Chapter 3
Installation and Setup Procedures

There are special considerations that need to be taken into account before the 835-3 can be installed. For example, if the installation is completed during cool weather, a heat-related problem may not surface for many months, suddenly appearing during the heat of summer. This section provides planning information for the installation and set up of the transmitter.

3.1 Site Considerations

The 835-3 transmitter requires two main AC input lines, a 3-phase 208/240 VAC, 60 Hz input of at least 100 amp rating that connects to the amplifier cabinet assembly and a single-phase 208/240 VAC, 60 Hz input of at least 40 amp rating that connects to the exciter/driver assembly. Make sure that the proposed site has the necessary voltage requirements.

The 835-3 is designed and built to provide long life with a minimum of maintenance. The environment in which it is placed is important and certain precautions must be taken. The three greatest dangers to the transmitter are heat, dirt, and moisture. Heat is usually the greatest problem, followed by dirt, and then moisture. Over-temperature can cause heat-related problems such as thermal runaway and component failure. Each amplifier tray in the transmitter contains a thermal interlock protection circuit that will shut down that tray until the temperature drops to an acceptable level.

A suitable environment for the transmitter can enhance the overall performance and reliability of the transmitter and maximize revenues by minimizing down time. A properly designed facility will have an adequate supply of cool, clean air, free of airborne particulates of any kind, and no excessive humidity. An ideal environment will require temperature in the range of 40° F to 70° F throughout the year, reasonably low humidity, and a dust-free room. It should be noted that this is rarely if ever attainable in the real world. However, the closer the environment is to this design, the greater the operating capacity of the transmitter.

The fans and blowers designed and built into the transmitter will remove the heat from within the trays, but additional means are required for removing this heat from the building. To achieve this, a few considerations should be taken into account. The first step is to determine the amount of heat to be removed. There are generally three sources of heat that must be considered. The first and most obvious is the heat from the transmitter itself. This can be determined by subtracting the average power to the antenna (2100 watts) from the AC input power (10,000 watts). This number in watts (15,900) is then multiplied by 3.41, which gives 54,200, the BTUs to be removed every hour. 12,000 BTUs per hour equals one ton, so a 5-ton air conditioner will cool a 3-kW transmitter that is vented into the room. If the air exhaust will be vented externally, a 1-ton air conditioner will be needed to properly cool the transmitter.

The second source of heat is other equipment in the same room. This number is calculated in the same way as the equation for BTUs. The third source of heat is equally obvious but not as simple to calculate. This is the heat coming through the walls, roof, and windows on a hot summer day. Unless the underside is exposed, the floor is usually not a problem. Determining this number is usually best left up to a qualified HVAC technician. There are far too many variables to even estimate this number without detailed drawings of the site showing all construction details. The sum of these three

sources is the total amount of heat that must be removed. There may be other sources of heat, such as personnel, and all should be taken into account.

Now that the amount of heat that must be removed is known, the next step is to determine how to accomplish this. The options are air conditioning, ventilation, or a combination of the two. Air conditioning is always the preferred method and is the only way to create anything close to an ideal environment.

Ventilation will work if the ambient air temperature is below 100° F, or about 38° C, and the humidity is be kept at a reasonable level. In addition, the air stream must be adequately filtered to ensure that no airborne particulates of any kind will be carried into the transmitter. The combination of air conditioning for summer and ventilation during the cooler months is acceptable when the proper cooling cannot be obtained through the use of ventilation alone and using air conditioning throughout the year is not feasible.

Caution: The operation of air conditioning and ventilation simultaneously is not recommended. This can cause condensation in transmitters. For tube type transmitters, this can be especially serious if the condensation forms in the tube cavity and creates damaging arcs.

The following precautions should be observed when using air conditioning systems:

1. Air conditioners have an ARI nominal cooling capacity rating. In selecting an air conditioner, do not assume that this number can be equated to the requirements of the site. Make certain that the contractor uses the actual conditions that are to be maintained at the site in determining the size of the air conditioning unit. With the desired conditioned room temperature under 80° F, the unit must be derated, possibly by a substantial amount.

