TV – Repack Implementation Planning

April 23, 2017

GatesAir Connect @ NAB Show 2017

Featuring GatesAir's

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TV - Repack Implementation Planning

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Topics

- Planning for Repack
- Importance of site surveys - what to look for
- Identifying items affected by Spectrum Repack in your RF plant
- Staying on the air during the transition
- Summary of site survey and findings at KBJR-KDLH, Duluth, MN

Planning for Repack

- Be prepared – save time later!
- Site surveys done now can reveal potential issues and prevent delays later, when time is critical
- A repack transition plan will prove valuable!
- It’s not too late to start now

The Transmitter Site

- Identifying the items that must be replaced – often a big headache
- Most sites already have been retrofitted from analog to digital and may not be in the best shape now
- Buildings vary a lot
- Transmitter, RF systems and other items also vary considerably

The Transmitter Site

Site surveys will help to provide an understanding of the situation today and help to provide a solution for repack

A thorough look at the tx building is ***critical***. Factors to examine include the access roads, moving equipment in and out. Note the challenges, available space, where do we secure equipment like transmission line?

Items to check

- ✓ Location
- ✓ Site Access
- ✓ Roads
- ✓ Environment
- ✓ Weather
- ✓ Site Condition
- ✓ Community
- ✓ Restaurants
- ✓ Lodging

Tall Building Transmitter Sites

Some sites may be quite challenging:

- Tall buildings
- Remote locations
- Mountain tops
- Presenting numerous challenges. such as:
  - Accessibility
  - Cooling system
  - Local/City codes……

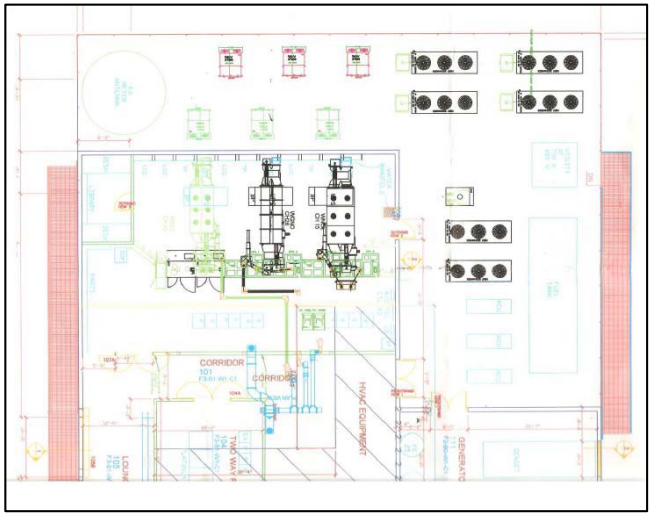
Site Hazards

- Other challenges and hazards at the site should be duly noted in the site survey…

Does this thing bite?

Building & Site Inspection

Building:



- Space availability
- Does the old equipment need to be removed first?

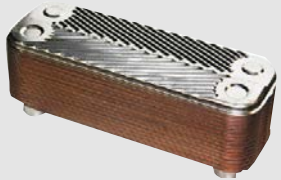
Drawings, or sketches, of the existing site should be made to indicate where things are currently located.

Often, issues not shown on a drawing or sketch are found. Example: an area that builds up excess heat during the summer months due to trapped air or poor air flow.

- Building materials
- Can the wall /ceilings support the new equipment?
- How is the existing equipment mounted?

HVAC System

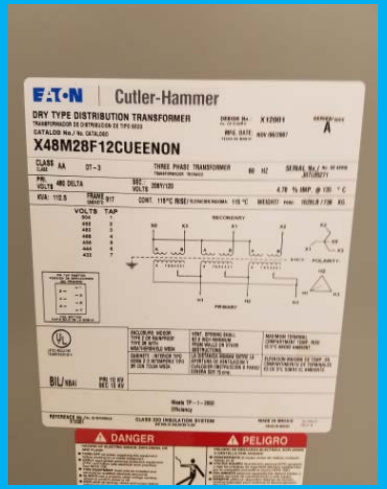
- Changes in transmitter size, design, power & efficiency will effect the HVAC system requirements
- Review existing HVAC system – find out if it is sized to handle the new equipment
- Old, inefficient HVAC systems generally should be replaced
- Waste heat can also be used heat the building in the Winter season, reducing heating costs considerably



“Brazed Plate” Heat Exchanger

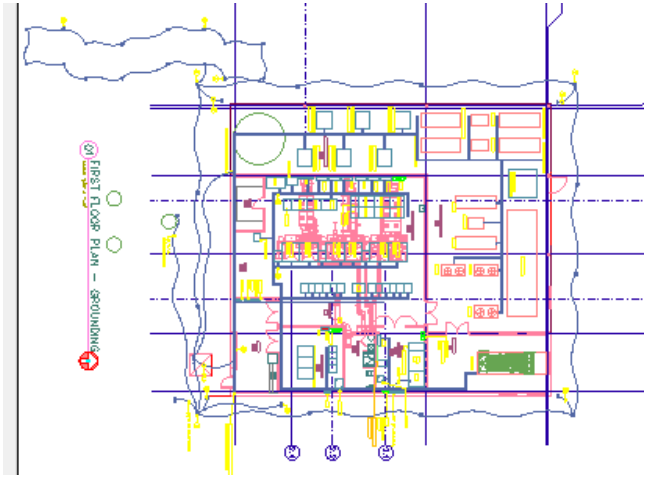
An inexpensive way to utilize transmitter waste heat to warm the building

Electrical Plant



- Inspection of the existing electrical service is very important
- Is the service to the building sufficient for the current, plus the new equipment? What might change from a electrical demand?
- The size and capacity of any existing UPS, AVR or Generator needs to be evaluated carefully
- Existing service may be 480V
- Newer transmitter systems often operate at 208-240V or 380-415V, do you need a transformer?

