Communications for Model Railroads

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Agenda

- What are we modeling?
- Station Sets (phones)
- Common Equipment
- Signaling
- Hints

Don't just model train and terrain, we model operations which means jobs and processes

Communications for Operations

- Different eras had different dispatching models based on available communications
  - Telegraph/Telephone: TT&TO, CTC
  - Radio: DTC, TWC, CTC

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So the big question is: "what do you want to do?" Try to pick a scheme that is consistent with what you are modeling

Note CTC/TCS started in the 20s and continues. It coexisted with telegraph, phones and radio

What communications are you trying to model?

- Communications *among* DS and Operators?
  - Open speakers – a Radio Shack intercom is a good choice IF the DS and Agent/Operators are in quiet places, isolated from the railroad
- Communications *between* DS and crews
  - Idea is to keep crews "isolated" (no radio chatter)
  - Need to go to a "station" or phone booth to talk
  - Remember real crews rarely OSd themselves, so this is generally a non-prototypical operation
- Modern Railroading
  - Use radios: 5 channel (Maxon/Radio Shack) or FRS (Cobra, Motorola etc). This is true for CTC as well as DTC/TWC

Understand your operational requirements!

In actuality you may find the same constraints: lack of room and mainline affect your communications system as your layout. TT&TO era is hardest because there is no room for all of the operators needed. As usual compromises are needed.

Party line – safety feature. Radio were a great safety.

Phone booth show Kermit's

I'm addressing Communications *between* DS and crews in pre-radio (<1980) days, but these techniques may be adapted for communications between DS and Station Operators

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What most layouts want

How should it work? - 1

- OS from Station:
  - Conductor goes off hook
  - DS phone buzzes (or DS is listening to speaker)
  - DS goes off hook – buzzer stops (speaker muted, if present)
  - OS transmitted
  - Everyone goes back on hook

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No provision for station-to-station calling, although it could be done with extra button pads

How should it work? - 2

- DS Calls a station:
  - DS goes off hook
  - DS presses button corresponding to station(s)
  - Station buzzes, (optionally) lamp on "phone booth" lights & locks
  - Station answers (when crew sees lighted phone booth) – light extinguishes
  - TO read & copied
  - Everyone goes back on hook

Light on phone booth goes off and stays off until next time the DS calls. See Kermit's example.

Sets:

- W.E 211 type "space saver"
- Doesn't take much space in aisle
- Needs external speech network and ringer/buzzer*
- Appropriate for 20's thru 80's
- Originally had E or F type handset – consider replacing with G type handset (correct for 50s and 80s)
- Phoneco >= $125

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E and F type handsets are a problem waiting to happen: they have a triangular cross section so you can't tuck under your chin, they will fly off and being made of brittle bakelite they will shatter when they hit the concrete floor.

I have a friend who has some of these and can make better deals for stuff in better shape than Phoneco. See me off line.

There are other, "Active" methods and I am working on it with a colleague. These are easy to do and can use any old phone you might have around.

302 Set

- 302 type desk set
- Has internal speech network
- Appropriate for 30s through early 50s
- Equipped with F type handset
- Phoneco >= $199

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OK for the DS. Also consider candlestick phone on scissor mount. You will need to rewire the candlestick: all of the refurbishers wire the transmitter in series with the receiver resulting in excessive sidetone

500/554 Set

- 500 type desk set
- Designed by Henry Dreyfus of NYC fame
- Improved internal speech network
- Appropriate for 50s through early 80s
- Equipped with G type handset
- Has extra hook switch contacts
- Phoneco >= $99, often available cheap at garage sales and swap meets

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Early G type handsets had rectangular cross section but were bakelite, later ones ABS. Go for the ABS: lighter and unbreakable.

Roll your own

- Electrically a 500 set
    - G type handset
    - 425e network
    - Cradle and hookswitch
- Can be panel or Fascia mounted

Courtesy of Jack Burgess

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Neat, sweet and out of the way Note how nice Jack's look.

Common Equipment

- A way to power the phones: "Battery Feed"
- A way to signal (ring or buzz) a station or the Dispatcher
- A way to indicate when a station is off hook, "Supervision"
- A way to indicate that a train needs to stop and call
- Optionally: a way to indicate that a conversation is in progress so that crews can see before barging into an ongoing call

What is "Battery Feed?"

- Power
- DC v. AC
- What is "impedance?"
  - Think of it as AC resistance
  - A component (usually a coil) can have low DC R but high AC Z!