2. Do not have the air conditioner blowing directly onto the transmitter. Condensation may occur on, or worse in, the transmitter under certain conditions.

3. Do not isolate the front of the transmitter from the back with the thought of air conditioning only the front of the unit. Cooling air is drawn in at the front of all transmitters and in the front and back of others. Any attempt to isolate the front from the rear will adversely affect the cooling air flow.

4. Interlocking the transmitter with the air conditioner is recommended to keep the transmitter from operating without the necessary cooling.

5. The periodic cleaning of all filters is a must.

When using ventilation alone, the following general statements apply:

1. The blower and its filters should be on the inlet. This will pressurize the room and prevent dirt from entering the transmitter.

2. The inlet and outlet vents should be on the same side of the building, preferably the leeward side. As a result, the pressure differential created by wind will be minimized. Only the outlet vent should be released through the roof.

3. The inlet and outlet vents should be screened with 1/8" hardware cloth (preferred) or galvanized hardware cloth (acceptable).

4. Cooling air should enter the room as low as practical but in no case higher than four feet above the floor. The inlet must be located where dirt, leaves, snow, etc., will not be carried in with the cooling air.

5. The exhaust should be located as high as possible. Some ducting is usually required to insure the complete flushing of heated air with no stagnant areas.

6. The filter area must be adequate to insure a maximum air velocity of 300 feet per minute through the filter. This is not a conservative number but a never-exceed number. In a dusty or remote location, this number should be reduced to 150 CFM.

7. The inlet and outlet(s) must have automatic dampers that close any time the ventilation blower is off.

8. In those cases in which transmitters are regularly off for a portion of each day, a temperature-differential sensor that controls a small heater must be installed. This sensor will monitor inside and outside temperatures simultaneously. If the inside temperature falls to within 5° F of the outside temperature, the heater will come on. This will prevent condensation when the ventilation blower comes on and should be used even in the summer.

9. A controlled-air bypass system must be installed to prevent the temperature in the room from falling below 40° F when the transmitter is operating.

10. The blower should have two speeds, which are thermostatically controlled, and interlocked with the transmitter.

11. The blower on high speed must be capable of moving the required volume of air into a half inch of water pressure at the required elevation. The free air delivery method must not be used.

12. Regular maintenance of the filters, if used, can not be overemphasized.

13. Tube transmitters should not rely on the internal blower to exhaust cooling air at elevations above 4000 feet. For external venting, the air vent on the cabinet top must be increased to an 8" diameter for a 1 kW transmitter and to 15" for a 10-kW transmitter. An equivalent rectangular duct may be used but, in all cases, the outlet must be increased in area by 50% through the outlet screen.

14. It is recommended that a site plan be submitted to ADC for comments before installation commences.

To calculate the blower requirements, filter size, and exhaust size if the total load is known in watts, 2000 CFM into 1/2" of water will be required for each 5000 watts. If the load is known in BTUs, 2000 CFM into 1/2" of water will be required for each 17,000 BTUs. The inlet filter must be a minimum of seven square feet, larger for dusty and remote locations, for each 5000 watts or 17,000 BTUs. The outlet for the exhaust must be at least four square feet at the exhaust screen for each 5000 watts or 17,000 BTUs.

The information presented in this section is intended to serve only as a general guide

and may need to be modified for unusually severe conditions. A combination of air conditioning and ventilation should not be difficult to design. System interlocking and thermostat settings should be reviewed with ADC. As with any equipment installation, it is always good practice to consult the manufacturer when questions arise. ADC can be contacted at (724) 941-1500.

3.2 Unpacking the Cabinets and Trays

Note: Air conditioning and any related heat-exhaust ducts should be in place before continuing with the installation of the transmitter.

Thoroughly inspect the cabinets and all other materials upon their arrival. ADC certifies that upon leaving our facility the equipment was undamaged and in proper working order. The shipping containers should be inspected for obvious damage that indicates rough handling. Check for dents and scratches or broken switches, meters, or connectors. Any claims against in-transit damage should be directed to the carrier. Inform ADC as to the extent of any damage as soon as possible.