Grounding Inspection



- Grounding is key for safety and equipment protection
- This includes the electrical safety ground and also the station ground system for the tower, transmitter, transmission line, etc.

Existing RF System

- RF system – Floor, or ceiling mounted?
- Is the current system re-tunable to the new channel, or is it channel-specific?

- Are you co-located and channel combined?
- How is a channel change going to effect the other stations?
- Will the other stations affect your system?

Transmission Line / Tower

	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
20																			
19 ¾ FT.																			
19 ½ FT.																			

	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51
20																			
19 ¾ FT.																			
19 ½ FT.																			

Prohibited Channel per Catalog

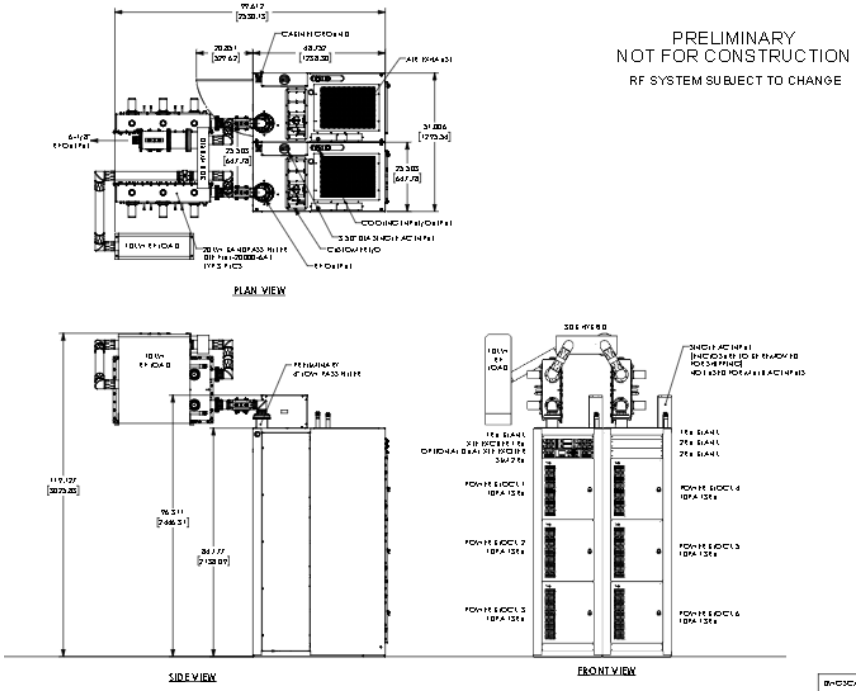
Prohibited line lengths per channel (1.5MHz guard band)

Courtesy: Dielectric

- Will the new channel(s) will work with your existing transmission line?
- Will a standby antenna be required during the transition and test phase
- What about the tower? - Structural analysis ANSI/TIA-222-G may apply in your state

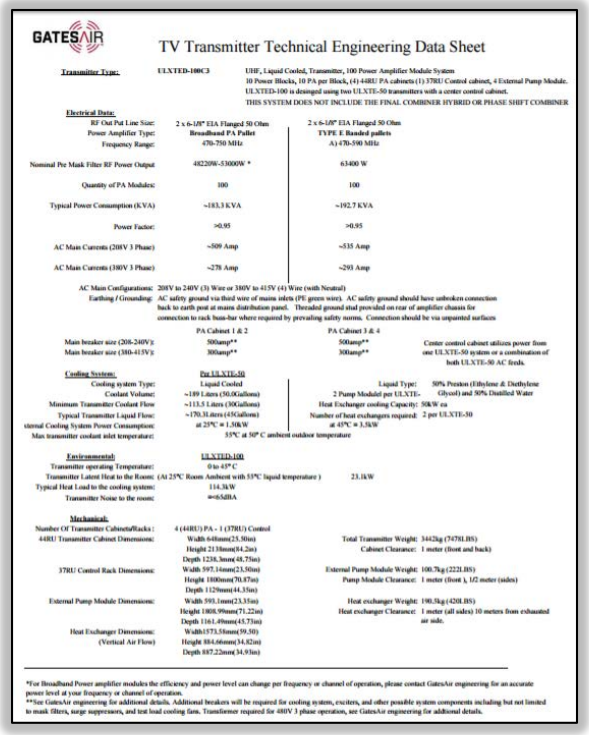
Create a Plan

- New channel assignments are known
- But questions will be asked:
  - Do I need V-Pol in the future – how much?
  - Will I need a rental/loaner transmitter?
  - What are the new electrical demands?
  - What is the size of the new transmitter?
  - Liquid or air-cooled transmitter?
  - What equipment can be re-used?
  - Full turn-key, or project management needed?