Battery feed alternatives

- Telco style Intercom
- Battery feed relay
- Normal relay
- Retard coil (401A KTU)
- PBX is not recommended
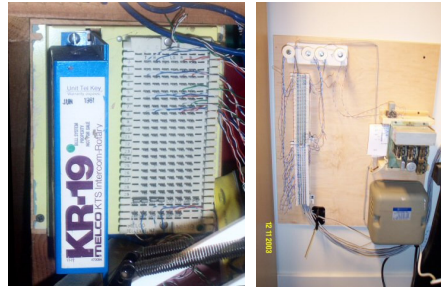
The goal is to have a relatively low DC Resistance (to power the phone) while keeping the impedance (AC resistance) at voice frequency as high as possible so we don't lose speech energy (so we can hear).
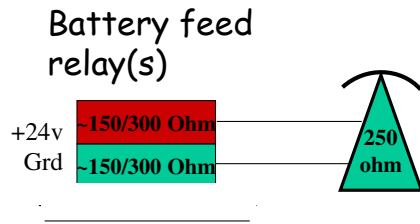
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Phone likes 20-80 mA.

PBX is a real pain, too much dialing and waiting. Conferencing is awkward at best.

Show a 401A card

Battery Feed Circuits with Supervision

Battery feed relay(s)

+24v ~150/300 Ohm
Grd ~150/300 Ohm

250 ohm

Same general circuit with Telco style battery feed relay, standard relay or retard coil. Current through relay causes it to operate.

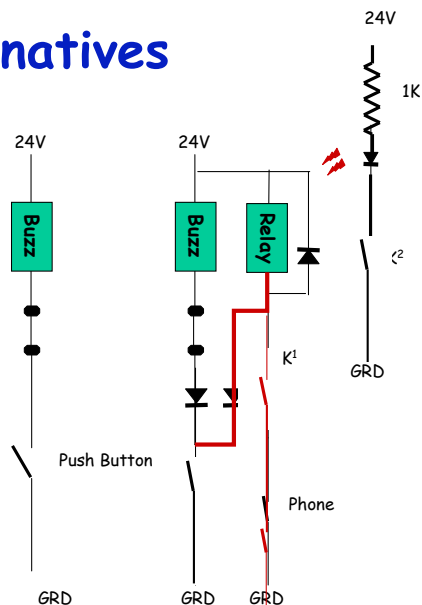July 8, 2004   15

Does the bottom circuit need a cap across the zener-resistor pair?

Contact for buzzer or other off hook indication. Show ice cube relay, 150 ohms

Signaling Alternatives

- Intercom
- Button/Buzzer arrangements
- Latching station circuit
- All circuits 24V

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Station Circuit   16

Left circuit is simple button buzzer

Right circuit buzzes, but also cause relay (K1) to operate and latch thru contact K1 and normally closed hookswitch contact. This keeps the station led

(use phone booth casting) lit. When crew goes off hook at station, K1 is released.

If you are using Chubb a few extra inputs and outputs can easily do all the logic you need.

Button buzzer pads can be any push buttons you like on your dispatcher's panel. SP used buttons on the CTC panels.

DS buzzer with cut-off

- DS buzzes when first station off hook, but turns off when DS off hook and stays off until everyone on hook (no re-ring)

250 ohm

24V

Buzz

Relay

K¹ K²

BF

DS Phone

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GRD DS Circuit 17
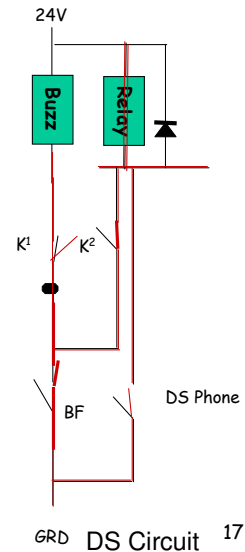
In this circuit, the BF ground causes the DS to buzz.

When the Ds goes off hook, the relay operates and then latches to the BF ground, so the buzz won't restart until everyone goes on hook

Can do all this logic with spare Chubb leads

Noise/Adequate Volume

- Use high impedance battery feed if possible
- Busy indicator to warn of conversation in progress (user discipline)
- Push-to-talk or noise canceling handsets
- DO NOT use amplified handsets: they amplify the noise in the room, too!

