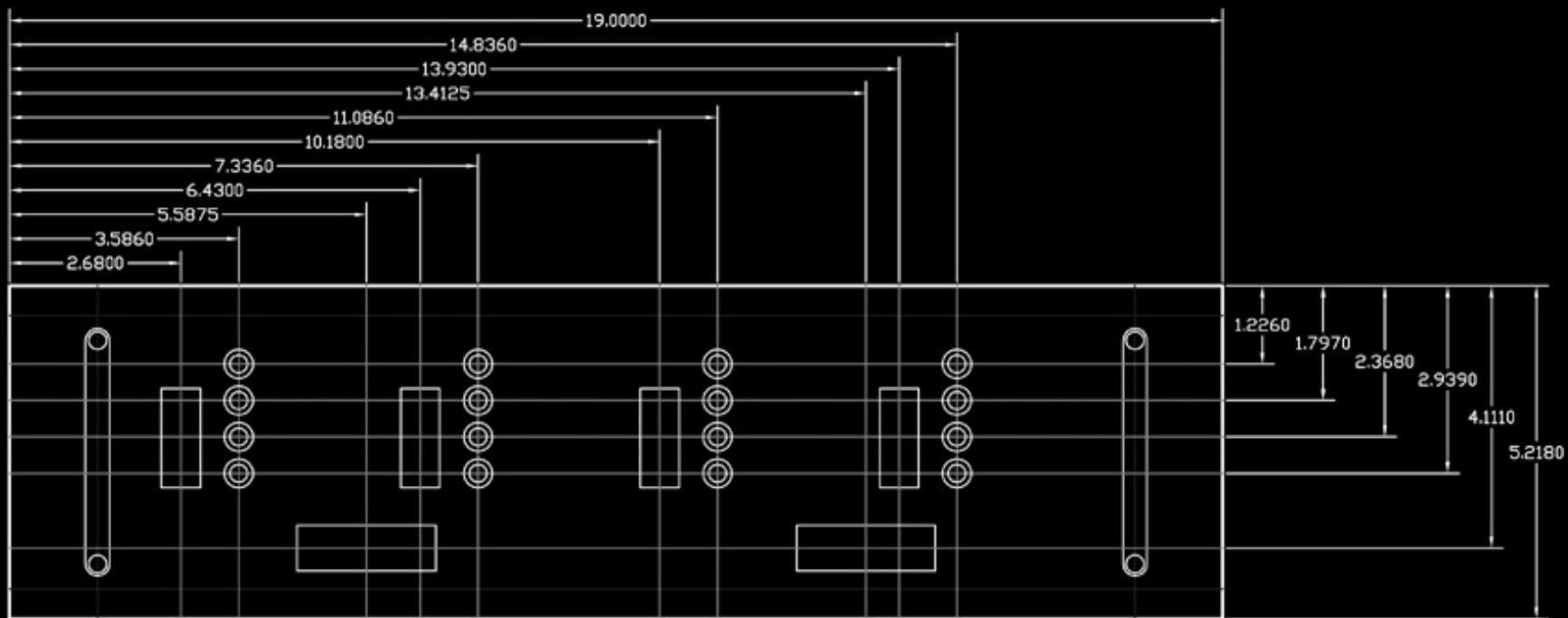
232SDD16



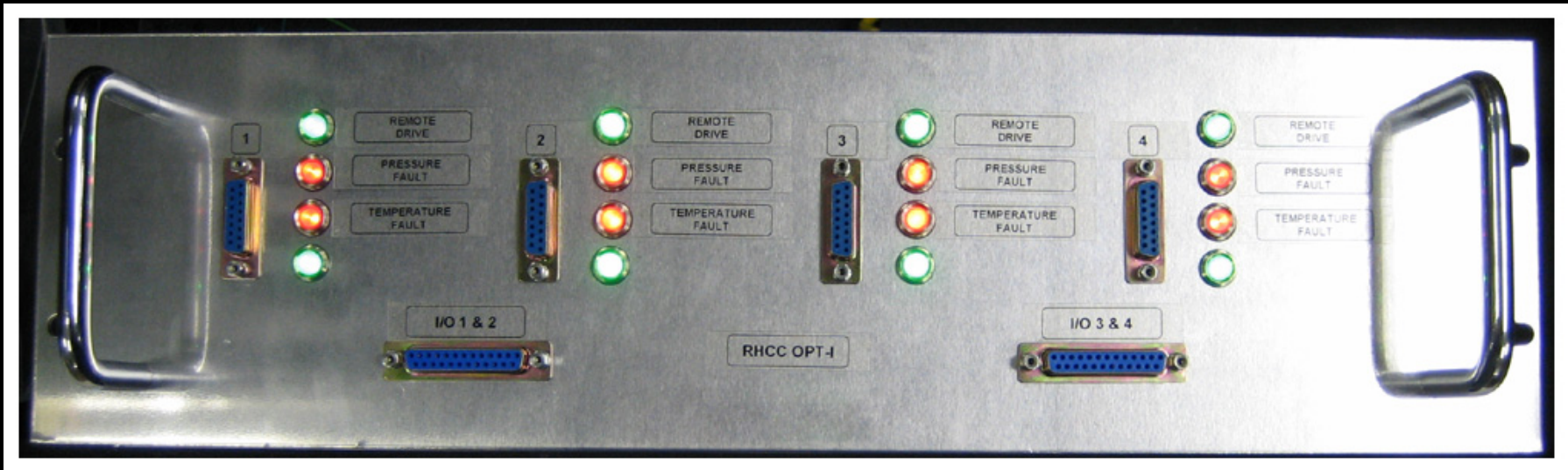
DBM16



- Converts analog signal (voltage) to digital (RS232 protocol)
- Digital buffer allows higher voltage input
- Used in HCCB system



REMOTE HELIUM COMPRESSOR CONTROLLER (RHCC)



- Four controllers, 4 compressors each
- Remote power on/off
- Temperature and pressure fault monitoring
- Communication to server and network
- Remote reset capability

WORK TO BE COMPLETED

- Fabrication of first controller
- Prototype testing
- HCCB software modification
- Fabrication of remaining controllers
- Installation of all four controllers at summit
- Final testing and documentation

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