Technical Engineering Data Sheets

(A.K.A. TED Sheets)



GATESAIR

TV Transmitter Technical Engineering Data Sheet

Transmitter Type:	ULXTED-100C3	UHF, Liquid Cooled, Transmitter, 100 Power Amplifier Module System 10 Power Blocks, 10 PA per Block, (4) 44RU PA cabinets (1) 37RU Control cabinet, 4 External Pump Module. ULXTED-100 is designed using two ULXTE-50 transmitters with a center control cabinet. THIS SYSTEM DOES NOT INCLUDE THE FINAL COMBINER HYBRID OR PHASE SHIFT COMBINER
Electrical Data:		
RF Out Put Line Size:	2 x 6-1/8" EIA Flanged 50 Ohm	2 x 6-1/8" EIA Flanged 50 Ohm
Power Amplifier Type:	Broadband PA Pallet	TYPE E Banded pallets
Frequency Range:	470-750 MHz	A) 470-590 MHz
Nominal Pre Mask Filter RF Power Output	48220W-53000W *	63400 W
Quantity of PA Modules:	100	100
Typical Power Consumption (KVA)	~183.3 KVA	~192.7 KVA
Power Factor:	>0.95	>0.95
AC Main Currents (208V 3 Phase)	~509 Amp	~535 Amp
AC Main Currents (380V 3 Phase)	~278 Amp	~293 Amp
AC Main Configurations:	208V to 240V (3) Wire or 380V to 415V (4) Wire (with Neutral)	
Earthing / Grounding:	AC safety ground via third wire of mains inlets (PE green wire). AC safety ground should have unbroken connection back to earth post at mains distribution panel. Threaded ground stud provided on rear of amplifier chassis for connection to rack buss-bar where required by prevailing safety norms. Connection should be via unpainted surfaces	
	PA Cabinet 1 & 2	PA Cabinet 3 & 4
Main breaker size (208-240V):	500amp**	500amp**
Main breaker size (380-415V):	300amp**	300amp**
		Center control cabinet utilizes power from one ULXTE-50 system or a combination of both ULXTE-50 AC feeds.
Cooling System:	Per ULXTE-50	
Cooling system Type:	Liquid Cooled	Liquid Type: 50% Preston (Ethylene & Diethylene
Coolant Volume:	~189 Liters (50.0Gallons)	2 Pump Modules per ULXTE- Glycol) and 50% Distilled Water
Minimum Transmitter Coolant Flow	~113.5 Liters (30Gallons)	Heat Exchanger cooling Capacity: 50kW ea
Typical Transmitter Liquid Flow:	~170.3Liters (45Gallons)	Number of heat exchangers required: 2 per ULXTE-50
ternal Cooling System Power Consumption:	at 25°C = 1.5kW	at 45°C = 3.5kW
Max transmitter coolant inlet temperature:	55°C at 30° C ambient outdoor temperature	
Environmental:	ULXTED-100	
Transmitter operating Temperature:	0 to 45° C	
Transmitter Latent Heat to the Room:	(At 25°C Room Ambient with 55°C liquid temperature)	23.1kW
Typical Heat Load to the cooling system:	114.3kW	
Transmitter Noise to the room:	=<65dBA	
Mechanical:		
Number Of Transmitter Cabinets/Racks :	4 (44RU) PA - 1 (37RU) Control	
44RU Transmitter Cabinet Dimensions:	Width 648mm(25.50in) Height 2138mm(84.2in) Depth 1238.3mm(48.75in)	Total Transmitter Weight: 3442kg (7478LBS) Cabinet Clearance: 1 meter (front and back)
37RU Control Rack Dimensions:	Width 597.14mm(23.50in) Height 1800mm(70.87in) Depth 1129mm(44.45in)	External Pump Module Weight: 100.7kg (222LBS) Pump Module Clearance: 1 meter (front), 1/2 meter (sides)
External Pump Module Dimensions:	Width 593.1mm(23.35in) Height 1808.99mm(71.22in) Depth 1161.49mm(45.73in)	Heat exchanger Weight: 190.5kg (420LBS) Heat exchanger Clearance: 1 meter (all sides) 10 meters from exhausted air side.
Heat Exchanger Dimensions: (Vertical Air Flow)	Width573.58mm(59.3lt) Height 884.66mm(34.82in) Depth 887.22mm(34.93in)	

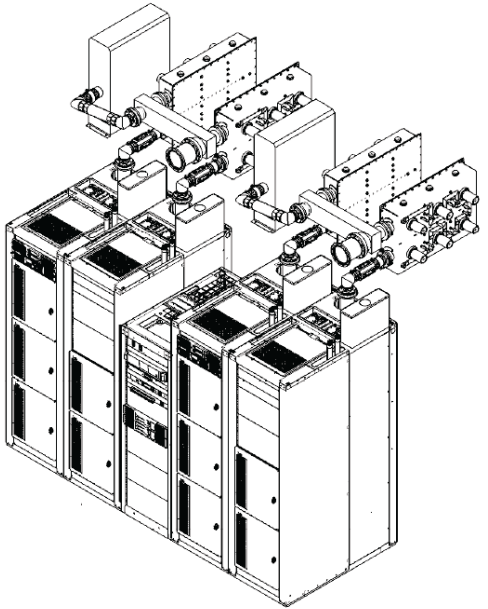
*For Broadband Power amplifier modules the efficiency and power level can change per frequency or channel of operation, please contact GatesAir engineering for an accurate power level at your frequency or channel of operation.
**See GatesAir engineering for additional details. Additional breakers will be required for cooling system, exciters, and other possible system components including but not limited to mask filters, surge suppressors, and test load cooling fans. Transformer required for 480V 3 phase operation, see GatesAir engineering for additional details.