Remove the two cabinets, bandpass filter, trap filter, directional coupler, and installation material that make up the 835-3 from the crates and boxes. Remove the straps that hold the cabinets to the shipping skid and slide the cabinets from the skid. Remove the plastic wrap and foam protection from around the cabinets. Do not remove any labeling or tags from any cables or connectors; these are identification markers that make assembly of the transmitter much easier.

Refer to the racking plan drawing (1595-7251) for the proper position of the cabinets. Position the exciter assembly with the 1-kW transmitter cabinet to the left of the 3-kW amplifier cabinet. The air intake to the transmitter is intended for room air only. The cabinets should be positioned with consideration given for adequate air intake and exhaust; the opening of the rear doors; access to the trays, including sliding them out for testing; the main AC hook-up; and the installation of the output transmission line. After positioning, the cabinets should be permanently mounted to the floor of the site through the holes in the bottom of the cabinets. The cabinets also should be grounded using copper strapping material.

The trays are mounted in the cabinet using Chassis Trak cabinet slides. The tray slides are on the top and bottom of the 600-watt amplifier trays and on the sides of the UHF exciter trays. Inspect the trays for any loose hardware or connectors, tightening where needed. Open the rear door; if a lock is present, the key to unlock the door is found in a tan envelope taped to the door. Inspect the interior of the cabinet for packing material and carefully remove any packing material that is found.

3.3 Installing the Cabinets and Trays

The AC distribution panel from the 2-kW transmitter mounts into the left cabinet (see drawing 1595-7251). Position the exciter for the 1-kW transmitter to the right of the AC distribution panel even with the top. The two 600-watt amplifier trays for the 1-kW transmitter mount at the bottom of the cabinet. The UHF exciter for the 3-kW transmitter mounts at the top of the cabinet.

Refer to the interconnect drawing (1176-8528) for point-to-point connections while doing the following procedure. Slide the six 600-watt amplifier trays into the amplifier cabinet on the right. Slowly slide each tray in and out to verify that they do not rub against each other and have no restriction to free movement. In the installation material that has been provided with the transmitter, locate six equal length RG-55

coaxial cables with BNC connectors on both ends. Connect these cables from the (A9-A1) splitter to RF input jack J1 on each 600-watt amplifier tray. Also in the installation material, should be six equal lengths of ½-inch superflex cable with N connectors on each end. Connect the cables from the output of each amplifier tray at J2 to the 6-way combiner. Connect the D connector jacks to J3 and J4 on the rear of each 600-watt amplifier tray.

Caution: After installation, each 600-watt UHF amplifier tray will have a hardline coaxial cable connected to the rear panel. The tray will not slide out unless this connection is first removed.

To pull out the tray for testing, use the extender coaxial cable included in the installation material kit to connect the tray to the output cable.

Adjustments to the position of the trays may be necessary and are accomplished by loosening the cabinet slide mounting bolts that hold the front of the slide to the mounting frame of the cabinet. Move the trays up or down, as needed, to correct for any rubbing.

3.4 Main AC Input Connection

Once the cabinets and the trays are in place, the main AC hookup is ready to be made.

Caution: Before connecting the 230 VAC, make certain that all of the circuit breakers associated with the transmitter are switched off. There are two AC input circuits to the 3-kW transmitter: one 40 amp to the exciter and one 100 amp to the amplifier cabinet.

The 40-amp, 230-VAC input connections to the exciter cabinet are made to terminal block TB1 in the AC distribution panel: connect line 1 to TB1-1A, line 2 to TB1-2A, and ground to TB1-3A. Connect an AC power plug to an unused jack on the AC distribution panel and connect the other end to J14 on the rear of the exciter tray. The AC to the UHF exciter tray can be switched off and on using the circuit breaker that is part of the power entry module on the rear of the tray.

