

BROOKHAVEN NATIONAL LABORATORY PHYSICS DEPARTMENT	Number: 1.0.1	Revision: 1
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Subject: Accelerator Test Facility – Linear Accelerator General Systems Guide		
Prepared by: Michael Zarcone	Reviewed by: ES&H Committee	Approved by: Department Chair

ACCELERATOR TEST FACILITY LINEAR ACCELERATOR GENERAL SYSTEMS GUIDE

The following is a guide to all of the equipment necessary to operate the linear accelerator with and without the Nd:YAG laser system.

1. Water Systems

Recirculating water systems are used at ATF to provide temperature control of RF and Magnet system components. Temperature control for all systems is achieved by either a self-contained portable after-market chiller/heater unit or by a prototype unit with a process controller of some form (after market or ATF designed).

Gun.....NESLAB Unit (60.5°C)
Front End Solenoid.....BAY VOLTEX Unit (25.1°C)
Linac.....Prototype Unit with Omega controller
(44.60±0.05°C)
Klystron#1, #2, and Waveguide#1.....Prototype Unit with Yokogawa Controller
(44.60±0.05°C)
Waveguide#2.....Prototype with ATF designed controller (38°C)

1.1. The RF water system

These recirculating water systems which feed the accelerating sections, the klystrons and the waveguides are of very low pressure and flow rate and each is heated by a servo controlled heating element. The heat is rejected through ambient convection. The temperature setpoint is set manually via the process controllers. These systems require about 2 to 3 hours to reach equilibrium if starting from ambient temperature. The restart process, at a minimum, requires resetting flow switch interlocks on the pump station followed by turning on power to the pumps, as in the case of the Linac, or it may also require a complete restart of the modulators (described in Section 2.1) as in the case of the Klystron water system. These systems are located in the highbay, either in or near the klystron hutch or gun areas.

1.2. The magnet water systems

There are two closed loop re-circulating systems. A simple power on switch controls each unit. These systems are located in the highbay, next to the plug door.

Magnet Power Supplies (Darlington, Bruker).....REMCOR Unit (57°F)

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Magnets and CO2 Area.....NESLAB Unit (16°C)

2. RF System

2.1. The modulators

Two modulators are used at ATF to drive the klystrons, which in turn provide RF power to the electron gun and linac sections. Each modulator has a high voltage (208VAC) safety lockout switch, and two security interlock boxes, one for each security system interlock chain RIA and RIB. For modulator #1 they are situated on Building column C3 to the right of the modulator. For modulator #2 they are situated on Building column C4 to the rear and left of the modulator. On the interlock boxes there are reset buttons and indicator lamps to inform whether all AC power phases are present and the interlock chains RIA and RIB are satisfied. All of this equipment is located within the ATF mezzanine.

Modulator control power is fed from breaker panel ATF-1 located on the mezzanine column C3. Modulator #1 feeds the r.f. gun and the r.f. phase meter.. Filament and control power is fed from ATF-1 circuit breaker #8, 10, and 12. The high voltage power supply for this modulator is fed from ATF-1 circuit breaker #29, 31 & 33.

Modulator #2 feeds the accelerator sections. Filament and control power is fed from ATF-1 circuit breaker #28B. The high voltage power supply for this modulator is fed from ATF-1 circuit breaker #38, 40 & 42.

Once all interlocks are satisfied the high voltage to the modulator can be turned on. On both modulators there are "arc detector" boxes that shut down the modulator high voltage in the event arcing is detected. Whether an arc has been detected or the modulator high voltage has been turned off on purpose, it is necessary to reset the arc detector box by using a reset key (found on the operator's key ring) in order to re-enable high voltage. The key is turned to the "Reset" position (enabling the high voltage contactors in the modulator), the high voltage power supply is turned on (the modulators start pulsing), the operator waits a few seconds (to allow the power supply to reach setpoint), and the key is returned to the "Run" position and removed.

On modulator #1 high voltage is also controlled by a toggle switch on the lower front center of the modulator on rack #203 in addition to the push button located on the front of the high voltage power supply.

The core bias meters which are situated in relay rack #203 for modulator #1 and relay rack 205B for modulator #2 should be set to the numbers designated on their front panels and should not be adjusted. The reservoir voltages should also be set to the numbers designated and should not be adjusted. The filament control knobs control the voltage/current to the klystron filaments. The optimum filament current varies from one klystron to another so the voltage set point must first be determined by rf power output studies. The designated set points are then posted on the front of the filament control panels in relay rack #103 for Modulator #1 and relay rack #205B for Modulator #2. There is an automatic slow turn on for the filament power to each klystron which helps to preserve klystron lifetime. This step

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takes about 5 minutes. To avoid damage to the filament, at no time should the current exceed 3.4 amperes. A time delay unit prevents application of high voltage to the klystron until the filament has been on for about 20 minutes. Attempting to cut this time short can destroy the klystron.