1 Sheet provides handy basic data

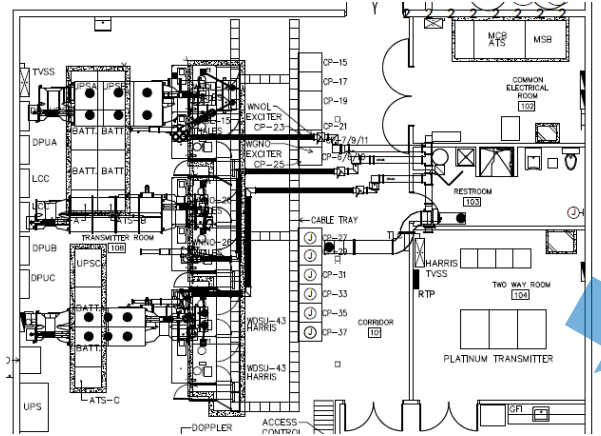
Most manufacturers can provide data sheets and drawings to aid in planning.

Planning items needed:

- Electrical (consumption)
- Heat load (room)
- Heat to the transmitter cooling system
- Recommended Circuit Breaker sizes
- Size, weight and number of racks
- Pump module size/weight
- Heat exchanger size/weight
- Layout drawings



Carefully Plan the Transition

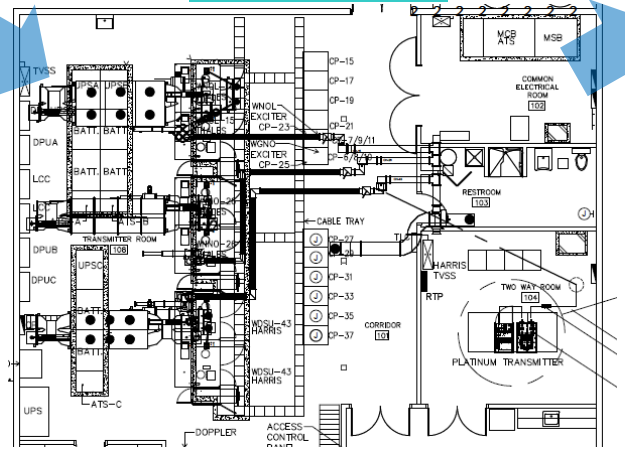


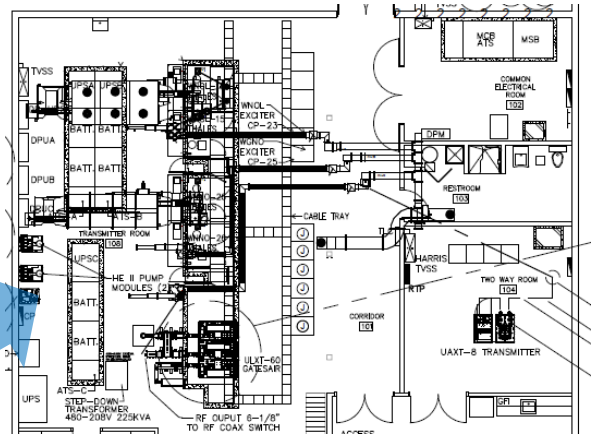
Today

- Current equipment placement

- Transition period