Connect the 100-amp, 230-VAC input to terminal block A10-TB1. This terminal block is part of the AC distribution assembly, 3-kW amplifier assembly (1245-1300), located near the center, right-hand side, rear portion of the cabinet. Connect line 1 to TB1-1, ground to TB1-2, and line 2 to TB1-3. Connect the AC power plugs to an unused jacks on the AC distribution panel and connect the other end to J4 on the rear of each 600-watt amplifier tray. The AC to each tray can be switched off and on using the circuit breakers on the AC distribution panel.

The output of the amplifier assembly connects through (A5) a 1-5/8-inch to 3-1/8-inch adapter to (A9) a bandpass filter and (A10) an output trap filter assembly. The filtered output connects through (A11) the output coupler assembly (1020-1002) to the transmission line that is connected to the antenna system.

This completes the unpacking and installation of the 835-3 3-kW UHF transmitter. Refer to the operation and setup procedures in the following section before applying power to the transmitter.

3.5 Operation and Setup Procedures

Initially, the transmitter should be turned on with the RF output at J2 of (A11) the output coupler assembly terminated into a dummy load of at least 3000 watts. If a load is not available, check that the output of the coupler assembly is connected to the antenna.

Connect the baseband, balanced audio input to XLR jack J5 or the composite audio, stereo, input to BNC jack J3 on the rear of the top UHF exciter tray for the 3-kW transmitter. Connect the baseband video input to BNC jack J1 also on the rear of the UHF exciter assembly.
Switch on the main AC and UHF exciter circuit breakers on the AC distribution panel in the exciter cabinet. Switch on the main AC and all of the amplifier circuit breakers on the AC distribution panel in the amplifier array cabinet. Also switch on the circuit breaker on the rear of the UHF exciter tray for the 3-kW transmitter. Move the Operate/Standby switch on the front panel of the UHF exciter to Standby and move the Auto/Manual switch to Manual. Normal operation of the transmitter is with the Auto/Manual switch in Automatic. Automatic operation of the transmitter uses the video input to the UHF exciter as an Operate/Standby switch. In Auto, if the input video is lost, the transmitter will automatically revert to Standby and, when the video signal is restored, the transmitter will automatically return to Operate.

Move the Operate/Standby switch on the UHF exciter tray to Operate. Note the power supply reading, +28 VDC, on the front panel of each of the 600-watt amplifier trays.

Note: If the transmitter does not switch to Operate when the Operate/Standby switch is moved to Operate, check that the external interlock plug, with a jumper from pins 23 to 24, is connected to jack J11 on the rear of the UHF exciter tray.

Observe the % Output Power reading of the meter on the UHF exciter tray; it should read 100%. If needed, adjust the power adjust screwdriver adjust pot on the front panel of the UHF exciter. As the power level is being observed, check the meter reading in the % Reflected Power position. If the % Reflected Power is very high, above 40%, there may be a problem with the output coaxial lines that needs to be checked and corrected. A center bullet missing from the 7/8-inch or 3 1/8-inch rigid coax lines or loose bolts on the connections can cause this problem. Return the Operate/Standby switch to Standby.

The gain and phase controls on the front panels of the individual 600-watt UHF amplifier trays need to be adjusted to attain 100% output of the transmitter. The readings on the individual trays may not all be the same. To set up the phasing and power adjustment procedure for the 600-watt amplifier trays, refer to Section 4, Detailed Alignment Procedures, of this manual.

If a dummy load is connected to the transmitter, switch the transmitter to Standby and switch off the AC circuit breaker on the rear of the UHF exciter tray. Also switch off the main AC circuit breaker for the amplifier array cabinet. Remove the dummy load and make all of the connections required to hook up the transmitter to the antenna. Switch on the UHF exciter and the amplifier array main AC circuit breaker. Move the Operate/Standby switch to Operate. Adjust the output power screwdriver pot to attain 100% output.

If the transmitter is already connected to the antenna, check that the output is 100%. If needed, adjust the power screwdriver pot.

This completes the transmitter setup and operation procedure for the 835-3 3-kW UHF transmitter. The transmitter can now be operated normally.