Large System Issues

- Have more stations (5 – 20)
- More phones off hook as crews tend to call in every time they see a red signal
- More phones means more ambient noise and less volume – combining loss
- Traditional phones don't work well
- Systems with active combiners and amplification work better.
- Chubb once made one like this
- Contact me if you are interested

Remote Access

- Real dispatchers sit/sat miles from the action, why should your friends who don't live nearby miss the Op Session?
- with SBC and Verizon now offering $20 "all the toll you can eat" plans, Long Distance cost should NOT be an issue
- Internet is nicer for cable modem/DSL users as it leaves the home phone free – or else tell your family to use their cell phones!
- We're planning to add this capability as option to the phone system discussed in the last slide

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Other

- Use Cat 5 ($30/kft), has 4 pair, or CAT 3 ($10/Kft if you can find it)
- Use terminal strips or telephone style 66 blocks for connections

Sample of Punch block, tools

Cat 5 often available as scraps

Resources

- Phoneco 608-582-4124
    - www.phonecoinc.com
- Antique phone collectors site
    - atcaonline.com/diagrams.html
- Graybar 408 441-9009
    - www.graybar.com
- Radio Shack, Fry's, HDB etc.
- I have a limited number of telephone sets available. Contact me at sneumann@pacbell.net
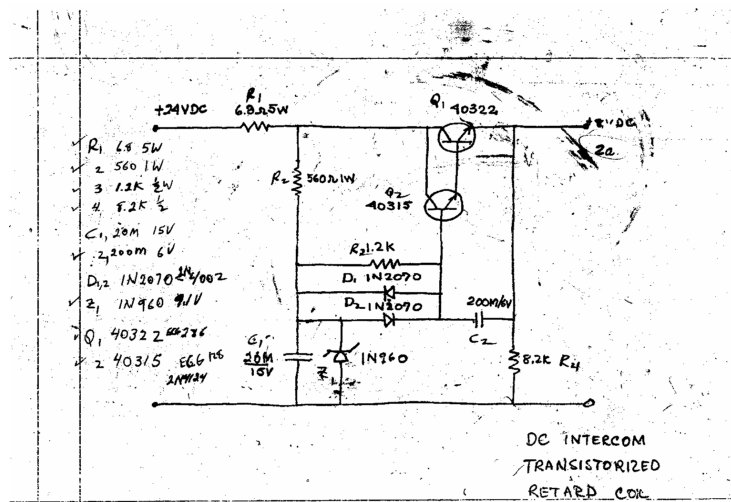
Wiring Diagrams

Wiring for 211 Set

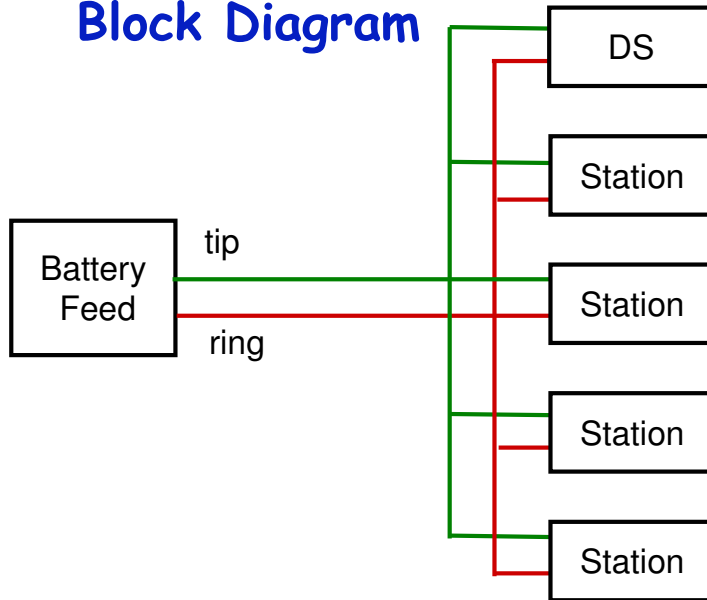| Name	425 network	211	F1 Handset	G3 Handset
	B	White/Blue	Black (XMTR)	Black (XMTR)
	R	Blue/White	Red (XMTR, RCVR)	Red (XMTR) White (RCVR)
	GN	White/Orange	White (RCVR)	White (RCVR)
	RR	White/Green Contact 1		
Tip	G* (traditionally used L1)	Green/White Contact 1		
	C	White/Brown Contact 2		
Ring	L2	Brown/White Contact 2		

Transistorized High Impedance Feed

Courtesy of Hilding Larson

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Block Diagram