- Back-up transmitter, or temporary system

Transition

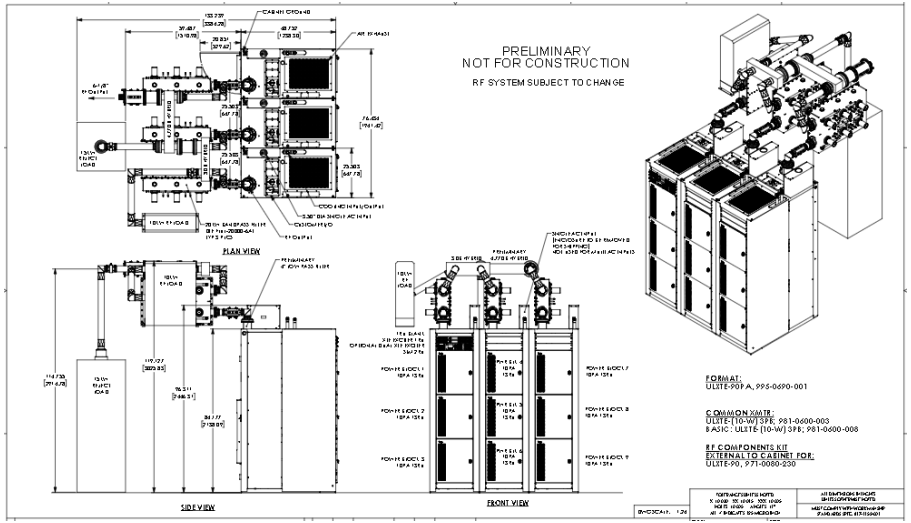




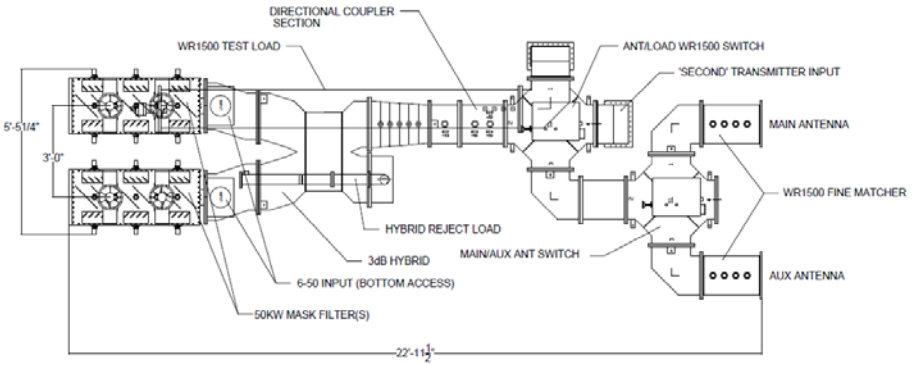
Tomorrow

- The finished project
- Follow-up with as-built, as sometimes plans change

RF System Layout Drawings

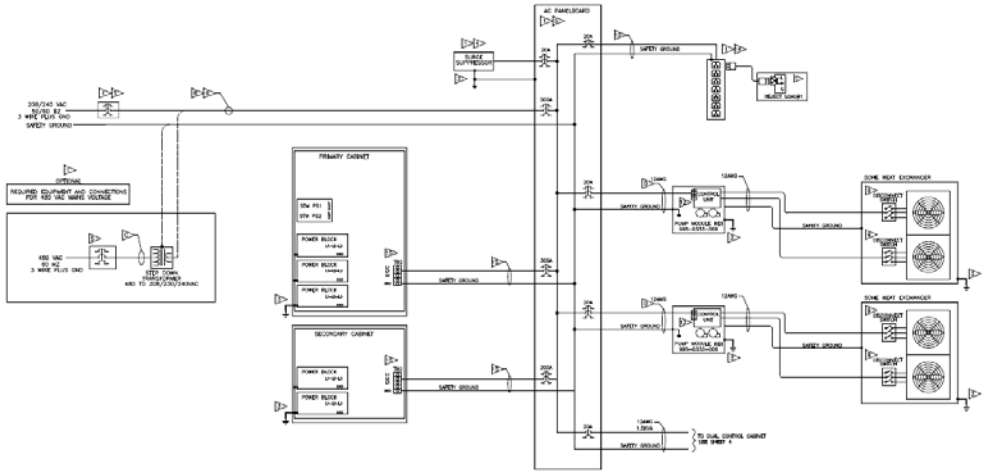


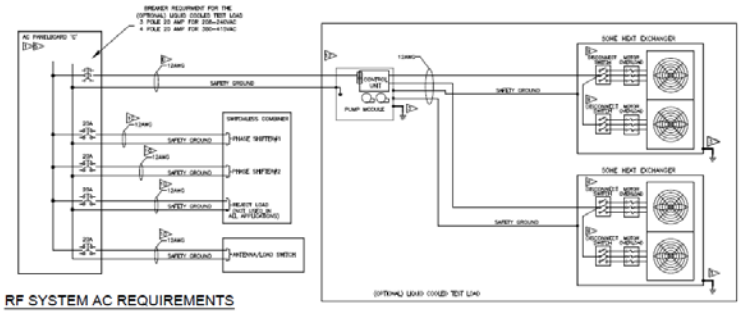
- System layout drawings will be invaluable when placing equipment in room



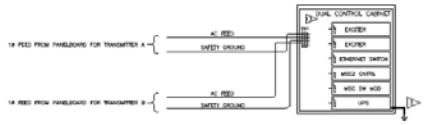
- RF system layouts specific to your equipment allows your team (or contracted installers) to better utilize the space available in your broadcast plant

Electrical / AC Power Drawings





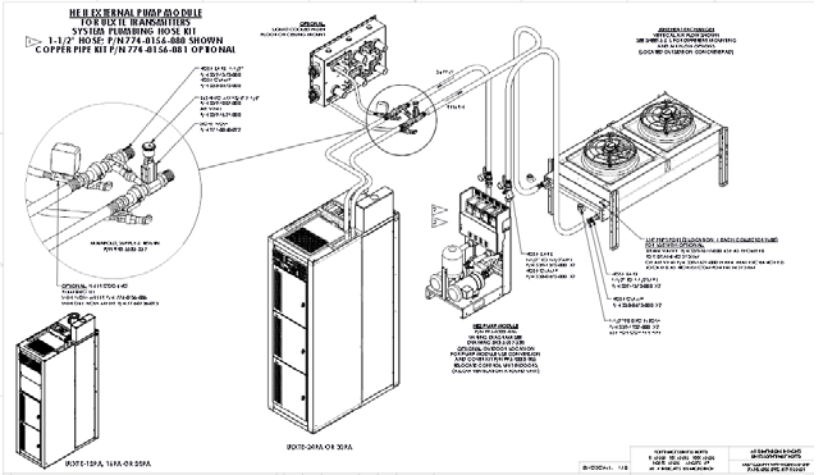
RF SYSTEM AC REQUIREMENTS



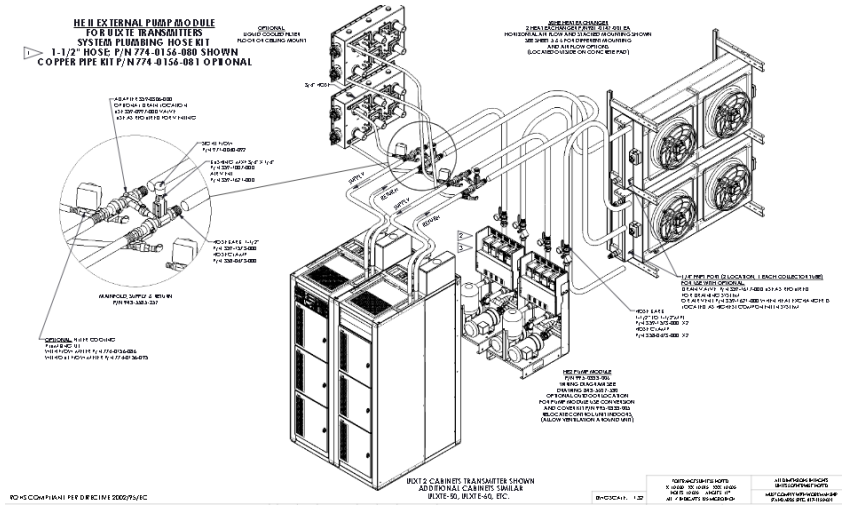
DUAL CONTROL CABINET

- Electrical drawings provide information to local trades on breaker & wire sizes and how the electrical connections are made

Plumbing Drawings



Single Cabinet Plumbing



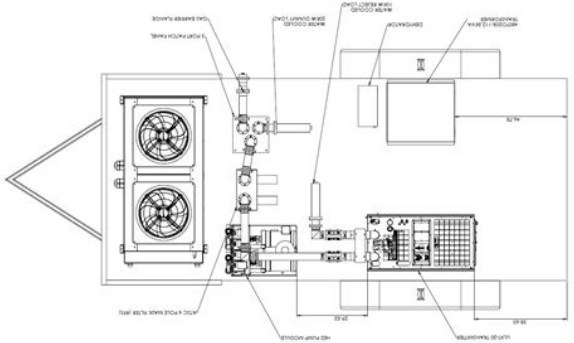
Multiple Cabinet Plumbing

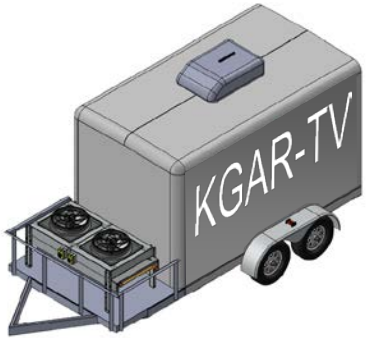
- Depending on location and applicable local/city/state codes, it may be possible for the transmitter supplier to install the plumbing, or use a local plumber.

Rental & Moveable Transmitter Systems

"Can I rent a transmitter to use while my old transmitter and RF system is being removed?"

- Some manufacturers may be able to provide a rental transmitter
- Typical systems 2kW up to 10kW
- Air-cooled is better for short term operation but liquid-cooled is possible
- Trailer tx solution can be moved site to site during repack

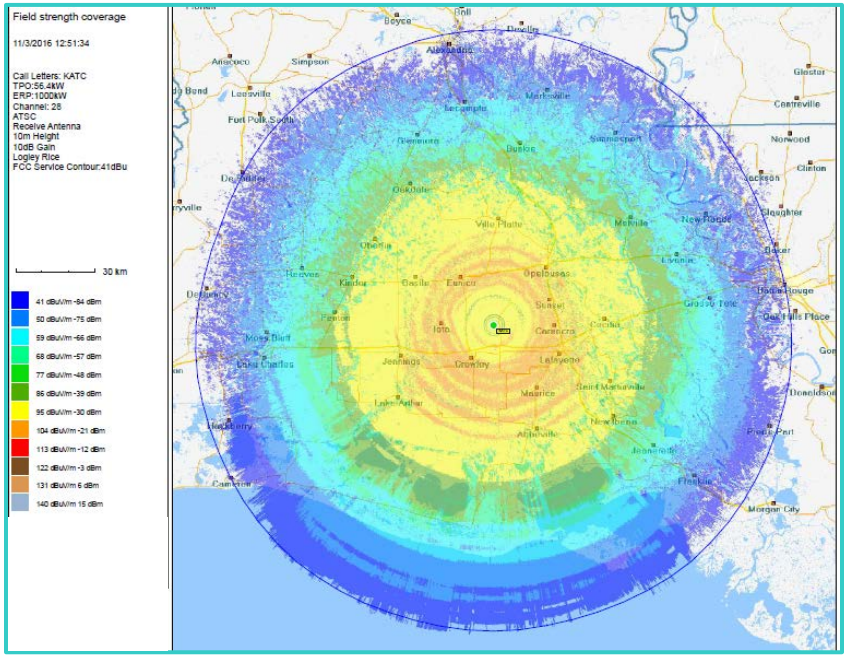




Trailer - Transmitter

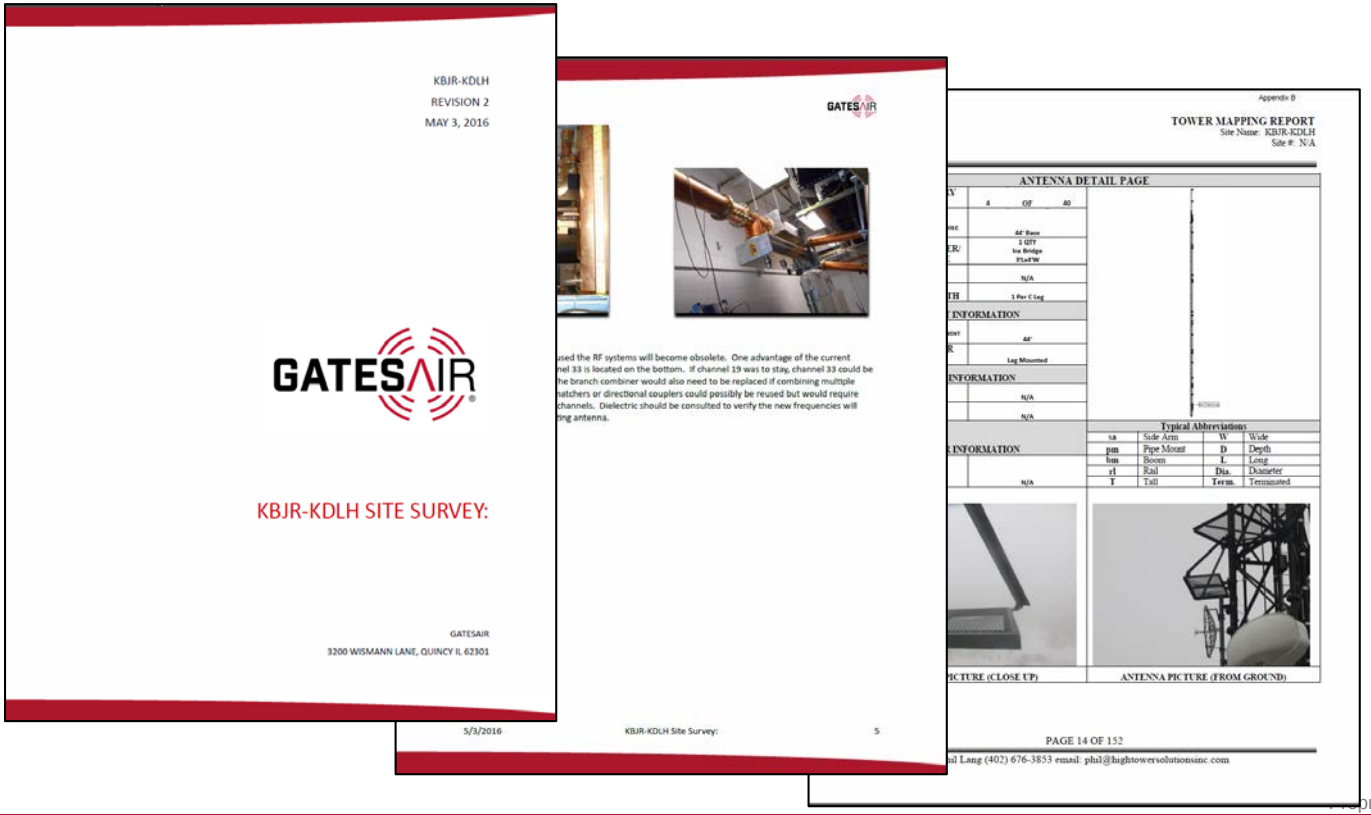
Coverage Analysis

- Changing channel, antenna type and mounting and tower changes could affect your pattern
- An option to consider:
  - Ahead of time, or
  - During testing phase, or
  - After repack for verification



Site Survey at KBJR-KDLH, Duluth, MN

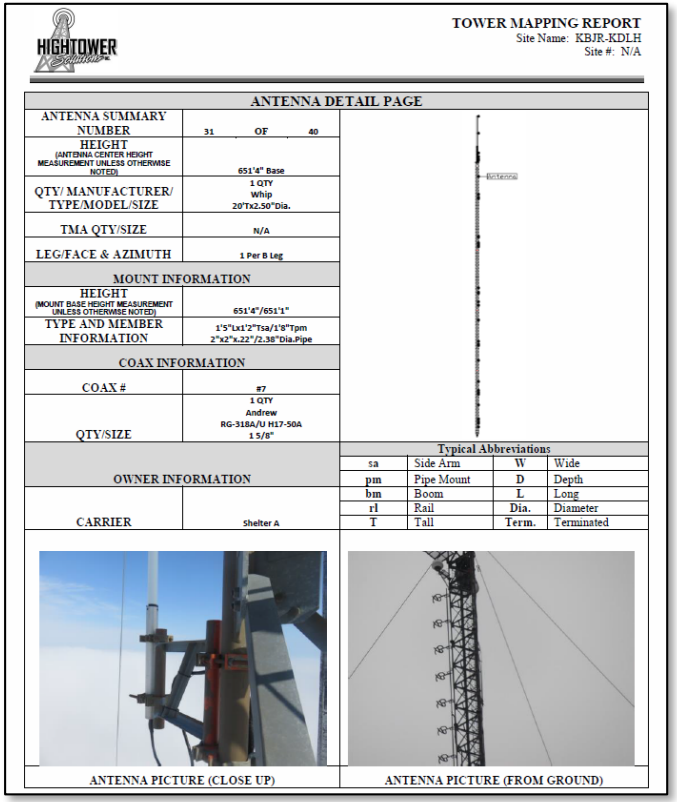
This section courtesy Quincy Newspapers, Inc.



KBJR / KDLH Site Survey

Comprehensive 232 page report, includes:

1. Current Transmitters Installed at the Facility
2. Survey of RF Systems
3. Internal and External Feedline Identification
4. Electrical Considerations
5. HVAC Capabilities
6. Tower Structural Analysis
7. Site and Building Layout



HIGHTOWER

TOWER MAPPING REPORT
Site Name: KBJR-KDLH
Site #: N/A

ANTENNA DETAIL PAGE

ANTENNA SUMMARY NUMBER	31 OF 40
HEIGHT (ANTENNA CENTER HEIGHT MEASUREMENT UNLESS OTHERWISE NOTED)	651'4" Base
QTY/ MANUFACTURER/ TYPE/MODEL/SIZE	1 QTY Whip 20'Tx2.50"Dia.
TMA QTY/SIZE	N/A
LEG/FACE & AZIMUTH	1 Per B Leg
MOUNT INFORMATION	
HEIGHT (MOUNT BASE HEIGHT MEASUREMENT UNLESS OTHERWISE NOTED)	651'4"/651'1"
TYPE AND MEMBER INFORMATION	1'5"Lx1'2"Tsa/1'8"Tpm 2"x2"x.22"/2.38"Dia.Pipe
COAX INFORMATION	
COAX #	#7
QTY/SIZE	1 QTY Andrew RG-318A/U H17-50A 1 5/8"
OWNER INFORMATION	
CARRIER	Shelter A

Typical Abbreviations

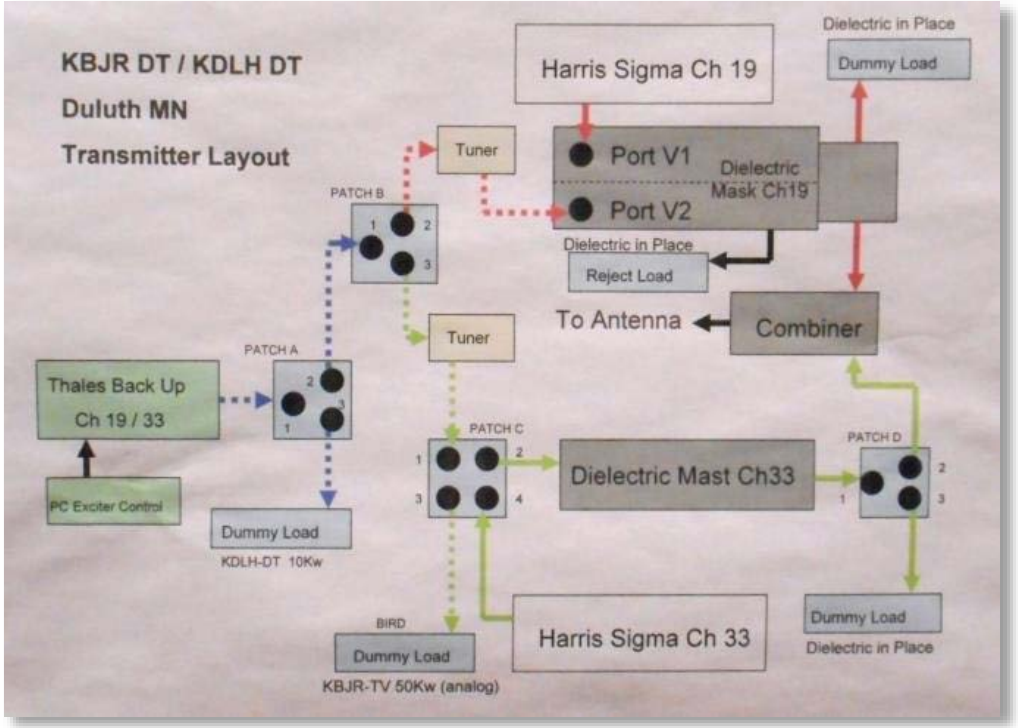
sa	Side Arm	W	Wide
pm	Pipe Mount	D	Depth
bm	Boom	L	Long
rl	Rail	Dia.	Diameter
T	Tall	Term.	Terminated

ANTENNA PICTURE (CLOSE UP)

ANTENNA PICTURE (FROM GROUND)

Current Tx Room Summary

- 4 Transmitters on site:
  - KBJR Ch19 – 1-Tube Std. IOT @ 26kW (480V)
  - KDLH Ch33 – 1-Tube Std. IOT @ 25.8kW (480V)
  - 5kW Solid State back up tx
  - 44kW Analog Tx (not in service)
- Determined due to obsolescence and other factors, both KBJR and KDLH systems will need to be replaced with new (Solid State) systems



Some Images From Tower Mapping Report








Summary

- Transmitter Building
  - Both IOT transmitters will be replaced with new Solid State
  - This site has the space, electrical capacity and HVAC to support the new equipment
  - New equipment can be quoted, along with needed support services, drawings, details, etc.
- Tower Analysis Results
  - The tower does not have sufficient capacity to carry the existing loads, per ANSI/TIA-222-G. One diagonal at 118.3% of maximum load
  - The following will require modifications:
    - *Tower diagonals from 130-ft to 160-ft and 175-ft to 220-ft*
    - *Tower diagonal connections from 17.5-ft to 40-ft*
  - If changes are made to the antennas (likely), the tower analysis will need to be adjusted

Thank You!

Martyn Horspool
Product Manager, TV Transmission